

Scientific Monograph No. 5.

MS. 10.5

Of the Imperial Council of Agricultural Research.

# THE BOMBAY GRASSES

BY

E. BLATTER, SJ., Ph.D., F.L.S.,

AND

C. McCANN, F.L.S.,

*Assistant Curator, Bombay Natural History Society*

**Illustrated**

BY

R. K. BHIDE,

*Economic Botanist, Department of Agriculture, Dhule*



Published by the Imperial Council of Agricultural Research

DELHI: MANGERS OF PUBLICATIONS  
1940

Printed by the Imperial Council of Agricultural Research





Photograph

A field containing a Bland of *ijtirj/xittoyyn montantj* Trm. mid *SsATHM lurtNMum* Btaf with \*catterotl *lItUroj,ioo<nd nMigtlM* Tliw

Photo by

W. Burns.

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In the key we have, wherever possible, closely adhered\* to Stapf in vol. IX of Praia's Flora of Tropical Africa.

We have made the synonymy as complete as possible. We thought this to be not only useful but necessary, especially in a country where very few people have access to good botanical libraries and where many a worker has to rely on some odd books, sometimes of a very early date. Everybody will thus be enabled to co-ordinate the old or antiquated names with the more recent ones.

\* Regarding the vernacular names we mention chiefly those which are known in the Bombay Presidency. We have not been in a position to examine them critically, not even superficially and, therefore, not much reliance should be put on them.

Of herbaria we have seen the following: Calcutta, Dehra Dun, Gujarat College, St. Xavier's College, Poona (Science College, Herbarium of the Economic Botanist, and Talbot's Herbarium), Lisboa's collections and the private herbarium of L. J. Sedgwick and T. R. Bell, and our own collections.

The preliminary revision of the Bombay Grasses was published by us in the Journal of the Bombay Natural History Society, Vol. XXXII-XXXIV (1927-30).

It now remains to express our deep gratitude to all those who have helped us in this work. Mr. C. E. C. Fischer and Mr. C. E. Hubbard of the Kew Herbarium were always ready to reply to our numerous inquiries and Pr. Stapf obliged us in many ways. We can say the same of several other members of the staff at Kew. Equal thanks are due to Dr. W. Burns, Director, Department of Agriculture, Bombay Presidency and Mr. K. Biswas, Curator of the Calcutta Herbarium. Dr. A. D. Blascheck, President of the Forest Research Institute and College, Dehra Dun has been kind enough to permit the reproduction of 4 plates from Hole's Forest Grasses.

All asterisk in front of a name means that the particular genus or species has been introduced.

—  
Pamshgani, November 1933.

E. BLATTER.

n M nAW  
C. McCANN.



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# THE BOMBAY GRASSES

BY

E. BLATTER, S.J., Ph.D., F.L.S.,

AND

C. McCANN, F.L.S.,

*Amtani Curator, Bombay Natural History Society.*



Illustrated

BY

R. K. BHIDE,

*Economic Botanist, Department of Agriculture, Hyderabad-Deccan.*

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## GEAMINEAE

Erect decumbent or creeping herbs (rarely suffruticose), or in Tribe *Bambuseae* shrubs or trees; stems usually branched at the base, terete or compressed, with hollow or solid internodes. Leaves distichous, simple, usually long and narrow, generally parallel-nerved, with a sheathing base (sheath) distinct from the blade and rarely an interposed petiole; sheath split to the base (very rarely entire), with usually a transverse erect appendage (ligule) consisting of a membrane or a fringe of hairs at the union with the blade.

Inflorescence terminal (rarely terminal and lateral), composed of variously arranged spikelets, paniculate, racemose, capitate, simply or compoundly spicate (rarely of a single spikelet). Spikelets consisting of an axis (rhachilla) and typically of 3 or more alternate distichous more or less heteromorphous bracts (glumes), of which the 2 lowest (involucral glumes) form an involucre to the spikelet and are empty, while the following (floral glumes) bear in their axils sessile flowers subtended by a hyaline 2-keeled or 2-nerved dorsal scale (palea); floral glumes differing usually in structure and size from the involucral glumes, and forming with the palea and the flower proper false flowers (florets), which are alike or different in structure and sex. Flowers hermaphrodite or 1-sexual (often with the rudiments of the other sex), consisting of 2 (rarely 3) minute hyaline fleshy scales (lodicules) which represent a perianth (sometimes absent), and of stamens or a pistil or both. Stamens usually 3 (rarely 6, 4, 2, or 1, very rarely more), hypogynous; filaments slender, usually free; anthers versatile, fugacious, with 2 parallel cells, usually dehiscing by a longitudinal slit. Ovary entire, 1-celled; ovule erect, anatropous; styles 2 (rarely 3 or 1), free or connate at the base, usually elongate and exerted from the apex or sides of the spikelet, clothed with simple or branched stigmatic hairs.

Fruit a seed-like grain, free within the flowering glume and palea or adnate to either or both; pericarp very thin (rarely thick and separable from the seed). Seed erect; albumen copious, floury; embryo minute, at the base of and outside the albumen; cotyledon shield-shaped with an erect conical plumule and a descending conical radicle.

Genera about 483. Specimens over 5,870.—In all regions of the world.

KEY TO THE GENERA.

We follow, where possible, the systematic arrangement given by Stapf in the Flora of Tropical Africa.

**SUBFAMILY I: PANICOIDEAE-Mature spike-**

lets falling entire from their pedicels OJ with them, all alike or differing in sex and structure; perfect spikelets with 2 heteromorphous florets, the upper hermaphrodite, the lower male or barren; rhachilla not continued beyond the upper floret (Genera 1-62).

**Tribe I:** Mayidea<sup>^</sup>.—Sexes in different inflorescences on the same plant or the female spikelets at the base of the inflorescence, the male above them; spikelets never awned, the male and female very dissimilar (Genera 1-4).

1. Male and female spikelets in separate inflorescences; male spikelets in a large terminal panicle; the female spikelets in the axils of the leaves.
  - a. Female spikelets distinct, articulated . . . . . 1. *Euchlaena*\*
  - b. Female spikelets grown together into a spongy more or less cylindrical body . . . . . 2. *Zea*.
2. Male and female spikelets in separate portions of the same spike, the female below.
  - a. Grain enclosed in the usually globose or ovoid ivory-like capsuliform supporting sheath . . . . . 3. *Coix*.
  - b. Grain enclosed in the hardened outer glumes . . . . . 4. *Polytoca*.

**Tribe II: Andropogoneae**.—Spikelets usually in pairs, one sessile, the other pedicelled, very rarely both pedicelled, those of each pair alike as to sex (homogamous) or different (heterogamous), rarely 3-nate or solitary on the axis of a usually spike-like raceme. Involucral glume more or less rigid and firmer than the floral glumes, the lower always longer than the florets; floral glumes membranous, often hyaline, that of the upper floret usually awned or reduced to an awn (Genera 5-41).

1. SUBTRIBE: DIMERINAE.—Spikelets homogamous, secund on a slender inarticulate rhachis, 1-flowered, diandrous . . . . . 5. *Dimeria*\*
2. SUBTRIBE: ISCHAEMINAE.—Fertile spikelets 2-flowered; fertile floret awned from the sinus of the bifid or bidentate upper floral glume (sometimes awnless) in *Apluda* (Genera 6-13).
  - a. *Oroup Ischaemastrae*.—Racemes several- to many-noded, espatheate; spikelets of each pair homogamous or more often heterogamous, usually similar in shape and nervation, rarely distinctly heteromorphous; fertile spikelets awned (Genera 6-12).
    - \* Margins of lower involucral glume of sessile spikelet inflexed.
    - f Stem not woolly below; joints and pedicels stout; spikelets heterogamous (Genera 6-8).
    - J Spikes clustered; lower involucral glume not channelled . . . . . 6. *Ischaemum*.
    - J J Spikes solitary; lower involucral glume usually channelled . . . . . 7. *Sehima*.
    - lf Eootstock and base of sterile clothed with woolly sheaths; spikelets similar and homogamous . . . . . 8. *Pallinidium*.
  - \*\* Margins of lower involucral glume of sessile spikelet not inflexed (Genera 9-12).

- † ~~Spikes~~ solitary; 'spikelets 2-nate, 1-2-flowered, 2-awned . . . . . 9. *Pogonatherum*.
- ft Spikes solitary or 2-nate; spikelets 2-flowered, diandrous; lower involucre glume very broad truncate . . . . . 10. *Apocopis*.
- ftt Spikes digitate; spikelets 2-flowered; lower involucre glume tubercled . . . . . 11. *Thdepogon*.
- tttt Spikes 2-8-nate; spikelets 2-nate, upper alone awned . . . . . 12. *Lophopogon*.
- b. *Group Apludastrae*.—Racemes 1-noded, reduced to 3 heteromorphous spikelets, the sessile with a male and a hermaphrodite floret and an inflated callus, one pedicelled with 2 male florets, the other rudimentary on a glume-like pedicel; fertile florets awned or awnless . . . . . 13. *Apluda*.
3. STJBTBIBE : ROTBOELLINAE.—Fertile spikelets 1- or 2-flowered ; fertile florets awnless (Genera 14-21).
- Group Rotboelliastrae*.—Racemes at the ends of the culms and their branches in a false (rarely true) spatheate panicle or solitary and terminal on simple or sparingly branched culms.
- a. Spikelets all alike, also as to sex ; racemes tough or tardily disarticulating, much compressed, joints and pedicels fused . . . . . 14. *Hemarihria*.
- b. Spikelets of each pair more or less dissimilar, at least as to sex, the pedicelled male, neuter or suppressed (Genera 15-21).
- \* Sessile spikelets small, globose, foveolate, 1-flowered, pedicelled very dissimilar ; joints and pedicels fused . . . . . 15. *Manisuris*.
- \*\* Sessile spikelets not globose (Genera 16-21).
- f Sessile spikelets winged from the transversely rugose or muricate lower involucre glumes, 1-flowered, pedicelled very dissimilar; joints and pedicels fused . . . . . 16. *Peltophorus*.
- ft Sessile spikelets not winged (Genera 17-21).
- t Racemes usually more or less villous, very rarely glabrous, never cylindrical; joints and pedicels moderately stout, gaping.
- § Spikelets 2-flowered, very villous all over, the sessile sometimes 2 at a node and sub-opposite . . . . . 17. *Lasiurus*.
- §§ Spikelets 1-flowered; racemes more or less villous from the joints and pedicels or the edges of the spikelets, rarely glabrous; lower involucre glume with a transparent oil-duct inside each keel or a fringe of penicillate warts . . . . . 18. *Elyonurus*.
- %% Racemes glabrous, cylindrical, particularly when the spikelets are closed (Genera 19-21).
- § Pedicels and joints fused.
- ^] Racemes stout, few from each culm ; sessile spikelets 2-flowered, pedicelled male or neuter . . . . . 19. *Rotboellia*.
- IHf Racemes slender in ample spatheate panicles; sessile spikelets 1-flowered . . . . . 20. *Ophiurus*.
- §§ Pedicels free from the joints; racemes usually in terminal and lateral spatheate fascicles or fastigiata panicles; coarse tall grasses . . . . . 21. *Codorrhachis*.
4. SUBTRIBE : SACCHARINAE.—All spikelets alike in shape and sex, or if different in sex, then the pedicelled female (Genera 22-25).
- a. *Group Saccharastrae*.—Racemes in more or less compound panicles or racemosely arranged



on an elongated common axis; spikelets 1-flowered; awn from the sinus of the 2-dentate floral glume or from the tip of the entire valve or O (Genera 22-24').

- \* Rhachis quite tough; racemes in spike-like or thyrsoid solitary panicles; all spikelets pedicelled, muticous . . . . . 22. *Imperata*.
- \*\* Rhachis of racemes readily disarticulating,
  - t Spikelets in a wide, often thyrsoid, more or < less plumose and silvery panicle, 2-flowered, usually awned, rarely mucronate or awnless . . . . . 23. *Saccharum*.
  - ff Spikelets in paniced racemes, 2-flowered, awned . . . . . 24. *Spodiopogon*.
- 6. *Group Polliniastrae*.—Racemes digitate, rarely solitary; spikelets 1-2-flowered; awn from the sinus of the 2-fid or 2-dentate floral glume; spikelets dorsally compressed; callus short, obtuse . . . . . 25. *Eulalia*.
- 5. SUBTRIBE : ANDROPOGONINAE.—Spikelets of each pair different in sex and frequently also in shape and size, or if those of some pairs of a raceme are alike in sex, then both male or neuter; fertile spikelets 1-flowered (Genera 26-41).
  - a. Racemes in more or less compound espatheate panicles; pedicels without a translucent middle line (Genera 26-29).
    - Group Sorghastrae*.—Pedicelled spikelets male, neuter or suppressed (including the pedicel in *Cleistachne*); awn from the sinus of the 2-fid floral glume.
    - \* Spikelets dorsally compressed, at least when in flower; lower involucrel glume of the fertile spikelets firmly chartaceous to coriaceous,
      - f Spikelets in threes, one of them fertile, or in racemes of 2-8 pairs the pedicelled male, neuter, or if quite suppressed then at least the pedicels present . . . . . 26. *Sorghum*\*
      - ft Spikelets solitary. . . . . 27. *Cleistachne*.
    - Spikelets laterally more or less compressed,
      - f Racemes of many pairs of spikelets; primary branches of panicles in whorls of 6-20 . . . . . 28. *Vetiveria*.
      - ff Racemes usually reduced to 1 sessile hermaphrodite and 2 pedicelled male or barren spikelets, rarely of 2 or more but always few pairs . . . . . 29. *Chrysopogon*.
    - b. Racemes not in compound espatheate panicles or if so (*Capillipedium*) then the pedicels with a translucent middle line (Genera 30-41).
      - \* Fertile floral glume awned from low down on the back.
        - Group Arthraxonstrae*.—Sessile spikelets convex on the back and rounded on the sides, often muriculate, particularly along the sides; pedicelled usually rudimentary or O, rarely male; racemes digitate . . . . . 30. *Arthraxon*,.
      - \* Fertile floral glume awned from the sinus of a 2-fid or 2-dentate valve or continuing the more or less stipitiform floral glume (Genera 31-41).
        - f Margins of the lower involucrel glume of the fertile spikelets inflexed and the glume therefore sharply 2-keeled more or less all along with a short obtuse callus, rarely the keels rounded off downwards with the margins subin volute, but then the back of the glume deeply sunk

- between the keels and the callus short or long and acute; awn glabrous or scabrid, very rarely hirsute (*Andropogon sp.*); spikelets awned (Genera 31-37).
- X **Awn forming** a continuation of the stipitiform fertile floral glume.
- Group Amphilophiastrae.*—Racemes digitate or racemosely digitate, and then usually very numerous, all more or less peduncled on simple or almost simple culms, or solitary at the end of the culms and their branches and sometimes gathered into a scanty spatheate false panicle, rarely in compound spatheate panicles (*Capillipedium*) (Genera 31-34).
- § Racemes in compound spatheate panicles . . . . . **31. *Capillipedium*.**
- £§ Racemes not in compound spatheate panicles (Genera 32-34).
- ^[] Racemes digitate, or many racemosely arranged on a common axis shorter than the raceme (Genera 32-34).
- || Sessile spikelets of all pairs hermaphrodite, awned . . . . . **32. *Amphilophis*.**
- ||| Sessile spikelets of the lowest 1-3 or 4 pairs male or neuter and awnless . . . . . **33. *Dichanidium*.**
- ff Racemes solitary at the ends of the culms and branches . . . . . **34. *Eremopogon*.**
- XX Awn from the sinus of the 2-fid or 2-dentate fertile floral glume (Genera 35-37).
- § *Group Schizachyriastrae.*—Racemes solitary at the ends of the culms and their branches, the branches usually gathered into a narrow, lax, spatheate false panicle; joints and pedicels thickened upwards; pedicelled spikelets male, neuter or suppressed . . . . . **35. *Schizachyrium*.**
- §§ *Group Andropogonastreae.*—Racemes 2-nate at the end of simple or almost simple culms or gathered into spatheate false or true panicles.
- ^J Racemes 2-nate on a slender peduncle arising from a flattened spathe; sessile spikelets alike in sex and form; joints opaque . . . . . **36. *Andropogon*.**
- ^f[] Racemes 2-nate, with a spathe supporting or surrounding each pair, gathered into often much decompound spatheate panicles; the lowest pair of one of the racemes homogamous, male or neuter; all pairs of the other heterogamous; mostly aromatic grasses . . . . . **37. *Cymbopogon*.**
- ff Margins of the lower involucre of the fertile spikelets involute, inflexed and 2-keeled (if at all) only close to the tips, the spikelets therefore with rounded sides or quite terete; callus elongate and acute or pungent; awn more or less hirsute, from the stipitiform floral glume (Genera 38-41).
- X *Group Heteropogonastreae.*—Racemes many-noded, solitary; all pairs of spikelets heterogamous and alike or the lowest many homogamous and barren, very different from the fertile, not forming an involucre around them . . . . . **38. *Heteropogon*.**
- XX *Group Themedastrae.*—Racemes fasciclediform, solitary at the apex of the stem and branched. Spikelets dimorphic, the 4 lower ~~sessile~~ forming an involucre round the upper.
- § Rhachis articulate below the involucre spikelets . . . . . **39. *Iseilema*.**

- §§ Rhachis articulate above the involucre spikelets . . . 40. *Themeda*.  
 fJJ Group *Pseudoihemedastrae*.—Like *Themedastrae*  
 above, but without the involucre spikelets  
 of that group . . . . . 41. *Pseudanthistiria*\*

**Tribe III**: Paniceae.—Spikelets in usually continuous spikes, racemes or panicles. Involucral glumes herbaceous or membranous, the lower generally smaller, very small or suppressed. Lower floral glume generally resembling the involucre glumes in structure and nervation, the upper fertile firmer, at length rigid, often chartaceous or crustaceous, awnless, very rarely mucronate (*Urochloa*) (Geneva 42-62).

1. SUBTBDMS : PAOTCINAE.—Upper floret only fertile ; lower floral glume usually resembling the upper involucre glume, not indurated (Genera 42-61).

A. Undershrubs; flowers dioecious.

Group *Spinificalstrae*.—Male spikelets 2-flowered, articulate in rigid umbellate spikes ; female in large globose heads of stellately spreading quill-like rhachis, one spikelet at the base of each

42. *Spinifex*.

B. Herbs; flowers not dioecious (Genera 43-61).

a. Group *Digitariastrae*.—Inflorescence of usually slender, spiciform, digitate or subdigitate or somewhat distant, very rarely solitary racemes; fruiting floral glume with usually flat, thin to hyaline margins, thinly cartilaginous, often brown or dark, with the usually minute, often microscopic, scale-like palea of the barren floret attached to the base.

\* Spikelets awnless; lower involucre glume minute, rarely 0; lower floral glume usually with 5-7 close, straight, prominent nerves . . . . . 43. *Digitaria*.

\*\* Spikelets slender awned . . . . . 44. *Alloteropsis*.

b. Inflorescence usually different (but see *Axonopus* and *Paspalum*); fruiting floral glume with more or less inrolled margins, usually crustaceous and straw-coloured or whitish; palea of the barren floret, if developed, not attached to the false fruit (Genera 45-61).

\* Spikelets falling entire and singly from the persistent pedicels (Genera 45-58).

f Group *Panicastrae*.—Spikelets not awned, or if awned, then sessile in false second variously arranged spikes and with the awns from the entire tips of the upper involucre glume and lower floral glume (*Echinochloa* sp.) or from the tips of both involucre glumes or at least the lower (Genera 45-58).

t Inflorescence of variously arranged (rarely solitary) simple or compound, usually secund, spike-like, dense (rarely loose) racemes, not an open or contracted and cylindrical panicle; spikelets usually paired or sometimes particularly\* towards the base of the raceme in fascicles of 3 (rarely more) unequally pedicelled or solitary, alternately to the right and the left of the median line of a usually dorsiventral rachis ; fruit dorsally (vtTy

- rarely laterally) compressed, its glume and palea crustaceous; racemes usually rather dense (Genera 45-52).
- f Back of fruit abaxial (Genera 45-47).
    - || Spikelets strongly laterally compressed, distant on long slender rhachises; lower involucrel glume herbaceous, as long as the spikelet . . . . . 45. *Pseudechinolaena*\*
    - III Spikelets more or less dorsally compressed; lower involucrel glume never herbaceous.
    - H Lower involucrel glume rudimentary with a swollen annular callus at the base of the rhachilla; fruit mucronate . . . . . 46. *Eriochloa*.
    - HH No swollen annular callus at the base of the spikelet. Lower involucrel glume present; racemes racemosely arranged . . . . . 47. *Brachiaria*.
  - fff Back of the fruit adaxial (Genera 48-52).
    - || Lower involucrel glume typically absent; spikelets usually conspicuously plano-convex, with the flat side turned away from the rhachis . . . . . 48. *Paspalum*.
    - HH Lower glumes developed; rhachis persisting, not articulate; spikelets falling from the pedicels (Genera 49-52).
      - H Involucrel glumes neither awned nor caudate; if shortly cuspidate-acuminate, then the fruiting floral valve obtuse with an imposed mucro and the margins inrolled all along.
      - T Fruiting flowering glume acute, not mucronate; spikelets solitary, closely biseriate, contiguous with their sides; false spikes rigid, not several times longer than the internodes of the long common axis; their lower parts more or less appressed to the alternately hollowed out flanges of the latter . . . . . 49. *Paspalum*.
      - TT Fruiting flowering glume obtuse, abruptly mucronate or aristulate; spikelets solitary or paired, when solitary contiguous with their backs; false spikes often flexuous or curved, usually several times longer than the internodes of the relatively short common axis, spreading from the base . . . . . 50. *UrocMoia*.
    - HH Glumes caudate or cuspidate-acuminate or awned.
      - T Glumes awned from the entire acute or acuminate tip, or caudate or cuspidate-acuminate; margins of the fruiting flowering glume flat upwards, not embracing the tip of the palea; racemes dense, more or less secund, often very numerous . . . . . 51. *Echinochloa*.
      - TT Glumes awned from the slightly notched tips; racemes elongated or short to very short, secund, compact, spreading from the common axis . . . . . 52. *Oplismenus*.
    - jj Inflorescence an open panicle, rarely contracted, cylindrical and spike-like (*Saccolipsis*, *Setaria* \$p.\$) (Genera 53-58).
      - § Spikelets not supported by bristle-like branches (Genera 53-57).
        - Spikelets not gibbous or, if slightly so, then not in cylindrical false spikes (Genera 53-56).
        - || Branches of panicle not adnate to the main axis.
          - H Panicle much contracted, dense, very compound, with erect narrowly lanceolate spikelets; lower floral glume beaked, upper floral glume rather thin . . . . . 53. *Hymenocne*.

- HH** Panicle usually **open**; lower floral glume not beaked, upper floral glume **ors** *staccous* . . . . . 64. *funnevm.*
- **HH** Branches of panicles more or less *U*nate to the main axis so that the *pedioeU* appear to spring more or less directly from the axis . . . . . 55. *SacdolepU.*
  - HI** Branches of the panicle **produced beyond** the *ujijiermost* spikelets; *lower* **trohtoral** glume minute, orbicular, white, hyaline . . . . . 56. *Pseudoraphis.*
  - Sj** *Sj*nkeleta [**listinctly** gibbous, **laterally** much compressed . . . . . 57. *Cyrtococaum.*
  - g§** All the **spikaete** or **only** the **upper of each** branch supported by bristle-like branches . . . . . 58. *Setaria.*
  - fj- Group Meliniastra** etc.—Spikelets finely awed at mucronate from the notch; **tips** of the upper *inv«lateral* **glume** and barren *itornl* glumes (or if *mutir«ous*, these *it lfn.st* slightly **notched**) **delicately pedioeHed, paniced; lower in** *olneral gl»mp* very minute, *l. upper* *inv«lateral* glume and *iarren* floral glume *gibl»nie* at or below the **middle, both** *«nerved*; **nerves hidden** by copious and long silky **hairs** and anastomosing below the obtuse tips . . . . . 59. *Tricholoma.*
  - \*\*** Spikelets falling in **groups, of** if *sugly then* surrounded by an *involucral* of bristles or *nr* **supported by 1 to several** bristles.  
*Group Cerchastmc.*—Spikelets **calling by an involu- oral** of bristles or spines or **bract-like at** *base*, or at least **rap** by **several** bristles; or with the *lower* *involucral* **ghnnis** of each *gro»\»* forming a *fnlw?* involucre.  
 + *involucro* of *free* **ad or plumose** bristles . . . . . 60. *Pinnisetum.*  
 tt *Involucres* of *«-iaes* or rigid bristles united at the base into a hard cup . . . . . 61. *Ce»chru\$.*
  - 2. SUBTBIBK I-«HMX** *u.*—**Both**, *noets* **fertile**, or if the *lower* *nuiU.*, **then** its **Bora** *gtune* **Daore** *«r* less resembling that of this upper flonit *nnd* indurated.  
*QtOltp laacknastrrie* . . . . . 62. *Imchue.*

**SUBFAMILY II : POOIDEAE.**—Mature spikelets

- breaking **up, leaving** the persistent or *su!*—*]eraistnt* **gb** *mos* on the **pedicel, CH** if **falling entire, then not** *consUtiug* of 2 heteromorphous **Boreta** its **in Panicoidae** (Genera 63-111).  
 ]. **Blades** not articulated on the sheath, rarely (*C«ntotheca*) transversely veined (Genera 63-10<sup>0</sup>).  
 a. Awn of the *fenile* *floret*, if present, **kneed and twisted** **beloff tin- knee, as** straight *«* **ceduced** *torais* (Genera 63-79).  
 • Florets 2 or more (Genera *ftt-7' i*).

**Tribe IV : Arundinelleae.**—Florets 2, heteromorphous,

- the lower **awnlesa, or barren.** Rhachilla not continued **beyond** the **upper** *«fits* **Lower floral glume** *awnjeas, m«ut* *re«nibling* *lll»* **involucral** *glutnea*; **upper generally** *nvned*, at length firm or *liiinl* : awn from the *sinus* between 2, **sometimei** *minute, or* bristle-like, *loins*, rarely from the entire obtuse tip, usually **kneed and twisted** below the **knee.**  
 † **Upper** floral plume *2-aotose, minutely* 2-toothed or entire; awn sometimes *rednee* *«l*  
 tt **Upper** floral plume **always** distinctly *«-toothed* or 2-lobed *JKII*; *«lwE««»* *«* **kneed**; *«-««»* spikelets in clusters of 3 . . . . . 63. *Arundinella.*  
 84. *Truta* *«yga.*

Tribe V : Aveneae. — Florets 2-many, all alike, except the uppermost which often are reduced. Floral glumes with hyaline shining margins or firmer, 5- or more-nerved, rarely 3-nerved; awn, if present, from the back or sinus or between bristles.

t Floral glumes awnless or awned from the back; florets 2 or more, the uppermost reduced.

X Spikelets 2- or more-flowered, awned . . . . . 65. *Avena*.

XX Spikelets 2-flowered, awnless . . . . . 66. *Goeiochne*.

tt Floral glumes awned from the sinus of the bifid tip; florets 3-many, the uppermost reduced . . . . . 67. *DanOloma*.

Tribe VI: Artindineae.— Florets 2-many, enveloped in very long hairs, springing either from the callus or from the back or margins of the floral glumes,

t Hairs springing from the margins of the upper floral glume . . . . . (JS. *Thyswlaena*).

ft Hairs springing from the callus . . . . . 69. *Phragmita*.

tft Hairs springing from the involucrel glumes . . . . . 70. *Arundo*.

\*\* FloreU (Genera 71-79).

Tribe VII: Agrostae — Floret 1. Rhachis rarely produced beyond the floret; upper floral glume membranous, not changed when mature, usually 5-nerved, all the nerves or the outer side-nerves often slightly excurrent, parallel or at least not anastomosing. Spikelets awned or not.

t Spikelets in cylindrical spike-like panicles, not awned . . . . . 71. *Heleocliloa*.

ft Spikelets in open or contracted many-flowered panicles, awned.

X Involucrel glumes acuminate or awned . . . . . 72. *Gamotia*,

XX Involucrel glumes awned from the notched or lobed tips . . . . . 73. *Pottipogon*.

Tribe VIII: Stipeae.— Floret 1. Rhachis not produced beyond the upper floral glume which is bisexual, hardened when mature, tightly enveloping the fruit; nerves joining or closely approaching at the tip. Awn terminal, rarely absent.

Awns 3, from the entire tip, or 1, simple below and 3-branched above, or rarely jointed simple . . . . . 74. *Arielida*.

Tribe IX : Zoysiaeae.— Floret 1. Mature spikelets falling entire and singly, or in clusters. Rhachis not continued beyond the floret. Involucrel glumes equal or the lower much smaller and suppressed. Floral glume small, delicately membranous, 5-nerved; spikelets in slender spiciform panicles or racemes (Genera 75-79).

t Spikelets falling in distichs of 1-1, fascicled.

S; Fascicles secund on a broad rachis; glumes 1: involucrel glume not echinate . . . . . 75. *Traehys*.

§§ Fascicles all round a slender rachis; glumes 3; upper involucrel glume . . . . . 76. *Phaia*,

Xt Spicelata singly.

i Lower involucrel glume with pectinate margin; upper involucrel glume spinulose tuberculate; glumes 3 . . . . . 77. *Latipe*.\*

^ Involucrel glumes neither pectinate nor tuberculate. • Glumes 2; spikelets not awned . . . . . 78. (*Herdania*).

" • Glumes 3; spikelets with a long awn . . . . . 79. *Perota*.

b. Awn of the fertile floret, if present. Movable and twisted below the knee (Genera 80-100).

\* Floral glumes typically 3-nerved (Genera 75-79).

**Tribe X : Sporoboleae.**—floret 1. Involucre! and floral glumes very similar ; rachilla not or rarely produced beyond the floret. Upper floral glumes membranous, acute or obtuse, not changed when ripe, 1- or more or less distinctly 3-nerved, awnless, usually olive-green or grey ; side-nerves, if present, delicate, evanescent above. Seed often free in the delicate pericarp. Spikelets small . . . . . 80. *Sporobolus*.

**Tribe XI : Eragrosteae.**—Florets usually numerous and fast exerted from the glumes, spikelets variously panicle, sometimes spike or subpanicate; involucre and floral glumes somewhat, similar in general appearance ; floral glumes membranous or cartaceous, entire or 2-3-cleft, 3-nerved, the nerve evanescent above or excurrent into bristles; side-nerves usually submarginal, glabrous or pubescent or imbricate below ; panicle often persistent or sub-persistent (**Genera** 81-85).

† Floral glumes entire (Miliaria 81-84).

X Upper involucre glume 3-nerved . . . . . 81. *Eragrostis*.

XX Upper involucre glume 5-nerved . . . . . 82. *Habypnum*.

XXX Upper involucre glume 1-nerved.

• Floral glumes ovate subacute or obtuse . . . . . 83. *Leptochloa*.

§§ Floral glumes acute or acuminate; . . . . . 84. *Demostachya*.

†† Panicle limbed toothed . . . . . 85. *Diplachne*.

**Tribe XII : Chlorideae.**—Florets 1 to many. Spikelets usually in branched and spikes or spike-like racemes, rarely distinctly pedicellate and paniculate ; floral glumes usually membranous, entire, emarginate or toothed, 3-nerved ; nerves distant, subparallel, distinct, percurrent or excurrent, and often dilated all along, the lateral submarginal (in five-nerved or more sometimes additional side-nerves added to the middle nerve of the glume). Awn, if present, straight, usually from a truncate or toothed tip (**Genera** 86-95).

† Floral glumes entire, emarginate or more or less 2-decussate or 2-lobed, mucicous or with the middle-nerve running out into an awn or inlets, or reduced to a point in some species of *Tripsacum* (**Genera** 86-94).

I Spikelets 1 (Qowered) (**Genera** 86-89).

§ Spikes solitary, terminal (or also *Chloris*) (**Genera** 86-88).

If spikelets minute, more or less sunk in the rachis, . . . . . 86. *Oropetium*.

†† Spikelets not sunk in the rachis.

|| Spikelets minute, unilateral on flattened rachis, 1-flowered . . . . . 87. *Microchloa*.

III Spikelets minute, 1-2-flowered in deoiduous articulate clusters . . . . . 88. *Gracilicoma*.

§§ Spikes digitate . . . . . 89. *Cynodon*.

††† Spikelets with several bracts (**Genera** 90-94).

J Spikelets will 1 (rarely 2, *Chloris* etc.) fertile and . . . . .

• Spikelets in long secund solitary spike; floral glumes narrow, firm, glabrous or scaberulous with a short erect awn from the notched or subulate tips . . . . . 90. *Btileropogon*.

†††† Spikelets in digitate, rarely solitary or 2-nate spikelets ; the floras much widened upward, or if narrow, then decussate and usually with a fine awn from below the tips, often ciliate ; floral glumes or at least some of them awnless . . . . . 91. *Chloris*.

S<sup>r</sup> Spicclels with 2 or more fertile florets and without imperfections below them (See also *Oligoloma* sp.); floral glumes a witless or with a i<sup>r</sup>i<l mucro or very short awn from the acuminate tips (*Dactyloctenium* sp.), i-ntiiv or subentire (Genera 92-94).

¶ Sp<sup>r</sup>ktsttte in digitate or subdigitate spikes.

j Spikes terminated by a spikelet; involuclral and flunil nliini^ cinucronat- or obscurely mucronab:

92. *Skunae*.

ljj Spikes teruinating with a sharp poiut; u]jpar iavolucral glume and floral glumes rigidly mucronate or shortly awned

93. *Dactyloctetium*,

" Spikflleta in raoemoaelj arranged spreading 01 def• xrd, finally deciduous spikes

94. *IHnebia*.

†† Fialal glumes variously toothed or lobod with the middle and side-nervee miming out into i>-na or mucros.

Spikes solitary and terminal on tin- culms; spikelets pioatly olive-green or dark greyish ; all 3 nerves or at least the middle-iiorve running out into a tine short awn or mucro .

95. *Tri-pogon*.

\*\* Floral glumes S-nuny-aerved, very rarely 3-nerved (Oeneru 96-100).

**Tribe XIII: Pappophoreae.**—Floral glumes broad, 5-many-nerveil , cleft int• 3-many subulate lolxis with or without alterantitij; Sue straight awns from the aiauses. Floral glumes y-tileft

96. *Enneapogon*.

**Tfibe XIV : Oryzae.**—SpikeJeta all alike or more or lea3 heteromorphous and unisi aal. h'-i He Soret 1, awmed or not, terminal with 2 piinuto empty Qorets (floral glumes) below it or solitary. Involucral glumes vray minute or oaafiuetri into an annular rim or suppreatiRd : palea 8-9-nerved ; stamena usually 6, rarely mqjrc, or I-S.

† A floating glabrous grass; spikelet'; awned

ST. *Uygrortiza*.

ft Leafy tall grasses, not floatinff; spikelete usually awnless.

J Keels of ftowl glume and pale-, peutimtelv tiliate ; spikelete awnless

98. *Hoiuiilocenchrus*.

‡ Keels of (tonil glume and ynlea. not pectitately eiliii' : apikoleta rarely awned I

99. *Ori/m*.

**Tnbe XV : Festuceae.**—Involuural glumes moce or less resembling the floral ones in general nppearance. Fruirug florets :: to many wry rarely L, often drool exsertod from the glumes. EItotal ghrmes '>• or n-ore-nerved (rarely L-3-netved). Awns, if present, tenninul en sub-terminal, never geniculate.

t Jjeavea narrgw, not tesselhrttery nerved ; fruiting; ^luini's without Bbnurgmal bi •les.

‡ Leaves reaching 30 in. long or inori<sup>1</sup>, flouid ; infloteBceiue in •ng, often inte•upted cylindrio spikes

[00. *Elytrophorus*.

%% Leaves loas than "J ran. long, rit;id. pongent: in-Somcence in short rabcaprtate spike\*

L01. *Achropua*.

ft L*i*v<sup>is</sup> l>road, tvsMllntflv nerved ; fruiting glumes Witt, reflexed Mtibnuir^insl tiihercle-based bristles

LOS. *Centotheca*.

**Tribe XVI : Hordeae.**—Spikulet« aeaalk, xingly or in du-iterx, nior or less sunk in in hollow\* oi I he chachis df A simple spike ; Bonta I or more,

† Spikel-I\* solitary at the no. lds of the spike.



- % {Spikelets with their median plane radial to the rhachis ; florets 1-2 ; floral glumes membranous to subhyaline, 3-nerved . . . . 103. *Lepidosperma*.
- %% Spikelets with their median plane tangential to the rhachis ; floral glumes more or less ventricose, keeled upwards, 5-9-nerved . . . . 104. *Tillandsia*.
- ft Spikelets in groups of 3 at the nodes of a dense spike; floral glumes 5-nerved . . . . 105. *Hordeum*.

2. Blades articulate on the sheath and transversely veined.

**Tribe XVII: Bambuseae.**—Shrubs or trees; spikelets all of one kind; florets few to many (rarely 1); lower 2 or more glumes empty, gradually increasing in size up to the flowering, with sometimes small terminal imperfect ones; floral glumes subherbaceous to subcoriaceous, 5-many-nerved, usually awnless ; lodicules usually 3 ; stamens 3-6 or more ; styles 2 or 3 (Genera 106-110).

- a. Pericarp thin, adnate to the seed.
- \* Paleae all 2-keeled ; stamens 6 ; filaments free . . . . 106. *Bambusa*
- \*\* Paleae of upper flowers 0 or glume-like, not keeled :  
f i l a m e n t s connate. . . . 107. *Oxytenanthera*.
- b. Pericarp fleshy or crustaceous, not adnate to the seed.
- \* Spikelets 2-many-flowered; palea 2-keeled; lodicules none ; stamens 6 ; pericarp crustaceous . . . . 108. *Dendrocalamus*.
- \*\* Spikelets many-flowered ; paleae 2-keeled ; lodicules 3, conspicuous . . . . 109. *Teinostachyum*.
- \*\*\* Spikelets 1-flowered ; palea absent or glume-like ; stamens 6-120; pericarp fleshy . . . . 110. *Ocymandra*,

# THE BOMBAY GRASSES.

## SUBFAMILY I: PANICOIDEAE.

The mature spikelets fall entire from their pedicels or with them, all are alike or differ in sex and structure. Perfect spikelets with 2 heteromorphous florets, the upper hermaphrodite, the lower male or barren. Bhachilla not continued beyond the upper floret.

### TRIBE I: Mayideae.

Sexes borne on different inflorescences on the same plant or the female spikelets at the base of the inflorescence, and the male above them. The male spikelets in pairs, one sessile, the other pedicelled, or both pedicelled, in spike-like solitary or paniced racemes, 2-flowered. Involucral glumes membranous or chartaceous enclosing the florets. Floral glumes more or less hyaline, awnless. The female spikelets solitary with or without a rudimentary pedicelled companion, 1-flowered. Involucral glumes firm, at least the lower which ultimately often becomes bony, or both thin and more or less hyaline. Floral glumes hyaline, awnless.

See key pags xi.

#### \*1. EUCHLAENA Schrad,

Stout and tall annuals with leaves very broadly linear or oblong.

Male spikelets 2-nate (sessile and pedicellate) on the spiciform fascicled branches of a terminal panicle, 2-flowered with coriaceous glumes. Female spikelets in 2-ranked spikes which are clustered in the leaf-axils, not fused as in the Maize, joints rhomboidal, oblique, articulate, excavate, with the margins of the excavation embracing the cartilaginous outer glume and with it forming a smooth pseudocarp.

Species 2 or 3.<sup>1</sup>—Mexico.

#### • 1. EUCHLAENA MEXICANA Schrad.

*Euchlaena mexicana* Schrad. Ind. Sem. Hort. Gotting. (1832); reprinted in *Linnaea* 8 (1833)

Litt. 25 ; H. H. Mann in Bull. 177, Dept. of Agric, Bombay.

*Reana luxurians* Dur.<sup>2</sup> in Bull. Soc. Acclim. II, 9 (1872) 581.<sup>3</sup>

**Vernacular name** : Teosinte.

**Etymology** : *Euchlaena* comes from the Greek *eu*, well, and *chlaina*, covering.

**Description** : A large, very succulent, strong growing, annual grass, 30 cm. to 3 m. high. Leaves long, 5-7\*5 cm. broad.

Male spikelets 8-9 mm. long, crowded in long spikes in a corymb 15-25 cm. long. Female spikes in the leaf-axils. Styles very long, protruding from the top of the enclosing leaf-sheath. The spike of the female spikelets breaking up at maturity into rhomboidal seed-like joints.— Nearly allied to Maize and resembling it in its tassel of male flowers and broad leaves. A single plant often sends up 100 stems. Hybridises with Maize.

**Locality** : *Deccan*: Cultivated in the Ganeshkhind Botanic Garden.

**Distribution**: Mexico.

**Economic uses** : Cultivated for green fodder, but it does not stand drought well. Horses are fond of it.

#### \*2. ZEA Linn.

Tall, stout, annual grasses with large leaves, the axils of the lower of which produce the cobs, tightly enveloped by large membranous bracts.

Sexes in different inflorescences on the same plant; male spikelets in large terminal panicles made up of racemosely arranged or subdigitate spike-like racemes; female spikelets in axillary sheathed " cobs ", consisting of several spikes whose axes are fused into a spongy more or less

<sup>1</sup> For a review and history of the species of *Euchlaena* Schrad, see G. N. Collins in *Journ. Hered.* 12 (1922) 339, and S. S. Hitchcock, A perennial species of Teosinte, in *Journ. Washington Acad. Sciences* 12 (1922) 205-207.

<sup>2</sup> Durieu in mentioning ' Teosinte ' thinks that it is probably the name of a country.

<sup>3</sup> The name is not technically published as there is no description.

cylindrical body. Male spikelets 2-nate, one sessile, the other alternate on the inarticulate rhachis of the spike-like racemes, 2-flowered, awnless; involucrel glumes subequal, membranous, convex, obscurely 2-keeled, 9-10-nerved; florets alike; floral glumes more or less hyaline, 3-5-nerved; paleae similar, 2-nerved, obscurely keeled; lodicules 2, fleshy; stamens 3; anthers linear. Female spikelets 2-nate in 4-11 longitudinal rows, slightly immersed in the spongy axis of the cob, with a lower barren and an upper fertile floret, awnless; involucrel glumes similar, very broad, fleshy below, hyaline above, nerveless, ciliate; lower floral glume resembling the involucrel glumes but shorter and eciliate, with or without a similar but smaller palea; upper floral glume similar to the lower with a palea about as long as the ovary; lodicules 0; ovary obliquely ovoid; style very Jpng, 2-fid at the tip, papillose upwards, exerted in long silky tassels from the sheathing bracts. Grain large, subglobose or dorsally more or less flattened, surrounded by the dried up involucrel glumes, floral glumes and paleae; scutellum large, equalling or exceeding two-thirds of the grain.

Species 1.—A native of America; in cultivation in all warm countries of the globe.

\*f. ZEA MAYS Linn.

*Zea Mays* Linn. Sp. Pl. (1753) 971; P. Beauv. Agrost. (1812) t. 24, fig. 3; Kunth Enum. Pl. I (1833) 19; Doell in Mart. EL Bras. II, II, 31, t. 11; Benth. & Trim. Medic. Pl. t. 296; Duthie Field & Gard. Crops. 25, t. 5; Koern. & Wern. Handb. d. Getreideb. I (1885) 330-378, II (1885) 772-870; Harshberger Maize in Contr. Lab. Univ. Pennsylv. I (1893) 75-202; Montgomery Corn Crops (1913) 1-275; Davy Maize (1914); Stapf in FL Trop. Afr. IX (1917) 26.

*Mays zea* Gaertn. Fruct. I (1788) 6, pi. 1.

**Vernacular names** : Maize, Indian Corn, Makai, Boota, Macka, Bari Joar, Bonda, Goinjol, Mekhejol.

Etymology : *Zea* is the old Greek name for a cereal mentioned by Homer.

**Description** : Culms up to 3 m. high, sometimes more. Leaf-sheaths terete, more or less hairy upwards along the margin; ligule short, truncate, thinly membranous, more or less pubescent; blades linear-lanceolate, up to over 90 cm. long and 10 cm. wide, glabrous or almost so, tips often drooping.

Male panicle up to over 20 cm. long; rhachis pubescent; spikelets up to 12 mm. long; anthers 6 mm. long. Female spike (cob) and grains varying much in size and shape, the grains also in colour.

Locality : Chiefly cultivated in the Panch Mahals either as a rains or as a late irrigated crop. A good deal is grown in Satara, Sholapur and Belgaum. In the Deccan it is mostly grown for early fodder, though the grain is allowed to ripen and the ears are readily sold in towns for roasting.—Area in 1922-23, 208,914 acres.

Ecology : Where rainfall is sufficient Maize does best on the rich brown soils of the Panch Mahals. Also Eice land by retention of moisture either by position or by depth and density, suits the crop. As its quick habit of growth does not make it a good companion for subordinate mixtures, it is usually sown alone. It grows rapidly and requires little water considering the yield of fodder which it gives. It is very likely the best emergency fodder crop to grow when the rain fails and when famine is imminent.

Distribution : Maize seems to be a native of New Granada, but is now cultivated almost throughout the world. There is scarcely a doubt that Maize came to India from America. It was possibly brought thence direct by the Portuguese, just about the time when the East India Company arrived in India.

Origin ; The origin of Maize is a much discussed question. Some are of opinion that it has been developed from Teosinte (*Euchlaena*), others that the original wild form has become extinct. A more acceptable opinion is that it is a hybrid between Teosinte and an unknown or extinct species resembling pod-corn, a variety of *Zea Mays* in which each kernel is enveloped in the elongated floral bracts.<sup>1</sup>

Kuwada<sup>2</sup> who studied the number of chromosomes in Maize came to the conclusion that *Zea Mays* was originally derived from the hybridization between *Euchlaena* and some unknown specie\* of the tribe *Andropogoneae*, long chromosomes belonging to the former and short ones to the latter, and that the nuclei of its various individuals possess both kinds of chromosomes in various combinations according to the law of chance.

<sup>1</sup>ColliiiB, The Origin of Maize. Journal Wash. Acad. Sci. 2 (1912) 520.

<sup>2</sup>Kuwada, Y., Die Chromosomenzahl von *Zea Maya* L. Ein Beitrag zur Hyphthcse der Individualist der Chromosomen und zur Frage fiber die Herkunft von *Zea Maya* L. Jour. Coll. Sci. Imperial Univ., Tokfo, 39 (1919) 1448.

To explain the structure of the ear of Maize Collins published evidence which indicated that the ear may have developed through the twisting of yoked pairs of spikelets. Weatherwax<sup>1</sup> tries to refute this opinion. He contends that dropping of rows of seeds is due to the discontinuance of a row of paired spikelets and not to the loss of the pedicellocl spikelets from yoked pairs, and that there is no indication that short rows represent long rows partially aborted, but that the abortion of spikelets or of rows in the ear seems to be much more constant as a characteristic of theories than of real ears.

**Genetics** : Those interested in Maize from a genetic point of view are referred to the more recent publications mentioned in the footnote.<sup>2</sup>

**Economic uses** : See Watt, Diet. Econ. Prod. VI, pt. IV, 326 and Commercial Prod. of India (1908) 1132, and various authors mentioned above.

Many experiments have been made in America to see if prussic acid, the poison of young jowar fodder, is to be found in Maize. It has never been detected in Maize, not even in suckers from Maize stalks in the field. See also M. H. Keith, A bibliography of investigations bearing on the composition and nutritive value of corn and corn products. Washington, 1920.

**Medicinal uses** : See Dymock, Pharmacogr. Ind. III (1893) 579, and Bentley and Trimen, Medicinal plants.

**Diseases** : For a good account of the fungi attacking Maize see E. J. Butler, Fungi and disease in plants (1918) 191-202.

The Moth-borer of the Sugar-cane, Maize and Sorghum is discussed in Mem. Dept. Agric. Ind. I (1907) No. 2.

### 3. Coix Linn.

Tall leafy monoecious annual or perennial grasses ; stem branching, spongy within. Leaves long, flat, broad.

Kacemes many, axillary and terminal; lower spikelets solitary, female, enclosed in an ultimately hardened, polished, nut-like bract, through the apex of which the male portion of the spike protrudes. Male spikelets 2-3-nate at each node of the rachis, 1 sessile and 1 or 2 pedicellate, lanceolate. Glumes 4 ; involucre glumes subequal, empty, rigid or herbaceous; lower involucre glume winged along the inflexed margin ; upper involucre glume not winged ; floral glumes hyaline, paleate, triandrous or empty. Female spikelets ovoid, acuminate. Glumes 4 ; lower involucre glume chartaceous, the other 3 glumes becoming successively thinner ; upper floral glume paleate. Lodicules 0. Stamines minute. Ovary ovoid; styles 2, free, slender. Grain orbicular, ventrally furrowed, enclosed in the hardened globose ovoid or cylindrical involucre.

Species 5 or 6.—Hot countries of the Old World; only 1 in the Bombay Presidency.

### 1. Coix LACHRYMA-JOBI Linn.

#### PLATE 1/

*Coix Lachryma-Jobi* Linn. Sp. PL (1753) 972 ; Hook. f. Fl. Brit. Ind. VII (1896) 100; Cooke Fl. Bomb. II (1908) 997.

*C. Lachryma* Linn. Syst. ed. X (1759) 1261; Beauv. Agrost. (1812) 137, t. 24, fig. 5 ; Roxb. Fl. Ind. III (1832) 568; Grah. Cat. Bomb. Pl. (1839) 240; Dalz. & Gibs. Bomb. Fl. (1861)

<sup>1</sup> Weatherwax, P., A misconception as to the structure of the ear of Maize. Bull. Torrey Bot. Club. 47 (1920) 359-362.

<sup>2</sup> Blaringhem, L., Production par traumatisme d'une forme nouvelle de Maïs à oaryopses multiples, *Zea Maya* var. *Polysperma*. Compt. Rend. Acad. Sci. Paris 170 (1920) 677-679.

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- 289 ; Duthie Graces N. W. Ind. (1883), Fodder Grasses N. Ind. (1888) 18 ; Hack, in Bolet. Soc. Brot. V, 212.  
*C. agrestis* Lour. Fl. Cochinch. (1790) 551.  
*C. arundinacea* Lam. Encycl. III, 422.  
*C. ovata* Stokes Bot. Mat. Med. IV (1812) 342.  
*C. pendula* Salisb. Prodr. (1796) 28.  
*C. puelhrum* Balans in Journ. de Bot. IV (Paris, 1890) 77.  
*C. stigmatosa* Kock. & Bouché Ind. Sem. Hort. Berol. (1855) 9.  
*Lithagrostis Lachryma Jobi* Gaertn. Fruct. I (178g) 7, 1. 1, fig. 10.

**Vernacular names** : Job's Tears, Christ's Tears, Ran-jondhla, Ranmaka, Kassar, Eardia, Gurgur, Keruch, Eassaibij (fruit).

**Etymology** : *Coix* is a name used by Theophrastus and Plinius for an Egyptian palm the leaves of which were used for mats and baskets. The name *Lachryma Jobi* means Job's Tear and conies from the fancied resemblance of the fruit to tears.

T<sup>^</sup>ICV̄Bi&Sll • ^tamSft-V&ft CTV.VV^orcmarc, <fara&, T.ootv%at fTaa Vraet nodes •, întemodes  
 ̄,moov, ^ois\fc&. leaves 10-45 by 2-5-5 cm., narrowed from a broad cordate base to an acuminate tip, smooth on xrfio. suiiace&, Vsfiit Stejtax nei^t& && ^H&qsj&s ^ r a t e m \ ^ \ m i &  
 stout; sheaths long, smooth ; ligule a very narrow membrane.

% Racemes 2-5-6-3 cm. long, nodding or drooping from long peduncles; rhachis within the bract slender, above the bract stout, notched at the nodes. Male spikelets 1-1-3 cm. long, subsecund, imbricating. Lower involucral glume 1 cm. long, elliptic-lanceolate, acute, concave, many-nerved, with inflexed margins and with a narrow wing arising from a little above the edge of the margin with many branched green veins; upper involucral glume similar to the lower but not winged, 5-9-nerved ; lower floral glume oblong-lanceolate, hyaline, paleate, triandrous, faintly 3-5-nerved ; upper floral glume similar, paleate, triandrous or empty. Anthers B mm. long, orange. Fruit from broadly ovoid to globose, bluish grey, 6-10 mm. long, smooth, polished.

**Locality** : *Std* : Umarnkot, sandy plains (Sabnis B 717 !); Chuar Ghemali, Indus Biver (Blatter & McCann D680 !); Mirpur Sakro (Blatter & McCann D681! D683 !); Gharo (Blatter & McCann D682!).

*Gujarat* (Graham).

*Khandesh* (McCann!).

*Konkan*: Gokhiwara, Bassein (Ryan 25); Dohe Forests (Ryan 713!); Junga Hill, Thana (Paranjpye !); Alibag, ricefields (Ezekiel!); Kanari Caves, foot (McCann 9876 !); Sion (McCann 8453!); Bhandup, near tank (McCann 5098!); Horse-shoe Valley, Ghatkopar (McCann 9877 !); common along line from Kalyan to Easara in streams (McCann!).

*W. Ghats*: Iगतपुरी (McCann 4346!); Matheran (Paranjpye!); Lonavla (Garade!, McCann!, Woodrow); Ehandala, common all over (McCann 9405!); Panchgani Ghat (Cooke); Panchgani (Blatter!).

*Deccan* : Purandhar (McCann 5005 !).

*S. M. Country*: Devarayi (Sedgwick & Bell 4426 !); Dharwar (Sedgwick 1856 !).

*N. Kanara* (McCann!).

**Ecology** : Gregarious, forming pure associations, very abundant in standing water. Common all through the Konkan and Deccan, filling up the banks of streams and fields.

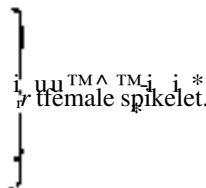
**Distribution** : Tropical Asia, cultivated in Africa and America.

**Economic uses** : Used as fodder for cattle. Duthie says that they fatten on it. Haines calls it a poor fodder for cattle. Of the false fruits there are several varieties differing much in size, shape and colour, and used for decorative purposes in place of beads. According to Stapf one variety with thin shells is an important cereal in Burma and in the Farther East. Waxy endosperm, first found in Maize from China, Burma and the Philippines has been found now in *Coix Lachryma-Jobi* from the same region.<sup>1</sup>

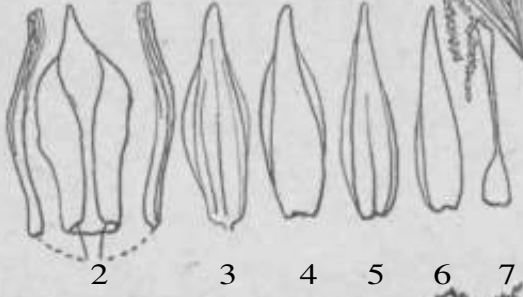
**Medicinal uses** : See Dyn4ock, 573.

**Explanation of Plate 1** : *Coix Lachryma-Jobi* Linn.

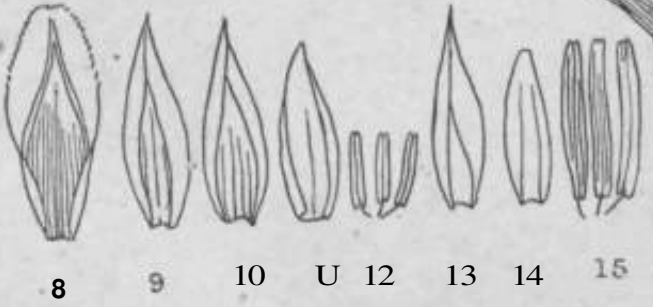
1. Female spikelet showing nut-like bract.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Upper floral glume.
6. Palea.
7. Grain and styles.



\* Kempton, J. H., Waxy endosperm in *Coix* and *Sorghum*. Journ. Heredity, 12 (1921) 396-400.



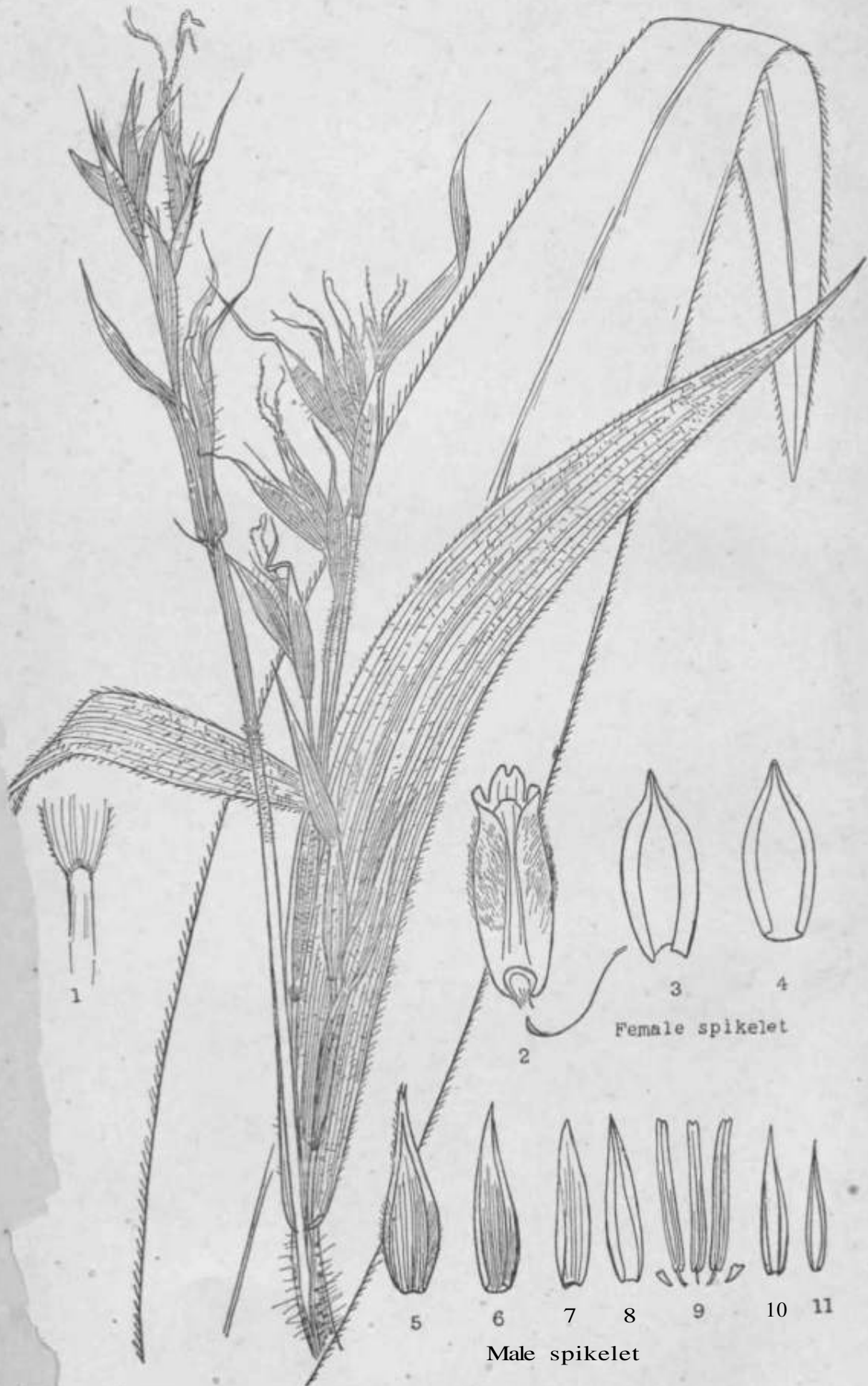
Female spikelet



Male spikelet



16



TOIBYTOCA COOKEI STAFF.

Delin: R. E. Bhidf.

- |                                  |   |
|----------------------------------|---|
| 8. Lower invol. glume.           | } |
| 9. Upper invol. glume.           |   |
| 10. Lower floral glume.          |   |
| 11. Palea of lower floral glume. |   |
| 12. Stamens.                     |   |
| 13. Upper floral glume.          |   |
| 14. Palea of upper floral glume. |   |
| 15. Stamens.                     |   |
| 16. Ligule.                      |   |

4. POLYTOCA R. Br.

Tall stout erect branching annual or perennial leafy monoecious grasses; stem spongy within; nodes bearded; flowering branches fascicled. Leaves long, flat.

Inflorescence of spike-like racemes, terminating the branches, at first enclosed in spathiform bracts; racemes all male or with one or more female spikelets at the base. Male spikelets 2-flowered, sometimes imperfect. Glumes 4 (with sometimes a terminal rudimentary one), all subequal in length; involucrel glumes empty; lower involucrel glume herbaceous, shallowly concave, many-nerved, with a narrow membranous margin; upper involucrel glume narrower, ovate, acuminate, 5-9-nerved; lower floral glume membranous, oblong, acuminate, 3-5-nerved, paleate, trifid; upper floral glume very slender, linear, hyaline, paleate, triandrous or empty. Lodicules 2, cuneate. Anthers long. Female spikelets broadly oblong, 1-flowered; lower involucrel glume thickly coriaceous, closely embracing the rhachis of the spike by its involute margins, with many obscure nerves, the other 3 glumes enclosed in the lower involucrel glume, hyaline; upper involucrel glume oblong, many-nerved; lower floral glume narrower, oblong, 3-5-nerved, empty; upper floral glume very narrow, truncate, 3-nerved, paleate. Styles very long; stigmas slender. Grain small, fusiform, terete, enclosed in the nut-like polished hardened glume.

Species 8.—Tropical Asia, Australia.

1. Leaves 45-60 by 5-7.5 cm.; lower involucrel glume of female spikelet 3-lobed at the tip . . . . . 1. *P. Cookei*.
2. Leaves 15-30 by 0.6-2.2 cm.; lower involucrel glume of female spikelet entire at the tip . . . . . 2. *P. barbata*.

1. POLYTOCA COOKEI. Stapf.

PLATE 2.

*Polytoca Cookei* Stapf in, Hook. Ic. PL 24 (1895) t. 2333; Hook. f. FL Brit. Ind. VII (1896) 101; Cooke FL Bomb. II (1908) 998.

**Vernacular name** : Kurisal.

**Etymology** • *Polytoca* is derived from the Greek *polys*, many and *tokos*, bringing forth.—The specific name refers to Th. Cooke, the author of the Bombay\* Flora.

**Description** : Annual; stem 90 cm. (or more) high, smooth; nodes bearded. Leaves 45-60 by 5-7.5 cm., linear-lanceolate, acuminate, more or less hispid on both sides with bulbous-based hairs, and with thickened and ciliate margins; sheaths rather loose, striate, hairy with bulbous-based hairs; ligule short, subhyaline, hairy with yellowish hairs.

Flowering branches fasciculate crowded in the axils of the upper leaves, each with a linear acuminate pubescent bract at the base. Male panicles reaching 7.5 cm. long. Male spikelets 8 mm. long, geminate, one longer than the other, shortly pedicellate or sessile. Glumes 4; lower involucrel glume lanceolate, acuminate, pubescent, many-nerved, with a hyaline more or less inflexed margin; upper involucrel glume slightly shorter and thinner than the lower one, with slender nerves. Floral glumes slightly shorter than the lower involucrel glume, glabrous, few-nerved, hyaline. Anthers 3, linear. Female spikelets 8 mm. long; lower involucrel glume crustaceous, oblong, the margins connate at the base, closely embracing the upper involucrel glume, the apex with a 3-lobed crest the lateral lobes of which are obliquely truncate, the midlobe emarginate; upper involucrel glume slightly shorter than the lower, oblong, acuminate; lower floral glume\* about equalling the upper involucrel glume, oblong, suddenly apiculate, 13-15-nerved; upper floral glume shorter than the lower, hyaline, ~~trifid~~, sometimes 2-fid,



**Locality** : *Kathiawar*: Junagad (Blatter!).

*Konkan*: Tungar forest, Bassein (Bhide !); Bombay (Dalzell); Salsette (Jacquesmont 706).

*W. Ghats*: Igatpuri (McCann 9880 !); Khandala (McCann 9881!); Mahableshtar (Woodrow, Cooke); near Mahableshtar (Woodrow !).

*N. Eanara* (Lisboa).

**Ecology** : Growing sporadic.

**Distribution** : Apparently endemic in the Presidency.

**Economic uses** : Bosaries are made of the stony fruits.

**Explanation of Plate 2** : *Polytoca Cookei* Stapf.

- |  |   |                  |
|--|---|------------------|
| 1. Ligule.   | } | Female spikelet. |
| 2. Lower and upper invol. glumes.  |   |                  |
| 3. Lower floral glume.   |   |                  |
| 4. Upper floral glume.   |   |                  |
| 5. Lower invol. glume (tip not correct, should be acuminate according to the description). | } | Male spikelet.   |
| 6. Upper invol. glume.   |   |                  |
| 7. Lower floral glume.   |   |                  |
| 8. Palea of lower floral glume.  |   |                  |
| 9. Stamens and lodicules.  |   |                  |
| 10. Upper floral glume.  |   |                  |
| 11. Palea of upper floral glume.   |   |                  |

## 2. POLYTOCA BABBATA Stapf.

### PLATE 3.

*Polytoca barbata* Stapf in Hook. f. Fl. Brit. **It.** VII (1896) 102 ; Cooke Fl. Bomb. II (1908) 999; Lisboa Bomb. Grasses (1896) 42.

*Coix arundinacea* Koen. ex Willd. Sp. PL IV, 203 (*non* Lam.).

*C. barbata* Koxb. Fl. Ind. III (1832) 569 ; Dalz. & Gibs. Bomb. Fl. (1861) 289.

*C. gigantea* Herb. Buss, ex Wall. 8626.

*C. Koenigii* Spreng. Syst. I, 228.

*Chionachne barbata* R. Br. in Benn. PL Bar. Jav. 18; Duthie Grasses N. W. Ind. (1883) 11; Fodder Grasses N. Ind. (1888) 19.

**Vernacular names** : Eanta-karvel, Varival, Kawdia, Karang, Gurgur.

**Etymology** : *Barbata* means bearded.

**Description** : Stem 90-180 cm. high, as thick as the little finger below, terete, smooth; nodes softly bearded. Leaves 15-20 by 0.6-2\*2 cm., linear, acuminate, scabrid above, with a stout midrib and scabrid margins; sheaths long, smooth, glabrous or hairy; ligule a narrow ridge.

Racemes paniculate, on slender peduncles; spathiform sheaths 2-5 cm. long (or more), with a long awn at the tip; proper sheaths 13 mm. long, oblong, awned; male portion of the raceme appearing as if sessile on the top of the female spikelet, articulate with the internode below it which is embraced by the margins of the outer glume of the female spikelet; rhachis hardly articulate between the male spikelets. Male spikelets reaching 1 cm. long. Lower involueral glume 8 by 4 mm., ovate, acute, concave, pubescent. Female spikelets 4 mm. long, glabrous. Glumes 4; lower involucral glume thickly coriaceous, white, shining, closely wrapped round the rhachis of the spike and the other glumes, obscurely many-nerved; tip entire.

This grass often reaches 2-7 m. The internodes are smooth and polished. The sheaths and leaves, particularly the former, are armed with long stiff brittle irritant hairs. With maturity the hairs are shed and are frequently completely lost in herbarium material.—The anthers when fresh are brick red. The inflorescence deteriorates in the herbarium leaving numerous spikelets.

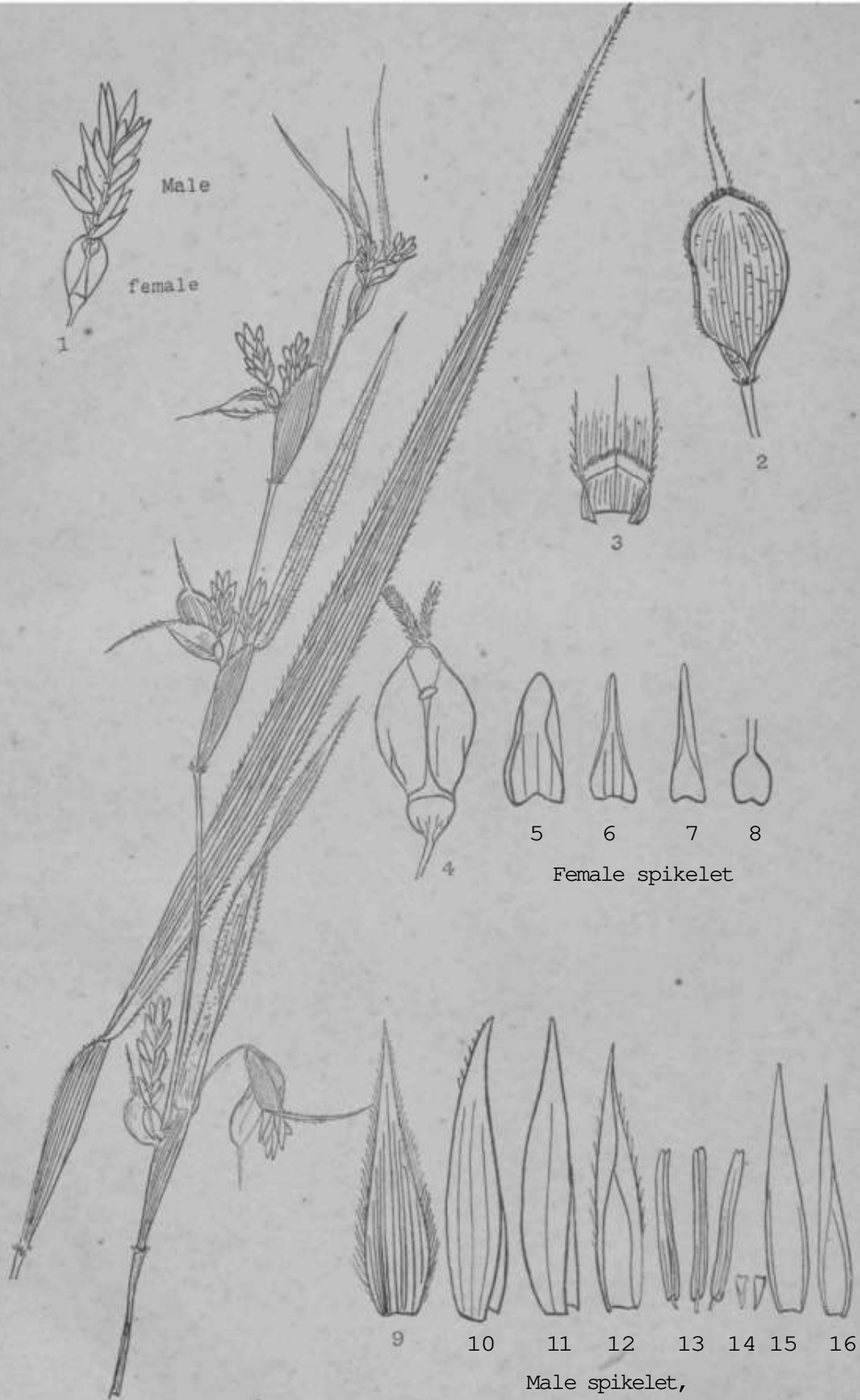
**Locality** : *Kathiawar*: Junagad (Blatter 3784 !).

*Gujarat*: Gharodi farm (Gammie 16536!); Nadiad'farm (Herb. Econ. Bot\* Poona!); Surat (Sedgwick!).

*Khandesh*: Toranmal (McCann 9883 !); Taloda (Golne!).

*Konkan*: Bombay, between Worli F6rt and Homby-Villurd Ed., on bank (Sabnis 9884 !); Thana (McCann!).

*W. Ghats*: Fitzgerald Ghat (McCann 3599!).



*JTOLYTOCA BARBATA* STAP\*\*

Vclia; B. K. Bhide.

# THE BOMBAY GRASSES.

## SUBFAMILY I: PANICOIDEAE.

The mature spikelets fall entire from their pedicels or with them, all are alike or differ in sex and structure. Perfect spikelets with 2 heteromorphous florets, the upper hermaphrodite, the lower male or barren. Ehachilla not continued beyond the upper floret.

### TRIBE I: Mayideae.

Sexes borne on different inflorescences on the same plant or the female spikelets at the base of the inflorescence, and the male above them. The male spikelets in pairs, one sessile, the other pedicelled, or both pedicelled, in spike-like solitary or paniced racemes, 2-flowered. Involucral glumes membranous or chartaceous enclosing the florets. Floral glumes more or less hyaline, awnless. The female spikelets solitary with or without a rudimentary pedicelled companion, 1-flowered. Involucral glumes firm, at least the lower which ultimately often becomes bony, or both thin and more or less hyaline. Floral glumes hyaline, awnless.

See key page xi.

#### \*1. EUCHLAENA Schrad,

Stout and tall annuals with leaves very broadly linear or oblong.

Male spikelets 2-nate (sessile and pedicellate) on the spiciform fascicled branches of a terminal panicle, 2-flowered with coriaceous glumes. Female spikelets in 2-ranked spike<sup>3</sup> which axe clustered in the leaf-axils, not fused as in the Maize, joints rhomboidal, oblique, articulate, excavate, with the margins of the excavation embracing the cartilaginous outer glume and with it forming a smooth pseudocarp.

Species 2 or 3.<sup>1</sup>—Mexico.

#### \*1. EUCHLAENA MEXICANA Schrad.

*Euchlaena mexicana* Schrad. Ind. Sem. Hort. Gotting. (1832); reprinted in *Linnaea* 8 (1833)

Litt. 25 ; H. H. Mann in Bull. 177, Dept. of Agric, Bombay.

*ReanaLuxurians* Dur.<sup>2</sup> in Bull. Soc. Acclim. II, 9 (1872) 581.<sup>3</sup>

**Vernacular name** : Teosinte.

**Etymology** : *Euchlaena* comes from the Greek *eu*, well, and *chlaina*, covering.

**Description** : A large, very succulent, strong growing, annual grass, 30 cm. to 3 m. high. Leaves long, 5-7-5 cm. broad.

Male spikelets 8-9 mm. long, crowded in long spikes in a corymb 15-25 cm. long. Female spikes in the leaf-axils. Styles very long, protruding from the top of the enclosing leaf-sheath. The spike of the female spikelets breaking up at maturity into rhomboidal seed-like joints.— Nearly allied to Maize and resembling it in its tassel of male flowers and broad leaven. A single plant often sends up 100 stems. Hybridises with Maize.

**Locality** : *Deccanj* Cultivated in the Ganeshkhind Botanic Garden.

**Distribution**: Mexico.

**Economic uses** : Cultivated for green fodder, but it does not stand drought well. Horses are fond of it.

#### \*2. ZEA Linn.

Tall, stout, annual grasses with large leaves, the axils of the lower of which produce the cobs, tightly enveloped by large membranous bracts.

Sexes in different inflorescences on the same plant; male spikelets in large terminal panicles made up of racemosely arranged or subdigitate spike-like racemes; female spikelets in axillary sheathed " cobs ", consisting of several spikes whose axes are fused into a spongy more or less

» FOP a review and history of the species of *Euchlaena* Schrad, see G. N. Collins in Journ. Hered. 12 (1922) 339, and S. S. Hitchcock, A perennial species of Teosinte, in Journ. Washington Acad. Sciences 12 (1922) 205-207.

\* Durieu in mentioning 'Teosinte' thinks that it is probably the name of a country.

• The name is not technically published as there is no description.

cylindrical body. Male spikelets 2-nate, one sessile, the other alternate on the inarticulate rhachis of the spike-like racemes, 2-flowered, awnless; involucre glumes subequal, membranous, convex, obscurely 2-keeled, 9-10-nerved; florets alike; floral glumes more or less hyaline, 3-5-nerved; paleae similar, 2-nerved, obscurely keeled; lodicules 2, fleshy; stamens 3; anthers linear. Female spikelets 2-nate in 4-11 longitudinal rows, slightly immersed in the spongy axis of the cob, with a lower barren and an upper fertile floret, awnless; involucre glumes similar, very broad, fleshy below, hyaline above, nerveless, ciliate; lower floral glume resembling the involucre glumes but shorter and eciliate, with or without a similar but smaller palea; upper floral glume similar to the lower with a palea about as long as the ovary; lodicules 0; ovary obliquely ovoid; style very *pingo* 2-fid at the tip, papillose upwards, exerted in long silky tassels from the sheathing bracts. Grain large, subglobose or dorsally more or less flattened, surrounded by the dried up involucre glumes, floral glumes and paleae; scutellum large, equalling or exceeding two-thirds of the grain.

Species 1.—A native of America; in cultivation in all warm countries of the globe.

\*f. ZEA MAYS Linn.

*Zea Mays* Linn. Sp. Pl. (1753) 971; P. Beauv. Agrost. (1812) t. 24, fig. 3; Kunth Enum. Pl. I (1833) 19; Doell in Mart. Fl. Bras. II, II, 31, t. 11; Benth. & Trim. Medic. Pl. t. 296; Duthie Field & Gard. Crops. 25, t. 5; Koern. & Wern. Handb. d. Getreideb. I (1885) 330-378, II (18\*5) 772-870; Harshberger Maize in Contr. Lab. Univ. Pennsylv. I (1893) 75-202; Montgomery Corn Crops (1913) 1-275; Davy Maize (1914); Stapf in Fl. Trop. Afr. IX (1917) 26.

*Mays zea* Gaertn. Fruct. I (1788) 6, pi. 1.

**Vernacular names** : Maize, Indian Corn, Makai, Boota, Macka, Bari Joar, Bonda, Goinjol, Mekhejol.

**Etymology** : *Zea* is the old Greek name for a cereal mentioned by Homer.

**Description** : Culms up to 3 m. high, sometimes more. Leaf-sheaths terete, more or less hairy upwards along the margin; ligule short, truncate, thinly membranous, more or less pubescent; blades linear-lanceolate, up to over 90 cm. long and 10 cm. wide, glabrous or almost so, tips often drooping.

Male panicle up to over 20 cm. long; rhachis pubescent; spikelets up to 12 mm. long; anthers 6 mm. long. Female spike (cob) and grains varying much in size and shape, the grains also in colour.

**Locality** : Chiefly cultivated in the Panch Mahals either as a rains or as a late irrigated crop. A good deal is grown in Satara, Sholapur and Belgaum. In the Deccan it is mostly grown for early fodder, though the grain is allowed to ripen and the ears are readily sold in towns for roasting.—Area in 1922-23, 208,914 acres.

**Ecology** : Where rainfall is sufficient Maize does best on the rich brown soils of the Panch Mahals. Also Bice land by retention of moisture either by position or by depth and density, suits the crop. As its quick habit of growth does not make it a good companion for subordinate mixtures, it is usually sown alone. It grows rapidly and requires little water considering the yield of fodder which it gives. It is very likely the best emergency fodder crop to grow when the rain fails and when famine is imminent.

**Distribution** : Maize seems to be a native of New Granada, but is now cultivated almost throughout the world. There is scarcely a doubt that Maize came to India from America. It was possibly brought thence direct by the Portuguese, just about the time when the East India Company arrived in India.

**Origin** : The origin of Maize is a much discussed question. Some are of opinion that it has been developed from Teosinte (*Euchlaena*), others that the original wild form has become extinct. A more acceptable opinion is that it is a hybrid between Teosinte and an unknown or extinct species resembling pod-corn, a variety of *Zea Mays* in which each kernel is enveloped in the elongated floral bracts.<sup>1</sup>

Kuwada<sup>2</sup> who studied the number of chromosomes in Maize came to the conclusion that *Zea Mays* was originally derived from the hybridization between *Euchlaena* and some unknown specie<sup>^</sup> of the tribe *Andropogoneae*, long chromosomes belonging to the former and short ones to the latter, and that the nuclei of its various individuals possess both kinds of chromosomes in various combinations according to the law of chance.

<sup>1</sup> C. B. Williams, The Origin of Maize. Journal Wash. Acad. Sci. 2 (1912) 520.

<sup>2</sup> Kuwada, Y., Die Chromozomenzahl von *Zea Maya* L. Ein Beitrag zur Hypothese der Individualität der Chromosomen und zur Frage über die Herkunft von *Zea Mays* L. Jour. Coll. Sci. Imperial Univ., Tokio, 39 (1919) 1-148.

To explain the structure of the ear of Maize Collins published evidence which indicated that the ear may have developed through the twisting of yoked pairs of spikelets. Weatherwax<sup>1</sup> tries to refute this opinion. He contends that dropping of rows of seeds is due to the discontinuance of a row of paired spikelets and not to the loss of the pedicelled spikelets from yoked pairs, and that there is no indication that short rows represent long rows partially aborted, but that the abortion of spikelets or of rows in the ear seems to be much more constant as a characteristic of theories than of real ears.

**Genetics** : Those interested in Maize from a genetic point of view are referred to the more recent publications mentioned in the footnote.<sup>2</sup>

**Economic uses** : See Watt, Diet. Econ. Prod. VI, pt. IV, 326 and Commercial Prod. of India (1908) 1132, and various authors mentioned above.

Many experiments have been made in America to see if prussic acid, the poison of young jowar fodder, is to be found in Maize. It has never been detected in Maize, not even in suckers from Maize stalks in the field. See also M. H. Keith, A bibliography of investigations bearing on the composition and nutritive value of corn and corn products. Washington, 1920.

**Medicinal uses** : See Dymock, Pharmacogr. Ind. III (1893) 579, and Bentley and Trimen, Medicinal plants.

**Diseases** : For a good account of the fungi attacking Maize see E. J. Butler, Fungi and disease in plants (1918) 191-202.

The Moth-borer of the Sugar-cane, Maize and Sorghum is discussed in Mem. Dept. Agric. Ind. I (1907) No. 2.

### 3. Coix Linn.

Tall leafy monoecious annual or perennial grasses ; stem branching, spongy within. Leaves long, flat, broad.

Eacemes many, axillary and terminal; lower spikelets solitary, female, enclosed in an ultimately hardened, polished, nut-like bract, through the apex of which the male portion of the spike protrudes. Male spikelets 2-3-nate at each node of the rhachis, 1 sessile and 1 or 2 pedicellate, lanceolate. Glumes 4 ; involucre glumes subequal, empty, rigid or herbaceous; lower involucre glume winged along the inflexed margin ; upper involucre glume not winged ; floral glumes hyaline, paleate, triandrous or empty. Female spikelets ovoid, acuminate. Glumes 4 ; lower involucre glume chartaceous, the other 3 glumes becoming successively thinner; upper floral glume paleate. Lodicules 0. Staminodes minute. Ovary ovoid; styles 2, free, slender. Grain orbicular, ventrally furrowed, enclosed in the hardened globose ovoid or cylindrical involucre.

Species 5 or 6.—Hot countries of the Old World ; only 1 in the Bombay Presidency.

### 1. Coix LACHRYMA-JOBI Linn.

#### PLATE 1/

*Coix Lachryma-Jobi* Linn. Sp. PL (1753) 972; Hook. f. Fl. Brit. Ind. VII (1896) 100; Cooke Fl. Bomb. II (1908) 997.

*C. Lachryma* Linn. Syst. ed. X (1759)-1261; Beauv. Agrost. (1812) 137, t. 24, fig. 5 ; Roxb. Fl. Ind. III (1832) 568; Grah. Cat. Bomb. Pl. (1839) 240; Dalz. & Gibs. Bomb. Fl. (1861)

- <sup>1</sup> Weatherwax, P., A misconception as to the structure of the ear of Maize. Bull. Torrey Bot. Club. 47 (1920)
- <sup>2</sup> Blarnehem, L., Production par traumatisme d'une forme nouvelle de Mais à caryopses multiples, *Zea Maya* var. *Polysperma*. Compt. Rend. Acad. Sci. Paris 170 (1920) 677-679.
- Collins, G. N., Structure of the Maize ear as indicated in *Zea-Euchlaena* hybrids. Jour. Agr. Res., 17 (1919)
- <sup>117</sup> Collins, G. N., Dominance and the vigor of first generation hybrids. Amer. Nat., 55 (1921) 116-133.
- Collins, J. L., Chimeras in corn hybrids. Jour. Heredity, 10 (1919) 2-10.
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- <sup>64-70</sup> Hume, A. N., A system for breeding corn or gregarious animals. Jour. Heredity, 11 (1920) 677-679.
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- Jones, D. F., The effect of inbreeding and crossbreeding upon development. Proc. Nation. Acad. Sc. 4 (1918)
- <sup>346</sup> Jones, D. F., Heritable characters of Maize. Jour. Heredity 11 (1920) 111-115.
- Jones, D. F., Selection in self-fertilized lines as the basis for corn improvement. Jour. Amer. Soc. Agftn. 12 (1920) 77-106.
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- Riohcy, F. D., The inequality of reciprocal corn crosses. Jour. Amer. Soc. Agron. 12 (1920) 186-196.
- Urban, A., Influence des matieres de reserve de l'albumen de la graine sur le developpement de rebryon. Rev. Gen. Bot. 32 (1920) 125-139, 166-191.

289 ; Duthie Grasses N. W. Ind. (1883), Fodder Grasses N. Ind. (1888) 18 ; Hack, in Bolet. Soc. Brot. V, 212.

*C. agrestis* Lour. Fl. Cochinch. (1790) 551.

*C. arundinacea* Lam. Encycl. III, 422.

*C. ovata* Stokes Bot. Mat. Med. IV (1812) 342.

*C. pendula* Salisb. Prodr. (1796) 28.

*C. puelhrum* Balans in Journ. de Bot. IV (Paris, 1890) 77.

*C. stigmatosa* Eock. & Bouché Ind. Sem. Hort. Berol. (1855) 9.

*Lithagrostis Lacryma Jobi* Gaertn. Fruct. I (178g) 7, 1. 1, fig. 10.

**Vernacular names** : Job's Tears, Christ's Tears, Ran-jondhla, Ranmaka, Kassar, Eardia, Gurgur, Keruch, Kassaibij (fruit).

**Etymology** : *Coix* is a name used by Theophrastus and Plinius for an Egyptian palm the leaves of which were used for mats and baskets. The name *Lachryma Jobi* means Job's Tear and comes from the fancied resemblance of the fruit to tears.

**Description** : Stem 90-150 cm. high or more, stout, rooting at the lower nodes; internodes smooth, polished. Leaves 10-45 by 2\*5-5 cm., narrowed from a broad cordate base to an acuminate tip, smooth on both surfaces, with slender nerves and spinulose serrate margins; midrib stout; sheaths long, smooth; ligule a very narrow membrane.

*r* Racemes 2\*5-6\*3 cm. long, nodding or drooping from long peduncles; rachis within the bract slender, above the bract stout, notched at the nodes. Male spikelets 1-1\*3 cm. long, subsecund, imbricating. Lower involucral glume 1 cm. long, elliptic-lanceolate, acute, concave, many-nerved, with inflexed margins and with a narrow wing arising from a little above the edge of the margin with many branched green veins; upper involucral glume similar to the lower but not winged, 5-9-nerved; lower floral glume oblong-lanceolate, hyaline, paleate, triandrous, faintly 3-5-nerved; upper floral glume similar, paleate, triandrous or empty. Anthers 6 mm. long, orange. Fruit from broadly ovoid to globose, bluish grey, 6-10 mm. long, smooth, polished.

**Locality** : *Std* : Umarkot, sandy plains (Sabnis B 717 !); Chuar Chemali, Indus Eiver (Blatter & McCann D680 !); Mirpur Sakro (Blatter & McCann D681! D683 !); Gharo (Blatter & McCann D682!).

*Gujarat* (Graham).

*Khandesh* (McCann!).

*Konkan*: Gokhiwara, Bassein (Ryan 25); Doñe Forests (Ryan 713 !); Junga Hill, Thana (Paranjpye!); Alibag, ricefields (Ezekiel!); Kanari Caves, foot (McCann 9876 1); Sion (McCann 8453!); Bhandup, near tank (McCann 5098!); Horse-shoe Valley, Ghatkopar (McCann 9877 !); common along line from Kalyan to Easara in streams (McCann !).

*W. Ghats*: Igatpuri (McCann 4346!); Matheran (Paranjpye!); Lonavla (Garade!, McCann!, Woodrow); Khandala, common all over (McCann 9405!); Panchgani Ghat (Cooke); Panchgani (Blatter!).

*Deccan*: Purandhar (McCann 5005 !).

*S. M. Country*: Devarayi (Sedgwick & Bell 4426 !); Dharwar (Sedgwick 1856 !).

*N. Kanara* (McCann!).

*x Ecology* : Gregarious, forming pure associations, very abundant in standing water. Common all through the Eonkan and Deccan, filling up the banks of streams and fields.

**Distribution** : Tropical Asia, cultivated in Africa and America.

**Economic uses** : Used a? fodder for cattle. Duthie says that they fatten on it. Haines calls it a poor fodder for cattle. Of the false fruits there are several varieties differing much in size, shape and colour, and used for decorative purposes in place of beads. According to Stapf one variety with thin shells is an important cereal in Burma and in the Farther East. Waxy endosperm, first found in Maize from China, Burma and the Philippines has been found now in *Coix Lachryma-Jobi* from the same region.<sup>1</sup>

**Medicinal uses** : See Dymock, 573.

**Explanation of Plate 1** : *Coix Lachryma-Jobi* Linn.

1. Female spikelet showing nut-like bract.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Upper floral glume.
6. Palea.
7. Grain and styles.



<sup>1</sup> Keington, J. II., Waxy endosperm in *Coix* and *Sorghum*. Journ. Heredity, 12 (1921) 396-400.



1

2

3

4

5

6

7

Female spikelet

8

9

10

11

12

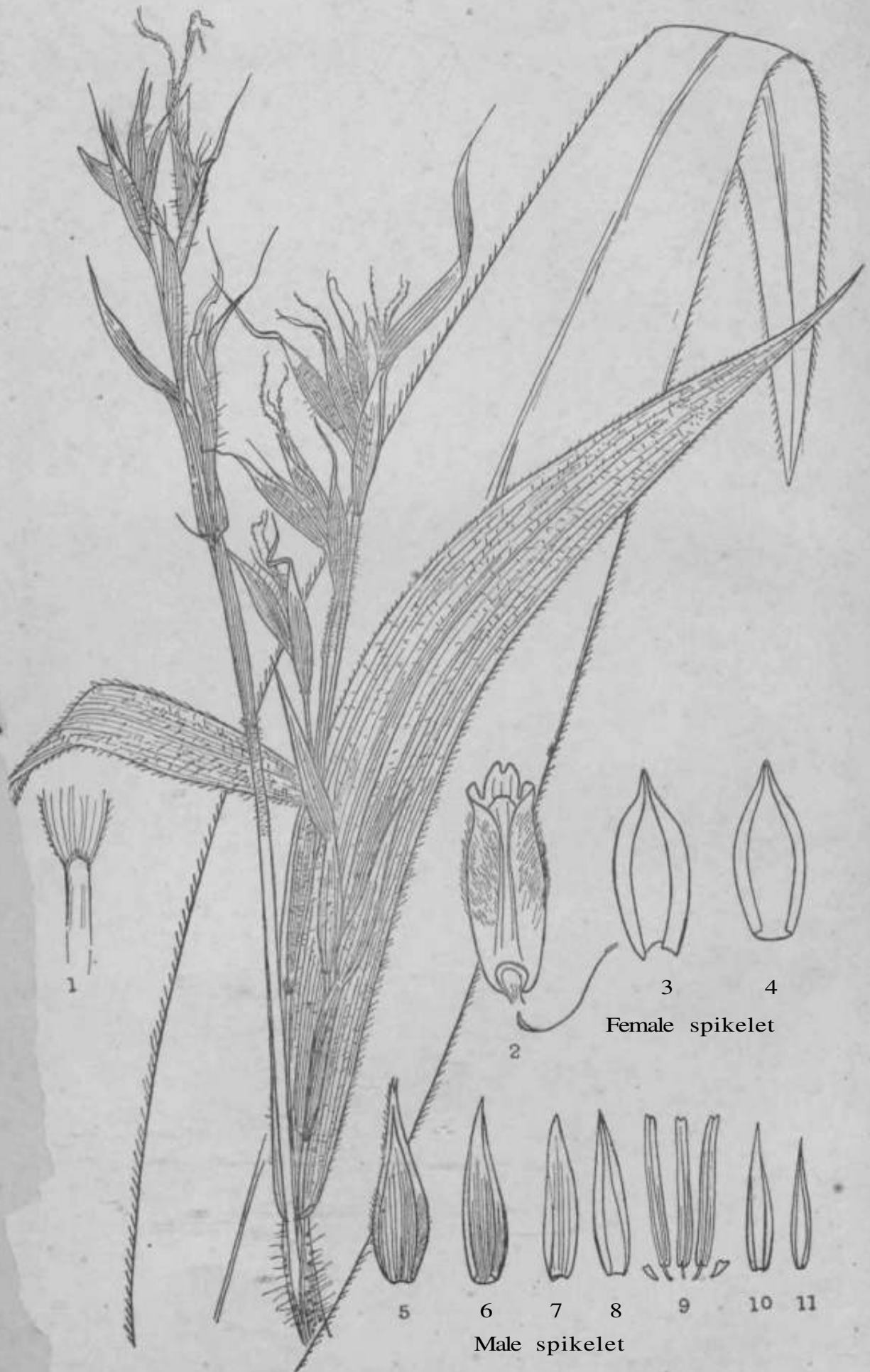
13

14

15

Male spikelet

1f



Female spikelet

Male spikelet

ROLTOOCA COOKEISTAPP,

Delin: R. K. Bhide.



- |                                  |   |                |
|----------------------------------|---|----------------|
| 8. Lower invol. glume.           | } | Male spikelet. |
| 9. Upper invol. glume.           |   |                |
| 10. Lower floral glume.          |   |                |
| 11. Palea of lower floral glume. |   |                |
| 12. Stamens.                     |   |                |
| 13. Upper floral glume,          |   |                |
| 14. Palea of upper floral glume. |   |                |
| 15. Stamens.                     |   |                |
| 16. Ligule.                      |   |                |

## 4. POLYTOCA K. Br.

Tall stout erect branching annual or perennial leafy monoecious grasses; stem spongy within; nodes bearded; flowering branches fascicled. Leaves long, flat.

Inflorescence of spike-like racemes, terminating the branches, at first enclosed in spathiform bracts; racemes all male or with, one or more female spikelets at the base. Male spikelets 2-flowered, sometimes imperfect. Glumes 4 (with soraeines a terminal rudimentary one), all aubequal in length; involueral glumes empty; lower involueral glume herbaceous, shallowly concave, many-nerved, with a narrow membranous margin; upper involueral glume narrower, ovate, acuminate, 5-9-nerved; lower floral glume membranous, oblong, acuminate, 3-5-nerved, paleate, triandrous; upper floral glume very slender, linear, hyaline, paleate, triandrous or empty. Lodicules 2, cuneate. Anthers long. Female spikelets broadly oblong, 1-flowered; lower involueral glume thickly coriaceous, closely embracing the rachis of the spike by its involute margins, with many obscure nerves, the other 3 glumes enclosed in the lower involueral glume, hyaline; upper involueral glume oblong, many-nerved; lower floral glume narrower, oblong, 8-5-nerved, empty; upper floral glume very narrow truncate, 3-nerved, paleate. Styles very long; stigmas slender. Grain small, fusiform, terete, enclosed in the nut-like hardened glume.

Species 8.—Tropical Asia, Australia.

1. Leaves 45-60 by 5-7.5 cm.; lower involueral glume of female spikelet 3-lobed at the tip, . . . , 1. *P. Cookei*.
2. Leaves 15-30 by 0.6-2.2 cm.; lower involueral glume of female spikelet entire at the tip . . . , 2. *P. barbata*.

## 1. POLYTOCA COOKEI Stapf.

## PLATE 2.

*Polyloca Cookei* Stapf & Hook. Ic. Pl. 24 (1895) t. 2333; Hook. f. Fl. Brit. Ind. VII (1896) 101; Cooke Fl. Bomb. II (1908) 998.

Vernacular name: Kurisfil.

Etymology: *Polyloca* is derived from the Greek *polys*, many and *lochos*, bringing forth.—The specific name refers to Th. Cooke, the author of the Bombay Flora.

Description: Annual; stem 90 cm. (or more) high, smooth; nodes bearded. Leaves 45-60 by 0.7-1.2 cm., linear-lanceolate, acuminate, more or less hispid on both sides with bulbous-based hairs, and with thickened and ciliate margins; sheaths rather loose, striate, hairy with bulbous-based hairs; ligule short, subhyaline, hairy with yellowish hairs.

Flowering branches fasciculate crowded in the axils of the upper leaves, each with a linear acuminate pubescent bract at the base. Male panicles reaching 7.5 cm. long. Male spikelets 8 mm. long, geminate, one longer than the other, shortly pedicellate or sessile. Glumes 4; lower involueral glume lanceolate, acuminate, pubescent, many-nerved, with a hyaline more or less inflexed margin; upper involueral glume slightly shorter and thinner than the lower one, with slender nerves. Floral glumes slightly shorter than the lower involueral glume, glabrous, fine-nerved, hyaline. Anthers 3, linear. Female spikelets 8 mm. long; lower involueral glume crustaceous, oblong, the margins connate at the base, closely embracing the upper involueral glume, the apex with a 3-lobed crest the lateral lobes of which are obliquely truncate, the middle lobe emarginate; upper involueral glume slightly shorter than the lower, oblong, acuminate; lower floral glume about equalling the upper involueral glume, long, suddenly apiculate, 13-15-nerved; upper floral glume shorter than the lower, hyaline, narrow.

**Locality** : *Kathiawar*: Junagad (Blatter!).

*Konkan*: Tungar forest, Bassein (Bhide !); Bombay (Dalzell); Salsette (Jacquesnont 706).

*W. Ghats*: Igatpuri (McCann 9880 !); Ehandala (McCann 9881!); Mahableshtar (Woodrow, Cooke); near Mahableshtar (Woodrow I).

*N. Kanara* (Lisboa).

**Ecology** : Growing sporadic.

**Distribution** : Apparently endemic in the Presidency.

**Economic uses** : Rosaries are made of the stony fruits.

**Explanation of Plate 2** : *Polytoca Cookei* Stapf.

- |  |                    |                  |
|--|--------------------|------------------|
| 1. Ligule.   | } Female spikelet. |                  |
| 2. Lower and upper invol. glumes.  |                    |                  |
| 3. Lower floral glume.   |                    |                  |
| 4. Upper floral glume.   |                    |                  |
| 5. Lower invol. glume (tip not correct, should be acuminate according to the description). |                    |                  |
| 6. Upper invol. glume.   |                    |                  |
| 7. Lower floral glume.   |                    |                  |
| 8. Palea of flower floral glume.   |                    | } Male spikelet. |
| 9. Stamens and lodicules.  |                    |                  |
| 10. Upper floral glume.  |                    |                  |
| 11. Palea of upper floral glume.   |                    |                  |

## 2. POLYTOCA BARBATA Stapf.

### PLATE 3.

*Polytoca barbata* Stapf in Hook, f. Fl. Brit. **isD.** VII (1896) 102 ; Oooke Fl. Bomb. II (1908) 999 ; Lisboa Bomb. Grasses (1896) 42.

*Coix arundinacea* Eoen. ex Willd. Sp. Pl. IV, 203 (*non* Lam.).

*C. barbata* Boxb. Fl. Ind. III (1832) 569 ; Dalz. & Gibs. Bomb. Fl. (1861) 289.

*C. gigantea* Herb. Buss, ex Wall. 8626.

*C. Koenigii* Spreng. Syst. I, 228.

*Chionachne barbata* B. Br. in Benn. PL Bar. Jav. 18 ; Duthie Grasses N. W. Ind. (1883) 11 ; Fodder Grasses N. Ind. (1888) 19.

**Vernacular names** : Kanta-karvel, Varival, Eawdia, Karang, Gurgur.

**Etymology** : *Barbata* means bearded.

**Description** : Stem 90-180 cm. high, as thick as the little finger below, terete, smooth; nodes softly bearded. Leaves 15-20 by 0.6-2.2 cm., linear, acuminate, scabrid above, with a stout midrib and scabrid margins; sheaths long, smooth, glabrous or hairy; ligule a narrow ridge.

Racemes paniculate, on slender peduncles; spathiform sheaths 2-5 cm. long (or more), with a long awn at the tip ; proper sheaths 13 mm. long, oblong, awned; male portion of the raceme appearing as if sessile on the top of the female spikelet, articulate with the internode below it which is embraced by the margins of the outer glume of the female spikelet; rachis hardly articulate between the male spikelets. Male spikelets reaching 1 cm. long. Lower involucral glume 8 by 4 mm., ovate, acute, concave, pubescent. Female spikelets 4 mm. long, glabrous. Glumes 4 ; lower involucral glume thickly coriaceous, white, shining, closely wrapped round the rachis of the spike and the other glumes, obscurely many-nerved; tip entire.

This grass often reaches 2-7 m. The internodes are smooth and polished. The sheaths and leaves, particularly the former, are armed with long stiff brittle irritant hairs. With maturity the hairs are shed and are frequently completely lost in herbarium material.—The anthers when fresh are brick red. The inflorescence deteriorates in the herbarium leaving numerous spikelets.

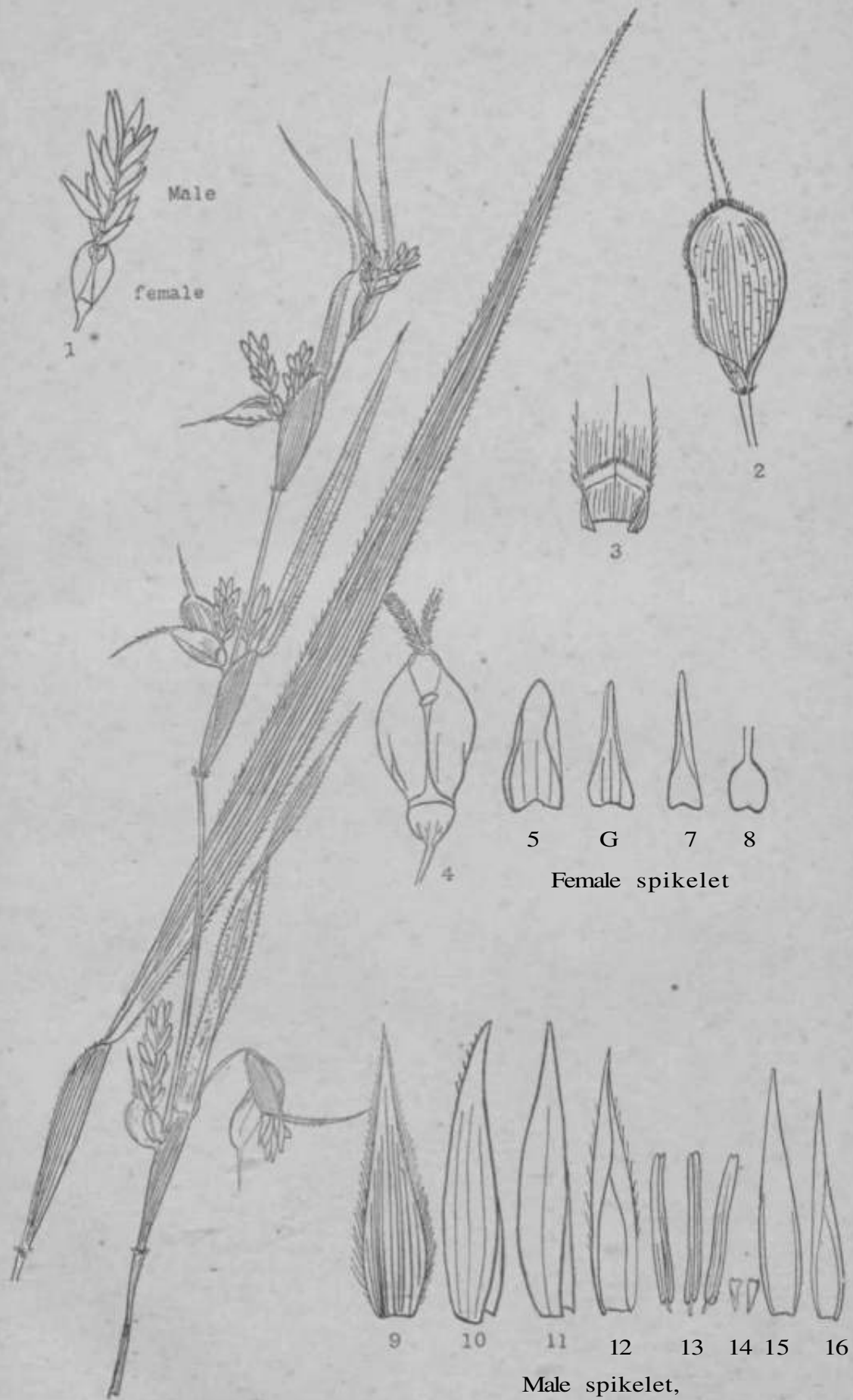
**Locality** : *Kathiawar*: Junagad (Blatter 3784!).

*Gujarat*: Gharodi farm (Gammie 16536!); Nadiad farm (Herb. Econ. Bot., Poona!); Surat (Sedgwick!).

*Khandesh* : Toranmal (McCann 9883 !); Taloda (Golne !).

*Konkan*: Bombay, between Worli Fort and Hornby-Villurd Ed., on bank (Sabnis 9884 !); Thana (McCann!).

*W. Ghats*: Fitzgerald Ghat (McCann 3599!).



POLYTOEA HAGUATA STAPF.

*Illia: It, K. Bhida.*

*Deccan:* Poona Dist., high hills round Junnar (Dalzell & Gibson); Poona (Woodrow); College of Science, Poona (Herb. Econ. Bot. Poona!); Ganeshkhind Bot. Gard. (Herb. Econ. Bot. Poona !); Haveli (Herb. Econ. Bot. Poona !); near Sholapur (Woodrow!).

*S. M. Country:* S.-W. of Dharwar (Sedgwick & Bell 4433!); Kunemelihalli (Sedgwick 1947!); Kolhapur (Woodrow!, Herb. Econ. Bot. Poona!).

*N. Kanara:* Gersoppa Falls (Talbot!).

**Ecology :** Sporadic, only found as isolated plants. Common on wet ground. Purely a monsoon species. The lowest nodes of the stem send out stout stiff roots on all sides at an angle of about 45°. The tip of the root when young and before it reaches the ground is enveloped for about 6 mm. or more with a mucilaginous transparent globule till it reaches the soil.—The male inflorescence appears at the terminal end of the culms and branches much in advance of the female flowers.—A most troublesome plant to press pr to go through in the jungle on account of the hairs.—Commonly growing in the shade of trees in deciduous forest on hillsides where water does not remain.—Begins to flower in late September, the male inflorescence appearing first and the female in the first week of October.

**Distribution :** India, Ceylon, Java.

**Economic uses :** Said to be used as fodder at Balaghat. The stony fruits used for rosaries.

**Explanation of Plate 3 :** *Polytoca barbata* Stapf.

- |                                  |   |
|----------------------------------|---|
| 1. Male and female spikelets.    |   |
| 2. Spathe.                       |   |
| 3. Ligule.                       |   |
| 4. Female spikelet.              | } |
| 5. Lower floral glume.           |   |
| 6. Upper floral glume.           |   |
| 7. Palea.                        |   |
| 8. Grain.                        |   |
| 9. Lower invol. glume.           | } |
| 10. Upper invol. glume.          |   |
| 11. Lower floral glume.          |   |
| 12. Palea of lower floral glume. |   |
| 13. Stamens.                     |   |
| 14. Lodicules.                   |   |
| 15. Upper floral glume.          |   |
| 16. Palea of upper floral glume. |   |

## TRIBE II: Andropogoneae.

Spikelets usually in pair, one sessile the other pedicelled, very rarely both pedicelled, those of each pair usually alike as to sex (homogamous) or different (heterogamous) on the axes of variously arranged, often spike-like racemes. Involucral glumes more or less rigid and firmer than the floral glumes, and the lower always longer than the florets. Floral glumes membranous, often hyaline, that of the upper floret awned or reduced to an awn or muticous.

See key page xi.

### 5. DIMERIA R. BR.

Erect slender, annual or perennial grasses. Leaves narrow.

Inflorescence of solitary or 2-nate or digitate slender racemes bearing many spikelets; rhachis of racemes inarticulate, terete, angular or flattened. Spikelets 1-flowered, articulate, subsessile or on very short pedicels, laterally much compressed, solitary, secund, bifarious, 2-sexual. Glumes 4; involucral glumes usually divaricate in flower, empty; lower involucral glume coriaceous, linear, with complicate sides, dorsally rounded; upper involucral glume as long as or longer than the lower one, chartaceous, oblong, with hyaline margins and complicate sides, dorsally keeled, the keel sometimes winged; lower floral glume shorter than the upper involucral glume, linear or oblanceolate, empty, epaleate; upper floral glume hyaline, complicate, oblong, 2-fid, awned in the sinus, the awn capillary with a short column; palea minute or 0. Lodicules 0 or very minute. Stamens 2; anthers long or short. Styles short; stigmas short, laterally exserted. Gram linear, compressed.

Species 18.—Indo-Malaya, S. China.

1. Spikelets in 2»3-nate racemes. Annuals.
  - a. Rhachis nearly straight. Awn long . . . 1. *D. ornithopoda*.
  - b. Rhachis circinate curved. Awn short . . . 2. *D. Woodrowii*. \*
2. Spikelets in many-nate racemes. Perennial . . . 3. *D. gracilis*.
3. Spikelets in panicles. Annual . . . 4. *D. diandra*.

The species of this genus usually inhabit open, flat, dry, gravelly plains which are well drained during the monsoon, and several species may be found associated with each other in the same locality to the exclusion of every other plant. Where *D. ornithopoda*, *gracilis* and *diandra* grow together, the 2 former are more numerous.

#### 1. DIMERIA ORNITHOPODA Trin.

##### PLATE 4.

*Dimeria ornithopoda* Trin. Fund. Agrost. (1820) 167, 1.14; Hack. Monogr. Androp. (1889) 81; Hook. f. Fl. Brit. Ind. VII (1896) 104; Cooke Fl. Bomb. II (1908) 945.

*D. filiformis* Hochst. in Hohenack. Pl. Ind. Or. n. 231.

*D. stipaeformis* Miq. Prolus. Fl. Jap. 176.

*Andropogon filiformis* Roxb. Fl. Ind. I (1832) 256.

*A. Roxburghianus* Schult. Mant. II, 451.

*Psilostachys filiformis* Dalz. & Gibs. Bomb. Fl. (1861) 305.

**Vernacular name** : Kap-kurdi.

**Etymology** : *Dimeria* means having two parts, very likely in allusion to the bifarious arrangement of the spikelets.—*Ornithopoda* means "bird-footed".

**Description** : A slender annual tufted leafy grass 15-50 cm. high. Leaves 2.5-7\*5 cm. by 2.5-3 mm., erect, linear, finely acuminate; sheaths usually glabrous.

Racemes 2 (rarely 3), very slender, 2-5-5 cm. long; rhachis flexuous, stout, angular. Spikelets about 2-5 mm. long, sessile or subsessile, linear, acuminate; callus villous with short white hairs. Glumes 4; lower involucre glume slender, linear, acute, 2-5 mm. long, slightly pubescent or nearly glabrous; upper involucre glume slightly longer than the lower one, linear, acuminate, with hyaline margins, pubescent on the back; lower floral glume 2 mm. long, linear, acute; upper floral glume 1-5 mm. long, hyaline; awn nearly 8 mm. long, the column 3 mm. long, brown, the upper part white, capillary.

**Locality** : *KonJan* : Vetora (Sabnis 33715 !); Eankeshwar Hills, Alibag (Bhide !); Mannagao (Talbot!).

*W. Ghats*: Ehandala, Tata's Lake, very common (McCann A309! 9885!, Woodrow); Lonavla, Sakhar-Pathar (Gammie 15948 !); Lonavla (Bhide!, Lisboa); Mahableshwar (Dalzell & Gibson, Lisboa); Lingmala to Mahableshwar, 4,000 ft., rainfall 200 in. (Sedgwick & Bell 4653 !); Panchgani (Blatter & Hallberg B1214! B1219 ! B1279 ! B1289!, Woodrowfc Castle Bock (Bhide!); Londa (Woodrow!).

*N. Kanara*: Yellapur (Sedgwick 3124!); Birchy (Talbot 2251!); Karwar (Hallberg & McCann A307 !); Siddhapur to Sirsi, open grass-land (Hallberg & McCann A313 !); Jagalbet (Talbot 1565).

**Ecology** : This species is subgregarious, *i.e.*, forming patches of many individuals or combining with other individuals "to form associations of few species.

**Distribution** : All over India, Malay Islands, Japan, tropical Australia.

**Explanation of Plate 4** *ijimeria ornithopoda* Trin.

1. Bhachilla with 2 spikelets.
2. Spikelet.
3. Lower invol. glume.
4. Upper invol. glume.
5. Lower floral glume.
6. Upper floral glume.
7. Stamens and styles.
8. Ligule.

#### 2. DIMERIA WOODROWII Stapf.

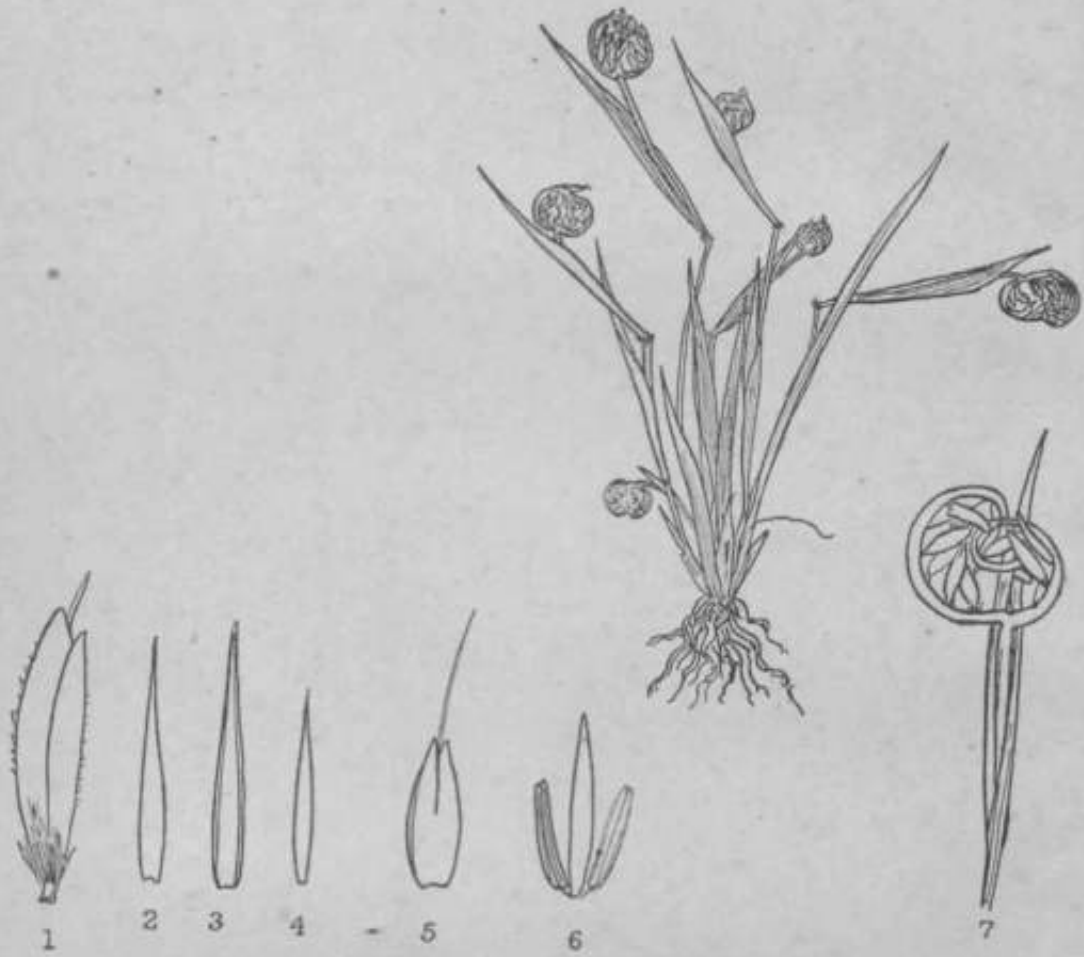
##### PLATE 5.

*Dimeria Woodrowii* Stapf in Hook. Ic. Pl. 24 (18i)5) t. 2312; Hook. f. Fl. Brit. Ind. VII (1896) 104; Cooke Fl. Bomb. II (1908) 945; Lisboa Bomb. Grasses (1896) 44.



DIMERLV OIMTHOPODA TIUN

Delin: R. K. Bhide



**Description** : Annual, 7-6-15 cm. high.; stem slender, leafy, more or less branched; nodes pubescent; upper internode (or peduncle) with its leaf abruptly deflexed after flowering. Leaves 3-8-7\*5 cm. by 1\*5-2-5 mm., linear, finely acuminate, 3-nerved, with a strong midnerve, glabrous or nearly so; sheaths glabrous; ligule very short, hyaline.

Racemes 2-2-5 cm. long, geminate, at first erect, then circinate incurved, glabrous; rhachis trigonous, subundulate; internodes shorter than the spikelets; pedicels distinct, about 0-6 mm. long. Spikelets 4 mm. long, sublinear, few, rather distant, suberect, diverging as the rhachis incurves; callus bearded. Glumes 4; lower involucral glume rather more than 3 mm. long, linear, acute, folded, 1-nerved, glabrous or sparsely hairy; upper involucral glume slightly longer than the lower one, broader, acute, narrowly keeled and thickened at the back, the margins hyaline; lower floral glume narrowly linear, hyaline, sometimes mucronulate; upper floral glume rather more than 2-5 mm. long, 2-fid, awned at the sinus, hyaline, the awn about 3 mm. long. Grain linear-lanceolate, compressed.

**Locality** : *Konkan*: Batnagiri (Herb. Dhura!, Woodrow); Karanjee, Ratnagiri Dist. (Herb. Econ. Bot. Poona!); Marmagao (McCann!, Bhide!, Talbot 2557).

*N. Kanara* : Mirjan (Hallberg & McCann!); Honavar, open rocks (McCann!).

**Ecology** : Usually growing in open rocky situations.

**Distribution** : W. Peninsula.

**Explanation of Plate 5** : *Dimeria Woodrowii* Stapf.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Upper floral glume.
6. Grain and stamens.
7. Inflorescence.

### 3. DIMERIA GRACILIS N

*Dimeria gracilis* Nees ex Steud. Syn. Pl. Glum. (1855) 3; Hack. Monogr. Androp. (1889) 88; Hook. f. Fl. Brit. Ind. VII (1896) 105; Lisb' Bomb. Grasses (1896) 45; Cooke JFL Bomb. II (1908) 946.

**Etymology** : *Gracilis* means slender.

**Description** : Perennial; stems densely tufted, 30-90 cm. high, leafy, stout or slender, rarely branched. Leaves 15-25 cm. by 3-4 mm., erect, rigid, narrowly linear, finely acuminate, glabrous or pilose, base narrowed into the sheath; sheaths terete, not auricled at the mouth; ligule short, broad, membranous, ciliolate.

Racemes 3-10, very slender, 7-5-12-5 cm. long, pale brown, lax-flowered, flexuous; rhachis filiform, obtusely trigonous or subterete, glabrous. Spikelets 4-6 mm. long; pedicels long or short; callus very short; densely bearded. Glumes 4; lower involucral glume 4 mm. long, linear, acute, plicate, more or less scaberulous; upper involucral glume 5 mm. long, linear, acute, aristate, with hyaline ciliolate margins; lower floral glume obovate-oblong, ciliolate above the middle; upper floral glume 2-5 mm. long, linear-oblong, acutely 2-fid; awn 1 cm. long (or more), the lower third brown, the upper two-thirds white; palea minute, narrow, ciliate. Lodicules large, broadly cuneate.

**Locality** : *Konkan*: Pen, hills (Bhide!); Vetora (Sabnis 3714!).

*W. Ghats* : Khandala (McCann A318!); Lonavla (Bhide!, Woodrow); on the Ghats (Lisboa!); Castle Bock (Bhide!); Anmod to Castle Rock (Sedgwick 3254!).

*N. Kanara* : (Sedgwick & Bell 3165!); Supa (Sedgwick & Bell 4880!); Arbail Ghat (Sedgwick & Bell 5018!); Sirsi (Gammie!); Eumwada (Talbot 2260!); Yellapur (Talbot 1527!); Kadra (Talbot!); Sampkhand (Hallberg & McCann A308!); Sirsi to Siddhapur (Hallberg & McCann A311!); Devimane (Talbot!).

**Ecology** : Where this species is growing together with other species of *Dimeria* it can easily be recognized by its over-towering the others. This species was found growing among other grasses, especially by the side of *Arthraxon serrulatus* Hochst., it has a peculiar withered look on account of the light brown or yellowish white colour of the inflorescence.

**Distribution** : W. Peninsula, Ceylon.

### 4. DIMERIA DIANDRA Stapf.

*Dimeria diandra* Stapf ex Bhide in Journ. & Proceed. Asiat. Soc. Bengal (new series) VII (1911) 515; Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1927) 19.



*Woodrowia diandra* Stapf in Hook. Ic. Pl. (1896) t. 2447; Hook. f. EL Brit. Ind. VII (1896) 241; Lisboa Bomb. Grasses (1896) 94; Cooke Fl. Bomb. II (1908) 1012.

By uniting the two species the genus *Woodrowia* Stapf ceases to exist.

**Vernacular name** : Kotir.

**Etymology** : *Diandra* means having 2 stamens.

**Description** : An annual grass 45-60 cm. high. Lower leaves 7-5-10 cm. by 2-4 mm., narrowly linear, setaceously acuminate; uppermost leaves reduced or entirely suppressed, hirsute, margins scabrid; sheaths close, glabrous or hairy at the mouth; ligule short, truncate, ciliolate.

Panicle about 5 cm. long; rhachis slender; pedicels very short, 1 mm. long; branches of panicle about 4. Spikelets 6 mm. long, rather distant, green or tinged with violet. Glumes 4: lower involucral glume more or less dorsally hairy, with ciliolate margins; upper involucral glume with a densely ciliate keel; lower floral glume obovate-oblong, hyaline, nerveless; upper floral glume 2-lobed, with a geniculate awn about 12 mm. long from the sinus, column of awn 4 mm. long, spirally ciliate, brown, the upper part of the awn yellow, longer than the column. Lodicules unequally lobed. Grain yellow, glabrous, 6-8 mm. long.

**Locality** : *Eonkan* : Vasco da Gama (Bhide !); Marmagao (Talbot 2557 !); Vikroli, near station (McCann 1019 !).

*W. Ghats* : Ehandala, open grass-land (Saxton & Bhide !, McCann A317 !); Caotle Rock (Bhide!).

*N. Kanara* : Kumberwada (Talbot 2261!); Kadra (Talbot 2822 !); Devimane (Talbot 3547 !); Jog to Siddhapur, open grass-land, rocky soil (Hallberg & McCann A314!); Mirjan (Hallberg & McCann A315!).

**Ecology** : A plant of open grass-land, frequently forming almost pure formations over large areas, often associated with species of *Eulalia*. On the whole a weak plant, but as the formations are very close, it can stand against wind and rain. A monsoon species, growing on well-drained soil.

Flowering about the middle of August.

**Distribution** : W. Peninsula.

## 6. ISCHAEMUM Linn.

Generally perennial; blades convolute when young, at length flat; ligules generally membranous.

Racemes compressed, joints flattened or subconvex on the inner side and often stout; sessile spikelets dorsally compressed, often rather broad, the pedicelled sometimes apparently laterally compressed with a median keel owing to the more or less complete suppression of one side. Spikelets of each pair alike, or differing only in sex, or more or less heteromorphic, one sessile or subsessile, the other pedicelled on the articulate fragile rhachis of 2-nate, digitate or fascicled, spike-like racemes, the pedicelled falling from their pedicels, the sessile deciduous together with the adjacent joint of the rhachis and the pedicel. Florets 2; lower generally male; upper hermaphrodite, rarely male or neuter in the pedicelled spikelets. Sessile spikelet: involucral glumes equal or subequal, lower dorsally flattened or somewhat convex and usually coriaceous below, chartaceous and markedly nerved upwards, rarely shallowly concave and more or less chartaceous throughout, more or less 2-keeled with indexed margins; upper boat-shaped keeled at least above, sometimes awned. Floral glumes rigidly membranous to hyaline, of lower floret muticous, of upper usually 2-fid and awned from the sinus, rarely mucronate or muticous. Paleae more or less equalling their floral glumes, hyaline. Lodicules 2, cuneate. Stamens 3, sometimes smaller or rudimentary in the fertile flower. Stigmas linear-oblong, laterally exerted. Grain oblong or lanceolate, dorsally compressed; embryo reaching to the middle of the grain. Pedicelled-spikelet in structure like the sessile, or more or less reduced, male or neuter and awnless.

<sup>1</sup> Species about 50.—All belonging to the Old World, except 3 found in tropical America.

Cooke describes 12 species. Of these *Ischaemum angustijolmm* has to go under *Pollinidium* and *Ischaemum laxum*, *mlcatum* and *spathijlorum* under *Sehima*. Instead 3 species new to the Presidency will be added to the genus *Ischaemum*, viz., *I. impressum* Hack., *I. conjugatum* Boxb. and *I. timorense* Eunth.

In *Ischaemum* the racemes are geminate or digitate.

Several species of this genus may be termed hygrophylous and under suitable conditions flower throughout the year. In these cases it will probably be possible to distinguish two distinct forms; those which flourish during the dry season and those which grow during the monsoon months. Before such a division can be made it will be necessary to gather much mat-

erial at different times of the year. For the present we can only say that there appears to be a reduction in the size and details of such plants.

- A. Margins of lower involucrel glume of sessile spikelet indexed or incurved from base to apex.
- I. Leaves rounded at the base (slightly cordate in *Z. molle*), sessile on the sheath.
1. Pedicel of upper spikelet less than one-third the length of the lower spikelet.
    - a. Lower involucrel glume of sessile spikelets with nodulose margins . . . . . 1. *I. aristatum*.
    - b. Lower involucrel glume of sessile spikelets closely transversely ribbed . . . . . 2. *7. rugosum*.
    - c. Lower involucrel glume of sessile spikelets dorsally villous all over, not transversely ridged nor with nodulose margins . . . . . 3. *7. moUe*.
  2. Pedicel of upper spikelet one-third the length of the lower spikelet or more.
    - a. Upper involucrel glume of sessile spikelets 2-fid, 3-nerved . . . . . 4. *I. diplopogon*.
    6. Upper involucrel glume of sessile spikelets acuminate, 5-nerved . . . . . 5. *I. pilosum*.
- II. Leaves hastate or cordate at the base, often petioled.
1. Pedicel of upper spikelet not one-third of the lower spikelet.
    - a. Leaves 7-5-13 cm. long . . . . . 6. *I. semisagittatum*.
    - b. Leaves 25-35 cm. long . . . . . 7. *I. conjugatum*.
  2. Pedicel of upper spikelets as long as the lower spikelet, or longer. . . . . 8. *I. impressum*.
- B. Margins of lower involucrel glume of sessile spikelets broadly incurved below the middle.
- I. Keel of upper involucrel glume winged above the middle.
1. Sessile spikelets 3 mm. long; callus large, glabrous; awn 4 mm. long . . . . . 9. *7. Lisboae*.
  2. Sessile spikelets 5 mm. long; callus short, bearded; awn 12 mm. long . . . . . 10. *7. dliare*.
- II. Keel of upper involucrel glume not winged . . . . . 11. *7. timorensis*.

#### 1. ISGHAEMUM ABISTATUM Linn.

##### PLATE 6.

*Isehaemum aristatum* Linn. Sp. Pl. (1753) 1049; Kunth Enum. Pl. I. (1833) 512, Suppl. 421; Hack. Monogr. Androp. (1889) 202; Hook. f. Fl. Brit. Ind. VII (1896) 126; Grah. Cat. Bomb. Pl. (1839) 239; Dalz. & Gibs. Bomb. Fl. (1861) 306; Cooke Fl. Bomb. II (1908) 958; Ranga Achariyar South Ind. Grasses (1921) 151.

*7. imberbe* Ketz. Obs. VI (1791) 35.

**Vernacular names** : Bangadi, Kanden, Bherda, Guj.

**Etymology** : *Isehaemum* is the Greek *ischaimos*, staunching blood.—*Aristatum* means being provided with an awn.

**Description** : Perennial; stems 30-120 cm. high, stout, erect or decumbent at the base, simple or branched above, leafy, glabrous, thickened at the top below the spikes. Leaves 10-25 by 0.6-2.5 cm., linear-lanceolate, finely acuminate, glabrous or sparsely hairy, glaucous beneath, narrowed to the acute or subcordate base, with scabrid margins; sheaths loose, glabrous, the mouth naked, auricled; ligule membranous.

Racemes 1 or 2, stout or slender, 2-5-10 cm. long. Spikelets reaching 5 mm. long, a sessile and a pedicellate closely pressed together; callus of sessile spikelets broad, thick, 1 mm. long. Sessile spikelets: lower involucrel glume 5 mm. long, broadly oblong, cartilaginous and often purplish below the middle, with 2-4 marginal nodules on each edge transversely connected by shallow ridges, thinner above the middle, with green anastomosing veins, tip obtuse or 2\* dentate, margins narrowly incurved, ciliolate; upper involucrel glume lanceolate, acuminate,

1-nerved, with smooth rounded keel; lower floral glume ovate-lanceolate, acuminate, 1-nerved, membranous, male or 2-sexual, with an oblong palea; upper floral glume female, cleft to or below the middle into lanceolate acuminate lobes, with a brownish red awn 13 mm. or more long at the sinus, twisted below, straight above; palea linear-oblong. Pedicellate spikelets as long as the sessile, inarticulate on the very thick amorphous pedicel, which is densely silky-hair<sup>1</sup> at the base; lower involucral glume gibbous or scimitar-shaped, acute, coriaceous, tinged with purple, with a ciliolate semicircular wing; upper involucral glume and lower floral glume as in the sessile spikelets; upper floral glume hyaline, with a mucro or very short awn.

Locality : *Khandesh*: W. Khandesh (Blatter!).

*Konkan*: Bassein (McCann 4474 !); Sion, Bombay (McCann 5233 !); Bhandup (McCann 9899!); Parsik, railway line (McCann 9901!); Matunga, near Bombay (Woodrow 4).

*W. Ghats* : Igatpuri (Blatter & Hallberg 5169 !); Khandala, on rocks (McCann 9908 !); Lonavla (Garade !); Mahableshwai (Talbot 4534 !); Panchgani (Blatter & Hallberg B1216 !); Pasarni Ghat (Blatter & Hallberg B1307 !); Castle Bock (Bhide!).

*"Diccan* : Lohagad, half way up (McCann 9906 !); Deolali (Blatter & Hallberg 4554!).

*S. M. Country*: Devarayi (Sedgwick & Bell 4456!); Belgaum (Ritchie 812/2).

<sup>1</sup> Distribution : India (also on higher hills), Ceylon, China, Malaya,

Explanation of Plate 6 : *Ischaemum aristatum* Linn.

- |                                     |   |   |
|-------------------------------------|---|---|
| 1. Lower invol. glume.              | } | T> J- n J -i •<br>^ ^ c e l l e d spikelet. |
| 2. Upper invol. glume.              |   |   |
| 3. Lower floral glume.              |   |   |
| 4. Stamens.                         |   |   |
| 5. Palea of lower floral glume.     |   |   |
| 6. Upper floral glume.              |   |   |
| 7. Palea of upper floral glume.     |   |   |
| 8. Styles.                          |   |   |
| 9. Ligule.                          |   |   |
| 10. Part of spike.                  | } | ^ Sessile spikelet.                         |
| 11. Lower invol. glume.             |   |   |
| 12. Upper invol. glume.             |   |   |
| 13. Lower floral glume.             |   |   |
| 14. Stamens.                        |   |   |
| 15. Lodicules.                      |   |   |
| 16. Palea of lower floral glume.    |   |   |
| 17. Upper floral glume.             |   |   |
| 18. Stamens, styles, and lodicules. |   |   |
| 19. Palea of upper floral glume.    |   |   |

2. ISCHAEMUM BUGOSUM Salisb.

PLATE 7.

*Ischaemum rugosum* Salisb. Ic. Stirp. Ear. (1791) 1, t. 1; Roxb. Fl. Ind. I (1832) 320; Hack. Monogr. Androp. (1889) 206; Duthie Grasses N. W. Ind. (1883) 18, Fodder Grasses N. Ind. (1888) 31; Hook. f. FL Brit. Ind. VII (1896) 127; Grah. Cat. Bomb. Pl. (1839) 239; Dalz. & Gibs. Bomb. Fl. (1861) 305; Watt. Diet. Econ. Prod. IV, 531; Cooke Fl. Bomb. II (1908) 959; Ranga Achariyar South Ind. Grasses (1921) 31.

*l. Royleanum* Miq. Fl. Ind. Bat. III, 498.

*l. segetum* Trin. in Mem. Acad. Petersb. Ser. 6, II (1833) 294.

*Meoschium Griffithii* Nees & Am. in Ann. & Mag. Nat. Hist. I (1838) 284.

*M. Arnottianum* Nees

*M. Wightianum* Nees

*M. Royleanum* Nees ex Steud. Syn. Grain. (1854) 375.

*Andropogon Arnottianus*

*A. Griffithsiae*

*A. segetum*

*A. Tong-dony*

*OoBa&oa Mstachya* Cnv. Ic. (1791-1801) 37, t. 460.



Pedicelled spikelet.

Sessile spikelet



Sessile spikelet

ISCHAEMUM LI 'o>!\ \ SALISB.

Delin: B. K. Bhide.

**Vernacular names** : Lag, Bardi, Bar, Bher, Karkel, Tiki grass.

**Etymology** : *Rngosum* means wrinkled, alluding to the lower floral glumes which are rugose.

**Description** : Annual; stems 30-60 cm. long, erect or ascending, slightly thickened beneath the inflorescence, leafy, compressed; nodes glabrous or bearded. Leaves 10-15 cm. by 4-13 mm., linear-lanceolate, acuminate, flat, glabrous or sparsely hairy, the margins scabrid, the uppermost leaves often reduced to spathiform lanceolate sheaths which partially enclose the racemes; sheaths compressed, loose, glabrous, the mouth auricled, the auricles membranous, confluent with the truncate ligules.

Racemes usually 2, erect, pale yellow, glabrous, 2.5-7.5 cm. long, fragile; rhachis trigonous, ciliate on the dorsal angle. Spikelets reaching 6 mm. long or more, linear-oblong, the sessile and pedicellate closely pressed together; pedicel of the latter very short and thick, clavate, angular, confluent with the bristly thick callus of the sessile spikelet. Sessile spikelets: lower involucral glume cartilaginous for two-thirds of its length from the base, the cartilaginous portion pale yellow, shining, concave, crossed by 3-6 deep smooth ridges, the upper third flattened, thinner, membranous, obtuse, with green veins, the margins narrowly incurved, the outer margin winged; upper involucral glume oblong-lanceolate, acuminate, keeled, the keel with a narrow ciliolate wing below the tip; lower floral glume ovate-lanceolate, acuminate, hyaline, male or empty, paleate, the palea hyaline, narrow; upper floral glume 4 mm. long, deeply cleft into 2 acute lanceolate lobes; palea linear-lanceolate; awn reaching 16 mm. long or more. Pedicellate spikelets variable, rather shorter than the sessile; lower involucral glume like that of the sessile or with fewer or sometimes more or less obscure transverse ridges, the upper half of the glume broader and more oblique; upper involucral glume not keeled, otherwise as in the sessile spikelet; lower floral glume as in the sessile; upper floral glume oblong, obtuse, not awned.

**Locality** : *Konkan*: Bombay Isl. (Blatter!); Eankeshwar Hills, Alibag (Bhide 1); Bassein (McCann 4479!).

*W. Ghats*: Igatpuri, common (McCann 4348!); Khandala, common, Echo Point in a dry pool (McCann 9903!).

*Deccan*: Poona (Woodrow).

*N. Kanara*: Halyal (Talbot 2140!).

**Ecology** : Common in wet marshy ground. According to Roxburgh it is generally found growing amongst *Bice*, and it is so much like it that until the plants have come into flower they are with difficulty distinguished from it. Davidson observes that it injures *Bice* plants.

**Distribution** : India, Ceylon, China, Malaya.

**Explanation of Plate 7** : *Ischaemum rugosum* Salisb.

- |   |   |                   |
|---|---|-------------------|
| 1. Spikelet and joint of rhachis.           | } | Sessile spikelet. |
| 2. Lower invol. glume.                      |   |                   |
| 3. Upper invol. glume.                      |   |                   |
| 4. Lower floral glume.                      |   |                   |
| 5. Palea of lower floral glume and stamens. |   |                   |
| 6. Upper floral glume.                      |   |                   |
| 7. Palea of upper floral glume.             |   |                   |
| 8. Grain.                                   |   |                   |

### 3. ISCHAEMUM MOLLE Hook. f.

*Ischaemum molle* Hook, f. Fl. Brit. Ind. VII (1896) 128; Lisboa Bomb. Grasses (1896) 50; Cooke Fl. Bomb. II (1908) 959.

**Etymology** : *Molle* means soft, alluding to the spikes being densely silky-villous.

**Description** : Stem 90-120 cm. long, solid, smooth, stout, leafy. Leaves 15-25 cm. by 6-8 mm., linear, finely acuminate, sparsely hairy, base rounded, cordate; sheaths 10-15 cm. long, smooth, glabrous, or sparsely hairy above, the mouth villous.

Racemes 1-2, axillary arid terminal, 7.5-12.5 cm. long, densely villous with soft white hairs. Spikelets reaching 5 mm. long; callus of sessile spikelets very short and broad. Sessile spikelets: lower involucral glume thinly coriaceous, broadly ovate, obtuse, dorsally villous all over, many-nerved; upper involucral glume chartaceous, obtuse, silky, keeled, the keel with a narrow ciliolate wing from the middle upwards; lower floral glume ovate, obtuse, hyaline, 3-nerved, ciliolate, paleate, the palea as long as the glume, narrow, obtuse; upper floral glume shorter than the lower one, cleft to the middle into 2 lanceolate acuminate ciliolate lobes; palea **small, narrow**; awn nearly 19 mm. long, the lower half dark brown, the upper **half** yellowish **white**. Pedicellate spikelets rather smaller **than the sessile**, with similar glumes **but awnless**.

Locality : *Konkan*: Sion creek (Sabnis 9900!).

*W. Ghats*: Igatpuri (McCann 9543 !); Khandala, railway line (McCann 9944 !); Lonavla (Bhide!, Woodrow).

**Distribution** : W. Peninsula, Central Provinces.

#### 4. ISCHAEMUM DIPLOPOGON Hook. f.

##### PLATE 8.

*Ischaemum diplopogon* Hook, f. Fl. Brit. Ind. IX (1896) 129 ; Lisboa Bomb. Grasses (1896) 50; Cooke Fl. Bomb. II (1908) 960.

**Etymology** : *Diplopogon* is a combination of *diplus*, two-fold, and *pogon*, beard, or, in other words, a double beard, alluding to the upper involucral glume having the lateral nerves pectinately ciliate near the apex with long erect hairs.

**Description** : Annual; stem 30-50 cm. long, branched from the base and upwards; nodes glabrous; internodes long. Leaves 7-5-15 cm. by 6-16 mm., linear-lanceolate from a narrow base, acuminate, with many slender nerves, dark green and shining above; sheaths glabrous, those of the upper leaves open, spathiform; ligule an oblong glabrous membrane.

Peduncles many from the upper spathe-like sheaths, solitary, filiform, the spathes 2-5-7-5 cm. long, lanceolate. Racemes usually 2, compressed, 2\*5-4\*5 cm. long; joints and pedicels half the length of the lower spikelets or longer, subclavate, dorsally rounded, ventrally concave. Sessile spikelets : callus nearly 1\*25 mm. long, thick. Spikelets reaching 6 mm. long. Glume\* 4; lower involucral glume 5 mm. long, oblong, shortly 2-cuspidate, obscurely nerved and with shortly incurved margins; upper involucral glume 5 mm. long, ovate, subacute, shortly 2-fid, 3-nerved, the lateral nerves pectinately ciliate near the apex with long erect hairs and furnished with a slender whitish awn 5 mm. long; lower floral glume linear-oblong, hyaline, 1-nerved; upper floral glume 4 mm. long, 2-fid at the apex into acute lobes, hyaline ; palea small, oblong; awn reaching 16 mm. long, the lower half brown, the upper yellowish white. Pedicellate spikelets often imperfect, not awned.

**Locality** : *W. Ghats*: Mahableshwar (Woodrow 4), wet rocks in a stream (Sedgwick & Bell 4595!); Matheran (Woodrow); Khandala (McCann!); Lonavla, Sakar Pathar (Gammi\* 15963!).

*Deccan*: Amberwadi, Nasik Dist. (Patwardhan!); Bhorkas, near Poona. (Woodrow 3!).

Ecology : This plant is found sporadically.

Distribution : W. Peninsula.

Explanation of Plate 8 : *Ischaemum diplopogon* Hook, f.

- |  |                     |
|--|---------------------|
| 1. Lower invol. glume.                         |                     |
| 2. Upper invol. glume.                         |                     |
| 3. L S w floral glume.                         |                     |
| 4. Upper floral glume.                         |                     |
| 5. Spikelets.                                  |                     |
| 6. Lower invol. glume.                         |                     |
| 7. Upper invol. glume.                         |                     |
| 8. Lower floral glume with stamens and styles. | } Sessile spikelet. |
| 9. Palea of lower floral glume.                |                     |
| 10. Upper floral glume.                        |                     |
| 11. Palea of upper floral glume.               |                     |
| 12. Grain.                                     |                     |
- // Pedicellate spikelet.  
J

#### 5. ISCHAEMUM PILOSUM Hack.

##### PLATE 9.

*Ischaemum pilosum* Hack. Monogr. Androp. (1889) 240; Duthie Fodder Grasses N. Ind. (1888) 31; Grah. Cat. Bomb. PL (1839) 239; Dalz. & Gibs. Bomb. Fl. (1861) 305; Lisboa Bomb. Grasses (1896) 51; Hook. f. Fl. Brit. Ind. VII (1896) 130; Cooke Fl. Bomb. II (1908) 961.

*Spodiopogon pilosus* Nees ex Steud. Syn. PI. Glum. (1855) 373.

*Andropogon pilifer* Steud. l. c.

*A. pilosum* Klein ex Willd. Sp. PI. IV, 920.

**Vernacular names** : Kunda, Nuth, Dungri-kunda, Pharari, Khavo, Kanigyanhulla.

**Etymology** : *Pilosum* means hairy, alluding to the spikes being clothed with long white hairs.



Pedicelled spikelet



Sessile spikelet

ISCHAKMI'M niPLOKKiON HOOK' F.

Delin: B. K. 7

K. M. S.





ISCHAEMUM PILOSUM HACK.

Delin: R. K. White.

**Description :** Rhizome giving out densely scaly long stolons; steins erect, 60-90 cm. long, slender, terete, glabrous; nodes glabrous. Leaves 15-30 cm. by 5-8 mm., linear, finely acuminate, glabrous; sheaths glabrous; ligule rounded, 2-3 mm. long, membranous, glabrous.

Racemes 2-6, fascicled, 2-5-10 cm. long, yellow or brownish, pilose; rhachis hairy; joints and pedicels slender, compressed, subclavate, shorter than the sessile spikelets, sparsely ciliate; pedicel about half as long as its spikelet. Sessile spikelets narrowly lanceolate, reaching 6 mm. long; callus minute, bearded with long hairs. Glumes 4; lower involucral glume chartaceous, narrowed from the middle upwards, dorsally hairy, the margins incurved throughout their whole length, the nerves anastomosing; upper involucral glume rather longer than the lower, chartaceous, ovate-lanceolate, acuminate, laterally compressed, 5-nerved, the lateral nerves anastomosing; lower floral glume a little shorter than the upper involucral glume, linear-oblong, obtuse, ciliate above, paleate, male, the palea acute, membranous, nerveless, glabrous; upper floral glume equalling the lower one, cleft almost to the middle into acute ciliolate lobes; palea a little shorter, lanceolate-subulate, nerveless; awn 6-10 mm. long. Pedicellate spikelets 4-5 mm. long, like the sessile but usually with a shorter awn, sometimes imperfect or reduced to a single glume.

**Locality :** *Gujarat:* Surat, roadside (Sedgwick!).

*Khandesh:* (Lisboa); Amalner (Blatter & Hallberg 4397!).

*Deccan:* Poona (Bhide!); Ganeshkhind Bot. Gard., Kirkee\* (Gammie!); Chattarshinji Hill, Poona (Ezekiel!); Mangri, 8 miles E. of Poona (Herb. Econ. Bot. Poona!); Yeravda (Herb. Econ. Bot. Poona!); Eirkee (Talbot!); Satara (Lisboa); Sholapur (Lisboa).

*S. M. Country:* Kunemelihalli (Sedgwick 2138!); Dharwar (Sedgwick & Bell 5341!); Haveii, black soil field (Talbot 2185!); Gadag (Talbot 2185!); 7 miles S. of Hubli, black soil field (Sedgwick 5341!).

**Ecology :** A characteristic black soil species. It is reported to infest the black cotton toil, to the great detriment of cultivation.

**Distribution :** W. Peninsula, Central Provinces, Rajputana.

**Economic uses :** Said to be a good fodder in some places; at Poona they call it a good fodder when young.

**Explanation of Plate 9 :** *Ischaentum pilosum* Hack.

- |  |                       |
|--|-----------------------|
| 1. Joint of rhachis and spikelets.                     | } » Sessile spikelet. |
| 2. Lower invol. glume.                                 |                       |
| 3. Upper invol. glume.                                 |                       |
| 4. Lower floral glume.                                 |                       |
| 5. Palea of lower floral glume, lodicules and stamens. |                       |
| 6. Upper floral glume.                                 |                       |
| 7. Palea of upper floral glume.                        |                       |
| 8. Stamens, styles and lodicules.                      |                       |

## 6. ISCHAEMUM SEMISAGITTATUM Roxb.

### PLATE 10.

*Ischaemum semisagittatum* Roxb. Hort. Beng. (1814) 8, Fl. Ind. I (1852) 320; Hack. Monogr. Androp. (1889) 208; Lisboa Bomb. Grasses (1896) 51; Hook. f. Fl. Brit. Ind. VII (1896) 130; Cooke Fl. Bomb. II (1908) 961.

*Spodiopogon semisagittatus* Voigt Hort. Suburb. Calc. 706.

*Meoschium semisagittatum* Schult. Mant. II, 435.

*Andropogon semisagittatum* Steud. Syn. PI. Glum. (1855) 376.

**Vernacular names :** Dalaga, Ber, Saj-kadi, Eari.

**Etymology :** *Semisagittatum* means half-arrow-shaped in allusion to the leaves which are cordate or sagittate at the base.

**Description :** Annual. Stems 30-60 cm. long, decumbent at the base, then ascending, slender, terete; nodes glabrous; internodes long. Leaves 5-7.5 by 1-1.6 cm., oblong-lanceolate, acuminate, with capillary tips, base auricled, broadly cordate or sagittate, the lower leaves with a filiform petiole reaching nearly 2-5 cm. long, the upper sessile, glabrous or sparsely hairy, the margins scabrid; sheaths loose, glabrous, those of the uppermost leaves spatheform; ligule oblong, 3 mm. long, obtuse, pilose.

Racemes 2, more or less softly villous with long white or grey hairs, 2-5-6-3 cm. long, fragile; internodes and pedicels much shorter than the spikelets, trigonous. Sessile spikelets 4-6 mm. long; callus short, bearded with long hairs. Glumes 4; lower involucral glume ovate, convex, the lower half cartilaginous, with 3-5 obscure or more or less conspicuous ridges ending in marginal nodules, the upper half chartaceous or membranous, with green veins and ciliolate margins;

upper involucre glume equalling the lower, ovate-oblong, obtuse, coriaceous; lower floral glume a little shorter than the lower involucre glume, ovate, acuminate, 1-3-nerved, paleate, male, the palea linear-oblong, hyaline, 2-nerved; upper floral glume female, cleft to below the middle into acute glabrous lobes; palea linear-oblong; awn 13-17 mm. long. Pedicellate spikelets rather shorter and narrower than the sessile, closely appressed to the sessile, with very broad pedicels 1 mm. long; lower involucre glume narrowly oblong, ridged or not; upper involucre and lower floral glumes as in the sessile spikelets; upper floral glume narrowly oblong, tip 2-toothed with a minute awn.

A weak plant with ascending stems. The lower nodes throw out wiry roots to support the culm. The cordate and sagittate leaves readily distinguish it from any other species in the Presidency. The lamina of the petioled leaves turn freely on the petioles with the slightest breeze.

The lower involucre glume of the sessile spikelet is frequently bifid, the thin membrane between the margins breaking down and bringing about this condition. We do not agree with the statement of most authors that the lower involucre glume of the pedicelled spikelet is not ridged. This is true of the uppermost spikelets, but those lower down in the spike are distinctly ridged, though slightly. The condition varies as one ascends the spike.

**Locality** : *Khandesh*: W. Khandesh (McCann!).

• *Eonkan*: Bombay, Sion (McCann 5251!), Sewri (McCann 3586!), Parel (Woodrow); Bassein (McCann 4482!); Kanari Caves (McCann 9914!); Thana (Lisboa); Mannagao (Talbot 2560!).

*Deccan*: Satara (Lisboa).

*W. Ghats*: Igatpuri, very common (McCann 4319!); Khandala, very common (McCann 9613!); Lonavla (Bhide!, Woodrow); Mahabaleshwar, in forests (Sedgwick & Bell 4802 !); Castle Bock (Bhide !); Dudhsagar Falls. (McCann !).

*N. Kanara*: Anmod (Sedgwick 3273!); Supa (Talbot 2092 !); Jugglepet (Talbot 2089 !); Yellapur (Talbot 738).

**Ecology** : This is a gregarious grass, very abundant on the crest of the Ghats in N. Eanara. Growing usually in the shade of trees. Common throughout the lower regions of the Presidency.

**Distribution** : Bengal, W. Peninsula, Ceylon.

**Explanation Of Plate 10** : *Ischaemum semisagittatum* Roxb.

1. Joint of rhachis.
  2. Dorsal view lower invol. glume.
  3. Spikelets.
  4. Ventral view of lower invol. glume. \*
  5. Upper invol. glume.
  6. Lower floral glume.
  7. Palea of lower floral glume.
  8. Upper floral glume,
  9. Palea of upper floral glume.
- } Sessile spikelet.

YAB. DASYANTHA Hack.

*Var. dasyantha* Hack. Monogr. Androp. (1889) 209 ; Cooke FL Bomb. II (1908) 962.

*Ischaemum conjugatum* Eoxb. Hort. Beng. (1814) 8, FL Ind. I (1832) 321; Grah. Cat. Bomb.

PL (1839) 239; Dalz. & Gibs. Bomb. FL (1861) 305.

**Etymology** : *Dasyantha*, from *dasy*, hairy, shaggy, and *anthos*, flower, alluding to the villous lower involucre glume, at least in the upper spikelets.

**Description** : Lower involucre glume appressedly villous at least in the upper spikelets; joints scabrous with hairy margins and keel.

**Locality** : *Konkan*: (Stocks ex Cooke).

*N. Kanara*: (Woodrow !).

## 7. ISCHAEMUM CONJUGATUM Eoxb.

### PLATE 11.

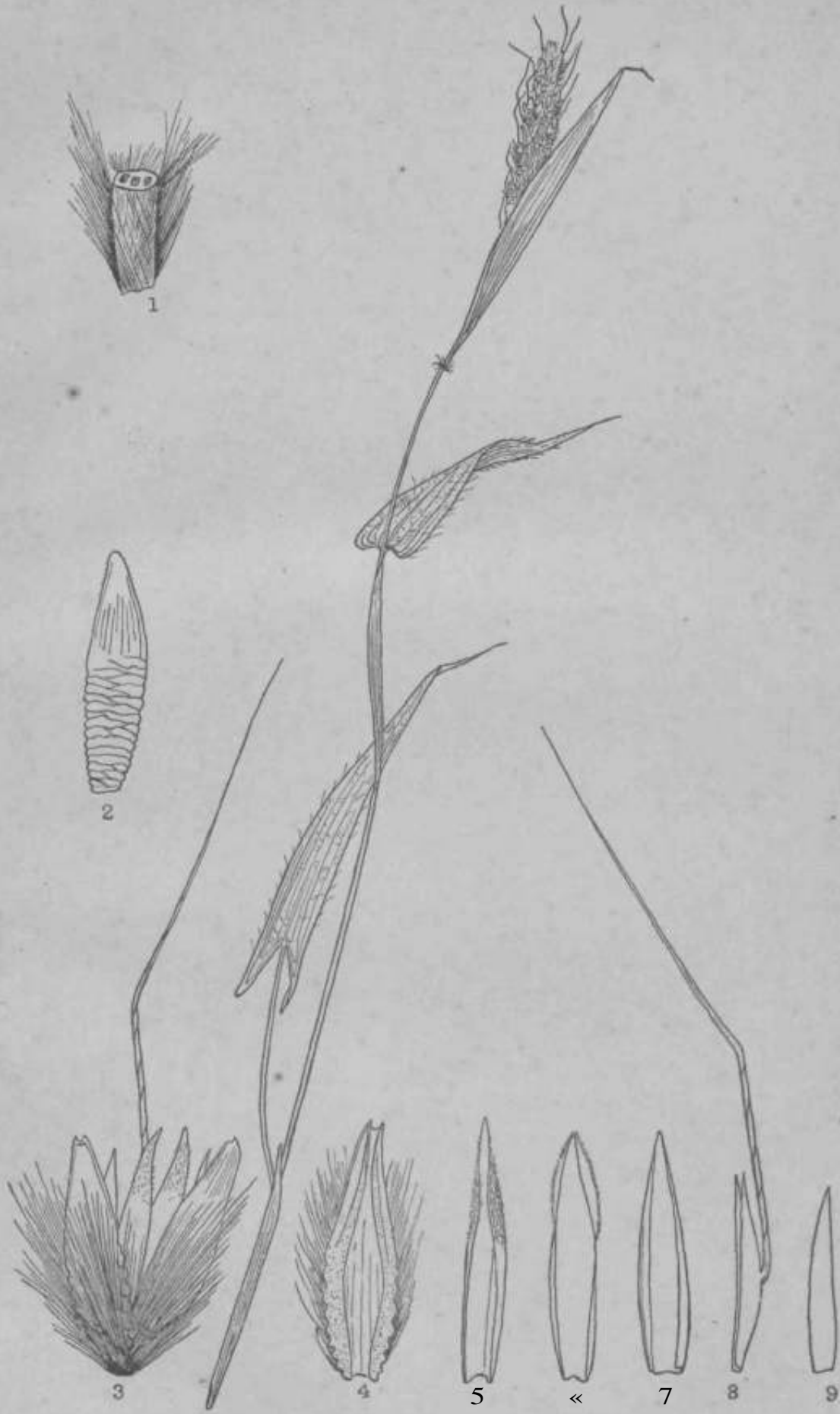
*Ischaemum conjugatum* Roxb. FL Ind. I (1832) 321 (*non* Roxb. Hort. Beng. (1814) 8); Hack.

Monogr. Androp. (1889) 205 ; Hook. f. FL Bri., Ind. VII (1896) 131.

*Spodiopogon conjugatus* Voigt Hort. Suburb. Calc. 706.

*Andropogon cordatifolius* Steud. Syn. PL Glum. (1855) 376.

**Etymology** : *Conjugatum* means united; what it refers to we are not able to say.



Sessile spikelet

IBOHA BMtM SBMKArftTW 11 M ROX n.

Delin: R. K. Bhide.



Sessile spike let

tscn AEMUM CONJUGATUM CM ROSB.

Delin: R. K. Bids.

**Description** : An annual. Stem spreading from the root and creeping, then geniculately ascending, 30-35 cm. high, slender, stiff, purplish, repeatedly branching upwards. Leaves short, 25-35 mm. long, base hastate or broadly, deeply cordate, acuminate, broadest at the base, rather rigid, striate, lower petioled; sheath of the upper ventricose and often open; ligule short, glabrous.

Spikes 2, short, 25-35 mm. long, sessile, villous; joints very short, quadrately clavate, plano-convex, ciliate. Sessile spikelets 3 mm. long, pale. Glumes 4. Lower involucrel glume oblong, obtuse, flat, 2-toothed, villous from below or above the middle to nearly the top, margins narrowly inflexed, not winged, upper half often greener, even, or lower margins obscurely nodose\*. Upper involucrel glume lanceolate, acuminate, strongly keeled, puberulous. Lower floral glume paleate. Upper floral glume cleft to about the middle, awn dorsally inserted at or below the cleft; slender, about twice as long as the spikelet. Pedicelled spikelets subsessile, almost awnless. Lower involucrel glume as in the sessile.

**Locality** : *Konkan*: Okda Forest (Ryan 712!).

*W. Ghats*: Ehandala (Garade!); Mahableshwar to Pratapghad (Bhide I).

*Deccan*: Poona, College Farm (Pawar!).

*N. Kanara*: Gersoppa Falls (Ghibber!).

**Distribution** : Bengal, W. Peninsula, naturalized in Ceylon.

**Explanation Of Plate 11** : *Ischaemum conjugatum* Roxb.

- |  |   |                   |
|--|---|-------------------|
| <ol style="list-style-type: none"> <li>1. Dorsal view of sessile spikelet.</li> <li>2. Lower invol. glume.</li> <li>3. Upper invol. glume.</li> <li>4. Lower floral glume with stamens.</li> <li>5. Palea of lower floral glume.</li> <li>6. Palea of upper floral glume.</li> <li>7. Upper floral glume.</li> <li>8. Stamens and styles.</li> </ol> | } | Sessile spikelet. |
|--|---|-------------------|

#### 8. ISCHAEMUM IMPRESSUM Hack.

*Ischaemum impressum* Hack. Monogr. Androp. (1889) 210; Hook, f. Fl. Brit. Ind. VII (1896) 132; Lisboa Bomb. Grasses (1896) 52.

**Description** : Stem 10-20 cm. high, slender, prostrate below, branching upwards, quite glabrous. Leaves 5-8 cm. long, upper 18 mm. broad, ovate- or oblong-lanceolate, cordate, lower narrower, petioled, sparsely hairy beneath, margin thickened, acaberulous, sometimes crenulate; sheath compressed, glabrous; ligule oblong.

Spikes 2, yellow; joints and pedicels stout, clavate, ciliate with rigid hairs, forked at the top. Sessile spikelets 6-8 mm. long, shining; callus short, broad, bearded. Lower involucrel glume linear-oblong, flat, dorsally broadly irregularly depressed with shallow subsemilunar pits in the lower 1/3, above it winged and 2-cuspidate, narrowed and margins subnodulose at the base, wings erose. Upper involucrel glume obtuse, chartaceous, ciliate, dorsally rounded with a median gibbosity and an auricle-like wing above it. Lower floral glume oblong-lanceolate, hyaline, 3-nerved, ciliate. Upper floral glume much shorter, glabrous, cleft to above the middle, awn short, geniculately inserted at the cleft. Pedicelled spikelets smaller than the sessile. Lower involucrel glume obtuse, glabrous, many-nerved, winged on one margin. Upper involucrel glume 7-nerved. Upper floral glume mucronate.

**Locality** : *W. Ghats*: Iगतपुरी (Blatter 1); Ehandala, Echo Point (McCann 9943!); Lonavla (Bhide!); Mahableshwar (Sedgwick & Bell 4514!); Panchgani, Tableland (Blatter 5083! B1221! B1285!).

**Ecology** : Subgregarious. Very abundant at Mahableshwar in damp grassy places.

**Distribution** : We have found this species only in the W. Ghats. Hooker f. mentions the Konkan, but with a sign of interrogation. As we have never met it in the Konkan, it is not likely to occur in that region. Where Huegel's specimen comes from we cannot say, and will in all probability never be known. We think it is quite safe to say that *I. impressum* is\* endemic in the W. Ghats of the Bombay Presidency.

#### 9. ISCHAEMUM LISBOAE Hook. f.

*Ischaemum Lisboaae* Hook, f. Fl. Brit. Ind. VII (1896) 133; Lisboa Bomb. Grasses (1896) 52; Cooke FL Bomb. II (1908) 962.

**Etymology** : The specific name *tiras* given after Dr. J. C. Lisboa, the author of Bombay

**Description** : Stem creeping below, very stout, rooting at the thickened nodes; branches ascending; 20-35 cm. long, glabrous. Leaves on the creeping stem 2-5-5 cm. by 6-10 mm., oblong, acute, closely imbricating in 2 series, the blades reflexed at right angles to the erect short open sheaths, softly tomentose on both surfaces; lower sheaths 13-25 mm. long, villous; ligule short, bearded with very long hairs.

Racemes 2, softly tomentose, 5 cm. long; joints and pedicels about half as long as the spikelets, stout, shortly villous, concave-convex, truncate. Sessile spikelets 3 mm. long; callus large, glabrous. Glumes 4; lower involucral glume thickly coriaceous, dorsally convex, 2-fid, ciliate above the middle, margins broadly incurved below the middle, keels with broad auricular ciliate wings; upper involucral glume 3 mm. long, rather longer than the lower, rigid, the keel winged above the middle, the back of the glume rounded below the wing, shortly awned; lower floral glume ovate-oblong, obtuse, with ciliate margins, paleate, male, the palea chartaceous, obovate, with broad hyaline wings above the middle; upper floral glume about 2 mm. long, 3-nerved below the middle, obtusely 2-lobed; palea lanceolate; awn about 4 mm. long.

**Locality** : *N. Kanara* : (Lisboa); Earwar (Talbot 2209 !, McCann !).

**Distribution** : Apparently endemic in *N. Kanara*.

#### 10. ISCHAEMUM CILIARE Retz.

##### PLATE 12.

*Ischaemum ciliare* Retz. Obs. VI (1791) 36; Hack. Monogr. Androp. (1889) 225; Duthie Fodder Grasses N. Ind. (1888) 30; Lisboa Bomb. Grasses (1896) 52; Hook. f. Fl. Brit. Ind. VII (1896) 133; Cooke Fl. Bomb. II (1908) 962.

*I. aristatum* Willd. Sp. PL IV, 939; Roxb. FL Ind. I (1832) 319.

*I. geniculatum* Roxb. 1. c. 322.

*I. scrobiculatum* Wight & Arn. ex Steud. Syn. PL Glum. (1855) 373.

*Spodiopogon ciliaris* Nees ex Steud. Nom. ed. II, II, 625.

*S. obliquivalvis* Nees in Nov. Act. Nat. Cur. XIX, Suppl. I (1843) 185; Duthie Grasses N. W. Ind: (1883) 16.

*S. zeylanicus* Nees ex Steud. 1. c. 377.

*S. villosus* Nees in Hook. & Arn. Bot. Beech. Voy. 242.

**Vernacular names** : Bara, Bar, Putena. . -

**Description** : Stems tufted, up to 30 cm. long, erect or ascending, sometimes decumbent below and rooting at the nodes, slender; nodes glabrous or bearded. Leaves 5-15 cm. by 4-13 mm., linear or linear-lanceolate, acuminate, flat, sessile, glabrous, pubescent or villous, narrowed towards the acute or rounded base, margins scabrid; sheaths glabrous or hirsute, compressed, loose, with ciliate rounded auricles; ligule short, obtuse, membranous, ciliate.

Racemes 2, rather short, 3-8-5 cm. long; rhachis fragile; internodes and pedicels of upper spikelets subequal, erect, compressed, trigonous, bearded dorsally and on the angles. Sessile spikelets 4-5 mm. long, oblong or ovoid; callus very short, oblong, bearded. Glumes 4; lower involucral glume 2-cuspidate, coriaceous, convex, smooth or pitted, hirsute below, flatter and veined above the middle, with lateral ciliolate broad or narrow equal wings, the margins narrowly incurved above, broadly so below; upper involucral glum? as long as or longer than the lower, chartaceous, lanceolate, acuminate or shortly awned, 3-5-nerved, keel narrowly winged towards the tip; lower floral glume ovate-lanceolate, acuminate, ciliate near the tip, triandrous, paleate, the palea lanceolate, acuminate, opaque, with broad hyaline ciliolate wings; upper floral glume cleft to the middle into oblong obtuse glabrous or ciliate lobes, female; palea lanceolate, acuminate, 2-nerved, not ciliolate; awn 10-13 mm. long. Anthers 3 mm. long. Styles and stigmas short. Pedicellate spikelets like the sessile, the upper floral glume usually awned.

**Locality** • *Kovikan*: Bombay, St. Xavier's College compound (McCann 4594!); Parel (Woodrow); Bassein (Ryan 445 !); Salsette (Jacquemont 710); Alibag, sandy shore (Ezekiel!); Uran (McCann 5126!); Campoli (McCann 9415!).

*W. Ghats*: Igatpuri (Blatter & Hallberg 3927A!); Khandala, very common (McCann 9612 !); Castle Rook (Bhide !).

*Deccan*: Ganeshkhind Bot. Gardens (Herb. Econ. Bot. Poona!).

*S. M. Country*: Mugad, hillside (Sedgwick 1823 !).

*N. Kanara*: Yellapur (Talbot 1526 !); Halyal, boiders of ricefields (Talbot 2141!); Ankola (Mamlatdar of Ankola); Karwar, soacoast, sandy soil near Gaol (Talbot 2821!); Gersoppa Falls (McCann!); common throughout Kanara (McCann!); Kakti (Woodrow).

**Ecology** : Subgregarious, found in newly formed pasture land.

**Distribution** : India, Ceylon, China, Malaya, Australia.



sessile spikelet

[SCBAKMIM OIMARE RETZ.

Delin: B. K. Bhida.



**Economic uses** : Apparently not fit for cattle.

**Explanation of Plate 12** : *Ischaemum ciliare* Betz.

- |   |                       |
|---|-----------------------|
| <ol style="list-style-type: none"> <li>1. Lower involucre glume of pedicelled spikelet.</li> <li>2. Spikelets.</li> <li>3. Lower invol. glume.</li> <li>4. Upper invol. glume with stamens.</li> <li>5. Lower floral glume.. .</li> <li>6. Palea of lower floral glume.</li> <li>7. Upper floral glume.</li> <li>8. Palea of upper floral glume with stamens and styles.</li> </ol> | } - Sessile spikelet. |
|---|-----------------------|

#### 11. ISCHAEMUM TIMORENSE Kunth.

*Ischaemum timorense* Kunth Rev. Gram. I (1829) 369, t. 98; Hack. Monogr. Androp. (1889) 229; Lisboa Bomb. Grasses (1896) 53; Hook. f. Fl. Brit. Ind. (1896) 136.

*I. tenellum* Roxb. Fl. Ind. I (1832) 323.

*Spodiopogon Blumii* Nees ex Steud. Syn. Pl. Glum. (1855) 373.

*Andropogon Asthenos* Steud. 1. c.

*A. timorensis* Steud. 1. c.

*Ischaemum* no. 4, Griff. Notul. 91, Ic. PL Asiat. (1847-52) t. 148, fig. 1.

**Etymology** : *Timorense*, after the island of Timor.

**Description** : Stem 15-45 cm. high, slender, branched, straggling, nodes glabrous, or sparingly bearded. Leaves 2-5-10 cm. long, sessile and petioled, linear-lanceolate, acuminate, glabrous or sparsely hairy, base of upper rounded, of lower rounded; sheath lax, mouth hairy; ligule obscure.

Spikes 2-3, 1-2 cm. long, rather slender, sparingly villous at joints and pedicels about half as long as the spikelets, nearly equal, shortly ciliate. Sessile spikelets 2-5-3 mm. long, greenish or with green nerves; callus narrow, long-bearded. Lower involucre glume ovate or ovate-lanceolate, acuminate, bicuspidate, 5-9-nerved, base ventricose, margins broadly involute below, subauricled, dorsally convex, polished, nerves strong. Upper involucre bracts longer, acuminate or aristulate, dorsally rounded, recurved, 3-5-nerved, tip 2-toothed, dorsally usually ciliate. Lower floral glume lanceolate falcate, palea linear-oblong. Upper floral glume short, 2-lobed, glabrous, awn in the cleft very slender, shortly exserted. Pedicelled spikelets like the sessile awned.

**Locality** : *Sind*: Sukkur (Mamlatdar of Sukkur!).

*W. Ghats*: Khandala, behind the Saddle (McCann 9915 !); Lonavla (Bhide !); Mahabaleshwar, common (Sedgwick & Bell 4503!); Londa (Bhide!).

*M. Country*: Deciduous forests W. of Dharwar (Sedgwick & Bell 4500!); Devikop (Sedgwick 2170 !); S. W. of Dharwar (Sedgwick & Bell 4429 !).

*N. Kanara* : Supa (Talbot 2101!); Yellapur (Talbot 2327 !); Dandeli (Talbot 2494!).

**Distribution** : Burma, Chittagong, Bengal, Central Provinces, Sind, W. Peninsula, Ceylon, Malaya, Pacific Islands.

#### 7. SEHIMA Forsk.

Perennial or annual; blades convolute when young, at length flat, narrow; ligules a line of stiff hairs.

Racemes usually gently curved, dorsiventral and laterally compressed, with the pedicelled spikelets converging over the convex side, joints and pedicels sublinear and parallel. Spikelets 2-nate, those of each pair differing in sex and also much in shape, one sessile, the other pedicelled on the articulate fragile rhachis of solitary spike-like racemes, the pedicelled tardily separating from their pedicels, the sessile deciduous together with the adjacent joint of the rhachis and the pedicel. Florets 2; lower male, upper hermaphrodite in the sessile, male or neuter in the pedicelled spikelets. Sessile spikelets: involucre glumes equal or subequal; lower deeply grooved, rarely flat, 2-dentate or 2-mucronate, more or less chartaceous, upwards acutely 2-keeled with inflexed margins, keels winged; upper involucre glume boat-shaped, keeled upwards with a bristle-like awn. Floral glumes hyaline, of lower floret entire, muticous, of upper 2-fid and awned from the sinus. Paleae more or less equalling their valves, hyaline. Lodicules 2, cuneate. Stamens 3. Stigmas linear-oblong, laterally exserted. Grain oblong, obtusely trigonous; embryo reaching to the middle of the grain. Pedicelled spikelets flat, with a strongly nerved or ribbed lower glume, and 2 florets resembling the lower floret of the sessile spikelets, the lower or both more or less reduced and barren.

Species about 5.—India, Arabia, tropical Africa, N. America.

- A. Racemes enclosed in long narrow spathes . . . . . 1. *S. spathiflorum*.  
 B. Racemes not enclosed in spathes.  
 I. Sessile spikelets 6-7 mm. long. Lower involucre  
 glume of sessile spikelet 6-nerved . . . . . 2. *S. nervosum*.  
 II. Sessile spikelets 7-11 mm. long. Lower involucre  
 glume of sessile spikelets 3-5-nerved . . . . . 3. *S. ischaemoides*.  
 JIL Sessile spikelet 9 mm. long. Lower involucre glume  
 of sessile spikelet 2-nerved . . . . . 4. *S. sulcatum*.

1. SEHIMA SPATHIFLORUM Blatter & McCann.

PLATE 13.

*Sehima spathiflorum* (Hook, f.) Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1927) 23.

*Ischaemum spathiflorum* Hook. f. Fl. Brit. Ind. VII (1896) 138 ; Lisboa Bomb. Grasses (1896) 54 ; Cooke Fl. Bomb. II (1908) 963.

**Etymology** : *Sehima* is formed from the Arabic name *Soehim* of *Sehima ischaemoides* JTorsk.—*Spathiflorum* refers to the long flowering spathes.

**Description** : A tall grass reaching 90-120 cm. high, much branched above ; branches erect. Stem as thick as a goose-quill below, leafy above ; nodes glabrous. Leaves 30-45 by 2 cm., linear-lanceolate, finely acuminate, narrowed from the middle, often tinged with purple, almost petiolate, thin, sparsely hairy, margins smooth ; midrib stout, nerves obscure ; sheaths of lower leaves 15 cm. long and upwards, terete, quite glabrous, the sheaths of the upper leaves passing into compressed lanceolate flowering spathes 7\*5-10 cm. long ; ligule short, scarious.

Racemes about 5 cm. long, more or less exserted from the spathes, very slender, pale straw-coloured ; joints and pedicels more than half as long as the sessile spikelets, compressed, one angle ciliate. Sessile spikelets 1 cm. long, narrowly linear-lanceolate ; callus very short, hairy ; lower involucre glume 1 cm. long, thinly coriaceous, nerveless, white with dense silky hairs to above the middle, dorsal furrow very deep, causing a thick ridge on the inside of the glume, margins equally incurved, the tip 2-dentate ; upper involucre glume chartaceous, dorsally convex, nerveless, but with a nerve-like fold towards the ciliate margin, keel with long cilia above the middle, scabrid towards the emarginate tip ; lower floral glume shorter, hyaline, oblong-lanceolate, obtuse, 3-nerved, paleate, the palea lanceolate, the anthers imperfect ; upper floral glume as long as the lower, linear, 3-nerved ; palea 0 ; awn 3-8 cm. long, the column twisted, brown, the upper portion slender, usually purple. Pedicellate spikelets longer than the sessile ; lower involucre glume 13 mm. long, dorsally convex, not furrowed, lanceolate, narrowed into a bisetose often purplish awn, sparsely silky, 7-9-nerved ; upper involucre glume lanceolate, acute, glabrous ; lower floral glume as in the sessile spikelet ; upper floral glume awnless.

**Locality** : *Khandesh* : Toranmal (McCann 9922 !).

*Konkan* : Pen (Bhide!) ; Bassein (Ryan 2300!) ; Kanari Caves (McCann D920 f) ; Island of Salsette, in hilly stony places (Jacquemont 797).

*W. Ghats* : Igatpuri (Blatter and Hallberg 3836!, McCann 1) ; Matheran (Paranjpye) ; Khandala (Woodrow), in watercourses very common (McCann 9928!) ; Palasdari on the Bhor Ghat, G. I. P. Ry. (Woodrow) ; Lonavla (Bhide!).

*Deccan* : Lohagad, plain (McCann 9919 1) ; Bairawadi, Purandhar (McCann 5054!).

**Ecology** : Some of our specimens are typical hot season forms which are barely 45 cm. high and which in appearance are quite unlike the common monsoon form. The spathes are not so prominent in this form as they are in the monsoon form. During the monsoon the plant frequently reaches about 1-8 m. in height bearing numerous spikes, whilst the dry season form produces but few spikes. The monsoon form flowers about the middle of September. The dry season culms, devoid of the inflorescences, are frequently to be seen in dry watercourses after the monsoon. The dry weather form will only grow in or near water. The monsoon form develops stout stilt roots.

**Distribution** : Endemic



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Sessile spikelet

**5ZHBUBATHIFLORUM** (HOOK. F.) BLATTER\*

McCANN.

Delin: R. K. Hilde.



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Pedicelled spikelet

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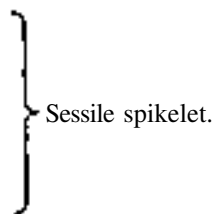
13

Soss'le splkciT

SEHIMA NBRVOSTJM STAFF.

**Explanation of Plate 13** : *Sehima spathiflorum* Blatter & McCann.

1. Spikelets and joint of rhachis.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Falea of lower floral glume with stamens.
6. Upper floral glume.
7. Palea of upper floral glume.
8. Grain.



## 2. SEHIMA NERVOSUM Stapf.

## PLATE 14.

*Sehima nervosum* Stapf in Fl. Trop. Afr. IX (1917) 36 ; Haines Bot. Bih. & Or. pt. 5 (1924) 1023 ; Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1927) 23.

8. *macrostachyum* Hochst. in Schimp. PI. Abyss. no. 1705.

*Andropogon nervosus* Kottl. apud Willd. in Verh. Naturf. Fr. Berlin IV (1803) 218.

*A. striatm* Klein apud Willd. Sp. PI. IV (1805) 903 ; R. Br. Prodr. (1810) 201.

*A. tacazensis* Steud. Syn. PI. Glum. I (1855) 369.

*A. macrostachys* Anders, in Schweinf. Beitr. Fl. Aeth. (1867) 306.

*Ischaemum laxum* R. Br. Prodr. (1810) 205 ; Hook. f. FL Brit. Ind. VII (1896) 136 (*partim*);

Lisboa Bomb. Grasses (1896) 53 ; Cooke Fl. Bomb. II (1908) 964 (*partim*).

*I. laxum* var. *genuinum* Hack. Monogr. Androp. (1899) 245.

*I. nervosum* Thw. Enum. PI. Zeyl. (1864) 305.

7. *macrostachyum* A. Rick Tent. Fl. Abyss. II (1851) 472.

*Pollinia striata* Spreng. Pug. II, 12.

*Hologamium nervosum* Nees in Edinb. N. Phil. Jour. XVIII (1835) 185.

**Vernacular names** : Paunat, Pavna, Suckal, Sheda, Pal.

**Description** : Perennial, forming dense tufts. Culms erect, 60 to over 90 cm. high, slender, terete, simple or nearly so, about 4-noded, middle and upper internodes exerted, smooth or slightly rough below the inflorescence, glabrous. Leaves glaucous ; sheaths tight, terete, striate, smooth or nearly so, glabrous or sparingly hirsute from tubercle-based hairs; ligules a line of short stiff hairs; blades linear, long attenuated to a setaceous point, up to over 30 cm. long and up to 5\*2 mm. wide, rigid, more or less scabrid, glabrous,, lateral nerves about 3 on each side, like the midrib whitish and prominent on both sides.

Racemes solitary, 7-5-11\*5 cm. long, erect, slightly curved; joints and pedicels parallel, sublinear, slightly compressed, 4\*2-5-2 mm. long, densely ciliate with white hairs along the angles, otherwise glabrous, tips more or less oblique. Sessile spikelets lanceolate-linear to linear, acuminate, 8-4-9-4 mm. long, pale green, with a shortly bearded callus. Involucral glumes subequal; lower subchartaceous to chartaceous, with an unequally 2-toothed flat and membranous beak, the teeth of which sometimes run out into ciliate mucros, deeply grooved, particularly below the middle, acutely 2-keeled, outer keel generally winged upwards, intracarinal nerves 4, with transverse veins in the upper part, like these green and raised on a white ground; upper involucral glume subchartaceous, somewhat shorter, boat-shaped, sublinear in profile, keeled above, with the keel widened at the apex and passing into a fine bristle 14\*7-16\*8 mm. long, 5-nerved with fine transverse veins, ciliate. Lower floret: floral glume faintly 2-nerved, hyaline, ciliate, 6-3 mm. long, with a narrow linear palea of about equal length and a male flower. Upper floret hermaphrodite: floral glume oblong-lanceolate, 5 mm. long, 2-fid, with narrow lobes, hyaline, 3-nerved, ciliate; awn up to 4-5 cm. long, slender, column spirally twisted, bronze colour very minutely ciliate along the spiral, bristle whitish, as long as the column or slightly longer; palea as long as floral glume, linear, subacute, 2-nerved, ciliate. Anthers up to nearly 4 mm. long. Styles and stigmas pale, 2-6 mm. long. Pedicelled spikelet lanceolate, acuminate, green or suffused with purple, 9-5-11-5 mm. long, glabrous; lower involucral glume slightly 2-toothed, long-ciliate from the hairs of the tightly inflexed margin, keels very narrowly or obscurely winged, wing rigidly ciliate, intracarinal nerves 5, the inner 3 very prominent and rough; upper involucral glume lanceolate, long and finely acuminate, hyaline, ciliate, 3-nerved; lower floret as in the sessile spikelet; upper floret very like the lower. Stamens smaller in the lower floret or both florets reduced and empty.

**Locality** : *Kathiawar*: Junagad (Blatter 3799 !); Porbandar (Bhide !).

*Gujarat*: Surat, city walls (Herb. St. X. C. 9498 !); Ahmedabad (Sedgwiok 1).

*Khandesh*: (Lisboa); Umalla village, on Tapti River (Blatter & Hallberg 5160!); Toranmal, common on the slopes (McCann 993 G!).

*W. Ghats*: Khandala, St. Xavier's Villa compound (McCann 9419!); Lonavla (Bhide!); Panchgani (Blatter & Hallberg B1269!).

*Deccan*: Deolali (Blatter & Hallberg 4548!); Foona (Woodrow); Poona to Karli (Jacquemont 530); Purandhar Fort (Bhide!, McCann 5106!).

*S. M. Country*: Dharwar (Bhide !); Haveri (Talbot 2186 !).

**Ecology** : Subgregarious. Very common in the Carnatic.

**Distribution** : Bengal, Bihar, Central Provinces, Rajputana, W. Peninsula, Ceylon\* tropical Australia, Somaliland, Abyssinia, Eritrea, Cape Verde Islands.

**Economic uses** : Considered as one of the best fodder grasses.

**Explanation of Plate 14** : *Sehima nervosum* Stapf.

- |   |   |                      |   |                   |
|---|---|----------------------|---|-------------------|
| 1. Spikelets and joint of rhachis.          | } | Pedicelled spikelet. |   |                   |
| 2. Lower invol. glume.                      |   |                      |   |                   |
| 3. Upper invol. glume.                      |   |                      |   |                   |
| 4. Lower floral glume with stamens.         |   |                      |   |                   |
| 5. Palea of lower floral glume.             |   |                      |   |                   |
| 6. Upper floral glume.                      |   |                      |   |                   |
| 7. Lower invol. glume.                      |   |                      |   |                   |
| 8. Upper invol. glume.                      |   |                      |   |                   |
| 9. Lower floral glume.                      |   |                      |   |                   |
| 10. Palea of lower floral glume.            |   |                      | } | Sessile spikelet. |
| 11. Upper floral glume (end of awn broken). |   |                      |   |                   |
| 12. Palea of upper floral glume.            |   |                      |   |                   |
| 13. Grain.                                  |   |                      |   |                   |

### 3. SEHIMA ISCHAEMOIDES Forsk.

*SeUrm ischaemoides* Forsk. Fl. Aegypt.-Arab. (1775) 178 ; Stapf in Fl. Trop. Afr. IX (1917) 37 ; Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1927) 24

*S. Kotschyi* Hochst. in Flora (1844) 247.

*Ischaemum Sehima* R. Br. Prodr. I (1810) 204.

*I. imca* Vptum Hochst. in Schimp. Pl. Abyss, no. 739, and Flora (1844) 247 ; A. Rich. Tent. Jfl. Abyss. 11 (1851) 472.

*Andropogon Sehima* Steud. Syn. Pl. Glum. I (1855) 369.

*A. lineatus* Steud. 1. c.

*A. schangulensis* Rupr. ex Steud. 1. c.

*4. inscalptus* Anders, in Schweinf. Beitr. Fl. Aeth. (1867) 306 (*per errorem* 310)

*Ischaemum laanm* R. Br. Prodr. (1810) 205 ; Hook. f. Fl. Brit. Ind. VII (1896) 136, *mrUm*

*I. laxum* var. *inscalptum* Hack, in Monogr. Androp. (1889) 245.

*Andropogon rhynciophorus* Stapf in Bull. Soc. Bot. Fr. LV (1908) Mem. VIII 101

**Etymology** : *Ischaemoides* means resembling *Ischaemum*.

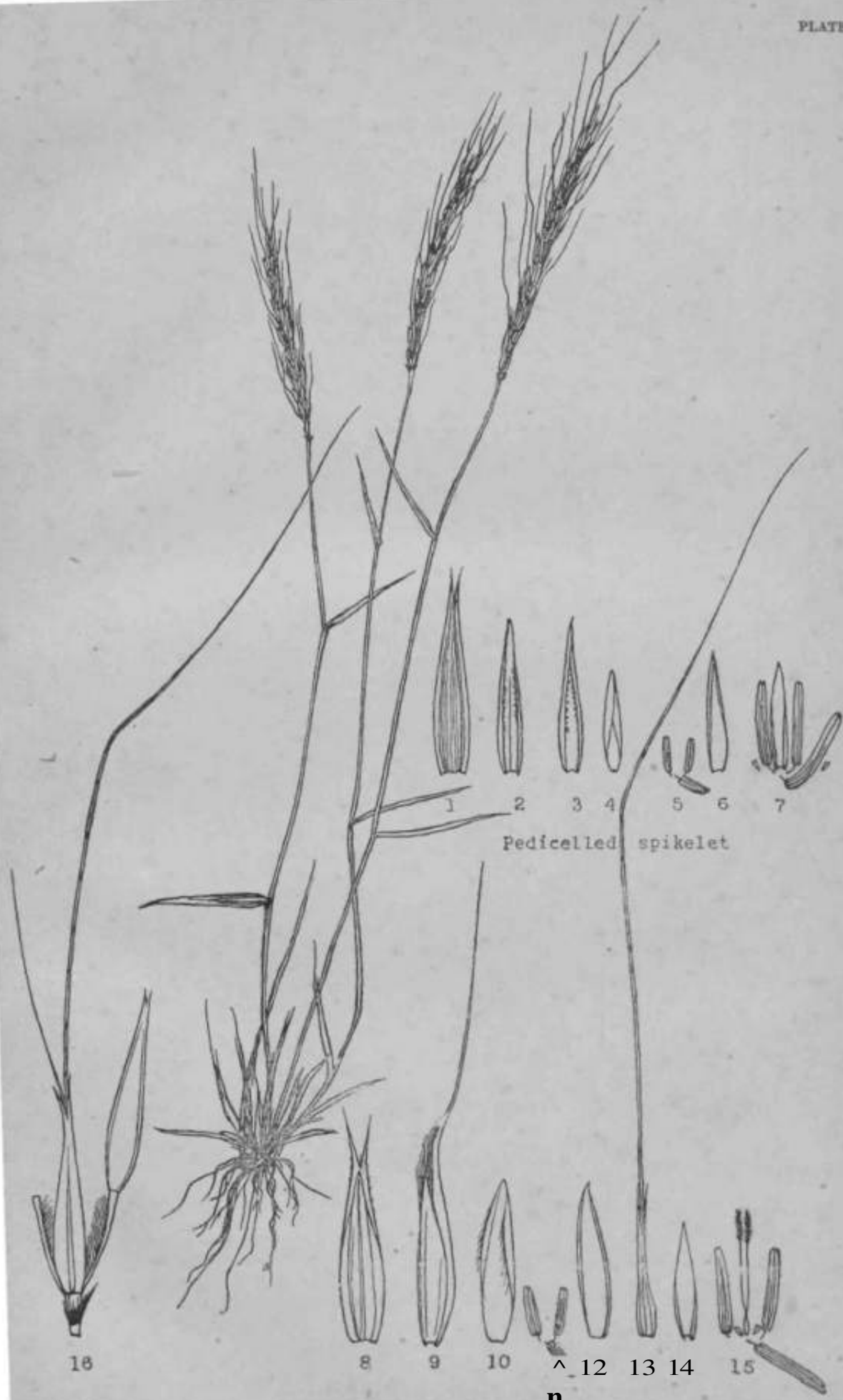
**Description** : Annual; culms usually in small fascicles, rarely over 45 cm. high, slender terete, simple, 2- or 3-noded, middle and upper internodes slightly exserted, smooth glabrous. Leaves glaucous, sheath terete, tight, or the upper somewhat inflated, smooth or slightly rough glabrous; hedges a fringe of stiff hairs; blades linear, tapering to a long fine point! up to 1-2\* 3 cm. long, 2-4 mm. wide, rather firm but hardly rigid, more or less scabrid, midrib fine like 4c 1 or 2 primary lateral nerves.

Racemes solitary, or sometimes an additional 1 or 2 from the upper nodes, 2.5-7.5 cm. long, erect or slightly nodding; joints and pedicels parallel, sublinear, slightly compressed 4 mm. long, very densely ciliate from white hairs along the angles, otherwise glabrous, tips more or less oblique. Sessile spikelets linear, 9.5-15 mm. long, pale green, with a shortly bearded callus; lower involucral glume subchartaceous to chartaceous, with an unequally 2-toothed flat and membranous long beak, the teeth of which run out into mucros, deeply grooved particularly below the middle, acutely 2-keeled, the outer keel generally winged upwards intracarinally; carinal nerves 3-5, raised, rough, only distinct just above the groove; upper involucral glume and florets as in *SeUma nervosum* excepting the bristle of the involucral glume which is over 21 mm. long and the awn, the column of which is generally more brown than bronze in colour and has much longer cilia along the spirals. Pedicelled spikelets narrowly lanceolate imbricate (acumen up to 6 mm. long), pale green, up to 17 mm. long, glabrous. Lower involucral glume with 2 long setaceous teeth, sparingly hairy on the back, otherwise the spikelets as in *S. nervosum*.

**Locality** : Deccan (Woodrow 147, Law, ex Stapf).

JASS

to : top ca I a, Yemen, Abyssinia, Sudan, Kurdistan, Nubia, Cameroons, India.



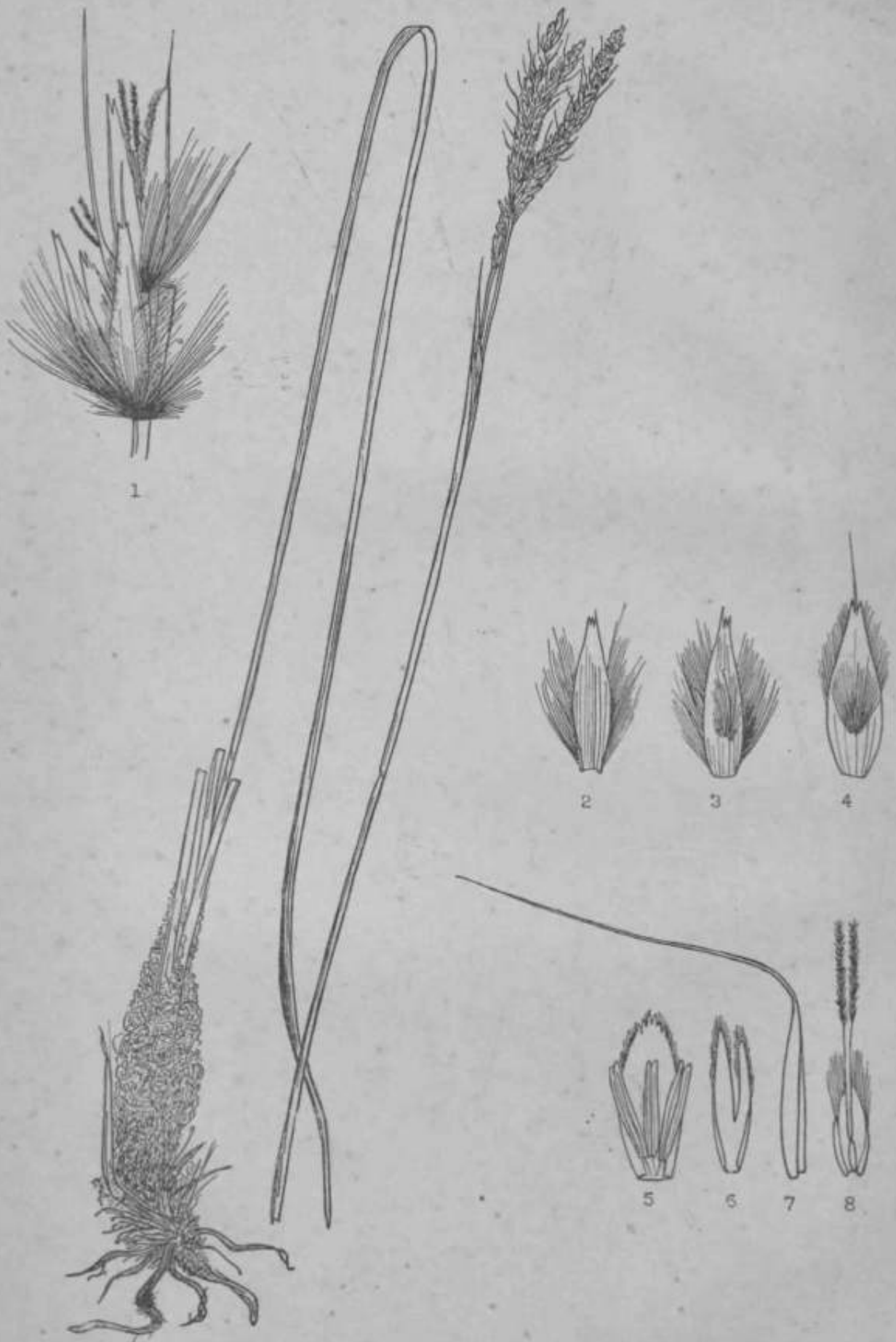
Pedicelled spikelet

n

Sessile spikelet

SKHIMA 9ULCATDM (HAOK) CAMUS.

Delin: R. K. Bhide.



*POLLIXIDIUM BINATUM* (RETZ.) C. E. HUBBARD.



## 4. SEHIMA SULCATUM Camus.

## PLATE 15.

*Sehima sulcatum* Camus Bull. Mus. Hist. Nat. V (1921) 3)\*,  
*Ischaemum sulcatum* Hack. Monogr. Androp. (1889) 248 ; Hook. f. Fl. Brit. Ind. VII (1896)  
 137 ; Lisboa Bomb. Grasses (1896) 54 ; Cooke Fl. Eomb. II (1908) 964.

**Vernacular names** : Sheda, Pavna.

**Etymology** : *Sulcatum* means grooved, alluding to the deep-channelled lower involucre glume.

**Description** : Stems geniculate, ascending, reaching 50 cm. long or more, weak, terete, glabrous, not ribbed, much branched from the base; nodes glabrous. Leaves 10-20 cm. by 3-4 mm., linear or lanceolate, setaceously acuminate, many-nerved, glaucous, glabrous ; sheaths lax, glabrous, constricted at the mouth; ligule a narrow ciliate membrane.

Raceme solitary, 5-7\*5 cm. long ; joints and pedicels shorter than the sessile spikelet, slender, ciliate. Sessile spikelets 1 cm. long; callus about 1-5 cm. long, shortly hairy at the base, cuneate; lower involucre glume 1 cm. long, upper, subchartaceous, bicuspidate, lanceolate, scabro-punctate, the margins incurved in the upper, open in the lower part, with a furrow in the middle in the place of the midnerve and 2. nerves one at each side of and close to the furrow ; upper involucre glume rather shorter than the lower, chartaceous, 3-5-nerved, shortly 2-dentate, ciliate in the upper part and with a capillary awn 1 cm. long from the sinus ; lower floral glume 6 mm. long, linear, subacute, with incurved margins, hyaline, paleate, the palea as long, oblong, slightly emarginate ; upper floral glume 6 mm. long, divided into 2 acute lobes; palea as long as the glume ; awn 2-3\*8 cm. long, the column brown, twisted, geniculate above the column, the upper part pale, scaberulous. Pedicellate spikelets smaller than the sessile, awnless; lower involucre glume lanceolate, bicuspidate, not furrowed, the margins recurved throughout, 7-nerved, the midrib slender, the lateral nerves green, approximate, close to the margin; upper involucre glume not awned ; lower floral glume as in the sessile spikelets; upper floral glume acute, not awned.

**Locality** : Deccan : Satara (Lisboa) ; Malsiras, Sholapur Taluka (Lisboa).

*S. M. Country* : Black soil banks 35 miles S. of Dharwar (Sedgwick 3745 1); banks of black soil fields 7 miles S. of Hubli (Sedgwick & Bell 5342 I); Dharwar, common {Sedgwick 1819 !, McCann !}.

**Ecology** : Gregarious.

**Distribution** : Central Provinces, W. Peninsula.

**Explanation of Plate 15** : *Sehima sulcatum* Camus.

- |  |   |                      |
|--|---|----------------------|
| 1. Lower invol. glume.                                     | } | Pedicelled spikelet. |
| 2. Upper invol. glume.                                     |   |                      |
| 3. Lower floral glume.                                     |   |                      |
| 4. Palea of lower floral glume.                            |   |                      |
| 5. Stamens.  |   |                      |
| 6. Upper floral glume.                                     | } |                      |
| 7. Palea of upper floral glume with stamens and lodicules. |   |                      |
| 8. Lower invol. glume.                                     | } | Sessile spikelet.    |
| 9. Upper invol. glume.                                     |   |                      |
| 10. Lower floral glume.                                    |   |                      |
| 11. Stamens.   |   |                      |
| 12. Palea of lower floral glume.                           |   |                      |
| 13. Upper floral glume.                                    |   |                      |
| 14. Palea of upper floral glume.                           |   |                      |
| 15. Stamens, styles, and lodicules.                        | j |                      |
| 16. Spikelets and joint of rhachis.                        | j |                      |

## 8. POLLINIDIUM Stapf.

As far as we can make out the diagnosis of this genus was published for the first time in Haines, Botany of Bihar and Orissa, pt. 5 (1924) 1020.

Densely tufted, perennial herbs with woolly rootstock and basal sheaths. Leaves convolute when old, wiry, mouth of sheaths ciliate.

Spikes digitate or fascicled, fascicles with, filiform peduncles on a more or less branched panicle. Spikelets 2-nate, sessile and pedicelled, similar, on the articulate, fragile, compressed, not stout rhachis. Callus densely clothed with long brown hairs. Glumes 4 : lower involucre glume flattened, 2-3-dentate, dorsally hairy at base, 5-7-nerved, margins inflexed; upper involucre glume cymbiform, minutely cuspidate, 3-5-nerved, with a slender awn. Lower

floral glume hyaline, sparsely ciliate, elliptic, palea finely ciliate; upper floral glume narrow, conduplicate, entire or 2-toothed, shortly awned from the tip or minute sinus, palea broad and nearly as long as the glume, densely ciliate on the top.

Species 1.—India, China, Philippines.

1. POLLINIDIUM BINATUM (Retz.) C. E. Hubbard.

PLATE 16.

*Pollinidium binatum* (Retz.) C. E. Hubbard in Kew Bull. (1932) 72.

*Andropogon binatus* Retz. Obs. V (1789) 21.

*PoUinidium angustifolium* Haines Bot. Bih. and Or. pt. 5 (1924) 1020.

*I8chaemum angustifolium* Hack. Monogr. Androp. (1889) 241; Lisboa Bomb. Grasses (1896) 51; Hook. f. Fl. Brit. Ind. VII (1896) 129; Cooke Fl. Bomb. II (1908) 960.

*Spodiopogon angustifolium* Trin. in Mem. Acad. Petersb. ser. 6, II (1833) 30; Sp. Gram. Ic t. 336.

& *laniQer* Nees in Royle 111. Himal. PL 416.

8. *notopogon* Nees ex Steud. Syn. PL Glum. 373.

**Vernacular names** : Sabai, Sabie, Bhabar.

**Description** : Perennial; stems tufted, woolly at the base, 60-90 cm. high, erect, slender, sparingly branched, grooved on one side, glabrous. Leaves 30-60 cm. by 2\*5-4 mm., tapering into a subpungent acumen, concave or convolute, base obtuse, fimbriate, margins scaberulous; sheaths glabrous; ligule a tuft of short hairs.

Racemes 2-4, on axillary and terminal filiform peduncles, 2\*5-5 cm. long, close or distant, erect, golden or rusty-villous; joints and pedicels half as long as the lower spikelet, slender, shortly ciliate, the pedicels bearded at the base. Sessile spikelets 4 mm. long, lanceolate; callus short, hairy. Glumes 4; lower involucral glume 3 mm. long, elliptic-oblong, chartaceous, 2-3-toothed, 5-nerved, the lower part of the glume ciliate with long rufous hairs and also with a tuft of hairs at the middle of the lower part of the back; upper involucral glume 4 mm. long, membranous, ovate-lanceolate, 2-dentate, often mucronate between the teeth, 3-5-nerved; lower floral glume equalling the lower involucral glume, oblong, obtuse, irregularly 2-dentate, hyaline, nerveless, paleate, the palea a little shorter than the glume, linear, 2-dentate; upper floral glume 3 mm. long, linear, hyaline, usually 2-dentate, but sometimes only acute at the apex; palea shorter than the glume; awn reaching 1 cm. long. Pedicellate spikelets like the sessile.

**Locality** : *Kathiawar*: Rajkot (Woodrow).

*Konkan*: Bombay, Victoria Gardens (McCann 4302 !).

*Deccan*: Poona, College Garden (Garade I); cultivated at Poona (Woodrow).

**Ecology** : Propagated by division of root and by seeds; thrives on coarse sandy soil.

**Distribution** : Afghanistan, India, China, Philippines.

**Economic uses** : Can be used for paper-making, strings, ropes and mats. Cattle do not eat it.

**Explanation Of Plate 16** : *Pollinidium binatum* (Retz.) C. E. Hubbard.

1. Spikelets.
  2. Lower invol. glume, ventral view.
  3. Dorsal view of lower invol. glume.
  4. Dorsal view of upper invol. glume.
  - 5. Lower floral glume.
  6. Palea of lower floral glume.
  7. Upper floral glume.
  8. Palea of upper floral glume with styles. ^
- } Sessile spikelet.

9. POGONATHERUM P. Beauv.

Delicate perennial grasses; stems leafy upwards, branching. Leaves narrow, suberect.

Racemes solitary on long flexuous peduncles, plumose from the slender awns; rachis at length fragile; internodes short. Spikelets very small, subterete, 2-nate, 1-2-flowered, a sessile 2-sexual, and a pedicellate male or neuter (rarely 2-sexual); callus bearded with fine hairs. Glumes 3 or 4, all membranous and hyaline, obscurely nerved or nerveless; lower involucral glume oblong, truncate, dorsally rounded; upper involucral glume longer/ovate,

keeled, 2-fid and awned in the sinus, the awn much longer than the spikelet, slightly twisted; lower floral glume nearly as long as the upper involucre glume, not awned, usually absent from the pedicellate spikelet; upper floral glume about half as long as the upper involucre glume, 2-fid and awned in the sinus like the upper involucre glume; palea broadly oblong, not keeled. Lodicules obsolete. Stamens 1 or 2; anthers long. Ovary narrow; styles short, free; stigmas very long, exerted at the top of the spikelet. Grain narrow, oblong, free.

Species 2 or 3.—From India to Japan.

- |  |           |                              |
|--|-----------|------------------------------|
| 1. Hairs of callus longer than the spikelet  | . . . . . | 1. <i>P. crinitum</i> .      |
| 2. Hairs of callus shorter than the spikelet | . . . . . | 2. <i>P. saccharoides</i> L. |

#### 1. POGONATHERUM CRINITUM Kunth.

*Pogonatherum crinitum* Kunth Enum. PL I (1833) 478; Lisboa Bomb. Grasses (1896) 59;;

Hook. f. FL Brit. Ind. VII (1896) 141; Cooke EL Bomb. II (1908) 965.

*P. saccharoideum* var. *monandrum* Hack. Monogr. Androp. (1889) 193.

*P. polystachyum* Kunth Rev. Gram. (1829) 493 (*partim*) t. 161.

*P. refractum* Nees in Hook. & Am. Bot. Beech. Voy. 239.

*Pollinia monandra* Spreng. Syst. I (1825) 288.

*Pogonopsis tenera* Fresl. Bel. Haenk. I (1830) 133, t. 46.

*Homoplitis crinita* Trin. Fund. Agrost. (1820) 166.

*Ischaemum crinitum* Trin. in Mem. Acad. Petersb. ser. 6, II (1833) 298.

*Andropogon crinitus* Thunb. FL Jap. (1784) 40, t. 7.

*A. monandrus* Roxb. FL Ind. I (1832) 260.

*Pogonatherum* Griff. Notul. III, 81, Ic. PL Asiat. 1.145, f. 2.

**Description** : Stems 15-30 cm. long, densely tufted. Leaves 2.5-7\*5 cm. by 2.5-5 mm., linear-lanceolate, acuminate, more or less hairy; sheaths lax, glabrous with a hairy mouth; ligule of long hairs.

Racemes terminating the branches of the stem, 2-2.5 cm. long; rhachis slender; inter\* nodes short, ciliate; tips thickened, truncate. Spikelets 2-2.5 mm. long, usually monandrous; hairs of callus longer than the spikelets. Glumes nerveless, hyaline; lower involucre glume oblong, dorsally rounded, ciliate at the rounded or retuse tip; upper involucre glume longer than the lower, ovate, keeled, 2-fid, the lobes ciliolate, awned in the sinus with a long capillary awn 13 mm. long or more; lower floral glume linear, nearly as long as the upper involucre glume, not awned, sometimes absent; upper floral glume cleft to the middle into 2 ciliolate lobes; awn straight or recurved, 2 cm. long.

**Locality** : *N. Kanara*: Sirsi (Gammie!); Sampkhand, in a cutting (McCann 9947!, Woodrow!); Nilkhund Ghat, on steep bank along roadside (Talbot 781!); Gersoppa Falls- (Talbot 2671!, McCann 9939!). Often cultivated in gardens as an ornamental plant.

**Ecology** : Grows only in tufts in deep forest tracks along banks and rocks in streams and rivers; usually shaded.

**Distribution** : More or less all over India, Afghanistan, China, Malaya, New Hebrides.

#### \*2. POGONATHERUM SACCHAROIDEUM P. Beauv.

*Pogonatherum saccharoideum* P. Beauv. Agrost. (1812) 56, t. 11, f. 7; Duthie Grasses N. W. Ind. (1888) 16, Fodder Grasses N. Ind. (1888) 27.

*P. saccharoideum* var. *genuinum* Hack. Monogr. Androp. (1889) 193.

*P. polystachyum* Roem. & Schult. Syst. II, 497.

*Pollinia polystachya* Spreng. Syst. I, 288; Kunth Rev. Gram. (1829) 493, t. 162.

*Perotis polystachya* Willd. Sp. PL I, 324.

*Saccharum paniceum* Lam. Encycl. I, 595, Illustr. t. 40, f. 31.

**Vernacular name** : Bamboo Grass.

**Description** : A much tufted, branched and very leafy elegant grass, 30-60 cm. high; stem firm or almost woody, slender, polished, from a perennial Woodstock; nodes on stem glabrous or bearded. Leaves 2.5-6.5 cm. long, up to 2.5 mm. broad, linear, acuminate, bearded at the base and margins of sheaths.

Spikes 1-7.5 cm. long, terminating all the branches; rhachis compressed and pedicel bearded; each spikelet with 2 long fine scaberulous awns 15-25 nun. long. Sessile spikelet: lower involucre glume narrow-oblong, broadest above, faintly 2-4-nerved, tip bearded. Upper involucre glume the largest, conduplicate, 2-5 mm. long, 1-nerved, keel produced into a long awn, tip densely ciliate. Lower floral glume sometimes absent. Palea of upper floral glume

broadly ovate-oblong, much exceeding the minute ovary. Pedicelled spikelet about the length of the sessile.

**Locality** : Grown in gardens.

**Distribution** : Hilly parts of India from the Punjab to Bhutan, Burma and China, southwards to Central India and Ceylon, Malaya.

#### 10. APOCOPIS Nees.

Annual or perennial grasses ; stems slender. Leaves narrow, flat.

Racemes solitary or 2-3-nate, compressed ; rachis firm, not readily disarticulating ; internodes very short, slender, villous. Spikelets secund, closely imbricating in 2 series, solitary, sessile, 1-2-flowered, the lowest 2-4 in each raceme imperfect, neuter ; callus very short, acute, bearing the long capillary ciliate pedicel of an obsolete upper spikelet. Glumes 4; lower involucre glume very large, cuneately obovate or obcordate, chartaceous below, membranous above, more or less villous with pale brown or yellow hairs, 7-9-nerved below the apex, margins incurved at the base only ; upper involucre glume as long as the lower, much narrower, membranous, oblong-ovate, truncate, 3-nerved, the sides broadly incurved ; lower floral glume and its hyaline palea oblong, the tips broadly truncate and ciliolate, male or empty; upper floral glume 2-sexual, linear, 2-dentate, 1-nerved, hyaline, paleate, awned; palea half as long as the glume, quadrately oblong, nerveless, truncate with ciliolate tip; awn short, very slender, twisted. Lodicules 0. Stamens 2 or 3; anthers linear. Ovary narrow; stigmas slender, exerted at the top of the spikelet. Grain small, narrowly oblong.

Species 8.—Indo-Malaya, China.

#### 1. APOCOPIS VAGINATUS Hack.

##### PLATE 17.

*Apocopis vaginatus* Hack, in Oestr. Bot. Zeitschr. 41 (1891) 8 ; Cooke Fl. Bomb. II (1908) 967.

*A. Wightii* var. *vaginata* Hook. f. Fl. Brit. Ind. VII (1896) 143.

**Etymology** : *Apocopis* is incorrectly formed from the Greek *apocopto*, to cut off, referring to the truncate glumes.—*Vaginatus* means sheathed.

**Description** : A low decumbent annual; stems much branched from the base, 7-5-20 cm. long. Leaves 2-4-5 cm. by 2-3 mm., linear, acute, shorter upwards, hairy from tubercular bases ; sheaths lax, longer than the internodes, hairy at the mouth ; ligule a small membrane.

Racemes 2-nate, 19-22 mm. long, closely appressed together, partly or almost entirely enclosed during flowering in the sheaths of the upper leaves, supported by a short common peduncle, more or less hairy with yellowish brown hairs ; joints much shorter than the spikelets, ciliate. Spikelets oblong, 5 mm. long, brown, nearly uniform in colour; callus very short, hairy with long brown hairs. Glumes 4; lower involucre glume 4 mm. long, membranous, obovate, truncate or emarginate at the ciliate hyaline apex, densely brown hair} in the lower half, 7-9-nerved, the nerves abruptly ceasing below the apex ; upper involucre glume as long as the lower, quadrate-oblong, truncate at the hyaline margin, hairy in the lower half, 3-nerved, finely ciliolate at the apex; lower floral glume 4 mm. long, hyaline, linear-oblong, obtuse, ciliolate at the apex; nerveless; upper floral glume 5 mm. long, conspicuously exceeding the other glumes, linear, membranous, truncate and shortly 2-dentate at the apex, awned; awn perfect, 22-32 mm. long.

**Locality** : *Gujarat*: Ahmedabad, field (Sedgwick!),

*Konkan*: Kalyan (Woodrow).

*S. M. Country*: Forests W. of Dharwar (Sedgwick !).

*N. Kanara*: (Woodrow); Halyal (Talbot 2379 !).

**Ecology** : A subgregarious grass. Very abundant in pastures and forest clearings in the Mallad tract of the Carnatic.

**Distribution** : Bihar, Central India, Deccan and W. Peninsula, Burma, Ceylon.

**Explanation** of Plate 17: *Apocopis vaginatus* Hack.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Upper floral glume.
6. Palea of upper floral glume.



APOCLIS VAUINATUS HACK.

Delin: R. K. Thide.



THELEPOGON ELEGANS 10TH.

Delin: R. K. Shide.

## 11. THELEPOGON Roth.

A coarse perennial grass. Leaves lanceolate, cordate, amplexicaul.

Racemes few or many, corymbosely fasciated, pedunculate; rhachis flexuous, fragile, the joints more or less deeply excavated. Spikelets ovoid, acute, solitary at the joints, the upper spikelet reduced to a mere almost glume-like rigid pedicel, the lower sessile, 2-flowered, the lower flower male, the upper 2-sexual. Glumes 4; lower involucre glume coriaceous, transversely rugose, ridged or tuberculate; upper involucre glume chartaceous, not keeled, sunk in the cavity of the joint, rigid, sparingly tuberculate; lower floral glume shorter, paleate, usually male, triandrous, with a similar palea; upper floral glume hyaline, 2-cleft, with a long twisted awn in the sinus, 3-nerved; palea narrow, equalling the glume. Lodicules cuneate, truncate. Stamens 3; anthers long. Styles free; stigmas short.

Species 1.—India and tropical Africa.

## 1. THELEPOGON ELEGANS Roth.

## PLATE 18.

*Thelepogon elegans* Roth ex Roem. & Schult. Syst. II, 788 et Nov. Pl. Sp. (1821) 62; Hack. Monogr. Androp. (1889) 267; Lisboa Bomb. Grasses (1896) 61; Hook. f. Fl. Brit. Ind. VII (1896) 148; Cooke Fl. Bomb. II (1908) 671.

*Andropogon princeps* A. Rich. Tent. Fl. Abyss. II (1851) 470, t. 102.

*Rhiniachne princeps* Hochst. ex Steud. Syn. Fl. Glum. I (1855) 360.

*Jardinea abyssinica* Steud. 1. c.

*Rhytachne princeps* Durand & Schinz Consp. Fl. Afr. V (1898) 700.

Vernacular names : Tirpha, Kadi.

Etymology : *Thelepogon* is derived from *thele*, a teat, and *pogon*, a beard.

Description : Annual. Culms somewhat stout, erect from a geniculate and frequently rooting base, up to over 60 cm. high, 6-9-noded, terete, smooth or more or less rough towards the inflorescence, simple or branched. Leaf-sheaths loose, prominently striate, glabrous or more or less hirsute with tubercle-based hairs and ciliate along the outer margin; ligules ciliate; blades lanceolate to linear-lanceolate, from a broad and often amplexicaul cordate base, up to 25 cm. by over 2-5 cm., flat, somewhat flaccid, glaucescent, glabrous and smooth, excepting the spinulose-ciliate margins or more or less scabrid from short tubercle-based hairs, midrib whitish above, primary lateral nerves 5-7 on each side, fine.

Racemes pale green, from 5-15 cm. long, 2-12, if many the lowest verticillate, simple or divided, the following 13-25 mm. higher up from the common rhachis, all with scabrid or hispidulous peduncles up to 2-5 cm. long; joints 6-9-5 mm. long, with several green scabrid nerves on the back and straight tips; pedicels linear, obtuse, somewhat longer than the spikelet, flat > scabrid on the back and the margins, slightly curved, contiguous with the apex of the joint, enclosing with it a lanceolate space exposing the back of the upper involucre glume. Spikelets with a short annuliform ciliate callus, 5-7 mm. long, ovate-oblong. Involucre glumes subequal; lower subacuminate, minutely 2-toothed, transverse rugae interrupted, most prominent towards the edge, nerves about 9, green, distinct in transmitted light, the inner 4 or 5 not reaching the tip; upper involucre glume slightly exceeding the lower, acuminate, with the acumen keeled and scabrid, 3-nerved. Lower floret male: floral glume hyaline, slightly shorter than the lower involucre glume, broad-lanceolate, 2-nerved, glabrous, with a similar but narrow palea. Upper floret hermaphrodite: floral glume as long as that of the lower floret, 2-fid to the middle, broad, quadrate-obovate, below the sinus, glabrous, lobes lanceolate, acute; awn up to 2\*5 cm. long, slender, kneed at and twisted below the middle, column dark brown, bristle yellowish. Anthers over 2 mm. long. Stigmas purple, up to 3 mm. long. Grain deep purple.

Locality : *Gujarat*: Eaira (ex Burns); Ahmedabad (Sedgwick!).

*Konkan* : Thana (ex Burns).

*W. Ghats* : Matheran (D'Almeida A257 !); Panchgani (Blatter & Hallberg B1267 !).

*Deccan*: Najara to Pasur Rd. (Paranjpye !); Lina Hill, Nasik Dist. (Blatter & Hallberg A79! 4544!); Katraj Ghat (Gammie!); Bairawadi, Purandhax (McCann 5053 !); Poona (Woodrow); Hewra (Dalzell); near Nasik (Edgeworth); Ahmednagar (ex Burns).

*S. M. Country*: Dharwar (Sedgwick 1824!); Alnavar (Talbot 2303!); Belgaum (Ritchie 812).

*N. Kanara*: Halyal (Talbot 20941 2142 !).

Ecology : A subgregarious grass. Very abundant on banks between ricefields in the Mallad tract of the Carnatic. It forms the principal constituent of monsoon headloads of grass at Dharwar. It often grows on the sides of roads.

**Distribution** : Central India, W. Peninsula, tropical Africa.

**Economic uses** : According to Dalziel eaten by horses, although very bitter.

**Explanation of Plate 18** : *Thelepogon elegans* Both.

- |  |                     |
|--|---------------------|
| 1. Ligule.                                 | } Sessile spikelet. |
| 2. Sessile spikelet with joint of rhachis. |                     |
| 3. Lower invol. glume.                     |                     |
| 4. Upper invol. glume.                     |                     |
| 5. Lower floral glume.                     |                     |
| 6. Stamens.                                |                     |
| 7. Palea of lower floral glume.            |                     |
| 8. Upper floral glume.                     |                     |
| 9. Stamens and styles.                     |                     |
| 10. Palea of upper floral glume.           |                     |

## 12. LOPHOPOGON Hack.

Small perennial densely tufted grasses. Leaves very narrow.

Spikes short, solitary, 2-nate or fasciculate at the ends of capillary branches, fragile. Spikelets usually 2-nate at each node of the rhachis; the upper shortly or very shortly pedicellate, 1-2-flowered, aristate from the upper floral glume; the lower spikelet sessile, 2-flowered, not awned from the upper floral glume; lower involucral glume of both spikelets 3-4-dentate, 5-7-nerved; upper involucral glume of same 2-dentate, aristate between the teeth; lower floral glume narrow, hyaline, empty or male; upper floral glume hyaline or membranous, that of the upper spikelet with a long awn, that of the lower spikelet awnless. Lodicules 0. Stamens 2. Styles very short; stigmas exerted from the apex of the spikelet.

Species 3.—Indo-Malaya, Australia.

### 1. LOPHOPOGON TRIDENTATUS Hack.

#### PLATE 19.

*Zophopogon tridentatus* Hack, in Engl. & Prantl. Pflanzenf. II, pt. II (1887) 22, 26; Monogr.

Androp. (1859) 254, t. 1, fig. 14; Hook. f. Fl. Brit. Ind. VII (1896) 149; Lisboa Bomb.

Grasses (1896) 61; Cooke Fl. Bomb. II (1908) 966.

*Indropogon tridentatus* Eoxb. Fl. Ind. I (1832) 257.

*Saccharum tridentatum* Spreng. Syst. I (1825) 283.

**Etymology** : *Lophopogon* is derived from *lophos*, a crest, and *pogon*, a beard, referring to the upper involucral glume which is hirsute and aristate near the apex. *Tridentatus* means 3-toothed, alluding to the lower involucral glume.

**Description** : Perennial; stems tufted, 10-20 cm. high, erect, slender, terete, glabrous. Leaves 5-10 cm. by 1-1.5 mm., linear, acuminate, rigid, erect, green; sheaths close, quite glabrous, striate, shorter than the internodes, the upper ventricose; ligule very small, truncate, hyaline, ciliate.

Heads of racemes erect; sheaths ovoid, flattened, membranous, caudate-acuminate. Racemes usually 2, closely appressed together, appearing like one, 13-20 mm. long, erect, pilose with golden or ferruginous hairs, the peduncle shortly exerted or more or less enclosed in the upper sheath; joints of rhachis very short, slender, glabrous. Spikelets densely imbricate. Lower spikelets reaching 5 mm. long, brown when dry, obovate-oblong; callus 0.8 mm. long, obtuse, with a small tuft of ferruginous hairs at the very tip. Glumes 4; lower involucral glume chartaceous, cuneate-oblong, truncate, with 2 long lateral teeth and 1 or 2 shorter ones between, glabrous on the back, 5-nerved; upper involucral glume 5 mm. long, membranous, lanceolate, acute, 3-nerved, hirsute near the apex with ferruginous hairs, and sending out an awn as long as the glume; lower floral glume 4 mm. long, narrowly linear, subacute, hyaline, nerveless, glabrous, epaleate; upper floral glume 4 mm. long, lanceolate, entire or 2-fid, hyaline, not awned. Upper spikelets very shortly pedicellate; lower involucral glume membranous, 3-toothed, clothed with tufts of long bristles below the middle; upper floral glume with a long awn 2 cm. long, geniculate about the middle, the column brown, twisted.

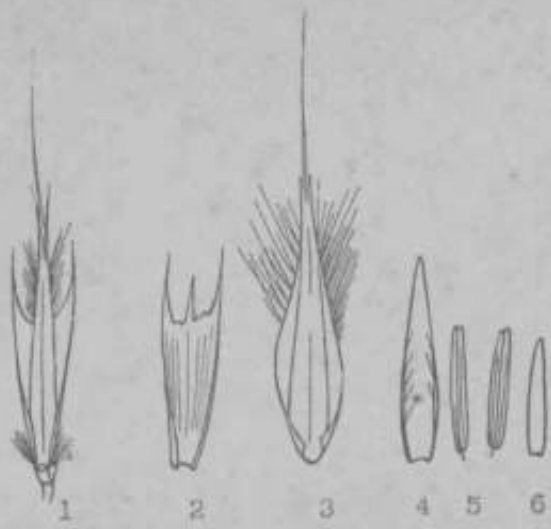
**Locality** : *Khandesh*: Tapti, Bhusawal (Blatter & Hallberg 5457!).

*W. Ghats*: Igatpuri (McCann 4572!).

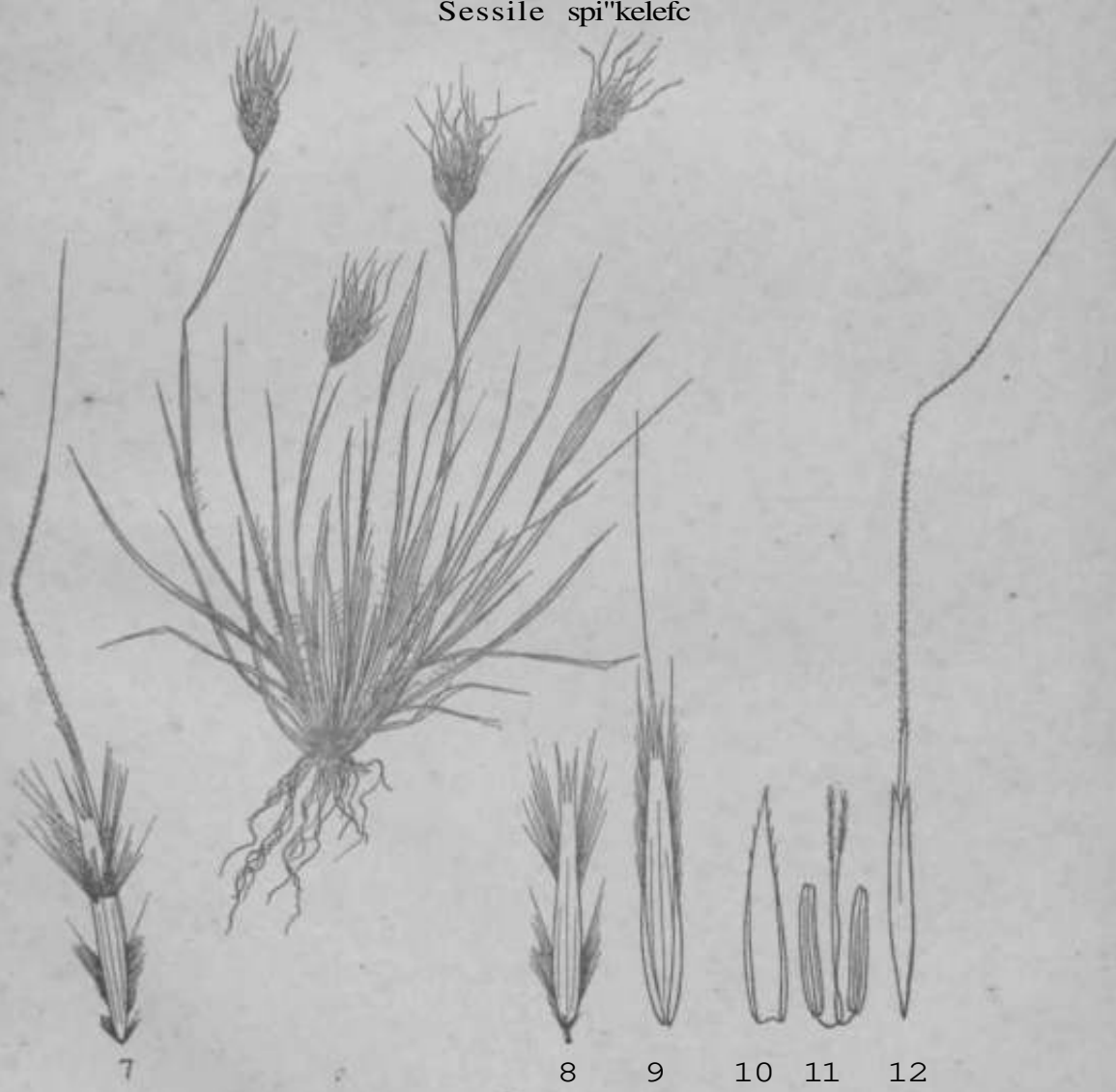
*Deccan*: Eirkee, Agricultural College compound (Bhide!); Bapodi, near Poona (Gammie 15315!); Bowadhar, near Foona (Garade!); Bahuri (Nana A80!); Ghattarshinji Hill, Poona (Ezekiel!); Deolali (Blatter 9610! 9620!); Jeur, Sholapur Dist. (Woodrow!).

*S. M. Country*: Dharwar, on dry gravelly uplands, 2,400 ft., rainfall 34 in! (Sedgwick 3010!).

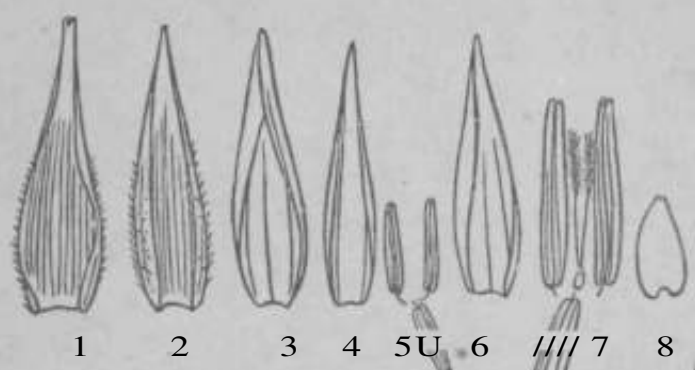




Sessile spikelet



Pedicelled epikelet



1 2 3 4 5U 6 // // 7 8

Pedicelled spikelet



10



9

11



12

13

14

15

16

17

18

19

Sessile spikelet,

**Ecology** : Grows sporadically. Common in the Dharwar neighbourhood on arid uplands. Flowering only in the late monsoon months, October-November.

**Distribution** : Central Provinces, W. Peninsula.

**Explanation of Plate 19** : *Lophopogon tridmtatua* Hack.

- |                         |                               |
|-------------------------|-------------------------------|
| 1. Spikelet.            | } <b>Sessile spikelet.</b>    |
| 2. Lower invol. glume.  |                               |
| 3. Upper invol. glume.  |                               |
| 4. Lower floral glume.  |                               |
| 5. Stamens.             |                               |
| 6. Upper floral glume.  |                               |
| 7. Spikelets.           | } <b>Pedicelled spikelet.</b> |
| 8. Lower invol. glume.  |                               |
| 9. Upper invol. glume.  |                               |
| 10. Lower floral glume. |                               |
| 11. Stamens and styles. |                               |
| 12. Upper floral glume. |                               |

### 13. APLUDA Linn.

A tall slender perennial leafy grass ; stems erect or subscandent, branching. Leaves narrow, flat, more or less petiolate.

Inflorescence paniculate, leafy, of small spikes each in a spathiform bract. Spikes deformed, base rounded, often utricular, bearing in front a sessile 2-sexual spikelet, prolonged above the base into 2 flat linear truncate parallel arms, one terminated by a solitary minute glume, the other by the upper spikelet. Glumes of both spikelets 4, the involucrel glumes empty, the floral glumes delicately membranous. Lower spikelets: lower involucrel glume longest, anibicous, linear-oblong, coriaceous, rigid; upper involucrel glume thinner, tumid, beaked, dorsally gibbous, 7-nerved; lower floral glume oblong, acute, 3-nerved, triandrous or neuter, with a linear 2-nerved palea; upper floral glume short, quadrate, deeply 2-fid, awned in the sinus, female or 2-sexual, with a minute ovate palea. Styles short, free ; stigmas short, penicillate. Upper spikelets dorsally compressed; lower involucrel glume oblong, acute, many-nerved, herbaceous, the margins narrowly incurved; upper involucrel glume chartaceous, ovate-lanceolate, acuminate, 3-nerved; lower floral glume oblong, 1-nerved, triandrous; upper floral glume oblong, 1-nerved, female or imperfectly 2-sexual; paleae of both floral glumes as in the lower spikelets. Lodicules of all flowers 2, cuneate. Anthers linear. Grain oblong, subcompressed.

Species 1.—Tropical Asia to New Caledonia, tropical Arabia and Sootra.

### 1. APLUDA VARIA Hack. VAR. ARISTATA Hack.

#### PLATE 20.

*Apluda varia* Hack, in Monogr. Androp. (1839) 196, *vat. aristata* Hack. 1. c.; Hook. f. Fl. ~~Ind.~~ Ind. VII (1896) 150 ; Stapf Fl. Trop. Afr. IX (1917) 40.

*A. aristata* Linn. Cent. II, 71 ; Schreber Besch. d. Graes. 93, t. 42 ; P. Beauv. Agrost. (1812) 133; Sfeud. Syn. PL Glum. I (1853) 403; Roxb. Fl. Ind. I (1832) 324; Dalz. & Gibs. Bomb. Fl. (1861) 303; Duthie Fodder Grasses N. Ind. (1888) 44, t. 29.

*A. Gfryllus* P. Beauv. Agrost., Expl. planches 15, t. 23, fig. 5 (6 *per error em*).

**Vernacular names** : Phulse, Tulsi, Paodi, Khavas, Bhichusa, Makka, Bhas, Phulaer, Pockli, Pokilia, Kurdia, Ghickwar, Tambat, Tambiti, Kharwel.

**Etymology** : *Apluda* means chaff.—*Varia* refers to the great variability of the species.

**Description** : Mostly annual, branched from the base. Culms erect, 30-180 cm. high, or geniculately ascending and often rooting from the nodes, many-noded, terete, smooth and glabrous. Leaf-sheaths terete, tight and glabrous or very rarely sparingly hairy, those supporting the flowering branches wider and shorter with reduced blades ; ligules short, rounded off, glabrous or ciliolate ; blades linear-lanceolate, long-attenuated towards the base, almost petioled, tapering upwards to a fine setaceous point, up to over 30 cm. long, 5-15 mm. wide, convolute in bud, then flat, somewhat rigid or flaccid, glaucous below, glabrous or very rarely sparingly hairy, slightly rough above, scabrid along the margins, midrib white above, stouter towards the base, primary lateral nerves 5-8 on each side, fine.

Panicle up to 60 cm. long, much compound, primary branches long, those of the following orders gradually shorter, bearing clusters of trios of spikelets; spathe at the base of the trios ovate to ovate-oblong, mucronate or bearing rudimentary blades, glabrous, green or tinged with purple, 5-6-3 mm. long; bulbous basal joint **up** to 2 mm. long, whitish. Sessile

spikelet lanceolate-oblong, acute, up to 6 mm. long. Lower involuoral glume chartaceous, firmer below, many-nerved; upper somewhat gibbous on the back, scaberulous on the keel. Lower floret: floral glume oblong-lanceolate, acute, slightly shorter than the involuoral glumes, 3-nerved, glabrous; palea linear-lanceolate, almost as long as the floral glume, 2-nerved. Upper floret: floral glume 4 mm. long, 2-fid to beyond the middle, awn up to 12 mm. long, very fine, with or without a distinct twisted column; palea generally much shorter, oblong to broad-ovate, nerveless. Anthers 3-2-4-2 mm. long. Stigmas purple, up to 6-3 mm. long. Grain over 1 mm. long. Pedicels 3-2-4-2 mm. long, sparingly ciliate. Lateral pedicelled spikelet 5-2-5-8 mm. long. Involuoral glumes similar, subherbaceous, lanceolate, acute, many-nerved; lower involuoral glume rather flat on the back; upper not or obscurely keeled and not gibbous. Florets as in the sessile spikelet, but the upper not awned, both male or more or less reduced. Terminal spikelet reduced to a short striate involuoral glume, continuing the pedicel.

Locality : *Cutch*: Eala Pacham Isl. (Blatter 3735!); Kara Boa (Blatter 3776!).

*Gujarat*: Broach (Chibber!); Nadiad Farm (Herb. Econ. Bot. Poona I); Surat (Gammie 16467 !, Cooke); Garvi Dangs (Sedgwick!); Ahmedabad (Cooke).

*Khandesh*: Muravat, Tapti bank (Blatter & Hallberg 4434!); N. slope of Chapseli Hill (McCann A83!); Toranmal (McCann A84!); Mummad, Ankai Hill (Blatter A146!).

*KonJcan*: Extremely common throughout the islands of Bombay and Salsette (McCann!); Bassein (McCann 4480!); Alibag, margin of water works (Ezekiel!); Dhapliforest (Ryan!).

*W. Ghats*: Khandala, very common (McCann 5294!); Igatpuri, very common (McCann 4325 ! 4324 !); Panabgani (Blatter £385 !, Btide !, Blatter & HaJltergB1322!); Londa (Gammie 15851!).

*Deccan* : Purandhar (McCann 5008 !, Bhide !); Diva Ghat (McCann A86 !); Sholapur (D'Almeida A87 !).

*S. M. Covntry*: Dhairwar, 2,400 ft., rainfall 34 in. (Sedgwick & Bell 4489 !); Belgaum (Ritchie 824).

*N. Kanara*: Halyal (Talbot 2495!); Jugglepet (Talbot!); Kawarwad (Talbot 2246!).

Ecology : Commonly found in hedges and amongst bushes. In these localities it often becomes elongated and assumes a climbing habit. One of the commonest forest grasses but also found outside forest tracts. Purely a monsoon species, but the dry plants remain erect for a considerable time after the monsoon.

DistrifcuUcn : Scotra, India, Ceylon, E. tropical Asia, Malaya, Australia, Pacific Islands.

Economic uses : In some districts it is considered to be a good fodder, especially for buffaloes when young and green. It, however, breaks down easily whtn tall and is, therefore, not fit for cutting and stacking (Lisboa).

Explanation of Plate 20 : *Aplyda varia* Hack. var. *aristata* Hack.

- |   |   |                      |
|---|---|----------------------|
| 1. Lower invol. glume.                      | } | Pedicelled spikelet. |
| 2. Upper invol. glume.                      |   |                      |
| 3. Lower floral glume.                      |   |                      |
| 4. Palea of lower floral glume.             |   |                      |
| 5. Stamens.                                 |   |                      |
| 6. Upper floral glume.                      |   |                      |
| 7. Stamens and styles.                      |   |                      |
| 8. Palea of upper floral glume.             |   |                      |
| 9. Spikelet.                                | } | Sessile spikelet.    |
| 10. Ligule.                                 |   |                      |
| 11. Spikelets.                              |   |                      |
| 12. Bract.                                  |   |                      |
| 13. Spikelets.                              |   |                      |
| 14. Lower invol. glume.                     |   |                      |
| 15. Upper invol. glume.                     |   |                      |
| 16. Lower floral glume, anthers and styles. |   |                      |
| 17. Palea of lower floral glume.            |   |                      |
| 18. Upper floral glume and palea.           |   |                      |
| 19. Stamens and styles.                     |   |                      |

#### 14. HEHARTHIA B. Br.

Decumbent or ascending perennial grasses with many-coded branched compound culms ; blades linear, conduplicate in bud, then flat; ligules very short, membranous.

Racemes compressed, often curved, tips more or less subulate owing to the slender terminal spikelet; spikelets pseudo-opposite owing to the fusion of joints and pedicels, each pair made up of a sessile (secondary) spikelet and the pedicelled companion of the sessile spikelet of the next lower node. Spikelets 2-nate on the tough or tardily disarticulating rhachis of spike-like spathe-supported racemes which terminate the culms and their often fascicled branchos, alike in sex and shape, or at least similar; joints and pedicels fused into roughly semicylindric internodes, hollowed out on the inner face for the reception of the sessile spikelet; disarticulation at a right angle to the rhachis or slightly oblique, tips of joints truncate, not hollowed out or appendaged. Sessile spikelet: florets 2, lower reduced to a barren floral glume, upper hermaphrodite, awnless. Involucral glumes equal or subequal, lower flat on the back, 2-keeled, very narrowly inflexed along the margins, coriaceous or subcoriaceous, closing up the cavity formed by the adjacent joint and pedicel, upper membranous adhering to the inner face of the cavity. Floral glumes hyaline, of lower floret 2-nerved, of upper usually nerveless. Palea (of upper floret) hyaline, small, nerveless. Lodicules 2, cuneate. Stamens 3. Stigmas laterally exerted. Grain oblong, dorsally slightly compressed; embryo about two-thirds the length of the grain; hilum conspicuous, punctiform, subbasal. Pedicelled spikelet with more elongated acuminate involucral glumes, particularly the terminal, the upper involucral glume mucronate or aristate.

Species about 8.—Throughout the warm countries of the Old World, 1 also in America > drat probably introduced.

#### 1. HEMARTHRIA COMPRESSA (Linn, f.) R. Br.

##### PLATE 21.

*Hemarthria compressa* (Linn, f.) R. Br. Prodr. Nov. Holl. (1810) 207.

*J7. coromandelina* Steud. Syn. I (1855) 358.

*Rotboellia compressa* Linn. f. Suppl. (1781) 114; Lisboa Bomb. Grasses (1896) 56; Hook, f. FL Brit. Ind. VII (1896) 153 *{partim}*; Cdoke Fl. Bomb. (1908) 952.

*E. compressa* var. *genuina* Hack. Monogr. Androp. (1889) 286; Hook. f. Fl. Brit. Ind\* VII (1896) 153.

*R. glabra* Roxb. Fl. Ind. I (1832) 353.

*H. compressa* Eunth Enum. I, 465 *{partim}*; Grah. Cat. Bomb. PL (1839) 233; Duthie Grasses N. Ind. (1883) 18, Fodder Grasses N. Ind. (1888) 30.

**Vernacular name** : Baika.

**Description** : Perennial; stems erect from a decumbent rooting base, 60-150 cm. long (according to Roxburgh scandent and reaching 6 m. long), branched, compressed, glabrous, striate, leafy. Leaves 2-5-12-5 cm. by 3-5 mm., linear, acuminate, flat, glabrous, base rounded, margins scabrid; sheaths shorter than the internodes, compressed, loose, glabrous; ligule short, membranous, ciliate.

Racemes few or many, often fascicled, 5-12-5 cm. long, erect, straight or curved, herbaceous, dark green; rhachis almost inarticulate; internodes broad, striate, glabrous, nearly as long as the glabrous spikelets. Sessile spikelets 4-5 mm. long; callus small, naked. Glumes 4; lower involucral glume coriaceous, bluntly acuminate, the tip often shortly membranous, 7-9-nerved; upper involucral glume as long as the lower, linear-oblong, acutely acuminate, membranous, 3-nerved, adhering to the cavity of the internode; floral glumes subequal, 4 mm. long, lanceolate, acute, nerveless, hyaline; palea linear, 2\*5 mm. long. Pedicellate spikelets rather longer and narrower than the sessile; lower involucral glume acutely acuminate; upper involucral glume chartaceous, 5-7-nerved; floral glumes as in the sessile spikelets.

**Locality** : *Sind*: Bughar, Indus River (Blatter & McCann D661!); Mirpur Sakro (Blatter & McCann D662 !).

*Gujarat*: Eankaria Tank, Ahmedabad (Sedgwick I).

*Khandesh*: Tapti, Bhusawal N. E. (Blatter & Hallberg 5495 !).

*N. Kanara*: Sirsi to Siddhapur (Hallberg & McCann A78 !).

We have not included the localities mentioned by Cooke Fl. Bomb. II, 952 as some of his specimens might belong to another species.

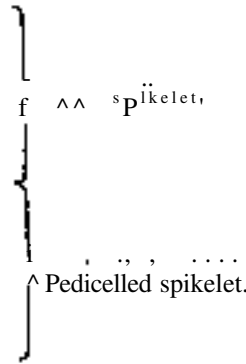
**Ecology** : Found in pasture lands, borders of ricefields, and other moist places. A hygrophilous species.

**Distribution** : Throughout the hotter parts of India! Ceylon, most warm countries.

**Economic uses** : Cattle like it.

**Explanation of Plate 21** : *Hemarthria compressa* (Linn, f.) R. Br.

1. Part of spike.
2. Ligule.
3. Lower invol. glume.
4. Upper invol. glume.
5. Lower floral glume.
6. Upper floral glume.
7. Palea of upper floral glume.
8. Grain.
9. Lower invol. glume.
10. Upper invol. glume.
11. Lower floral glume.
12. Upper floral glume.
13. Palea of upper floral glume.
14. Grain and lodicules.



## 15. MANISURIS Linn. f.

Annual erect slender leafy grasses. Leaves flat, cordate.

Racemes small, terete, axillary and terminal, shortly pedunculate; rhachis green, ultimately fragile, glabrous, with short broad internodes excavate opposite the sessile spikelets. Spikelets minute, in dissimilar pairs, one globose, sessile, 2-sexual, the other ovate, pedicellate, male or neuter, the pedicel adnate or closely appressed  $U >$  the joint of the rhachis. Sessile spikelets: glumes 4; lower involucre glume hard, globose, foveolate, coriaceous at length crustaceous, with an oblong opening opposite the rhachis; upper involucre glume minute, oblong, coriaceous, 1-nerved, closing the orifice of the lower involucre glume; lower floral glume very minute, hyaline, orbicular, empty; upper floral glume and its palea hyaline, broadly oblong. Lodicules 2, subquadrate. Anthers minute. Styles and stigmas short.

Species 1.—Throughout the tropics.

## 1. MANISURIS GRANULARIS Linn. f.

## PLATE 22.

*Manisuris granularis* Linn. f. Nov. Gram. Gen. (1779) 40; Sw. Prodr. Veg. Ind. Occ. (1788) 25; P. Beauv. Agrost. (1812) t. XXI, fig. 10; Roxb. Pl. Corom. II, 11, t. 118, Fl. Ind. I (18b2) 352; Grah. Cat. Bomb. PL (1839) 234; Dalz. & Gibs. Bomb. FL (1861) 300; Hack. Monogr. Androp. (1889) 314; Duthie Grasses N. W. Ind. (1883) 18, Fodder Grasses N. Ind. (1888) 29, t. 46; Lisboa Bomb. Grasses (1896) 62; Hook. f. Fl. Brit. Ind. VII (1896) 159; Cooke Fl. Bomb. II (1908) 955; Stapf Fl. Trop. Afr. IX (1917) 57.

*Cenchrus granularis* Linn. Mant. II, App. 575.

*Hackelochloa granularis* O. Kuntze. Rev. Gen. PL II (1891) 776.

*Rytilyx granularis* Skeels in U. S. Dept. Ag. Bur. PL Indust. Bull. 282 (1913) 20.

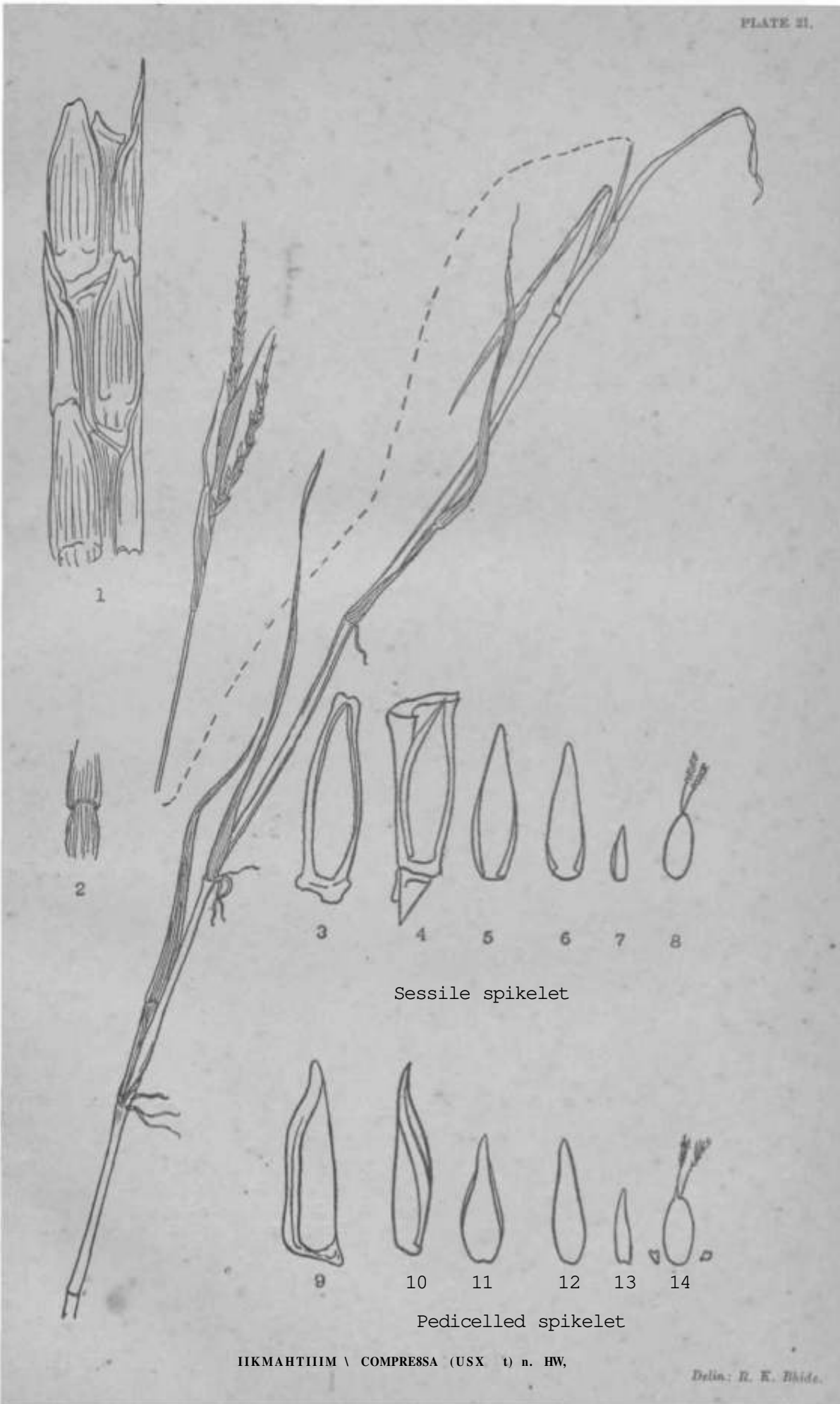
*Manisuris polystachya* P. Beauv. FL Owar. et Ben. t. 14.

**Vernacular names** : Kangri, Datura ghas.

**Etymology** : *Manisuris* is derived from *manis*, a scaly lizard, and *oura*, a tail, in allusion to the appearance of the foveolate and verrucose surface of the lower glume of the fertile spikelet.

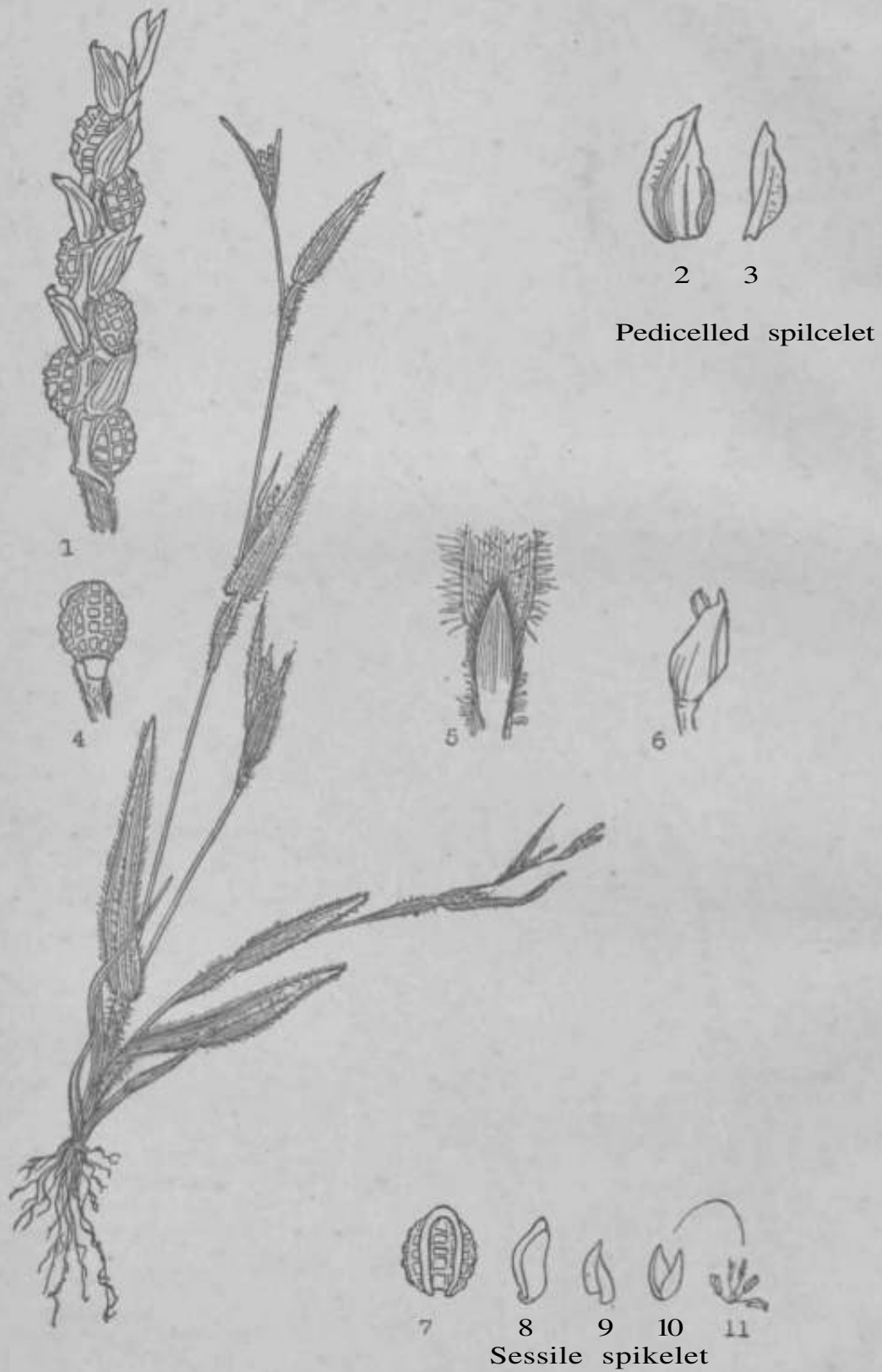
**Description** : Stems 10-75 cm. high, slender, compressed, softly hairy, leafy; nodes hairy. Leaves 3-8-20 cm. by 6-13 mm., linear-lanceolate, acute or acuminate, flat, hairy on both surfaces or on the lower only with bulbous-based hairs, margins ciliate, base cordate; sheaths much shorter than the internodes, hispid with bulbous-based hairs; ligule very short, membranous, densely ciliate.

Racemes 6-25 mm. long, resembling a string of minute beads, solitary or seemingly fascicled in the axils of the leaves, but individually from shortened axillary branches. Sessile spikelets 1-5-2 mm. long, subglobose; callus tumid, glabrous. Glumes 4; lower involucre glume irregularly foveolate on the back; upper involucre glume closing the cavity of the lower floral glume, elliptic-oblong, obtuse, 1-nerved; lower floral glume hyaline, shorter than the upper involucre glume; upper floral glume about equalling the lower, broadly ovate obtuse; palea similar but a little shorter. Pedicellate spikelets equal in length to the sessile or longer, of 2 equal green glumes about 2-5 mm. long; lower involucre glume broadly ovate

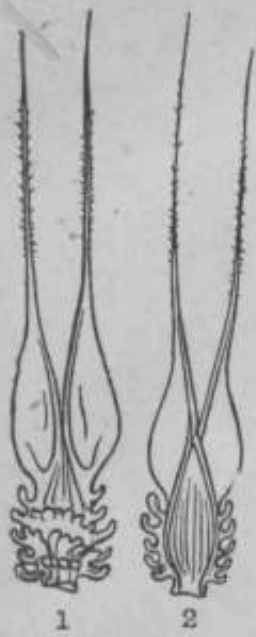


Sessile spikelet

Pedicelled spikelet







Sessile spike -let



Pedicelled spikelet



13



3 4  
Pedicelled spikelet



5 6 7 8 9 10 11  
sessile spikelet  
PELTOPHOHUS AOUMINATI S (HACK.) CAMUS.

or suorbicular, obtuse or subacute, 5-7-nerved, one margin narrowly folded, the other with a hyaline wing; upper involucrel glume boat-shaped, laterally compressed, the keel with a dorsal hyaline ciliolate wing.

**Locality** : *Gujarat*: Charodi (Gammie 16534!).

*Konkan*: Wada Taluka (Ryan 690!); Mulgaum in Salsette, open grass-land (McCann 3642!).

*W. Ghats*: Igatpuri (McCann 4573!); Ehandala (Woodrow), behind Hotel (McCann 9410 !), behind Duke's Nose (McCann 9393 !); Panchgani, on way to Bajpuri (McCann 1752!).

*Deccan*: Poona (Woodrow!, Cooke); Chattarshinji Hill (Ezekiel!); Deolali (Blatter *So* Hallberg 4552!); Kirkee to Poona, railway line (Garade 8231!).

*S. M. Country* : Dharwar, 2,400 ft., rainfall 34 in. (Sedgwick *So* Bell 4146 !, Woodrow); Kuput Hill, Dharwar Dist. (Talbot 2323!).

*N. Kanara*: Halyal (Talbot 1733 ! 2385 !).

**Ecology** : Very common in open grassland.

**Distribution** : Throughout the tropics.

**Economic uses** : Coldstream says that it is both grazed and stacked in the Punjab, but not much relished by cattle. Said to be a good fodder grass at Ajmere.

• **Explanation of Plate 22** : *Manisuris granularis* Linn, f.

- |                                   |                        |
|-----------------------------------|------------------------|
| 1. Part of spike.                 |                        |
| 2. Lower invol. glume. ")         | } Pedicelled spikelet. |
| 3. Upper invol. glume. )          |                        |
| 4. Fertile spikelet.              |                        |
| 5. Ligule.                        |                        |
| 6. Sterile spikelet.              |                        |
| 7. Lower invol. glume.            | } Sessile spikelet.    |
| 8. Upper invol. glume.            |                        |
| 9. Lower floral glume.            |                        |
| 10. Upper floral glume and palea. |                        |
| 11. Stamens and styles.           |                        |

16. PELTOPHOBUS Desv.

Annual or perennial short grasses with slender much-branched rarely simple culms ; blades linear, narrow, conduplicate in bud, then flat, ligules short, membranous.

Kacemes much compressed, rather slender, straight or curved, very conspicuously dorso-ventral; spikelets pseudo-opposite owing to the fusion of joints and pedicels, each pair made up of a sessile (secondary) spikelet and the pedicelled companion of the sessile spikelet of the next lower node. Spikelets 2-nate on the more or less fragile rhachis of spike-like spathe-supported racemes which terminate the culms and their branches, different in sex and shape; joints and pedicels fused into somewhat stout internodes, convex on the back, hollowed out on the inner «face for the reception of the sessile spikelet; disarticulation at a right angle to the rhachis, tips of internodes truncate with two concavities corresponding to the next upper sessile and the adjacent pedicelled spikelet. Sessile spikelet dorsally much compressed. Florets 2, lower male or neuter and then with or without a palea, upper hermaphrodite, awnless. Involucrel glumes equal or the upper shorter; lower coriaceous, transversely rugose or muricate, conspicuously winged from the keels, upper membranous, immersed in the cavity formed by the joint and pedicel, usually 3-nerved, keeled (often obscurely). Floral glumes hyaline, nerveless or 2-3-nerved. Palea, if present, hyaline, nerveless or 2-nerved. Lodicules 2, cuneate. Stamens 3. Stigmas linear, laterally exerted low down. Grain oblong; embryo equalling the grain. Pedicelled spikelet male or neuter. Lower involucrel glume coriaceous, smooth, asymmetrically or unilaterally winged; upper variously winged from the keel. Florets as in the sessile spikelet but male or barren.

Species 5.—Indian Peninsula (4) and tropical Africa (1).

- |  |                          |
|--|--------------------------|
| I. Lower involucrel glume 2-aristate.                            | 1. <i>P. divergens</i> . |
| II. Lower involucrel glume with a simple awn or acuminate.       |                          |
| 1. Lower* involucrel glume broadly ovate, acuminate (not awned)  | 2. <i>P. acunmatu*</i> . |
| 2. Lower involucrel glume lanceolate with a slender scabrid awn. | <i>Z.P. Talboti</i> .    |

## 1. PELTOPHORUS DIVERGENS (Hack.) Camus.

## PLATE 23.

*Peltophorus divergens* (Hack.) Camus in Bull. Mus. Hist. Nat. 5 (1921) 371; Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 2 (1927) 29.

*Rotboellia divergens* Hack. Monogr. Androp. (1889) 293; Lisboa Bomb. Grasses (1896) 57; Hook. f. Fl. Brit. Ind. VII (1896) 155; Cooke Fl. Bomb. II (1908) 953.

**Vernacular names** i Marel, Marvel.

**Etymology** : *Peltophorus* is derived from *peltis*, a shield, and *phero*, I bear.

**Description** : Annual; stems 10-23 cm. high, erect or ascending, slender; nodes 2-3, all with usually 2-nate flowering branches. Leaves 5-10 cm. by 2\*5-4 mm., linear, acuminate, complicate, rising without constriction from the sheath, hairy; sheaths 2\*5-3\*8 cm. long, shorter than the internodes, loose, hairy; ligule 2 mm. long, membranous, rounded.

Raceme 2\*5-3-8 cm. long, pale yellow, simple solitary; peduncle filiform, sheathed; joints of the rachis shorter than the spikelets, subclavate, excised. Sessile spikelets 6 mm. long (excluding the awns), nearly 13 mm. long when the awns are included, 2-aristate; callus short. Glumes 4; lower involucrel glume coriaceous, with 5-7 transverse echinulate ridges below the middle, the tips of the echinae curved upwards, the central portion of the glume above the echinate base ovate-lanceolate, acute, cleft at the apex, with 2 nearly semicircular equal membranous wings with thickened flattened green margins on the inner edge, which margins are prolonged into slender, slightly divergent awns; upper involucrel glume much shorter, about 3 mm. long, thinly membranous, oblong, acute, 1-nerved; lower floral glume about 2-5 mm. long, broadly ovate, nerveless, empty; upper floral glume slightly shorter than the lower. Pedicellate spikelets as long as the sessile; pedicels about 2-5 mm. long; lower involucrel glume chartaceous without a muricate base, winged on one side only and with 1 awn from the thickened margin of the wing, about 7-nerved; upper involucrel glume with a large membranous wing on the back at the apex and an awn about 2 mm. long.

**Locality** : *Konkan*: Trombay (McCann A71!); Kanari Caves, on open rock faces (McCann!).

*W. Ghats*: Khandala (Woodrow), Saddle, very common all over (McCann 9616 !); Lonavla (Bhide !); Mahableshwar, 4,500 ft., rainfall 270 in. (Sedgwick & Bell 4560 !, Lisboa); Panchgani (Blatter & Hallberg B1252 ! B1259 ! B1263 ! B1286 !), behind the Table-land on rocks (Blatter 3805 !); Castle Rock, 1,800 ft., rainfall 300 in. (Sedgwick & Bell 4295 !).

*Deccan*: Satara (Lisboa).

*S. M. Country*: Amboli Ghat (Talbot 4305!); Belgaum (Ritchie .808, 827).

*N. Kanara* : Karwar (Talbot 3171!).

**Ecology** : Usually growing in tufts on rocks. The spikes are very brittle when dry and always fall off. Occurs on the cTest of the Kanara Ghats. Begins to flower in early September.

**Distribution** : W. Peninsula.

**Explanation of Plate 23** : *Peltophorus divergens* (Hack.) Camus.

- |  |   |                        |
|--|---|------------------------|
| 1. Dorsal view of lower invol. glume.  | 1 |                        |
| 2. Ventral view of lower invol. glume. |   |                        |
| 3. Upper invol. glume.                 |   |                        |
| 4. Lower floral glume.                 |   |                        |
| 5. Palea of lower floral glume.        |   | } Sessile spikelet.    |
| 6. Upper floral glume.                 |   |                        |
| 7. Palea of upper floral glume.        |   |                        |
| 8. Stamens and styles.                 |   |                        |
| 9. Lower invol. glume.                 |   | } Pedicelled spikelet. |
| 10. Upper invol. glume.                |   |                        |
| 11. Lower floral glume.                |   |                        |
| 12. Upper floral glume.                |   |                        |
| 13. Pedicel.                           |   |                        |

## 2. PELTOPHORUS ACUMINATUS (Hack.) Camus.

## PLATE 24.

*Peliopharus acuminatus* (Hack.) Camus in Bull. Mus. Hist. Nat. 5 (1921) 371<sup>f</sup> Bkff  
tlann iu Journ. Bomb. Nat. Hist. Soc. 32 (1927) 29. P \* Mo

*Rotboellia acuminata* Hack. Monogr. Androp. (1889) 296; Lisboa Bomb. Graft\*\* /Q«\*X  
Hook. f. Fl. Brit. Ind. VII (1896) 155; Cooke Fl. Bomb. II (1908) 953. } 56 :

**Description** / Annual, quite glabrous except the sheaths; stems 7\*5-30 cm. high, erect or ascending, compressed, densely leafy. Leaves flaccid, the lower 5-7.5 cm. by 2.5-4 mm., linear-lanceolate, acuminate from a narrow base, the upper shorter, spreading and recurved; sheaths turgid, compressed, keeled, the mouth hairy; ligule short, truncate, membranous, glabrous.

Racemes 2\*5-5 cm. long, sheathed at the base, straight or slightly curved, usually pale brown; joints subclavate, much shorter than the sessile spikelets, the base not excised. Sessile spikelets up to 8 mm. long; callus scarcely distinct. Glumes 4; lower involucre glume 8 mm. long, sometimes up to 10 and 12 mm., ovate, coriaceous, winged above the middle, with 3-6 dorsal transverse echinulate or warty ridges below the wings, longitudinally striate between the ridges, 5-nerved in the narrow coriaceous part between the wings, with a long ciliate acumen, the cilia pointing upwards; upper involucre glume 4 mm. long (equalling the lower minus the acumen), elliptic-lanceolate, membranous, subacute, scarcely keeled, 3-nerved; lower floral glume equalling the upper involucre glume, elliptic, paleate, male; upper floral glume less than 3 mm. long, oblong, obtuse, nerveless; palea small, 2-lobed, nerveless. Pedicellate spikelets 4 mm. long, oblong; lower involucre glume lanceolate, 5-nerved, with a membranous ciliolate wing on one side; upper involucre glume shortly winged on the back below the apex, elliptic, concave, 3-nerved; lower floral glume empty; upper floral glume male; pedicel 2\*5 mm. long, dumbbell-shaped, flattened.

**Locality** : *Konkan*: Marmagao (Talbot 1291); Vasco da Gama (Herb. St. X. C. 9483 !); Malvan (Woodrow).

*W. Ghats* : Castle Rock (Bhide !).

*N. Eanara*: Karwar (Talbot 3171! 2539, Hallberg & McCain\* A75!, Lisboa); Katgal (Hallberg & McCann 9934 !).

**Distribution** : W. Peninsula.

**Explanation of Plate 24** : *Pdtophorus acuminatus* (Hack.) Camus.

- |  |                        |
|--|------------------------|
| 1. Pedicel.                                    |                        |
| 2. Ligule.                                     |                        |
| 3. Lower invol. glume.                         | ) ^ . , , , ,          |
| . TT • i i                                     | c Pedicelled spikelet. |
| 4. Upper invol. glume.                         | )                      |
| 5. Ventral view of lower invol. glume.         | }                      |
| 6. Dorsal view of lower invol. glume.          |                        |
| 7. Upper invol. glume.                         | }                      |
| 8. Lower floral glume.                         |                        |
| 9. Upper floral glume with stamens and styles. |                        |
| 10. Palea of lower floral glume with stamens.  | }                      |
| 11. Palea of upper floral glume.               |                        |

### 3. PELTOPHORUS TALBOTI Camus.

*Pellophorus Talboti* Camus in Bull. Mus. Hist. Nat. 5 (1921) 371; Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1927) 30.

*Rotboellia TaJboti* Hook. f. Fl. Brit. Ind. VII (1896) 155; Lisboa Bomb. Grasses (1896) 57; Cooke Fl. Bomb. II (1908) 954.

**Description** : Annual; stems 15-20 cm. high, slender, erect, or geniculate at the base. Leaves 5-7\*5 cm. by 2.5-4 mm., linear, smooth; sheaths glabrous; ligule short, membranous.

Raceme 20-32 by 4 mm., solitary, green; joints very short, tumid, excavate opposite the spikelet, the top broad, with a very large cavity and thick hispidulous margins. Sessile spikelets 13 mm. long (or more) including the awn, closely imbricating; callus annular, ciliolate. Glumes 4; lower involucre glume 5 mm. long (not including the awn), coriaceous, lanceolate, narrowed into a slender scabrid awn, with 2-3 transverse ridges at the base, the uppermost ridge extending right across the glume, the others only in its centre, broadly winged at each side above the base; upper involucre glume 3 mm. long, thinly membranous, ovate-oblong, acute, 1-nerved; lower floral glume broadly oblong, faintly 3-nerved, male; upper floral glume flinall, oblong, obtuse, nerveless; palea as long, nerveless. Pedicellate spikelets as long as the sessile; lower involucre glume very ii regularly winged, dorsally smooth, awnless, as in the sessile; pedicel wholly adnate to the joint of the rhachis.

**Locality** : *KonJcany* Vasco da Gama (Bhide!) ; Marmagao (Talbot 2572 1).

**Distribution** : So far only found in Goa.

## 17. LASIURUS Boiss.

Perennial; more or less branched and woody below; branches often in dense fascicles, intravaginal; blades linear, convolute or flat, hard; ligule a fringe of hairs.

Eacemes silky-villous. Spikelets usually 3-nate, rarely 2-nate, on the more or less fragile rhachis of villous spike-like racemes which terminate the culms and their branches (if any) and are supported by or exerted from often spathaceous sheaths, if 3-nate 2 sessile, the sessile different in sex from, but similar in shape to, the pedicelled; rhachis nodes bearded all round; joints and pedicels linear, the latter more slender and shorter, opposite the joints if 2 sessile spikelets be present, otherwise approximate, but not contiguous, and parallel to one of the sides of the joint; disarticulation at a right angle to the rhachis, scar at the tips of the joints suborbicular, smooth, often ciliate. Sessile spikelets, if 2, one on each side of the pedicel with a narrow annuliform callus. Florets 2, lower male, upper hermaphrodite, awnless. Involucral glumes unequal; lower longer, subcoriaceous, flat on the back, acuminate 2-keeled upwards and 2-dentate, densely ciliate, upper boat-shaped, membranous, keeled. Moral glumes hyaline, 3-nerved. Paleae hyaline, 2-nerved. Lodicules 2, cuneate. Stamens 3. Stigmas linear, laterally exerted. Grain oblong, slightly dorsally compressed; embryo half its\* length. Pedicelled spikelet similar to the sessile, but with an indistinct glabrous callus and with both florets male or more or less reduced.

Species 1 or 2.—From Nubia through Arabia and Baluchistan to Sind and Rajputana.

## 1. LASIURUS HIRSUTUS Boiss.

## PLATE 25.

*Lasiurus hirsutus* Boiss. Diagn. ser. 2, IV (1859) 146; Stapf Fl. Trop. Afr. IX (1917) 60.

*Baccharum hirsutum* Forsk. Fl. Aeg.-Arab. (1775) 16.

*Roiboellia Ursula*. Vahl Symb. I (1790) 11; Hack. Monogr. Androp. (1889) 311.

*Ischaemum mastrucatum* Trin. in Mem. Acad. Petersb. 6me ser. II, 296.

*I. hirsutum* Nees in Schimp. PL Arab. Fel. no. 791.

*Coelorhachis hirsuta* Brogn. apud Dene, in Ann. Sc. Nat., 2 ser. II, 13.

*JSlionurus hirsutus* Munro ex Benth. in Journ. Linn. Soc. XIX (1881) 68; Boiss Fl. Or. V (1884) 466; Hook. f. FL Brit. Ind. VII (1896) 162.

**Etymology** : *Lasiurus* is derived from *lamas*, woolly, and *oura*, tail, alluding to the silky-villous racemes.

**Description** : Perennial; rootstock woody, branched; stems 30-60 cm., ascending from a branching base, stout, smooth, rigid, more or less scabrid or pubescent; nodes pubescent. Leaves 7-5-15 cm. by 2-5-4 mm., linear, finely acuminate; sheaths terete, glabrous or nearly so, the upper sheaths shorter than the internodes, glaucous or nearly white.

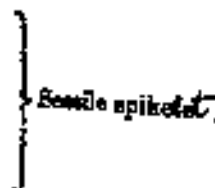
Raceme solitary, stout, 5-10 cm. long, silvery-silky all over; joints shorter than the sessile spikelets, subclavate, densely villous on the back. Sessile spikelets at each node of the rhachis solitary or 2-nate, imbricate, Teaching 1 cm. long or more (including the beak), pale green. Glumes 4; lower involucral glume 1 cm. long (including the beak), coriaceous, 7-9-nerved, the beak often as long as the body of the glume, deeply 2-fid, densely silky-villous, the lobes divergent; upper involucral glume 6 mm. long, ovate, aristately acuminate, chartaceous. 3-5-nerved, the acumen ciliate at the tip; lower floral glume equalling the upper involucral glume, hyaline, ovate-oblong, acute, 3-nerved, paleate, the palea lanceolate, acute, as long as the glume; upper floral glume shorter, ovate, acute, glabrous, with incurved margins. Pedicellate spikelets rather shorter than the sessile ones; pedicels about 4 mm. long, shorter than the joints, flattened, subclavate, hairy on the back and with ciliate margins.

**Locality** : *Sind*: Karachi (Bhide!); Sehwan to Laid, foot of hills (Sabnis B613 I), Umarkot, sandy plains (Sabnis B940!).

**Distribution** : Kajputana, Sind, Punjab, Baluchistan, Afghanistan, Arabia, Brit. Soma-Uland, Egypt, Nubia.

**Explanation of Plate 25** : *Lasiurus hirsutus* Boiss,

1. Spikelets.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Palea of lower floral glume.
6. Upper floral glume.
7. Palea of upper floral glume, with stamens, ovary and styles.





LASIXJRPS IIII.'sl"ns Hots\*.

Delin: R. K. Bhide.



Sessile spikelet

RM'OXUKUS U(Y)LEAX[Is KEEN

Delin: R. K. Thida.



## 18. ELYONURUS Humb. &amp; Bonpl.

Generally perennial, caespitose, aromatic; blades flat or folded; ligules membranous, very short.

Racemes erect, joints strongly compressed, usually villous, tips oblique, not appendaged. Spikelets similar, usually awnless, but differing in sex, 2-nate, one sessile, the other pedicelled, on the articulate fragile rhachis of solitary spike-like racemes, the sessile deciduous with the adjacent joint of the rhachis and the pedicel. Florets 2; lower reduced to an empty floral glume; upper hermaphrodite in the sessile, male, rarely barren, in the pedicelled spikelet. Involucral glumes equal; lower subcoriaceous to herbaceous, often 2-toothed or 2-fid, rarely awned, dorsally flattened, 2-keeled, usually with fine filiform transparent balsam ducts close to the ciliate or penicillate keels; upper membranous, lanceolate, acute, rarely awned. Floral glumes hyaline, awnless. Palea obsolete or 0. Lodicules 2, cuneate. Stamens 3. Stigmas laterally exerted. Grain oblong, dorsally compressed; embryo about half the length of the grain.

Species about 15.—Tropical and subtropical regions of both hemispheres.

## 1. ELYONURUS ROYLEANUS Nees.

## PLATE 26.

*Elyonurus Royleanus* Nees ex A. Rich. Tent. Fl. Abyss. II (1851) 471; Stapf Fl. Trop. Afr. IX (1917) 65; Hack. Monogr. Androp. (1889) 343; Lisboa Bomb. Grasses (1896) 63; Hook. f. Fl. Brit. Ind. VII (1896) 161; Duthie Grasses N. W. Ind. (1883) 17, Fodder Grasses N. Ind. (1888) 28, t. 54; Cooke Fl. Bomb. II (1908) 972.

*E. Grisebachii* Schmidt Beitr. z. Fl. Capverd. (1852) 154.

*Ratzeburgia Schimperii* Steud. Nomencl. ed. II (1840) 439.

*Rotboellia elegantissima* Hochst. ex Steud. Syn. PL Glum. I (1855) 365.

*Andropogon elegantissimus* Steud. 1. c. 364.

*A. Grisebachii* Steud. 1. c. 365.

**Etymology** : *Elyonurus* is derived from *elyo*, to involve, roll or wrap up, and *oura*, a tail, referring to the racemes which are embraced below by the spathe.—*Royleanus* after J. F. Royle (1800-58) once Curator *dt* Saharanpur.

**Description** : Annual; stems 7-5-30 cm. high, slender, leafy, geniculate; nodes pubescent. Leaves 3-8-10 cm. by 1-25 mm., linear-lanceolate, acute or acuminate, rigid, suberect, at first green then together with the whole plant turning red, glabrous or sparsely hairy, fimbriate at the base; lower sheaths terete, much shorter than the internodes, the upper spathiform; ligule very short, membranous.

Racemes 2-5-5 cm. long, erect, yellowish green or often variegated with purple, each enclosed in a long narrow flattened sheath; joints densely bearded at the apex with long white silky hairs, obliquely disarticulating, shorter than the sessile spikelets. Sessile spikelets nearly 13 ~~mm~~ long (including the beak); callus about 0-8 mm. long, densely bearded. Glumes 4; lower involucral glume coriaceous, nearly 13 mm. long (including beak), running out into a usually violet-coloured, 2-fid beak about 6 mm. long, the lobes ciliate, linear, slightly divergent, the margins of the glume below the beak with a row of large violet-coloured tubercles each carrying a pencil of whitish glistening hairs; upper involucral glume as long as the body of the lower, linear-lanceolate, acuminate, finely mucronate, membranous, 1-nerved; lower floral glume a little shorter than the involucral glumes, oblong, acute, nerveless, glabrous, ^paleate; upper floral glume much shorter than the lower, oblong, obtuse, nerveless. Pedicellate spikelets: pedicels 3 mm. long, ciliate on one margin. Spikelets linear-subulate. Lower involucral glume 1 cm. long, narrowed almost from the base into a long narrow linear ciliate beak; upper involucral glume 6 mm. long, ovate-lanceolate, concave, membranous, narrowed into a short scabrid purplish awn.

**Locality** : *Sind* (Woodrow).

*Cutch*: Bhodir Maka (Blatter 3747 !); Bhuj (Blatter 3795!).

*Kathiawar*: Rajkot (Woodrow).

**Distribution** : Upper Gangetic Plain, Rajputana, W. Peninsula, Arabia, Somaliland, Eritrea, Abyssinia, Sudan, Nubia, Cape Verde Islands.

**Explanation of Plate 26** : *Elyonurus Royleanus* Nees.

- |                        |                     |
|------------------------|---------------------|
| 1. Lower invol. glume. | } Sessile spikelet. |
| 2. Upper invol. glume. |                     |
| 3. Lower floral glume. |                     |
| 4. Upper floral glume. |                     |
| 5. Grain»              |                     |

## 19. ROTBOELLIA Linn. f.

Annual, usually coarse grasses, often with stilt-roots from the lowest nodes, more or less branched, particularly upwards; blades large, linear-lanceolate, rather wide; ligule membranous, short.

Racemes dorsiventral, with the spikelets placed anticously and laterally; the barren terminal appendages often very slender and their imperfect spikelets very narrow, green. Spikelets 2-nate on the nodes of the very fragile rhachis of stout cylindrical perfectly glabrous spike-like racemes which terminate the culms and their branches (in the latter case spathe-supported), different in sex and usually also in size, colour and nervation except those of the uppermost pairs which are barren, homoeomorphous and upwards increasingly reduced forming a tail-like tapering appendage to the raceme; joints dorsally flattened below, widely cup-shaped and hollowed out upwards, more or less completely fused, although externally marked off, with the equally flattened and upwards very slightly thickened pedicels along their posticous angles, forming a deeply concave rather thin-walled receptacle for the reception of the sessile spikelet; disarticulation of the joints at a right angle or oblique to the rhachis of the pedicelled spikelets slightly oblique, leaving a crescent-shaped, faintly concave scar. Sessile spikelet pale, triangular in cross section, the narrow callus fused with the bases of the adjacent joint and pedicel into a glabrous ring from the centre of which protrudes a knob fitting into the cup-shaped hollow of the next lower joint, the whole plexus falling together. Florets 2 lower male, upper hermaphrodite, awnless. Involucral glumes equal; lower coriaceous] flat on the back, with very narrow inflexed margins, 2-keeled upwards, obtuse or subobtuse; upper boat-shaped, keeled upwards, acute. Floral glumes hyaline, 3-nerved. Paleae as long or almost as long as the floral glumes, hyaline, 2-nerved. Lodicules 2, cuneate. Stamens 3. Stigmas suberect or shortly laterally exerted above the middle of the spikelet. Grain broad-oblong or ellipsoid, dorsally compressed; hilum large, suprabasal; embryo almost as long as the grain. Pedicelled spikelet similar to the sessile,\* but more compressed, green, striate, with 2 male florets, or smaller and more or less reduced.

Species 2 or 3.—Tropics of the Old World.

## 1. ROTBOELLIA EXALTATA Linn. f.

## PLATE 27.

*Rotboellia exaltata* Linn. f. Suppl. (1781) 114, Roxb. PL Corom. t. 157, Fl. Ind. I (1832) 354; Grah. Cat. Bomb. PL (1839) 233; Duthie Grasses N. W. Ind. (1883) 17; Lisboa Bomb. Grasses (1896) 58; Hack. Monogr. Androp. (1889) 293; Hook. f. Fl. Brit. Ind. VII (1896) 156; Cooke Fl. Bomb. II (1908) 955.

*R. exaltata* var. *genuina* Schweinf. in Höhnell Disc. Lakes Rud. and Stefanie II, App. 352.

22. *exaltata* f. *arundinacea* Hack, in Bot. Soc. Brot. V, 215.

*R. arundinacea* Hochst ex A. Rich. Tent. Fl. Abyss. II (1851) 444.

*Stegosia cochinchinensis* Lour. Fl. Cochinch. (1790) 51.

*S. exaltata* Nash in Americ. Fl. XVII, I, 84.

**Vernacular names** : Bursali, Bura, Sooato, Eonda canookoo.

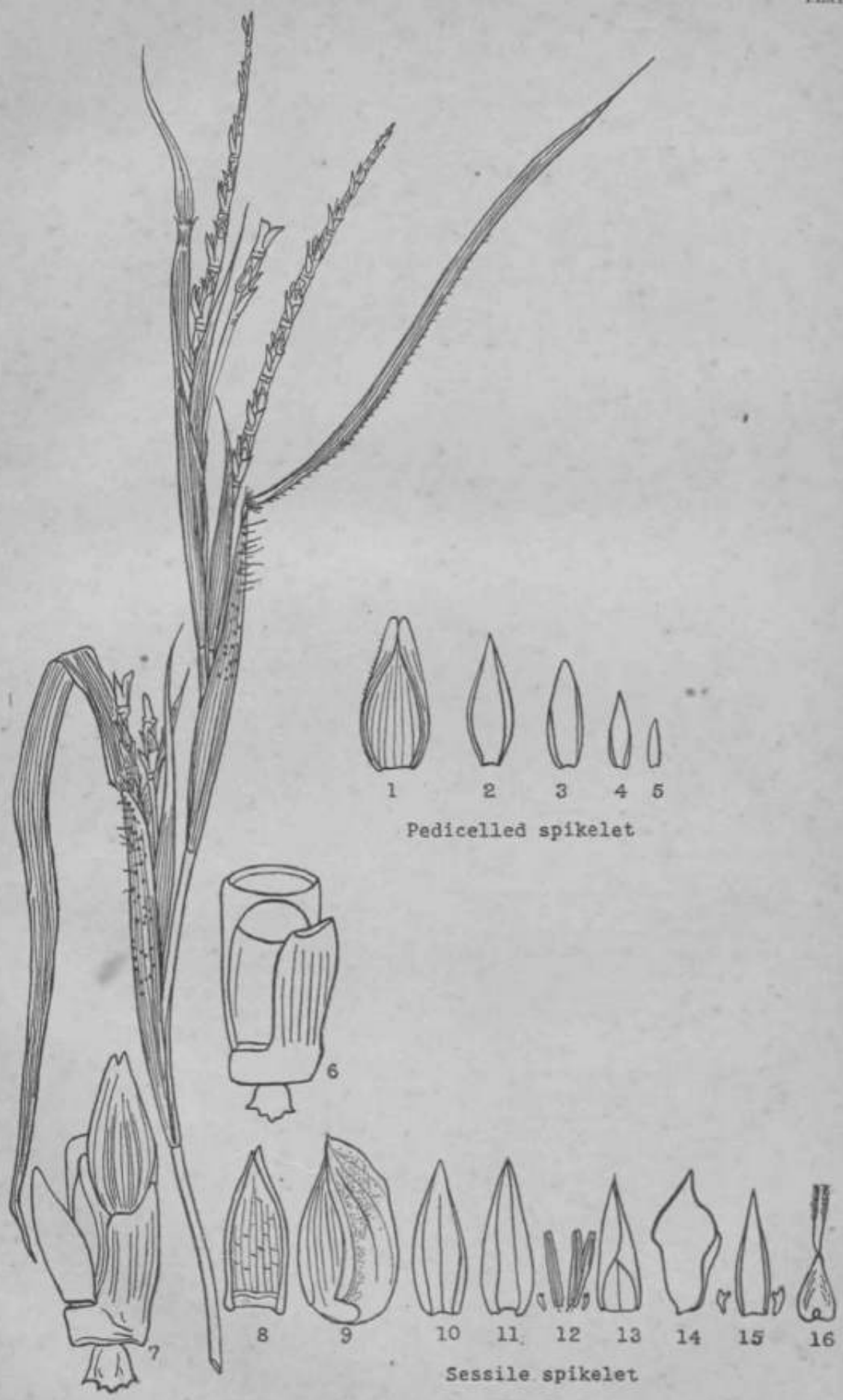
**Etymology** : *Rotboellia* after O. F. RotboeQ, 1727-1797, a Danish botanist.—*Exaltata* means exalted, alluding to *ike* great height of the plant.

**Description** : Perennial; stem 1-8-3 m. high, erect, leafy, solid, smooth, branching from the base. Leaves 15-60 cm. by 6-25 mm., linear-lanceolate, setaceously acuminate, scabrid or hispid and green above, smooth and glaucous beneath, the margins spinulose scabrid; midrib stout, prominent beneath; sheaths loose, glabrous or hispid, the mouth contracted; ligule short, ciliate.

Racemes 7-5-15 cm. long, terete, glabrous, fragile, the upper part of the raceme slender with imperfect spikelets; internodes 4-5 mm. long, dorsally rounded, smooth. Sessile spikelets about as long as the internodes, 5 mm. long. Glumes 4; lower involucral glume 5 mm. long, ovate-oblong, obtuse, coriaceous, smooth, with truncate base, many obscure nerves and scaberulous margins; upper involucral glume equalling the lower, chartaceous, broadly ovate, acute, 9-11-nerved, the keel very shortly winged towards the tip; lower floral glume as long as the lower involucral glume, broadly ovate, acute, 3-nerved, rigidly membranous, paleate male, the palea like *ike* glume, with incurved margins; upper floral glume a little shorter\* than the lower, ovate from a broad base, acute, 1-nerved; palea as long as the glume, hyaline nerveless. Pedicellate spikelets more or less imperfect; lower involucral glume <sup>narrowly</sup> winged.

**Locality** : *Kmhan*: Dohé forest, Thana Disk (Ryan 711!).

*Deccan*: Poona (Bhide!, Cooke, Woodrow 2!), Agricultural College Farm (Herb. Boon. Bot. Poona!); Purandhar, 4,000 ft, (McCann 5591!).



Pedicelled spikelet

Sessile spikelet

ROTBftIXIA EXALTATA I.I.W. F.

Delin: E. K. Shide.

*S. M. Country:* Dharwar, in field (Sedgwick 5469!).

*N. Kanara:* Hattikeri, near Karwar (Hallberg & McCann A741).

**Distribution :** India, Andamans, Ceylon, China, Malaya, Australia, Africa.

**Economic uses :** According to Welwitsch the grass is much disliked by cattle.

**Explanation of Plate 27 :** *RotboeUia exaltata* Linn, f.

1. Lower invol. glume.
2. Upper invol. glume.
3. Lower floral glume.
4. Upper floral glume.
5. Palea of upper floral glume.
6. Joint of rhachis with, the spikelets removed, showing the hollow at the top into which the basal portion of the upper joint fits.
7. Joint with spikelets.
8. Lower invol. glume.
9. Upper invol. glume.
10. Lower floral glume.
11. Palea of lower floral glume.
12. Stamens and lodicules.
13. Upper floral glume (ventral view).
14. Upper floral glume (lateral view).
15. Palea of upper floral glume and lodicules.
16. Grain.

} Fedicelled spikelet.

J> Sessile spikelet.

#### VAR. ROBUSTA Hook. f.

*Var. robusta* Hook, f. Fl. Brit. Ind. VII (1896) 156.

**Description :** Leaf-base more cordately confluent with the sheath. Spikes stouter below, slender above the middle. Spikelets in upper half distichously imbricate, longer than the joints, fertile nearly to the tip. Paleae of upper floral glume auricled at the base.

**Locality :** *Deccan:* Poona (Woodrow *ex* Hook, f.).—We have not seen this plant.

**Distribution :** Malabar and Palamcotta.

#### 20. OPHIURUS Gaertn. (*partim*); Stapf in EL Trop. Afr. IX (1917) 74.

Annual (?) or perennial, sometimes very coarse grasses, usually much-branched upwards; blades linear to lanceolate, short to very long, conduplicate or convolute in bud, then flat; ligules very short, membranous.

Racemes dorsiventral. Spikelets solitary on the nodes of the fragile rhachis of slender cylindrical spikes which terminate the culms and their usually fascicled spathe-supported branches, their pedicelled companions suppressed or rudimentary and very minute and the pedicels completely fused with the joints, both forming together a deeply hollowed out cylindrical receptacle for the reception of the sessile spikelet; disarticulation of the internodes at a right angle or slightly oblique to the rhachis, their tips hollowed out. Sessile spikelet with a very narrow callus which is fused with the base of the internode into a rim from the centre of which protrudes a small knob fitting into the hollow of the next lower internode, the whole plexus falling together. Florets 2, lower male or neuter, upper hermaphrodite, awnless. Involucral glumes equal; lower coriaceous, flat or subconvex on the back with very narrow inflexed margins, faintly nerved, with a transverse groove at the base, upper boat-shaped, Tiyaline, obtuse. Floral glumes hyaline, 2-nerved or nerveless. Paleae similar to the floral glumes. Lodicules 2, cuneate. Stamens 3. Stigmas short, laterally exerted. Grain oblong, dorsally slightly compressed; embryo a quarter the length of the grain.

Species about 4.—From the Sudan through tropical Asia to Australia.

Stapf has described the species *Ophiurus megaphyllus* which forms part of *O. corymbosus* Hook. f. in Fl. Brit. Ind. VII, 160 (not of Gaertn. f. and not of *RotboeUia corymbosa* Linn, f.). What is left over of Hook, f's. *O. corymbosus* after the separation of *O. magaphyUus* has to go under *O. corymbosus* Gaertn. f.

1. Leaves ensiform^ very hairy. Robust, 1-5-1-8 m. . . 1. *O. megaphyUus*.
2. Leaves linear, glabrous. Slender, 0-6-1-2 m. . . 2. *O. corymbosus*.

#### 1. OPHIURUS MEGAPHYLLUS Stapf.

*Ophiurus megaphyllus* Ptapf in Haines Bot. Bih. and Or. pt. V (1924) 1058.

*O. corymbosus* Hook. f. FL Brit. Ind. VII (1896) 160 (*partim, non* Gaertn. f.); Cooke Fl. Bomb. II (1908) 951 (*partim*); Hack. Monogr. Androp. (1889) 317 (*poftim*).

**Vernacular names :** Sputter, Sut, Sonthi, Katia, Karvel.

**Etymology** : *Ophiurus* derived from *ophis*, a snake, and *oura*, a tail; the allusion is not clear.—*Megaphyllus* means big-leaved.

**Description** : A large stout grass, 1.5-1.8 m. high, very leafy to the top. Leaves narrowly ensiform, tapering from base to apex, upper 10-18 mm. wide, lower much wider, flat, very hairy as are the sheaths, but more or less glabrescent with age, hairs with small tubercle bases, margins of sheath hirsute.

Spikelets 2-4 mm., slightly shorter or longer than the joints, in very numerous peduncled spikes 7.5-10 cm. long, from the leaf-axils. Peduncles 7.5-12.5 cm., sheathed at the base, finally far exserted, each solitary on a branch with a villous node, often geniculate at the node. Sessile spikelets: glumes 4. Lower involucre glume oblong, glabrous, with rounded tip, smooth or with few lines of small pits, not becoming recurved sometimes bearing a small appendage. Upper involucre glume white, becoming inclined forward, quite free from the rachis when the spikelet opens. Pedicelled spikelets: the lowest are sometimes free at the top and bear a small brown free appendage.

**Locality** : We have not been able to examine all the specimens which were formerly put under *O. corymbosus* Hook, f. and we are, therefore, not in a position to assign any specimen to *O. megaphyllus* Stapf.

**Distribution** : To make a definite statement all the herbarium material of *O. corymbosus*, Hook, f. would have to be examined.

## 2. OPKEURUS CORYMBOSUS Gaertn. f.

### PLATE 28.

*Ophiurus corymbosus* Gaertn. f. Fruct. III, 4, t. 181, f. 3a (*Ophiuros*); Haines Bot. Bih. andl Or. pt. 5 (1924) 1058.

*RotboeUia corymbosa* Linn. f. Suppl. (1781) 114.

*Ophiurus corymbosus* Hook. f. Fl. Brit. Ind. VII (1896) 160 (*partim*); Cooke El. Bomb. II (1908) 951 (*partim*).

#### Vernacular name : Hutia.

**Description** : Perennial. Stems very numerous, glabrous, erect, slender, 0.6-1.2 m\* high, bulbous at the base, the bulbous bases connected into a horizontal rhizome. Leaves, linear, glabrous, up to 5 mm. broad, margins minutely tubercled at base, the tubercles bearing cilia when young.

Spikes very slender, 5-12.5 cm. long, sometimes ending in a small tail like that of a rattlesnake (Haines), spikelets 2-5 mm. long, equalling the joint. Lower involucre glume of sessile spikelet glabrous, with many longitudinal lines of small pits, narrowly oblong, tip rounded, finally recurved.

**Locality** : *Deccan*: Deolali (Blatter & Hallberg 4564!); Nasik Road (Blatter 9624!); Talegaon (McCann!).

**Distribution** : Not known to us.

**Explanation of Plate 28** : *Ophiurus corymbosus* Gaertn. f.

1. Part of spike.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Stamens.
6. Palea of lower floral glume.
7. Upper floral glume.
8. Palea of upper floral glume.

## 21. COELORRHACHIS R. Br.

Mostly tall coarse perennial grasses, much-branched upwards.

Racemes with the not rarely imbricate sessile spikelets placed anticously and the pedicelled laterally. Spikelets 2-nate on the nodes of the fragile rachis of slender more or less compressed conspicuously dorsiventral spike-like racemes which terminate the culms and their usually fascicled spathe-supported branches, different or very rarely alike in sex, similar in shape or the pedicelled more or less to very much reduced; joints and pedicels similar or the latter more slender, linear to cuneate or subclavate, dorsally compressed, glabrous contiguous or nearly so; disarticulation of the joints at a right angle to the rachis, their tiira more or less hollowed out, with or without an auriculiform appendage. Sessile spikelet d. sally compressed, the narrow transverse callus frsed with the bases of the adjacent joint and

pedicel into an obscure rim from the centre of which protrudes a knob fitting into the hollow of the next lower joint, the whole plexus falling together. Florets 2, lower usually reduced to the floral glume, rarely with a small palea, always neuter, upper hermaphrodite, awnless. Involucral glumes subequal; lower flat or slightly convex on the back, smooth or variously sculptured with narrow inflexed margins, 2-keeled upwards and more or less winged from the keels, obtuse or emarginate, very faintly nerved; upper chartaceous, keeled, acute, 1-3-nerved. Floral glumes hyaline, of lower floret 2-nerved or nerveless\* of upper 3-1-nerved or nerveless. Palea hyaline, similar to the floral glume, 2-nerved or nerveless. Lodicules 2, cuneate. Stamens 3. Stigmas laterally shortly exerted. Grain oblong, dorsally compressed; embryo about half the length of the grain. Pedicelled spikelet very varied, similar to the sessile or more or less reduced or rudimentary, male or neuter, very rarely hermaphrodite.

Species about 12.—Tropics of both hemispheres.

### 1. COELORRHACHIS CLARKEI (Hack.) Blatter & McCann.

#### PLATE 29.

*Coelorrhachis Qlarlcei* Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1927) 33.

*Rotboellia Clarkei* Hack, in Oestr. Bot. Zeitschr. 41 (1891) 8; Hook. f. Fl. Brit. Ind. VII (1896) 156; Gooke Fl. Bomb. II (1908) 954.

*R. gibbosa* Hack, ex Lisboa Bomb. Grasses (1896) 58.

**Etymology** : *Coelorrhachis* is derived from *koilas*, a hollow or cavity, and *rhachis*, referring to the more or less hollowed out tips of the joints.

**Description** : Annual; stem 20-60 cm. high, erect, striate, compressed; nodes with a small ring of hairs. Leaves 10-15 cm. by 8-13 mm., linear-lanceolate, acuminate, narrowed to the subcordate base, scabrous and more or less hairy, the hairs with minutely tubercular bases; midrib prominent; sheaths compressed, ciliate; ligule a hairy membrane.

Raceme solitary, 13-25 mm. long, pale yellow, supported by a spathe; rhachis very fragile; joints pyriform, shorter than the spikelets, ciliolate and with a broad cavity at the tip, the sides not hollowed. Sessile spikelets 2\*5-3 mm. long, obtuse, closely imbricating; callus short and broad, cylindrical. Glumes 4; lower involucral glume with an ovate coriaceous 3-5-nerved disk and hyaline wings which are ciliate at the tip, dorsally gibbous, scabrid and hairy below the middle; upper involucral glume 2-5 mm. long, ovate-oblong, subacute, membranous, 1-nerved, glabrous; lower floral glume shorter than the upper involucral glume, ovate-oblong, subobtuse, hyaline, nerveless; upper floral glume rather smaller than the lower, oblong, obtuse, hyaline, nerveless, the margins incurved; palea like the glume, nerveless. Pedicellate spikelets imperfect, consisting usually of a solitary empty glume about 1-2 mm. long; pedicel quite free from the rhach. pyriform, flattened, about 1-5 mm. long.

**Locality** : *N. Kanara*: Birchy (Talbot 2072! 2820!); Jugglepet (Talbot 1566!).

**Distribution** : Chota Nagpux, W. Peninsula.

**Explanation Of Plate 29** : *Coelorrhachis Clarkei* (Hack:) Blatter & McCann.

- |                                  |   |                      |
|----------------------------------|---|----------------------|
| 1. Lower invol. glume.           | } | Pedicelled spikelet. |
| 2. Upper invol. glume.           |   |                      |
| 3. Lower floral glume.           |   |                      |
| 4. Upper floral glume.           |   |                      |
| 5. Palea of upper floral glume.  |   |                      |
| 6. Spikelets and joint.          | } | Sessile spikelet.    |
| 7. Lower invol. glume.           |   |                      |
| 8. Upper invol. glume.           |   |                      |
| 9. Lower floral glume.           |   |                      |
| 10. Upper floral glume.          |   |                      |
| 11. Palea of upper floral glume. |   |                      |
| 12. Stamens and styles.          |   |                      |

### 22. IMPEBATA Gyrill.

Erect perennial grasses; stem leafy; internodes solid. Leaves narrow.

Spikelets 1-flowered, in spike-like subcylindrical silvery-silky panicles, with very short filiform articulate branches and rhachises, all alike and 2-sexual, narrow, terete, hidden among very long hairs arising from a small callus and from outer glumes, 2-nate, a sessile and a pedicellate one, articulate at the base, fugacious. Glumes 4; involucral glumes subequal, membranous, dorsally rounded or the upper obscurely keeled, 3-5-nerved at the base; lower involucral glume ovate-lanceolate with a hyaline obtuse tip; upper involucral glume

acuminate; floral glumes short, often erose; palea minute, hyaline. Lodicules 0. Stamens 1 or 2. Styles connate below; stigmas very long, narrow, exerted at the top of the spikelets. Grain small, oblong.

Species 5 or 6, mostly closely allied.—Warm regions of both hemispheres.

1. IMPERATA CYUNDBICA (Linn.) P. Beauv.

PLATE 30.

*Imperata cylindrica* (Linn.) F. Beauv. Agrost. (1812) 165, t. V, fig. 1, Ezpl. planch. 5; Stapf in Fl. Trop. Afr. IX (1917) 87; Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1927) 281.

*I. arundinacea* Cyrill PL Ear. Neap. fasc. 2 (1792) 26, t. 11; Hack. Monogr. Androp. (1889) 92; Boiss. Fl. Or. V (1881) 452; Duthie Grasses N. W. Ind. (1883) 14, Indig. Fodder Grasses (1886) 1.15, Fodder Grasses N. Ind. (1888) 22; Hook. f. FL Brit. Ind. VII (1896) 106; Lisboa Bomb. Grasses (1896) 45; Cooke Fl. Bomb. II (1908) 946; R. S. Hole in Ind. For. Mem. I (1911) 91.

*I. Aladg* Jungh. in Tijdschr. Nat. Gesch. VII, 295.

«*I. condensate* Steud. Syn. PL Glum. I (1855) 431.

*Lfilifolia* Nees ex Steud. I.e.

*I. Koenigii* P. Beauv. Agrost. (1812) 165.

*I. pedicellate* Steud. in Flora XXIX (1846) 22.

*Saccharum cylindricum* Lam. Encycl. I, 594; Roxb Fl. Ind. I (1832) 234; Grah. Cat. Bomb. PL (1839) 239.

& *diandrum* Eoen. ex Retz. Obs. V, 16.

«*I. Koenigii* Retz. Obs. I.e.

*S. laguroides* Pourr. in Mem. Acad. Toul. III (1788) 326.

*S. Ravennae* Bieb. Fl. Taur. Cauc. III, 51.

*Lagurus cylindricus* Linn. Syst. ed. X, 878.

• *Colamagrostis Lagurus* Eoel. Descr. Gram. (1802) 112.

Vernacular names i Dhub.

Etymology : *Imperata* was given in honour of F. Imperati, a Neapolitan botanist.

**Description** : Culms erect, simple, slender, from 12 cm. in height and almost filiform to 2\*8 m. high and 8 mm. diam., 3-4-noded, glabrous, solid, slightly fistular at base; leaf-insertions tumid, glabrous, or densely bearded with erect white hairs. Leaf-sheaths rather loose, glabrous or gkbrescent, ciliate or glabrous along the margin towards the apex, the lowest at length usually breaking up into fibres, usually longer than proper internode ; ligules membranous, rounded, truncate or 2-lobed, ciliate, dorsally silky, attaining a height of 3 mm. Blade of uppermost leaf of flowering culm from mucroniform and 1-25 mm. long to 15 cm. long and 6 mm. wide with greatest width in middle, of lower leaves erect or arcuate and attaining a length of 1-2 m. and width of 27 mm., greatest width about the middle, dark green, midrib white, apex acuminate, narrowed towards the base where the midrib occupies almost the entire width of the leaf, smooth, but scabrid on margin and on one or more submarginal nerves above, especially towards the apex, white villous above on margins towards the base and behind the ligule.

Panicle spike-like, 3-50 cm. long, not exceeding 25 mm. in width, cylindric, very dense ; branches and branchlets very numerous, crowded, appressed; pedicels fine with clavate tips, glabrous, scaberulous or pubescent, with long fine hairs below. Flowering panicle purple with the exerted stigmas, the callus-hairs being closely appressed to the axis, fruiting panicle silvery-white with the wide-spreading callus-hairs. Spikelets not awned, lanceolate, 3 mm. long, both spikelets of each pair similar, each 1-flowered and hermaphrodite, and at length falling from the pedicel; callus-hairs soft, white 2-3 times as long as the spikelets. Lower involucral glume lanceolate, membranous, slightly thickened towards the base, apex hyaline, 3-9-nerved, none of the nerves extending to apex of glume, margins incurved, ciliate above, dorsally villous with soft white hairs overtopping the glume by 1J to 3 times the length of the glume. Upper involucral glume similar and subequal to the lower, but sometimes subkeeled with midnerve extending almost to apex. Lower floral glume oblong, hyaline, nerveless apex acute ui subtruncate and laciniate or denticulate, ciliate, £ to £ of the size of upper involucral glume. Upper floral glume subequal to the lower one, ovate-lanceolate, hyaline, nerveless, apex acuminate, acute, or obtuse and laciniate or denticulate, minutely ciliate or glabrous. Palea quadrate, rectangular or subpentagonal, hyaline, nerveless, apex denticulate or unequally laciniate, glabrous or ciliate, £ the size of the upper floral glume or subequal to it. Lodicules none or very minute. Anthers 2, 2\*5-3 mm. long, or\*nge, filaments sometimes connate below. Stigmas 2, 3-4 mm. long, purple.



BM'KRA'IA CYLINDRICA DEAOV.





Some authors distinguish varieties and subvarieties which scarcely seem to be justified. Stapf who mentions two varieties *var. Thumbergii* Durand & Schinz, and *var. Koenigii* Durand & Schinz, says in a note (l.c. 89): "The varieties and the type, although on the whole pretty distinct within their areas, often pass into each other, chiefly along the confines of their areas, or they possibly lose their distinctive characters under particular local conditions, when the separation becomes almost impossible." This does not speak in favour of good varieties. Hackel (l.c. 93-95) has 3 varieties and several subvarieties, and Anderson (in Oefvers. E. Yet. Akad. Forh. Stockh. 1885, p. 157) is still more liberal with his subvarieties. Hook. f. makes one variety *latifolia* (F. B. I. l.c.) and remarks about one of Hackel's varieties: "Hackel distinguishes the Indian form as *var. Koenigii*, having villous nodes and broader, less rigid leaves, but some of the Indian specimens appear to me quite like the Western."<sup>9</sup> Hackel's division depends chiefly on such characters as hairiness of the leaf-insertions, width of the leaves and height of the ligule. The height and shape of the ligule, however, seeing, according to Hole's investigations, more or less correlated with the width of the lamina, while the other characters appear to vary with the locality and do not define forms of any constancy. Hole's treatment of *Imperata arundinacea* (On some Indian For. Grasses and their Oecology, 1911, p. 95) appeals to us much more. Amongst the material observed at Dehra Dun he distinguishes 3 forms which are more or less clearly defined:

- (a) Tiflrdepauperate form common on lawns or areas where the grass is continually cut or grazed, with minute, almost filiform, culms and small-leaves. Leaf-insertions usually long-bearded. Glume IV and palea usually glabrous.
- (b) The ordinary savannah form which usually attains a height of about 90 cm. with leaves up to 17 mm. wide. Leaf-insertions bearded or glabrous. Palea and glume IV ciliate.
- (c) A robust form found in swamps or marshy soil where there is an abundance of available moisture more or less throughout the year. This plant attains a height of 2-8 m. and probably more. Leaves up to 26 mm. wide, leaf-insertions glabrous. Palea and glume IV ciliate. This is identical with *var. latifolia* Hook. f.

Forms of this kind could be multiplied according to various localities. As we are not going to distinguish any varieties we have given a description of the species including all the variations that so far have been observed.

**Locality** : *Sind* (Stocks).

*Gujarat* (Graham)..

*KonJan*; Bombay, Tardeo (Hallberg 5398!); Alibag, sandy shore (Ezekiel!); near Thana (McCann!); banks along railway track between Ghatkopar and Thana, Salsette (McCann!).

*W. Ghats*: Castle Bock (Bhide !); Londa, common (McCann!).

*S. M. Country* : Shiggaon (Sedgwick 2353 !); Devarayi (Sedgwick & Bell!).

*N. Kanara*: Halyal (Talbot 1896 !).

**Ecology** : For excellent detailed notes on this species see R. S. Hole, On some Indian Forest Grasses and their Oecology, in Ind. Forest Mem. I (1911) 96-101.

**Distribution** : Hotter parts of India, ascending in the Himalayas to at least 6,500 ft., Mediterranean region, Africa, Java, Japan, China, Australia.

**Economic uses** : Duthie says of this grass that "cattle relish it." "In Australia," he says, "it is called 'blady grass' and the young succulent foliage which springs up after the occurrence of a fire is much relished, by stock. I have observed the same effect resulting from periodical fires on certain parts of the Himalaya where this grass is plentiful." (Duthie, Fodder Grasses N. Ind. 23). "In India," according to Hole (l.c. 101) "the succulent white stolons are eaten by pigs and areas which have been well worked by pigs in their search for the stolons are not infrequently seen in the forest. It is possible that in some cases the eradication of the species might be cheaply accomplished by the aid of pigs."

This grass is also known as a paper-making material: "The ultimate fibre obtained from this grass is very similar in most respects to Esparto; the yield of bleached fibre being about the same. This is a favourable indication inasmuch as Esparto is one of the best known and most useful sources of supply\* to the trade. The results obtained from the chemical analysis show that the grass is capable of yielding a good quality of cellulose, suitable in every way for the manufacture of paper." (Agric. Bull. of the Straits and F. M. States VII (1908) 586),

The leaves are largely used for thatching (Hole).

**Explanation Of Plate 30** : *Imperata cylindrica* Beauv.

1. Flowering panicle.
2. Fruiting panicle.

## 3. Depauperate culm.

a. Bearded leaf-insertions.

6. Long villi at base of lamina.

4. Ligule of plant shown in fig. 3. (Figs. 1-4 all X £).

5. Pair of spikelets (x 2£).

6. and 7. Spikelet showing callus hairs (X 3).

I. Lower invol. glume.

II. Upper invol. glume.

III. Lower floral glume.

IV. Upper floral glume.—Palea.—S. S. Stamens.—Ovary, (all X 3).

## 23. SACCHARUM Linn.

The genus as understood by the latest agrostologists comprises also the species which were formerly described under the genus *Eriarthys* Micks. As already remarked by Haines in his Flora of CShota Nagpur the awned upper floral glume of some *Saccharum* breaks down the only distinction between *Saccharum* and *Erianthus*.

Perennial tall herbs. Leaves various.

Panicle large, often silvery-silky and showy; spikelets usually surrounded by long silky hairs from the base, all alike, binate, one sessile, the other pedicelled on the articulate fragile-rhachis of paniced racemes, the pedicelled falling from their pedicels, the sessile deciduous together with the contiguous joint of the rhachis and pedicel. Florets 2, the lower reduced to an empty valve, the upper hermaphrodite. The glumes equal, often chartaceous to subcoriaceous towards the base, membranous to subhyaline upwards; the lower glume with inflexed margins and in the sessile spikelet usually with an even number of nerves; upper glume 1-, 3-, or 6-nerved. Valves hyaline; upper with a terminal bristle-like usually straight awn, or mucronate, or muticous, or 0. Lodicules 2, cuneate. Stamens 3. Stigmas laterally exerted. Grain oblong to subglobose; embryo short to half the length of the grain or more; hirtum basal.

Species about 8.—Tropical and subtropical.

JL Awn of upper floral glume not or scarcely exerted from spikelets or 0.

I. Hairs on callus of sessile spikelet much exceeding the spikelet

1. Culms not leafy above, under 17 mm. diam.  
Leaves under 20 mm. broad. Lower involu-  
cral glumes ciliate.1. *8. spontaneum*.2. Culms densely leafy above, over 25 mm. diam.  
Leaves over 25 mm. broad. Lower involu-  
cral glumes glabrous.2. *8. officinarum*.

II. Hairs on callus of sessile spikelet shorter or not much longer than spikelet

1. Upper involucrel glume of sessile spikelet not villous dorsally.

a. Foliage not glaucous. Culms densely leafy above. Sessile spikelet shorter than internodes of rhachis

3. *8. arundinaceum*.

b. Foliage glaucous. Culms not leafy above. Sessile spikelet longer than internodes of rhachis.

4. *S. Munja*.

2. Upper involucrel glume of sessile spikelet villous dorsally.

5. *8. Griffithii*.

B. Awns of upper floral glume distinctly exerted from the spikelet.

I. Panicles thyrsoform. Spikelets 3-4 mm. long. Awn 2-5 to almost 6 mm. long.

6. *S. Ravennae*.

II. Panicles not thyrsoform. Spikelets 4 to almost 5 mm. long. Awn 8 mm. long.

7. *S. fastigiatum*.

## 1. SACCHARUM SPONTANEUM Linn.

## PLATE 31.

- Saccharum spontaneum* Linn. Mant. (1771) 183 ; Roxb. Fl. Ind. I (1832) 235 ; Griff. Ic. PL As. t. 139, fig. 63 ; Dalz. & Gibs. Bomb. Fl. (1861) 304 ; Puthie Grasses N. W. Ind. (1883) 15, Indig. Fodder Grasses (1886) 57, Fodder Grasses N. Ind. (1888) 25 ; Hack. Monogr. Androp. (1889) 113 ; Lisboa Bomb. Grasses (1896) 47 ; Hook. f. Fl. Brit. Ind. VII (1896) 119 ; Cooke Fl. Bomb. II (1908) 948 ; Hole in Ind. For. Mem. I (1911) 50 ; Haines Bot. Bit. and Or. (1924) 1011.
- S. spontaneum* var. *aegyptiacum* Hack. Monogr. Androp. (1889) 115 ; Stapf in Fl. Trop. Air. IX (1917) 95.
- S. semidecumbens* Roxb. Fl. Ind. I (1832) 236.
- S. canaliculatum* Roxb. 1. c. 246.
- S. chinense* Nees in Hook. & Am. Beechy's Voy. 241.
- S. aegyptiacum* var. *sinense* Anders, in Oefvers. K. Vet. Akad. Förhand. Stockh. (1855) 157 (non *S. sinense* Roxb.).
- S. spontaneum* Beauv. Fl. Owar. II, 71.
- S. biflorum* florsk. Fl. Aegypt.-Arab. (1775) 16.
- S. aegyptiacum* Willd. Enum. Hort. Berol. I, 82 ; Boiss. Fl. Or. V (1884) 454.
- S. caducum*, *S. speciosissimum* et *S. Palisotii* Tausch in Flora (1836) 527.
- Imperata spontanea* Beauv. Agrost. (1812) 165.

This is a very variable species and Hole does not think that we are justified in making different subspecies or varieties. He distinguishes 3 ecological forms :

- (a) The dry sandy soil-form, a xerophilous type. The culms are slender, erect and tufted, usually less than 5 mm. diam. The leaves exceedingly narrow, sometimes only a little more than 1 mm. wide. The callus-hairs not less than 3½ times the length of the spikelet.
- (b) The swamp-form, a hygrophilous type, found in marshes and swamps with an abundance of available moisture more or less throughout the year. The culms are stout, 5-15 mm. diam., usually decumbent at base and not tufted. Leaves broad, reaching a width of 17 mm. The callus-hairs 1½—3 times as long as the spikelets. The fruiting panicle elongate-elliptic to oblong with its branches usually more persistent than in other forms.
- (c) The loam-form, intermediate between (a) and (b). The culms are more or less decumbent at the base and not tufted, but less robust and with longer callus-hairs than in (b).

According to Hole the African forms placed under var. *aegyptiacum* differ from the Indian plants chiefly by their slightly larger spikelets. But he finds that this difference is very slight and that it fails in the case of some African specimens. "Considering the great variability of the species in India it seems possible that a more complete knowledge of the African plant will prove *aegyptiacum* to be merely one of the several ecological forms which are defined by inconstant characters and which are connected by numerous intermediates."

**Vernacular names** : Dharbi, Dhub, Kan, Bochri, Bagberi, Eamis, Ehair.

**Etymology** : *Saccharum* is the Latin word for sugar.

**Description** : Stem erect or decumbent at the base, reaching up to 6 m. in height and 15 mm. in diam., solid above, fistular below, terete, indistinctly striate, usually pruinose when young, polished when old, silky Below the panicle and minutely silky below the upper leaf-insertions, glabrous or minutely pubescent below the lower leaf-insertions. Leaf-sheath longer than proper internode, often with reddish or purplish blotches, villous at mouth, often minutely pubescent at base, otherwise glabrous or with scattered appressed hairs, sulcate. Blade erect, of uppermost leaf of flowering culm usually long, varying from 5 cm. to 90 cm. in length, of lower leaves up to 1-2 m. and even 2 m., usually very narrow, often not exceeding 1-5 mm. in width and then consisting of a very narrowly margined concavo-convex midrib, but also attaining a width of 16 mm., glaucous, midrib white, margin scabrid, often villous above at base immediately behind the ligule. Ligule ovate or deltoid, base often subauricled, membranous, subacute or subtruncate, often fimbriate when old, up to 6 mm. high. Minutely silky dorsally and ciliate.

Flowering panicle 15-60 cm. long, conical or lanceolate to oblong, branches horizontally spreading, or slightly ascending, usually reddish or purplish, with the callus-hairs closely appressed to the branches of the panicle; primary rachis sulcate, silky with long white hairs; primary branches subverticillate, simple or compound. Spikelets in pairs, one pedicelled and one sessile on the capillary jointed branches and branchlets, awnless, lanceolate, 2-5 mm. long, sessile and pedicelled similar, each one-flowered and hermaphrodite, pedicelled fruiting spikelet falling from the pedicel, the sessile spikelet falling later with the attached pedicel and joint of axis; joint of axis longer or shorter than sessile spikelet, villous on margins, or on margins and

doisally; pedicel i—1J the length of the sessile spikelet, but usually shorter than spikelet, glabrous or ciliate, shorter than proper joint; callus-hairs white, from  $\Lambda$ —7 times as long as sessile spikelets. Lower involucral glume lanceolate, the basal third thickened becoming hard and polished in fruit and more or less brown in colour, the upper two-thirds membranous-hyaline, with 2 lateral nerves from which the margin is inflexed; apex entire or minutely bidentate; margin ciliate; dorsally with the upper two-thirds minutely appressed-pubescent. Upper involucral glume broad-lanceolate, similar to the lower, but subkeeled with one central nerve; apex sometimes mucronate; margin inflexed and long ciliate. Lower floral glume hyaline, nerveless, shorter than upper involucral glume, ovate-lanceolate, long ciliate, minutely pubescent above dorsally. Upper floral glume minute, linear, ciliate, hyaline, sometimes 0. Palea minute, ovate, ciliate, often shorter than the lodicules. Lodicules 2, cuneate, glabrous or ciliate at apex. Anthers 3, yellow, turning brown. Stigmas 2, purple.

As good field-characters we may mention the narrow leaves and slender culms, the long\* callus-hairs and the brown coriaceous base of the involucral glumes.

**Locality** : *Sind*: Shikarpur (Woodrow); Mirpur Sakro (Blatter & McCann D697 !).

*Gujarat*: Baroda (Cooke); Domas, near Surat (Dalzell & Gibson).

*Khandesh*: Dadgaum (McCann 9892 !); northern slope of Ghanseli (McCann 893 !); Bor, Bori Biver (Blatter & Hallberg 4422 !).

*Konkan*: Kamana, Mahim (Ryan 2205 !); Sakwar, river-side (Ryan ? 2080 !); Bassein (Byan 4 !); Earjat (Woodrow), on river-bank (McCann!); Vehar Lake (McCann 9894 !); Alibag, sandy shore (Ezekiel!).

*W. Ghats*: Igatpuri, on banks of bund (McCann 4334!); Castle Bock (Gammie-15743!, McCann!).

*Deccan*: Poona, river-bank (Woodrow).

*S. M. Country*: Banks of streams, common in the S. Dharwar Dist. (Sedgwick & Bell 3693 !); Haveri (Talbot 2236 !); Belgaum (Ritchie).

*N. Kanara*: Supa, bed of Eala Nuddi (Talbot 2196); Hullikal (Talbot 1348!).

**Ecology** : For extensive notes see R. S. Hole in Ind. For. Mem. I (1911) 54-61.

<sup>6</sup> Th# horizontally spreading callus-hairs of the fruiting spikelet form an efficient parachute which aids its distribution by wind. The hairs of neighbouring spikelets becoming entangled together, characteristic flocculent masses of several spikelets are often seen being carried by the wind or hanging on the adjacent vegetation.' (Hole).

**Distribution** of the species, irrespective of the varieties: Africa (Upper Guinea, Nile Land, Mozambique District), Lower Egypt, Arabia, Syria, Afghanistan, India, Ceylon, Burma, China, Java, Philippines, New Guinea, Australia.

**Economic uses** : A favourite fodder of buffaloes. The leaves are used for thatching and brooms. Valuable as a fixing agent for shifting sand and unstable soil. For *S. spontaneum* as a potential source of paper pulp see W. H. Brown and A. F. Fischer, Philippine forest products, as sources of paper pulp, in Forest Bur. Philip. Islds. Bull. 16 (1918).

**Explanation Of Plate 31** : *Saccharium spontaneum* Linn.

1. Flowering panicle (Xf).
2. Culm and leaf (X|).
3. Ligule(Xf-).
4. Portion of culm with axillary shoot.
  - a. Culm-node.
  - b. Leaf-insertion (X|).
5. Culms with an erect habit of growth originating from the nodes of an older culm.
  - a. Culm-node.
  - b. Leaf-insertion (X I).
6. Base of culm showing the spreading habit of growth.—CC the short internodes at base of culm (X I).
7. Flowering spikelet (X6),

•2. SACCHARUM OFOTCINARUM Linn,

*Saccharum officinarum* Linn. Sp. PL (1753) 54; Roxb. Fl. Ind. I (1832) 237; Beauv. Agrost. Bxpl. Planch. 5, t. IV, fig. 10; Hack. Monogr. Androp. (1889) 111; Hook. f. Fl. Brit. Ind. VII (1896) 118; Lisboa Bomb. Grasses (1896) 47; Cooke Fl. Bomb. II (1908) 948; Statf. in Fl. Trop. Afr. IX (1917) 96; Haines Bot. Bih. and Or. (1924) 1012.

**Vernacular names** : Sugarcane, Us, Serdi, Ganderi, Usa, Kabbu, Kamand, Sherudi, Skerdi.

**Etymology** : *Officima* means drug-shop.

**Description** : Stems up to 6 in. high, many-noded, glabrous or pubescent below the panicle, more or less coated with wax below the nodes. Leaf-sheaths tight, terete, smooth, glabrous except when young; ligules very short, membranous, ciliate; blades linear-lanceolate, up to 1.5 m. long, and over 5 cm. broad, green above, glaucous below, more or less scabrid along the margins, midrib very stout, rounded on the back, more or less flat above.

Panicles pyramidal, up to 1 m. long, dense, silvery; primary rhachis glabrous except on the pubescent nodes, or more or less silky; primary branches verticillate or semiverticillate, very slender, glabrous or hairy. Racemes up to 10 cm. long, very fragile; joints and pedicels filiform, more or less ciliate or glabrous, the joints variable in length, the pedicels much shorter. Spikelets lanceolate, up to 4\*2 mm. long, surrounded from the callus by a tuft of long silky hairs up to 10 mm. long. Involucral glumes subequal, lanceolate, firm towards the base, otherwise Bubhyaline, the lower acute, 2-nerved to sub-4-nerved, glabrous, the upper very similar, 1-3-nerved, glabrous or ciliolate. Lower floral glume oblong, acute or subacute, hyaline, nerveless, ciliate, about 3\*3 mm. long, upper floral glume subacute, ciliate, as long as the lower or 0. Palea, if present, very minute, obovate, ciliate. Lodicules broad, cuneate, sparingly ciliolate from the top. Stigmas purplish, 2-1 mm. long. Grain oblong, attenuated upwards, subterete, flesh-coloured; embryo  $\frac{1}{2}$  the length of the grain.

**Varieties and races** : See Watt, Commercial Prod. of India (1908) 933; Imperial Gazetteer III, 39.

**Locality** : Grown throughout the Presidency. It occupies an area of about 60,000 acres.

**Ecology** : Always an irrigated crop in Bombay. Heavy manuring and regular watering are required. It does best on level well drained soils.

**Distribution** : There are many indications that S. Asia is the original home of the sugarcane.

For details see: A. De Candolle, Origin of Cultivated Plants 2nd ed. (1909) 154-60; G6ogr. Bot. Raisonnie p. 739; E. Bitter, Ueber die Geographische Verbreitung des Zuckerrohrs, 108 pages (not dated).

**Economic uses** : For sugar, food and fodder see Watt, Diet. Ec. Prod. India VI, pt. 2 (1893) 5; Commercial Prod. of India (1908) 930 ff; Kriiger, Das Zuckerrohr und seine Cultur, 1899.

**Medicinal uses** : See Bentley and Trimen, Medicinal Plants, and Dymock, Pharm. India III, 592.

**Diseases** : For the various fungoid diseases to which the Sugarcane is subject see E. J. Butler, Fungi and Disease in Plants (1918) 377-412.

### \*3. SACCHARUM ABUNDINACEUM Retz.

*Saccharum arundinaceum* Retz. Obs. bot. fasc. IV (1786) 16; Hack. Monogr. Androp. (1889) 117 (excl. syn. *S. exaltatum*); Hook, f. Fl. Brit. Ind. VII (1896) 119 (excl. syn. *S. cMare* Anders., *S. exaltatum* Roxb., *S. munja* Roxb., *S. Sara* Roxb.); Cooke Fl. Bomb. II (1908) 948 (excl. syn. *S. exaltatum* Roxb.); Haines Bot. Bih. and Or. (1924) 1012.

*S. bengalense* Retz. l. c. 16.

*S. procerum* Roxb. Fl. Ind. I (1832) 243.

**Vernacular name** : Eerpa.

**Etymology**: *Arundinaceum*, having the habit of *Arundo*, a reed.

**Description** : A gigantic tufted grass. Culms biennial (? or triennial), somewhat with the habit of the sugarcane, branched, often 5 m. high, the flowering culms sometimes nearly 9 m. high and over 18 mm. diam., solid. Stem glabrous, smooth, or slightly rough with very long internodes. Blade reaching 1-8 m. in length and 5 cm. in breadth, with rib stout and as broad as the blade at base, keeled below, villous with long silky hairs above, margins cutting. (According to Hole the midrib in basal leaves occupies at base  $\frac{1}{2}$  or less of the width of the blade.) Upper cauline leaves becoming folded and filiform. Leaf-sheaths glabrous. Ligule truncate with a ring or tuft of long silky hairs 6-25 mm. distance from its base.

Panicle 60 cm. to 1-2 m. long, pink, white or silvery, diffuse while flowering, with smooth glabrous axis, main branches tufted on the axis, tufts alternate or subverticillate. Spikelets 2.5—3\*7 mm. long, much shorter than the internodes of the spike. Pedicel  $\frac{1}{2}$  to equal the length of the sessile spikelet. Joint usually longer than sessile spikelet; majority of pedicels shorter than proper joint. Callus-hairs pale, not dense, as long as spikelet (according to Hole shorter than or subequal to spikelet). Hairs of joint overtop the joint by less than to 1 $\frac{1}{2}$  times the length of the joint. Sessile spikelet: lower involucral glume chartaceous, dorsally sparsely villous, villi overtopping the glume by about 1 $\frac{1}{2}$  the length of the glume. Upper involucral glume chartaceous, not villous dorsally. Mucro of upper floral glume not exerted beyond apex of spikelet. Pale ciliate. Pedicelled spikelet;

involucral glumes dorsally villous, villi overtopping spikelet by 1-1½ times the length of the spikelet. Spikelet sometimes 2-3-flowered with 1-2 additional paleate glumes inside the floral glumes.

**Locality** : Cultivated in gardens.

**Distribution** : Bengal, Assam, Burma, extending into China. It is a native of the ever-green zone of India characterized by a rainfall exceeding 70 in., but is frequently cultivated in gardens throughout India (Hole).

**Economic uses** : The stems being long, strong and straight, are used by the Indians for screens and other economical purposes.

4, SACCHARUM MUNJA Roxb.

PLATE 32.

*Saccharum Munja* Roxb. El. Ind. I (1832) 246; Hole in Ind. For. Mem. I (1911) 62; Haines Bot. Bih. and Or. (1924) 1013.

8. *Sara* Roxb. EL Ind. I (1832) 244.

8. *ciliare* Anders, in Oefvers. K. Vet. Akad. Förhand. Stockh. (1855) 155; Hack. Monogr. Androp. (1889) 118 (*excl vars. Griffithii et Boissierii*).

8. *arundinaceum* Hook. f. Fl. Brit. Ind. VII (1896) 119 (*partim*).

8. *arundinaceum* var. *ciliare* Haines in Fl. Chota Nagpur (1910).

**Vernacular names** : Munj, Munja, Sar.

**Etymology** : The specific name was taken by Roxburgh from the vernacular name *Munja*. (See Asiat. Res. IV, 248).

**Description** : An erect grass, attaining a height of 5-5 m. and 12 mm. diam., pale straw-coloured, smooth, striate, solid. Leaf-sheath shortly silky at extreme base, otherwise quite smooth, striate, pale straw-coloured, villous on margins at apex with long white hairs, usually much longer than proper internode, uppermost sheath sometimes extending beyond the base of the panicle. Upper leaf of flowering culm 22-70 cm. long, flat, tapering from the base, long-acuminate, 5-10 mm. broad. Lower leaves up to 2 and 2-4 m. by 25 mm., but usually only 18 mm. broad. In basal leaves the concave midrib occupies ½ or more of width of blade. Colour glaucous, midrib white. Margin scabrid as are one or more intramarginal nerves below, otherwise smooth, but densely white villous at base behind the ligule. Ligule truncate, usually a narrow membranous rim, of upper leaves longer, attaining 3 lines, minutely silky dorsally and ciliate.

Flowering panicle 30-90 cm. long, usually lanceolate, pale cream-coloured to dark reddish-purple, branches spreading. Fruiting panicle oblong, branches appressed to the axis, white to greyish white. Primary rachis glabrous, sulcate, more or less scabrid on the ridges. Primary branches subverticillate, compound. Ultimate branchlets triquetrous, more or less villous with long white hairs on angles and on two faces. Spikelets in pairs, one pedicelled and one sessile on the capillary jointed branches and branchlets of a terminal panicle, awnless, lanceolate, up to 5 mm. long; sessile and pedicelled similar, each one-flowered and hermaphrodite. Pedicelled fruiting spikelet falling from the pedicel, the sessile spikelet falling later with the attached pedicel and joint of axis. Joint of axis triquetrous, \ to subequal the sessile spikelet, but usually shorter than the spikelet, villous on two faces and on margins, the villi overtopping the joint by once to twice the length of the joint. Pedicels triquetrous, \ the length of the sessile spikelet, villous with long white hairs on two faces and on the angles. Most pedicels shorter than proper joint, rarely subequal to the proper joint. Sessile spikelets: lower involucral glume lanceolate, chartaceous, with 2 strong lateral nerves and usually 1-4 more or less distinct additional nerves, dorsally long villous on basal half or two-thirds, the hairs overtopping the glume by about the length of the glume, scabrid dorsally on keels, margin inflexed, sparsely ciliate above, apex minutely bidentate to entire. Upper involucral glume subequal to the lower, lanceolate, chartaceous, keeled, with one strong central nerve and usually 2-4 more or less distinct additional nerves, glabrous dorsally or minutely pubescent towards apex, scabrid dorsally on keel, margins incurved, ciliate above, apex usually shortly mucronate. Lower floral glume oblong-lanceolate, hyaline-membranous, or little shorter than the upper involucral glume, 1-3-nerved, margins incurved, ciliate, apex acute or shortly mucronate. Upper floral glume broad-lanceolate to elliptic, shorter than or subequal to the upper involucral glume, hyaline, 1-3-nerved, mucronate, ciliate, mucro short to 1-25 mm. long, but not exerted beyond the apex of the spikelet. Palea ovate, hyaline, ciliate, from ½-½ the length of the upper floral glume. Pedicelled spikelets similar, but both the involucral glumes are dorsally long villous and usually with 3-5 strong nerves and occasionally 2 additional fainter ones. Lodicules 2 cuneate, glabrous, 0-5 mm. long. Anthers 3, pale yellow to purple, 2-2.5 mm. long. Stigmas yellow, often tinted with purple, 1-1.5 mm. long.

To distinguish this species from *Saccharum Ravennae* Holt gives the following field-characters : Glaucous narrow leaves., awnless spikelets, smooth leaf-sheaths.

**Locality** : *Sind* (Stocks in Herb. Boiss. ex Hackel).

*Gujarat* (Sedgwick and Saxton). \*&

**Ecology** : This plant shows marked xerophylous adaptations. Although it attains its maximum development in moist sand, it thrives in typically xerophylous places. It does best on alluvial sandy deposits in the neighbourhood of streams where the soil is not water-logged. For further ecological notes, especially on the susceptibility to fire damage see Hole in Ind. For. Mem. I, 71-78.

**Distribution** : Northern India in the Punjab and Upper Gangetic Plain, Sind and Gujarat.

**Economic uses** : The fibre of the upper leaf-sheaths is used for mats, ropes, etc. It has also been favourably reported on as a paper material. (Haines). " At Jeypore it is extensively used as a sand-binding plant." (Duthie). See Hole 78, 79.

**Explanation of Plate 32** : *Saccharum Munja* Koxb.

1. Flowering panicle.
2. Three fruiting panicles.
3. Pair of spikelets with joint of axis (X6).
4. Pedicelled spikelet (x 6).
5. Sessile spikelet (X6).
14. Sessile spikelet:
  1. Lower invol. glume.
  2. Upper invol. glume.
  3. Lower floral glume.
  4. Upper floral glume (all x6).

PP. Palea(x6).

S. Anthers (x 6).

L. Lodicules (X6).

I. Lower invol. glume of pedicelled spikelet.

II. Upper invol. glume of pedicelled spikelet (x6).

#### 5. SACCHAKUM GRIFFITHII Munro.

*Saccharum Griffithii* Munro ex Aitchis. in Journ. Linn. Soc. XIX (1922) 191; Hole in Ind. For. Mem. I (1911) 68-70.

8.-*Sara* Aitchis. 1. c. 191; Boiss. Fl. Or. V (1884) 453.

? *S. Griffithii* Boiss. 1. c. 453.

*S. ciliare* var. *Griffithii* Hack. Monogr. Androp. (1889) 119.

*Erianthus Griffithii* Hook. f. Fl. Brit. Ind. VII (1896) 122 (*partirfi*).

**Etymology** : *Griffithii* after William Griffith (1810-45), one of the greatest botanists in India.

**Description** : A caespitose grass. Culms 2 m. high or slightly higher, solid. **Blade** glaucous, narrow, about 8 mm. wide; midrib at base usually occupies 1/3 or more of width of blade; sheath not hirsute, nodes not bearded. **Bhachis** of racemes fragile.

Spikelets 2 at each node of the rhachis, one sessile and finally deciduous with the accumbent joint, the other pedicelled, finally separating from the pedicel, both 1-flowered, hermaphrodite. Spikelets 4-6 mm. long, mutieous; pedicel 1/2 the length of the sessile spikelet; joint 1/3 the length of the sessile spikelet. Most pedicels subequal to longer than proper joint; callus-hairs-yellow, shorter than to subequal to the spikelet; hairs of joint overtopping joint by once to twice the length of joint. Sessile spikelet: lower involucre glume chartaceous, dorsally densely villous in basal 1/2, villi not overtopping the glume, or overtopping by less than 1/2 the length of the glume. Upper involucre glume chartaceous, dorsally villous in basal 1/2 or 3/4 villi not overtopping or overtopping by less than 1/2 the length of the glume. Lower floral glume sometimes sparsely villous dorsally. Upper floral glume with a very short mucro, 1/5 mm. long, not exerted beyond apex of spikelet. Palea ciliate. Pedicelled spikelet: involucre glumes dorsally villous in basal 1/2-3/4, villi not overtopping or overtopping by less than half the length of the spikelet; no additional glumes inside the floral glumes.

**Locality** : *Sind*: Near Hyderabad (Blatter & McCann D698!); W. of Tatta (Blatter & McCann D699!); near Karachi (*ex Hackel* 1. c).

**Ecology** : In his paper on the Euram Valley Aitchison writes: " Along the edges of the dry watercourses, and on the higher island-like plots of ground in the beds of these dried-up streams, *Saccharum Griffithii* a great coarse stiff grass, occurring in large tussocks, is very striking, owing to the absence of other vegetation generally, rather than to any peculiarity of its own."

**Distribution** : Kuram valley, Baluchistan, Punjab, Sind.

rather



## 6. SACCHARUM RAVENNAE Linn.

## PLATE 33.

- Saccharum Ravennae* Linn. Syst. ed. XIII, 88; Sibth. & Sm. Fl. Graeca t. 52; Reichb. Ic. FL Germ. fig. 1505; Stapf in Fl. Trop. Afr. IX (1917) 97; Haines Bot. Bih. & Or. (1924) 1014.  
*Erianthus Ravennae* Beauv. Agrostif (1812) 162; Hook. f. EL Brit. Ind. VII (1896) 121; Stapf in Kew Bull. (1907) 208; Nees Gen. EL Germ. t. 90; Boiss. Fl. Or. VI (1884) 455; Duthie Grasses N. W. Ind. (1883) 15; Fodder Grasses N. Ind. (1888) 26; Cooke Fl. Bomb. II (1908) 949; Hole in Ind. For. Mem. I (1811) 87.  
*Andropogon Ravennae* Linn. Sp. Fl. ed. II, 1481; Host Gram. Austr. III, 1,1.1.  
*Ripidium Ravennae* Trin. Fund. Agrost. (1820) 169.  
*Saccharum jamaicense* Trin. in M6m. Acad. Petersb. sfr. 6, II (1833) 312.

Etymology : The specific name refers to Bavenna, a town in Upper Italy.

Description : Culms erect, up to 6 m. high and 17 mm. thick, solid, often slightly fistular just below the panicle, smooth and polished, striate, shortly and finely bearded at the leaf insertions. Leaf-sheath hirsute with bulbous-based hairs, the latter varying in colour from white to yellow or brown, the hairs being more or less deciduous and old sheaths are often rough with the persistent bulbous bases; upper sheaths glabrous, always longer than the proper internode, long ciliate on margin towards the apex. Blade of uppermost leaf of flowering culm from 20 cm. long and 6 mm. wide, linear and tapering from base, to 75 cm. long and 16 mm. wide with greatest width about the middle; lower leaves usually 1-2—1.5 m. long and 25 mm. wide, but also attaining a length of 1.8 m. and width of 38 mm., broadest about the middle, sometimes in upper third, dark green, midrib white, apex acuminate, narrowed towards the base, in basal leaves the concave midrib occupies \ or more of width of lamina at base, often the entire width of the leaf, densely villous above towards the base with bulbous-based hairs, more or less scaberulous along nerves, margins scabrid. Ligule a narrow membranous rim not longer than 1.75 mm., entire, rounded or deeply 2-lobed, patently hairy dorsally with stiff white hairs, ciliate.

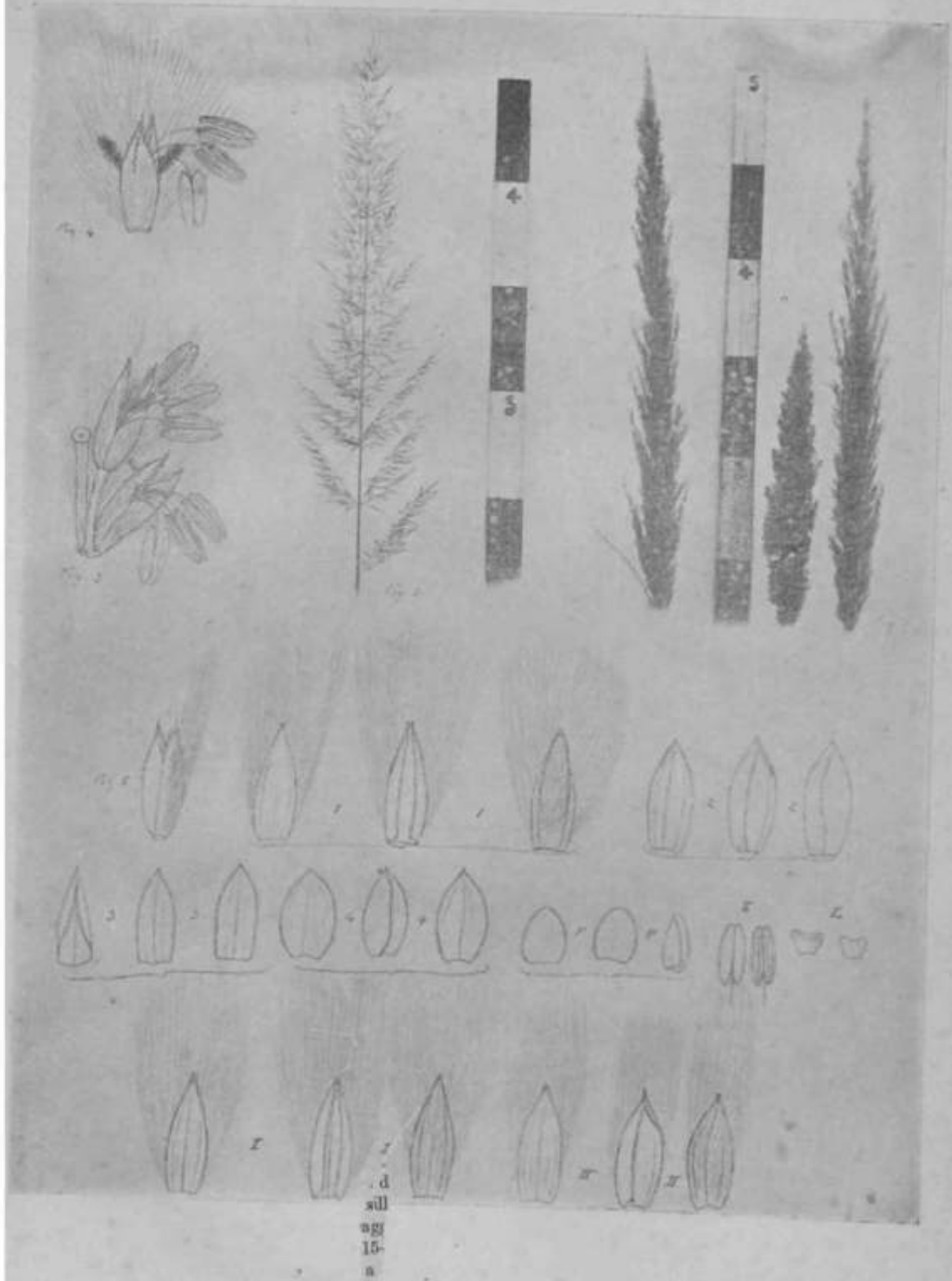
Panicle 30-90 cm. long, lanceolate, dense or somewhat lax and lobed, silvery silky, with a tinge of grey and purple, or quite white; primary rhachis silicate, glabrous, smooth below, scabrid on the ridges; branches slender, solitary from the distant nodes, divided from the base, up to 20 cm. long, branchlets unequal, divided again, glabrous except at the nodes. Racemes sessile or the lower more or less peduncled, narrow to oblong; joints and pedicels filiform, long-ciliate, with thickened tips, the latter shorter than the joints. Callus-hairs shorter than to subequal to length of spikelet, purplish or brownish. Sessile spikelet: lower involucrel glume lanceolate with 2 lateral keels, dorsally flat or depressed between the keels, apex 2-mucronulate, one or both margins incurved, dorsally scabrid on keels, otherwise glabrous, or more or less villous dorsally, villi not overtopping the glume, or overtopping by less than \ the length of the glume; 2-nerved, sometimes with 1-2 additional faint nerves between the keels. Upper involucrel glume subequal to the lower, with a central keel, mucronate, margin incurved; ciliate, dorsally scabrid on keel, otherwise glabrous or more or less villous dorsally, villi not overtopping the glume, or overtopping by less than J the length of the glume, 1-nerved and sometimes 1 or 2 partial lateral nerves. Lower floral glume slightly shorter than upper involucrel glume, oblong-lanceolate, hyaline, apex mucronate or acute, dorsally glabrous, margin incurved, ciliate above, 1-3-nerved. Upper floral glume usually £\*the length of the lower, ovate-lanceolate, hyaline, margin incurved, ciliate, long-awned, awn 2-5—6 mm. long, 3-nerved. Palea about £ the length of the upper floral glume, ovate-lanceolate, hyaline, glabrous, nerveless. Lodicules 2, cuneate, glabrous. Anthers 3, yellow, streaked with purple. Stigmas yellow. Pedicelled spikelet like the sessile, but involucrel glumes often strongly 3-nerved and hairy.

Can easily be distinguished from *Saccharum Munja* by its distinctly awned spikelets, the broader dark green leaves and hairy leaf-sheaths (Hole).

Locality : *Sind*: Laki (Bhide!); Khairpur Mirs, sandy plain (Sabnis B226 !); Sehwan (Sabnis B36 ! B664 !); Larkana (Sabnis B444!, Cooke); Pad-Idan (Sabnis B498 ! B509 !); Sukkur (Sabnis B552!); Nasarpur, sandy plains (Sabnis B1049!); Umarmkot, sandy plains (Sabnis 1211!); Sanghar (Sabnis B900 !); Jamesabad (Sabnis B968 !); Phuleli, canal, on banks (Sabnis B195 !); Mirva Canal, sandy banks (Sabnis B258 !); Khairpur, forests (Sabnis B329 !); Sita Koad (Sabnis 367 !); Sehwan to Laki, foot of hills (Sabnis B60! B111!); Mirpur Sakro (Blatter & McCann D694 !); Chuar Chemali (Blatter & McCann D695 !); Indus Delta (Blatter & McCann D696 !); Karachi (Cooke, Woodrow).

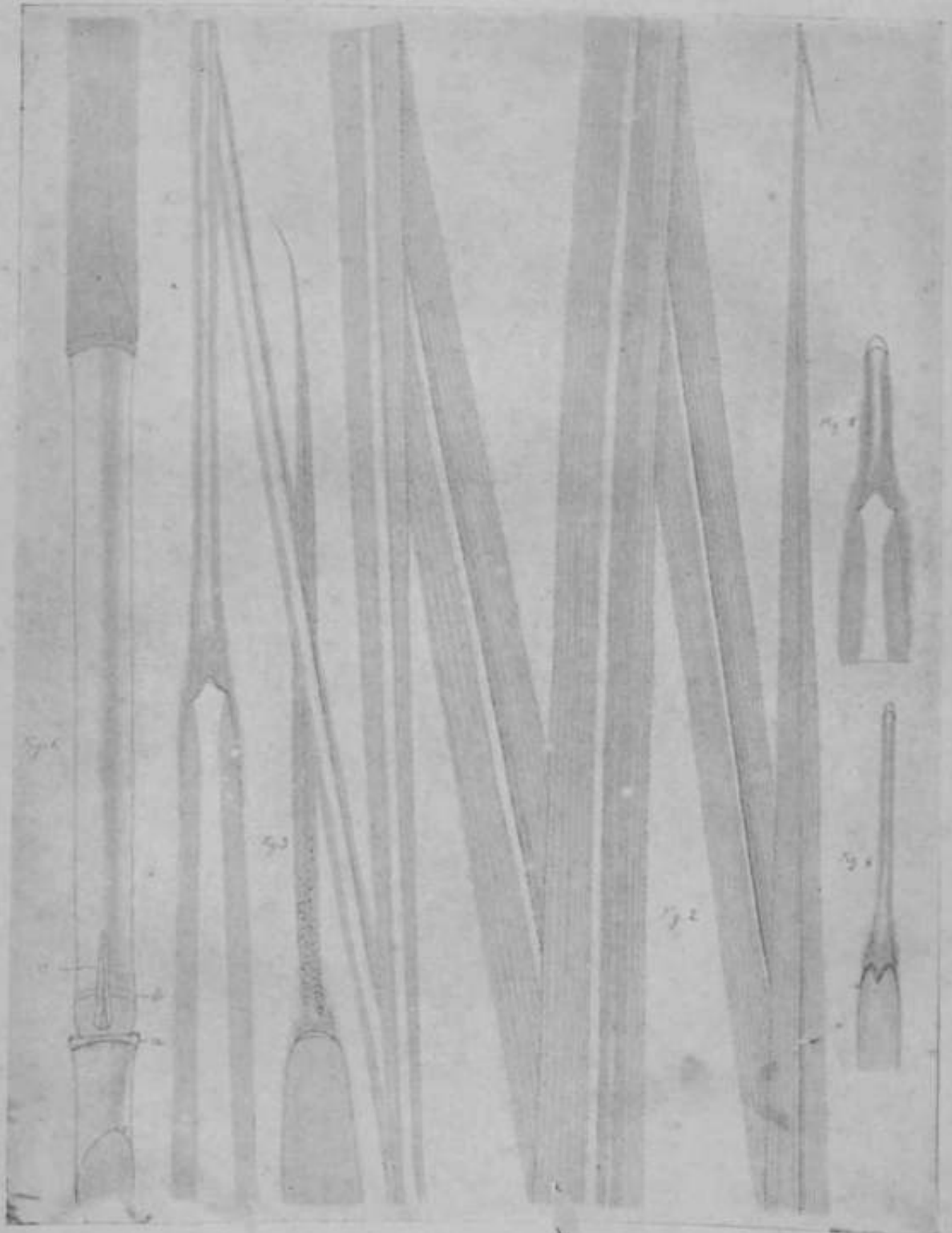
*Deccan*: Poona, College garden (Garade!).

Ecology : Found on sandy and clayey loam. Requires a liberal supply of available moisture (See Hole p. 90, 91).



SACCHARUM MUNJA ROXB.

Ex H. S. Holc.



b.  
ure

SACCHARUM RAVENNAE UNA\*.

**Distribution** : W. Himalaya, Punjab, Upper Gangetic Plain, Sind, extending westwards to the Mediterranean.

**Economic uses** : The culms are used for making screens, etc. The leaves quickly decay and are therefore useless for thatching.

The leaves, especially when young, are eaten by buffaloes to some extent.

**Explanation of Plate 33** : *Saccharum Ravennae* Linn.

1. Culm:

- a. Leaf-insertion.
- b. Culm-node.
- c. Axillary bud.
- d. Base of hairy leaf-sheath.

2. Lower leaf.

3. Uppermost leaf of flowering culm.

i & 5. Base of lamina and top of leaf-sheath showing the concave midrib and ligule. (All figs. xf).

#### 7. SACCHABUM FASTIGIATUM Steud.

*Saccharum fastigiatum* Steud. Syn. Pl. Glum. (1855) 409 ; Haines Bot. Bih. and Or. (1924) 1014; Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1927) 288.

*Erianthus fastigiatus* Nees ex Steud. 1. c.; Hack. Monogr. Androp. (1889) 150 ; Hook. f. FJ. Brit. Ind. VII (1896) 125 ; Cooke FL Bomb. II (1908) 949.

**Etymology** : *Fastigiatum* has here the same meaning as fasciate, alluding to the fascicled racemes.

**Description** : Stem 0-6-24 m. high, stout or slender, silky-hairy below the panicle. Leaves 2-5-5 cm. by 4-6 mm., linear from a narrow base, rigid, flat, smooth, with scabrid margins; sheaths glabrous, with fimbriate mouth ; ligule a narrow membrane.

Panicle oblong or fan-shaped; racemes crowded, subdigitately fascicled ; rachis angular, silky-hairy. Spikelets 5 mm. long, lanceolate, dark brown below, paler above; callus with white hairs which are much shorter than the spikelet; pedicels as long as the spikelets, with 2 opposite rows of silky hairs. Glumes 4 ; lower involucre glume 5 mm. long, chartaceous, brown, shining, ovate-lanceolate, acute, the margins near the base clothed with long silky hairs ; upper involucre glume chartaceous, lanceolate, acuminate, brown below, paler above, equalling the lower involucre glume ; lower floral glume 4 mm. long, narrowly lanceolate, acute, base membranous, coloured, the upper part hyaline; upper floral glume 2-5 mm. long, lanceolate, 2-toothed, hyaline, with a slender awn 6 mm. long or longer.

<sup>4</sup> **Locality** : S. M. Country: Belgaum (Ritchie 792).

**Distribution** : Sikkim, Ehasia, Assam, Bengal, Ghota Nagpur, Orissa, W. Peninsula.

#### 24. SPODIOPOGON Trin.

Tall grasses. Leaves often with long petioles.

Spikelets 1-2-flowered, paniculate, laterally compressed or subterete, 2-3-nate; lower sessile, male ; upper 2-sexual; rachis jointed. Glumes 4 ; involucre glumes subequal; lower involucre glume lanceolate, 5-9-nerved, with an acuminate or toothed tip ; upper involucre glume membranous, lanceolate, 3-7-nerved ; lower floral glume hyaline, paleate or not, triandrous or empty ; upper floral glume 2-fid or 2-partite, with a very slender exerted awn in the sinus; palea shorter than the glume. Lodicules cuneate. Anthers linear. Stigmas linear. Grain free, narrowly fusiform.

Species about 8.—Asia.

#### 1. SPODIOPOGON ALBIDUS Benth.

#### PLATE 34.

*Spodiopogon albidus* Benth. in Journ. Linn. Soc. XIX (1881) 66 ; Hack. Monogr. Androp. (1889) 185 ; Hook, f. EL Brit. Ind. VII (1896) 108 ; Cooke FL Bomb. II (1908) 947.

*Andropogon rhizophorus* Steud. Syn. PL Glum. (1855) 381 ; Duthie Fodder Grasses N.#Ind. (1888) 26.

*A. petiolatus* Dalz. Bomb. FL (1861) 303.

**Etymology** : *Spodiopogon* is derived from *spodos*, ashes, dust, and *pogon*, beard, therefore ash-grey beard, referring to the silky-hairy involucre glumes.

**Description** : A weak straggling tufted annual grass 60-120 cm. high; stem slender, much-branched, leafy. Leaves 15-25 cm. by 6-20 mm., oblong-lanceolate, acuminate, 1-nerved, usually suddenly narrowed into a slender petiole 2-5-7-5 cm. long; sheaths 15 mm. long; ligule oblong, glabrous.

Panicle at first enclosed in a long narrow spathaceous leaf-sheath; rhachis compressed, ciliate. Spikelets reaching 6 mm. long, lanceolate, silky-villous, one pedicellate, the other sessile; pedicels 2-5 mm. long, spatulate, flattened, ciliate. Glumes 4; involucrel glumes equal, ovate-lanceolate, finely mucronate, silky-hairy, 7-nerved; lower floral glume truncate, with erose tip, hyaline; upper floral glume 4 mm. long, deeply divided at the apex into 2 very acute lobes; awn reaching 13 mm. long, slender.

Easily distinguished by its purple stems, woolly panicles and sagittate leaves.

Locality : *Khandesh*: Toranmal (McCann 9886 ! 9888 !).

*Konkan* : Warsai, near Pen (Bhide !); Pen (McCann 5374A !); Bandra, below Pali Hill (Ryan !); Tungar, Bassein (Bhide !); Salsette (Jacquemont 708).

*W. Ghats*: (Woodrow 157); Igatpuri, common (McCann 4327 !); Matheran (Cooke), Harrison's Springs (D'Almeida A242 !); Khandala, very common (McCann 9401!); Khandala to Karjat (Blatter & Hallberg 5325!); Lonavla (Bhide!, McCann!, Woodrow) \*; Mahabaleshwar (Cooke); Mahabaleshwar to Pratapgad (Bhide 1182 !).

*Deccan*: Kirkee, Ganeshkhind Bot. Gardens (Gammie !); Sinhagad Forest, Poona Dist. (Bhide !); Lohagad, upper half (McCann 9437 !); Purandhar Fort (McCann 5004 !).

*S. M. Country*: Derikop, forest (Sedgwick 1862 !).

*N. Kanara*: (McCann!); Arbail Ghat (Sedgwick & Bell 3168!); Supa (Talbot 279!).

Ecology : A subgregarious plant. A forest grass, very abundant in N. Kanara and Mahabaleshwar forests. A monsoon plant, coming into flower about the last week of September.

Distribution : Central Provinces, Rajputana, W. Peninsula.

Explanation of Plate 34 : *Spodiopogon albidus* Benth.

- |  |   |                   |
|--|---|-------------------|
| 1. Spikelets.                              | } | Sessile spikelet. |
| 2. Lower invol. glume.                     |   |                   |
| 3. Upper invol. glume.                     |   |                   |
| 4. Lower floral glume.                     |   |                   |
| 5. Palea of lower floral glume and styles. |   |                   |
| 6. Upper floral glume.                     |   |                   |
| 7. Palea of upper floral glume.            |   |                   |
| 8. Grain and styles.                       |   |                   |

## 25. EULALIA Kunth.

(Formerly under *PoUinia* Trin.)

Perennial. Clums simple, erect or ascending. Leaf-blades convolute, in bud, then flat, usually narrow, gradually passing into the sheath.

Racemes often coloured (brown or purplish). Spikelets all alike or nearly so, 2-nate, one sessile, the other pedicelled, on the articulate fragile rhachis of 2-nate, digitate or fascicled spike-like racemes, the pedicelled falling from their pedicels, the sessile deciduous together with the contiguous joint of the rhachis and the pedicel. Florets typically 2; lower reduced to an empty floral glume or represented by a minute scale or quite suppressed; upper always hermaphrodite. Involucrel glumes equal, rigidly membranous to coriaceous; lower dorsally flattened or shallowly concave (not grooved), more or less 2-keeled with inflexed margins; upper 1-3-nerved, keeled. Floral glumes hyaline; lower mucous, sometimes much reduced or quite suppressed; upper very short, 2-lobed, awned. Paleae small or 0. Lodicules 2, small, cuneate. Stamens 3. Stigmas linear, laterally exserted. Grain oblong; embryo almost half the length of the grain or longer; hilum basal, punctiform.

Species about 25.—Tropical and subtropical regions of the Old World.

- |                        |                          |
|------------------------|--------------------------|
| 1. Racemes many, 6-12. | 1.2?. <i>argentea</i> .  |
| 2. Racemes few, 2-4.   | 2. <i>E. fimbriata</i> . |

### 1. EULALIA ARGENTEA Brogn.

#### PLATE 35.

*Eulalia argentea* Brogn. Voy. Coy. Bot. 92; Haines Bot. Bih. and Or. (1924) 1018 • Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1927) 290.

*PMinia argentea* Trin. in Bull. Sc. Acad. Petersb. I (1836) 71; Hack. Monocr. Androm M 162; Lisboa Bomb. Grasses (1896) 47; Hook, f. Fl. Brit. Ind. VIJ (1896) 111 • Pr. L. 889) Bomb. II (1908) 950. — Ujoke Bl.



Sessile spikelet

SODIOPOCION ALB 1 DCS BENTH.

Delin: R. K. Blide.



Sessile spikelet

*EILAUA ARGENTEA*. BROUM.

Delin: R. K. White

- P. tristachya* Thw. Enum. PL Zeyl. (1864) 363 (*partim*); Duthie Fodder Grasses N. W. Ind. (1883) 26, t. 53.  
*Erianihus rufus* Nees ex Steud. Syn. PL Glum. (1855) 409 (*partim*).  
*E. hexastychus* Hochst in Hohen. PL Ind. Or. no. 279.  
*E. Roxburghii* F. Muell Fragm. Phyt. VIII, 117.  
*Saccharum rufum et tristachyum* Steud. 1. c. 408 (*partim*).  
*Andropogon minutiflorus et hexastachyus* Steud. 1. c. 379, 380.  
*A. trispicattis* Schult. Mant. II, 452.  
*A. tristachyus* Eoxb. Fl. Ind. I (1832) 256.

Vernacular names : Roira, Chota kussal, Erer.

Etymology : *Eulalia* is a proper name.—*Argentea* means silvery.

Description : Perennial; stems tufted 45-120 cm. high, stout or slender, erect, simple or branched, smooth, shining, leafy at the base and upwards; nodes glabrous. Leaves 15-45 cm. by 1\*2.5 mm., erect, narrowly linear, rigid, often filiform, glabrous, striate, tips capillary; sheaths long, slender, coriaceous, not auricled at the mouth, the sides bearded with long hairs; ligule a short membrane fringed with long hairs.

Eacemes 6-12, narrow, 2-5-15 cm. long, lax-flowered; rhachis firm, flexuous, compressed; pedicels of spikelets flattened, slightly dilated at the apex, densely silky-villous on the edges. Spikelets 4 mm. long (excluding the long awn). Glumes 4; lower involucre glume linear-oblong, crustaceous below, membranous above with a hyaline tip, silky-villous on the back, the margins narrowly incurved, villous with long silky hairs; upper involucre glume oblong, 1-nerved, tip erose, margins incurved, ciliate; lower floral glume 3 mm. long, narrowly oblong, hyaline, flat, nerveless; upper floral glume shorter than the upper involucre glume, linear-oblong, cleft into 2 subulate lobes; palea 0; awn reaching 2 cm. long, not or scarcely ciliate, the lower half brown, twisted, the upper half white, straight.

Locality : *Khandesh*: Tapti Valley, railway line (Bhide!).

*Konhan* : Bombay, St. Xavier's College compound (McCann 4510 !), Marine Lines (Hallberg 9889 !); Bassein (McCann 9475 !); Vetora (Sabnis 33507 !); Parsik Hill (McCann 9715!); Eanari Caves (McCann 9723!); Ghatkopaf, Horse-shoe Valley (McCann 9891!); Katnagiri (Woodrow); near Ratnagiri (Herb. Econ. Bot. Poona !).

*W. Ghats*: Khandala, very common (McCann 9716!); Lonavla (Bhide I, McCann!, Woodrow, Lisboa); Panchgani (Blatter 5388!, Blatter & Hallberg B1213!, McCann 1); Castle Rock (Bhide !, McCann A304 !).

*Deccan*: Lohagad, way up (McCann 9718 !); Mawal (Woodrow). • .

*S. M. Country*: Dharwar Dist. (Sedgwick 2112 !); Dastikop (Sedgwick 20881).

*N. Kanara*: Supa Taluka (Talbot 2257 !); Jugglepet (Talbot 1569 !); Yellapur (Talbot 1525 !); Halyal (Talbot 2224 !); Kumberwada (Talbot 2257 !); Dandeli (Talbot 22671).

Ecology : A subgregarious species. Often found on newly laid down pasture ground. Very abundant in high grasslands in the Mallad tract of the Carnatic.

Distribution : Throughout India, Ceylon, Malaya, Australia.

Economic uses : When young it is eaten by cattle. In Poona it is used for thatching and brooms.

Explanation of Plate 35 : *Eulalia argentea* Brogn.

- |                        |                     |
|------------------------|---------------------|
| 1. Lower invol. glume. | } Sessile spikelet. |
| 2. Upper invol. glume. |                     |
| 3. Lower floral glume. |                     |
| 4. Upper floral glume. |                     |
| 5. Grain with styles.  |                     |

## 2. EULALIA FIMBRIATA Blatter & McCann.

### PLATE 36.

*Eulalia fimbriata* Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1927) 290.

*Pollinia fimbriata* Hack. Monogr. Androp. (1889) 164; Hook. f. Fl. Brit. Ind. VII (1896) 112; Cooke FL Bomb. II (1908) 950.

Description : Annual; stem 30-60 cm. long; internodes much longer than the sheaths; nodes glabrous. Leaves 15-25 cm. by 4 mm., flaccid, sparsely hairy above; sheaths glabrous; ligule a ciliolate ridge.

Racemes 2-6, villous with white hairs, 2-5-5 cm. long, flexuous, pale, with long peduncles; rhachis slender, silky-hairy; pedicels of spikelets with 2 opposite rows of dense silky hairs. Spikelets 3 mm. long; callus very short, silky-villous with long white hairs. Glumes 4; lower involucre glume elliptic-lanceolate, with villous keels above, 2-toothed; upper involucre glume as long as the lower, elliptic, obtuse, with incurved ciliate margins; lower floral glume 3



mm. long, narrowly oblong, obtuse, hyaline, ciliolate; upper floral glume 2-5 mm. long, hyaline, deeply 2-fid into 2 acute lobes; awn 13-19 mm. long, ciliate, the lower half brown, twisted, the upper half white; palea minute or 0.

**Locality** : *Konkan*: Dahe Forest (Ryan 708!); Uran (McCann 5123 !); Trombay (McCann 305 !); Borivli to Kanari Caves (McCann 1092 !).

*W. Ghats*: Matheran, Monkey Point (D'Almeida A254! A255!); Khandala, common (McCann 5300!); Lonavla (Chibber 11!, Woodrow 173).

**Ecology** : A smaller species than the last. It grows in open grassland occasionally in tufts by itself. When in open grassland it is frequently associated with species of *Dimeria*, *Ischaemum* and *Themeda*. Flowers towards the end of August.

**Distribution** : W. Himalaya, W. Peninsula, Pegu.

**Explanation of Plate 36** : *Eulalia fimbriata* Blatter & McCann.

- |                                      |                     |
|--------------------------------------|---------------------|
| 1. Pedicelled and sessile spikelets. | } Sessile spikelet. |
| 2. Lower invol. glume.               |                     |
| 3. Upper invol. glume.               |                     |
| 4. Lower floral glume.               |                     |
| 5. Upper floral glume.               |                     |
| 6. Stamens and styles.               |                     |
| 7. Ligule.                           |                     |

## 26. SORGHUM Pers.

Annual or perennial, often robust, grasses. Leaf-blades convolute in bud, usually flat, herbaceous, often large.

Panicles erect or nodding with verticillate or scattered branches, often large, in the spontaneous species mostly loose, in the cultivated forms frequently variously contracted to compact. Spikelets 2-nate, those of each pair differing in shape and sex, one sessile, the other pedicelled or represented by a pedicel only, on the articulate fragile or (in cultivated forms) tough rhachia of panicle few- (sometimes 1- or, the other extreme, 6-8-) jointed racemes, the sessile spikelet falling with the contiguous joint and the accompanying pedicelled spikelet or at least its pedicel. Florets 2, lower reduced to an empty valve, upper hermaphrodite in the sessile, male or neuter in the pedicelled spikelets, if present at all. Sessile spikelet: involucre equal, coriaceous, at least when mature, rarely permanently chartaceous, muticous. Lower with a broad flattened or convex back with the margins narrowly inflexed near the tips and elsewhere involute. Upper cymbiform with narrow hyaline, usually upwards ciliate margins. Lower floral glume empty, hyaline, ciliate, 2-nerved or nerveless. Upper oblong to ovate, 1-3-nerved, 2-lobed or dentate, with the lobes free or more or less adnate to a perfect or variously reduced awn or a mucro rising from the sinus, rarely entire and mucronate or muticous. Palea hyaline, often minute or 0. Lodicules 2, ciliate or glabrous. Stamens 3. Stigmas laterally exerted; styles terminal or subterminal. Grain in the wild species mostly obovoid, dorsally compressed, in cultivated forms frequently enlarged, globose or subglobose; embryo as long or slightly longer than half the grain. Pedicelled spikelets, if present, much narrower than the sessile, lanceolate to subulate, male or neuter, sometimes reduced to the glumes or one glume only or quite suppressed. Involucral glumes permanently herbaceous, awnless like the hyaline 2-1-nerved ciliate floral glumes.

According to Stapf (EL Trop. Afr. IX, 105) there are about 35 wild species in the tropical and subtropical regions of both hemispheres, very few extending into the temperate zones. One group of forms is widely cultivated in the tropics, particularly in Africa.

The classification of the material belonging to the section *Eu-sorghum* forms a difficult problem, which we are not prepared to tackle at present. The difficulties are well explained by Stapf (l. c), and we cannot refrain from quoting the passage, though somewhat lengthy, because it may be a help to workers on this genus and induce them, at the same time, to subject the vast material available in the Presidency to a more scientific examination and exact taxonomic treatment, by which Botany as well as Agriculture will profit.

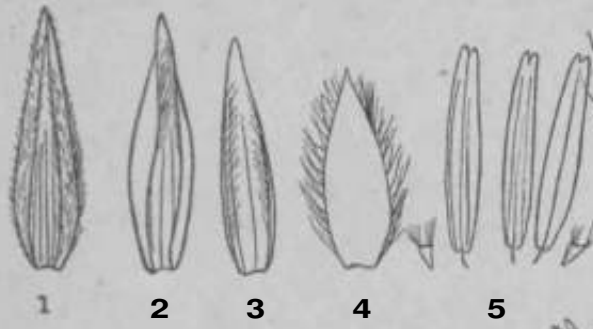
Those species, says Stapf, " which come under consideration in this work (Flora of Tropical Africa) have, with two exceptions (*S. purpureo-sericeum* and *S. versicolor*), been placed by Hackel in one vast species, *Andropogon Sorghum*, the leading idea being that they were all derived from one wild ancestor, the old *Holcus halepensis* Linn. Piper, however, has recently advanced good reasons why this is extremely improbable. He has pointed out that the Linnean *Holcus hdepensis* (*Andropogon Sorghum*, subsp. *halepensis*, var. *genuinus* Hack.) is a perennial type almost confined to the Mediterranean region (*sensu lato*) and absent from tropical Africa which is the home of most of the spontaneous annual forms and probably also the cradle of most of the cultivated races known collectively as Guinea corn [*Andropogon Sorghum*, subsp.



Sessile spikelet

EDLALIA FJM BILATA BLATTER & McOANN

VO»: B. K. Dhôte



Pedicelled spikelet



Sesile spikelet

SORGHUM HALEPENSE PER8

Delin: R. K. White.

*sativus*, Hack.)\* To these spontaneous annuals and the cultivated forms he confines the name *Andropogon Sorghum*, and dealing in particular with the former he groups them under 11 subspecies, whilst he abstains from attempting to classify the latter. Most of Pipei's subspecies are here recognised as definite units, but with the status of species, a procedure which seems to have the advantage of simplicity and directness, whilst it leaves the door open to any theoretical grouping which may in the future be desirable. The same reasoning has been applied to the cultivated forms. Hence the breaking up of Hackel's *Andropogon Sorghum*, var. *sativus*. Koernicke, who made the first comprehensive attempt to classify them, relied for that purpose exclusively on characters exhibited by mature infructescences, especially their degree of looseness or contraction and the colours of the ripe glumes and grains; but Hackel in his monograph introduced characters taken from the shape of the spikelets. The grain being in most cases the thing aimed at in the evolution of these very numerous races, it is clear that artificially introduced modifications must from the beginning have tended, in the grain-state, to obscure or repress the phytogenetically important features in so far as they were economically indifferent or undesirable. It seemed, therefore, more promising to base the primary grouping on the comparison of the flowering stages, which might be expected to be more or less outside the influence of the artificially moulding forces of man. Within these primary groups, which are treated here as species, nothing more than a purely artificial arrangement can for the present be attempted. An exhaustive treatment of the hundreds of races which have been given distinctive popular names would, even if it were possible, be beyond the scope of a colonial flora "•

If Stapf, with all the facilities of Kew and the British Museum and other European herbaria at his disposal, complains about "the very rudimentary state of our knowledge and of our collections," nobody can reasonably expect that we should bring order into the chaotic states of the *Sorghum-question* in India. Years of intensive study of Indian and African forms are required to bring the intricate problem nearer its solution.

For the present we follow Haines in retaining the old species of *S. halepense* and *S. vulgare*. Of species not known from the Presidency before we add *S. subglabrescens* Schweinf. and Aschers. and *S. nitidum* Pers. This, we admit, is not quite satisfactory, but it is all we can offer at the present state of our knowledge and with the material at our disposal in India.

In order to enable Indian Botanists to utilise Stapf's and Piper's investigations in the further study of the genus *Sorghum* we shall add, in the way of an appendix, the descriptions of those species which Stapf has described from tropical Africa and which have also been observed in India, whether in the Presidency or outside it. It is only in this way that we shall be able to coordinate the knowledge obtained on the so widely spread a genus *Sorghum* and it would not help botanical science to start the investigation of Indian Sorghums on independent lines without constant reference to the work done in other fields. It might be easier and perhaps also more convenient for certain practical purposes, but on the whole certainly less scientific and in the long run more confusing.

#### A. Wild species.

##### I. Racemes up to 4-noded.

##### 1. Primary branches of panicle divided.

- |   |                                  |
|---|----------------------------------|
| a. Stems up to 4-5 m. high . . . . .            | 1. <i>S. halepense</i> .         |
| b. Stem about 75 cm. high . . . . .             | 2. <i>S. subglabrescens</i> .    |
| 2. Primary branches of panicle simple . . . . . | 3. <i>S. purpureo-sericeum</i> . |

##### II. Racemes 2-8-noded.

4. *S. nitidum*.

#### B. Cultivated species.

5. *S. vulgare*.

#### 1. SORGHUM HALEPENSE Pers.

##### PLATE 37.

*Sorghum Mepense* Pers. Syn. I (1805) 101; Reichb. Ic. Fl. Germ. t. 54; Duthie Grasses N. W. Ind. (1883) 23, Fodder Grasses N. Ind. (1888) 40, t. 27.

*Andropogon halepensis* Brot. Fl. Lus. I (1804) 89; Sibth. Fl. Graec. I, t. 68; Kunth Enum. Pl. I (1838) 502, Suppl. 412, t. 40, fig. 1; Lisboa Bomb. Grasses (1896) 74; Hook. f. Fl. Brit. Ind. VII (1896) 182; Cooke Fl. Bomb. II (1908) 983; Haines Bot. BiA. and Or. (1924) 1033.

*A. Uxus* Roxb. Fl. Ind. I (1832) 271 (*non* Willd.).

*A. miliaceus* Roxb. 1. c. 272; Hack. Monogr. Androp. (1889) 541.

*A. Sorghum subsp. halepense* Hack. 1. c. 501.

*Holcus halepensis* Linn. Sp. Pl. (1753) 1047; Schreb. Beschb. Graes. I.

*H. decolorans* Willd. Sp. Pl. IV, 931.

**Vernacular names** : Boru, Baru, Kartal, Dacle, Batal.

**Etymology** : *Sorghum* after *sorgo* or *sorgho*, an African name of the grass.—*Halepense* from Aleppo, a town in Syria, where the grass was found.

**Description** : Perennial; stems erect, tall, up to 4-5 m. high, stout, simple or sparingly branched, glabrous, leafy; nodes minutely silky. Leaves 30-60 by 2-5 cm., linear-lanceolate, tapering to a fine point, glabrous, smooth, margins scabridly serrulate, midrib stout, base narrowed or sometimes rounded; sheaths glabrous, striate; ligule short, membranous, ciliate.

Panicle 15-45 cm. long, decompound; rhachis nearly smooth; branches mostly alternate, suberect, filiform, the lower branches up to 20 cm. long or more, the axils often bearded; racemes 13-25 mm. long, oblong; joints 3-7, more than half as long as the sessile spikelets, more or less ciliate; pedicels similar. Sessile spikelets 4-5 mm. long, ovoid-lanceolate, dorsally compressed, green or purplish; callus small, shortly bearded. Glumes 4; lower involucral glume subchartaceous, ovate, acute, convex, more or less silky-hairy, 5-13-nerved, with involute margins; upper involucral glume as long as the lower, lanceolate, acuminate, chartaceous, shining, 5-7-nerved; lower floral glume almost as long as the upper involucral glume, elliptic-oblong, obtuse, hyaline, ciliate; upper floral glume 2 mm. long, oblong, 2-lobed, hyaline, ciliate; awn 13 mm. long, sometimes reduced to a bristle or suppressed. Pedicellate spikelets about as long as the sessile but much narrower, not awned, male or barren; lower involucral glume herbaceous, 5-9-nerved, glabrous, the keels ciliate; upper involucral glume similar, 3-5-nerved; lower floral glume as in the sessile spikelets; upper floral glume linear-oblong, hyaline.

**Locality** : *Gujarat*: Ahmedabad (Gammie 16389 !); Perim Isl., Gulf of Cambay (Blatter 3813!).

*Khandesh*: Toranmal (McCann 9643 !); Khadgaum (McCann 9642 !).

*Konkan*: Bassein Fort (Chibber 138!); Kase Forest, Dhann Range (Ryan 1919 !); Vetora (Sabnis 33072 !); Trombay (McCann A269 !); Byculla (McCann 9656 !).

*W. Ghats*: Ehandala, railway line, near Rama's Bed (McCann 9426 !); Panchgani (Blatter & Hallberg B1302 !).

*Deccan*: Ganeshkhind Botanic Gardens (Herb. Econ. Bot. Poona!); Purandhar (McCann 5001!).

*S. M. Country*: Eunnur, 2,000 ft., rainfall 35 in. (Sedgwick & Bell 4984!); near Kilgerry (Talbot 2617 !).

*N. Kanara* : Halyal Fort (Talbot 2006 !).

**Ecology** : A gregarious grass. Common in cultivated and uncultivated soil, grows in hedges and banks of watercourses.

**Distribution** : Most warm countries.

**Economic uses** : A good fodder grass. The grain is eaten. See Vinalle, H. N., A study of the literature concerning poisoning of cattle by prussic acid in *Sorghum*, Sudan grass and Johnson grass, Journ. Amer. Soc. Agron. 13 (1921) 267-80. Gives remedies for hydrocyanic acid poisoning.

**Explanation of Plate 37** : *Sorghum halepense* Pers.


- |                                      |   |                      |
|--------------------------------------|---|----------------------|
| 1. Lower invol. glume.               | } | Pedicelled spikelet. |
| 2. Upper invol. glume.               |   |                      |
| 3. Lower floral glume.               |   |                      |
| 4. Upper floral glume.               |   |                      |
| 5. Stamens and lodicules. ^          |   |                      |
| 6. Pedicelled and sessile spikelets. |   |                      |
| 7. Lower invol. glume.               | } | Sessile spikelet.    |
| 8. Upper invol. glume.               |   |                      |
| 9. Lower floral glume.               |   |                      |
| 10. Upper floral glume.              |   |                      |
| 11. Palea of upper floral glume.     |   |                      |
| 12. Stamens, styles and lodicules. ^ |   |                      |

## 2. SORGHUM SUBGLABRESCENS Schweinf. & Aschers.

*Sorghum subglabrescens* Schweinf. & Aschers. in Beitr. Fl. Aethiop. (1867) 302, 306; **Stapf** in FL Trop. Afr. IX (1917) 157.

*Andropogon subglabrescens* Steud. Syn. Pl. Glum. I (1855) 393.

*A. Sorghum subsp. sativus, var. subglabrescens* Hack. Monogr. Androp. (1889) 519; Ghiovenda in Ann. Istit. Bot. Emua, VII, 25.

**Description** : Annual. Culms (Stapf saw only a meagre specimen) slender, almost sixm>le 75 cm. high, about 8-noded, internodes, except the uppermost shorter than the sheaths. 



OPHICHUS CORYMBOSUS QAEBTN. F.

Delin; B. K. Bhidi.



Pedicelled spikelet

Sessile- spikelet



SORGHUM PURPUREO- BEFUKUSI ASCHERS. d. B. SCHWEINF.

Delin: R. K. Bhide.



sheaths finely pubescent at the nodes; ligules very short, shortly ciliate from the back; blades, linear from a broad (middle and upper leaves) or slightly narrowed (lower leaves) base, long; attenuated upwards, up to 20 by 1<sup>7</sup> cm., green, flushed with red, quite glabrous.

Panicle oblong, erect, 8-5 by almost 2-5 cm., contracted, moderately dense; branches scattered, erect, the longest not much over 2-5 cm. long and undivided for about 12 mm. from the base, almost simple, scabrid to spinulously ciliate, sparingly hairy at the base. Racemes-tough, up to 4-noded and 8\*5-11 mm. long, dense; joints rather stout, up to 2 mm. long, shortly whitish ciliate; pedicels very similar, up to 1 mm. long. Sessile spikelet oblong, acute in **flower**, broad-ovoid or ellipsoid in fruit, 6\*3 by 3\*3 mm., at length variegated, awned; callus-beard scanty, 1 mm. long. Involucral glumes equal, gaping when mature, more or less coriaceous and glossy in the lower third, spongy-subcoriaceous and constricted about the middle, then papery, more or less whitish-strigillose, at length sometimes almost glabrous; lower finely 13-nerved, nerves showing above the coriaceous base, keels rather sharp, scabrid, running into minute-teeth, between which the minute hyaline tip protrudes, the coriaceous part rich maroon to almost black, followed by a pale transverse zone, then violet or purple across the middle, the **broad** triangular somewhat depressed tip straw-colour or reddish upwards; upper glume almost as broad as the lower, 9-nerved, slightly keeled, coloured like the lower. Floral glumes ciliate; lower broad-oblong, up to almost 5-3 mm. long; upper ovate, subentire, 3-3 mm. long, awn up to 12 mm. long, sharply bent, column stout, twisted, equalling the bristle. Grain exposed, upwards between the gaping glumes, equalling or slightly exceeding them, obovoid, 4\*2 mm; long, more or less orange; embryo-mark and nerves obscure. Pedicelled spikelet neuter, persistent, linear-lanceolate, acute, 5\*3 mm. long and more, reddish, lower involucral glume up to 11-, upper 7-nerved.

According to Stapf the specimen from India is a smaller variety of the type just described..

**Locality** : Mahratta Country (Young *ex* Stapf).

**Distribution** : Abyssinia, tropical Arabia.

### 3. SORGHUM PURPUREO-SERICEUM Aschers. & Schweinf.

#### PLATE 38.

*Sorghum purpureo-sericeum* Aschers. & Schweinf. in Schweinf. Beitr. Fl. Aethiop. (1867) 302<sup>^</sup> 306; Stapf in FL Trop. Afr. IX (1917) 140.

*Andropogon purpureo-sericeus* Hochst. *ex* A. Rich. Tent. EL Abyss. II (1851) 469; Hack. Monogr. Androp. (1889) 524; Hook, f. EL Brit. Ind. VII (1896) 185; Cooke EL Bomb. II (1908) 984.

**Etymology** : *Purpureo-sericeum* means purple-silky.

**Description** : Annual, robust; stem 90-120 cm. high, erect, stout or slender, smooth and polished, glabrous; nodes villous. Leaves 20-25 cm. by 6-8 mm., linear, finely acuminate, sparingly appressedly hairy on both sides, the margins scabrous; sheaths subcompressed, glabrous except the villous mouth; ligule very short, ciliate.

Panicle 10-20 cm. long, erect; rhachis glabrous; branches filiform, subflexuous, 1\*3-2-5\* cm. long, often bulbously swollen at their articulation with the rhachis; racemes 2\*5-3-8 cm. long, rarely of 3 joints, sometimes of 1 sessile and 2 pedicellate spikelets; joints about half as long as the sessile spikelets. Sessile spikelets reaching 6 mm. long, densely villous with red or white hairs; callus small, densely villous. Glumes 4; lower involucral glume ovate, acuminate, concave, coriaceous or cartilaginous, 7-nerved, with the margins involute from the base to the tip, clothed with long red or white hairs; upper involucral glume as long as or rather longer than the lower, oblong-lanceolate, coriaceous, concave, acuminate or aristulate, 5-nerved, the back clothed in the upper part with long hairs, the margins narrowly infolded; lower floral glume as long, membranous, densely ciliate, oblong-lanceolate, glabrous on the back; upper floral glume very fragile, 2-5 mm. long, hyaline, 2-lobed, ciliate; awn reaching 3-8 cm. long, the column dark brown, twisted, and ciliate with short erect hairs. Pedicellate spikelets equalling the sessile but paler and narrower; lower involucral glume linear-lanceolate, acute, 5-9-nerved, shortly silky; upper involucral and lower floral glumes as in the\* sessile spikelets; upper floral glume a little shorter, lanceolate, acuminate, hyaline, ciliate.

**Locality** : Gujarat: Garvi Dangs, in a field (Herb. Econ. Bot. Poona 1).

*Khandesh*: (Herb. Econ. Bot. Poona !); Bhusawal (McCann 5224 1).

*Deccan*: Poona, above the Ghats (*teste* W- Burns).

*S. M. Country*: Kolhapur (Woodrow!); Belgaum (Ritchie 887).

*N. Karvara* (Woodrow 40!).

**Distribution** : Central Provinces, W. Peninsula, tropical Africa,

**Explanation Of Plate 38** : *Sorghum purpureo-sericeum* Aschers. & Schwoml.

1. Pedicelled and sessile spikelets.
  2. Lower invol. glume.
  3. Upper invol. glume.
  4. Lower floral glume.
  5. Upper floral glume and lodicules.
  - £. Stamens, ovary, and styles.
- } Sessile spikelet.

## 4. SORGHUM NITIDUM Pers.

*Sorghum nitidum* Pers. Synops. I (1805) 101; Haines Bot. Bit. and Or. (1924) 1034.

*Andropogon nitidus* Kunth Revis. Gram. I (1829) 166.

*A. serratus* Thunb. Fl. Jap. (1784) 41; Hack. Monogr. Androp. (1889) 520.

*Anatherum nitidum* Spreng. Syst. I (1825) 290.

*Andropogon fuscus* J. S. Presl. in C. B. Presl. Eeliqu. Haenk. I (1830) 342.

*A. consimilis* Steud. Syn. Pl. Glum. (1855) 394.

*A. pedicellatus* Steud. l. c. 394.

*Hohusfulvus* R. Br. Prodr. (1810) 199.

*Sorghum fulvum* Beauv. ap. Roem. et Schult. Syst. II, 840.

*Chrysopogon fuscus* Trin. in Steud. Nomencl. ed. 2 (1840) 360.

**Etymology** : *Nitidum* means shining.

**Description** : A tall tufted grass, 1-2\*4 m. high, densely villous at the nodes. Leaves 10-75 cm. by 8-20 mm. setaceously acuminate, glabrous or sparsely hairy on both surfaces, hairs often tubercle-based, midrib broad, prominent, white; sheaths terete below, keeled upward, more or less hairy; mouth silky-villous; ligule very short, truncate.

Panicle 10-30 cm. long, oblong, lax, subsimple, rhachis glabrous, branches capillary, about equalling the spikes, glabrous or scaberulous, whorls distant. Spikes 8-37 mm. long, red-brown; joints and pedicles J to f the length of the sessile spikelets, margins shortly villous! Sessile spikelets broadly ellipsoid, callus rounded (Haines), or acute (Hook. £.). Lower involucral glume coriaceous, broadly oblong or elliptic acute or obtuse, dorsally flattened with incurved margins, brown-hairy and keels hispid, 7-nerved, or about 3-nerved between keels, sometimes nearly black, polished. Upper involucral glume broadly cymbiform with rounded back, lanceolate, acute, 1-nerved, hairy upwards. Lower floral glume as long as or shorter than the upper involucral glume, hyaline, margins inrolled, 2-keeled, ciliate; upper floral glume linear-oblong, 2-lobed, awned or not. Pedicellate spikelet linear-oblong, pale or greenish with brown hairs. Lower involucral glume oblong, rounded or subtruncate, dorsally depressed and 2-nerved between the keels; upper equal, rather narrower, obtuse margins much inflexed, 3-nerved between keels. Lower floral glume hyaline, linear.

**Locality** : *N. Kanara* : Tinai (Talbot 2574 !); Sambiani (Talbot 1337 !); Sirsi to Siddhapur (Hallberg and McCann A270!).

**Distribution** : India, Ceylon, Nicobars, Asia, tropical Australia.

## \*5. SORGHUM VQLGARE Pers.

*Sorghum vulgare* Pers. Syn. I (1805) 101; Watt Diet. Econ. Prod. VI, pt. 3, 289; Haines Bot. Bih. and Or. (1924) 1033.

*Andropogon Sorghum* Brot. Fl. Lusit. I (1804) 88; Lisboa Bomb. Grasses (1896) 75; Hook. f, Fl. Brit. Ind. VII (1896) 183; Cooke Fl. Bomb. II (1908) 991.

*Bokus Sorghum* Linn. Sp. PL (1753) 1047; Grah. Cat. Bomb. PL (1839) 238; Dalz. & Gibs, Bomb. FL (1861) 99.

**Vernacular names** : The Great Millet, Jondla, Jowar, Juari.

**Description** : Stout, usually tall annual grasses. Leaves broadly linear with a prominent white midrib.

Panicle usually thyrsoform decomposed with crowded whorls of erect branches and branchlets, rarely subeffuse. Rhachis of spike tenaceous, joints when forcibly separated leaving a ragged scar at the tip. Pedicelled spikelets usually neuter, pedicels short.

This is the Great Millet cultivated in most parts of the Presidency. (See H. H. M. Fodder Crops of W. India. Dept. Agr. Bombay, Bull. 77 of 1916, and G. L. Kottur' *Chastit'* tion and Description of the Jowars of the Bombay Karnatik. Dept. Agr. Bombay, Bull. 92 and others.) \*

After what we have said above, we do not consider it advisable to enter into details of the numerous varieties and forms. But we may mention in this place that a variety of the numerous varieties and forms. But we may mention in this place that a variety

in the Presidency viz., *S. vulgare* var. *Roxburghii* Hackel in Monogr. Androp. 510 has been described as a separate species by Stapf under the name of *S. Roxburghii* in Fl. Trop. Afr. IX, 126. So the description will be given in the following appendix to the genus *Sorghum*.

## APPENDIX

Containing species of *Sorghum* described from Africa by Stapf which occur also in India.<sup>1</sup>

- A. Mature sessile spikelets deciduous with the adjoining joint of the rachis and its pedicelled companion: spontaneous  
 1. *S. verticilliflorum*.
- B. Mature sessile spikelets persistent: cultivated grasses.
- I. Mature glumes wholly coriaceous or the lower with a herbaceous triangular tip, its nerves not visible on the back except at the tip, particularly when this is herbaceous.
1. Mature panicles more or less loose, usually with arched or drooping branches, never quite compact.
- a. Sessile spikelets ovate or elliptic- to lanceolate-oblong.
- \* Mature spikelets pale straw-colour, permanently more or less hairy; the grain embraced below by the tightly appressed glumes . . . . . 2. *S. Roxburghii* var. *sem%-clausum*.
- \*\* Mature spikelets bright tawny, early glabrescent; the grain almost wholly exposed between the involute glumes 2. *S. Roxburghii* var. *hian*\*.
- b. Sessile spikelets broadly obovate in outline . . . . . 3. *S. bicolor* var. *cbovatum*.
2. Mature panicles very dense to compact, rarely more or less loosened owing to the reduction of the primary axis and the consequent subdigitate arrangement of the branches . . . . . 4. *S. Durra*.
- II. Mature glumes thinly crustaceous to papery, the tips brittle and breaking irregularly. Back of spikelets longitudinally striate.
1. Sessile spikelets 6\*3-8\*5 mm. long. Pedicelled spikelets 7-6-10 mm. long . . . . . 5. *S. papyroδcen&*.
2. Sessile spikelets 5-6-3 mm. long. Pedicelled spikelets up to 6\*3 mm. long . . . . . 6.8. *cernuum*.

## 1. SORGHUM VERTICILLIFLORUM Stapf.

*Sorghum verticilliflorum* Stapf in Fl. Trop. Afr. IX (1917) 116.

*S. halepense* Nees Fl. Afr. Austr. (1841) 88 (*non* Pers.).

*Andropogon verticilliflorus* Steud. Syn. Pl. Glum. I (1855) 393.

*A. Sorghum*, subsp. *halepensis*, var. *effusus* Hack. Monogr. Androp. (1889) 503 (*partim*).

*A. Sorghum verticilliflorus* Piper in Proc. Biol. Soc. Wash. XXVIII, 37.

*A. halepensis* var. *effusus* Stapf in Dyer Fl. Cap. VII, 346 (*partim*).

**Etymology** : *Verticilliflorum* alluding to the whorled branches of the panicles.

**Description** : An annual. Culms 1\*2—2.4 m. high, sometimes slightly pruinose below the nodes. Leaf-sheaths delicately silky-pubescent at the nodes; ligules up to over 2 mm. long, scarious, hairy on the back; blades linear from a broad rounded and often clasping base, long-attenuated upwards, up to 45 cm. long, rarely over 25 mm. wide, green, sometimes slightly glaucous or flushed with purple, hairy just behind the ligule, otherwise glabrous.

Panicle oblong to ovoid-oblong, often rather contracted and more or less nodding at first, then spreading out and more erect, up to 37 cm. long and ultimately 15-22 cm. wide; branches slender, flexuous, whorled longest up to 22 cm. long and undivided to up to 5, rarely 7-5 cm. from

<sup>1</sup> All the information is taken from Stapf, mostly almost verbatim.

the base, distantly branched, slightly and shortly hairy to villous at the base, like the branchlets more OT less rough, at feadt upwards. Racemes fragile, up to 5-, but mostly 2- or 3-noded, rarely over 18 mm. long; joints slender, 3-3-4-2 mm. long, shortly ciliate, cilia dirty white or pale fulvous, often with a tinge of purple; pedicels similar, slightly shorter, their tips subdiscoid. Sessile spikelet ovate to ovate-lanceolate, shortly acuminate to acute, 5-3-6-3 mm. by 2-3 mm. Straw-coloured, greenish towards the tips (at least when young), sometimes tinged with purple, ultimately often turning bright or blackish-red, particularly below; callus-beard less than 1 mm. long. Involucral glumes equal, coriaceous, slightly glossy below (more so when ripening) thinner upwards, lower usually slightly bulging below and somewhat depressed towards the tips, 11-13-nerved, with the nerves very obscure near the tips or more or less marked, sharply 2-keeled and scabrid to spinulosly ciliate in the upper half or third, more or less strigillose, often glabrescent, rarely almost glabrous, hairs pale whitish or fulvous, loosely appressed, upper sharply keeled towards the tips with the keel rough, 7-nerved, more or less hairy. Floral glumes conspicuously ciliate, lower lanceolate, 5-3 mm. long, upper ovate, shortly 2-lobed, 3-2 mm. long; awn fine, 1-3-1-7 cm. long. Anthers 3-3 mm. long. Grain obovate-oblong, 3-3 mm. by 0-2 mm., fuscous, paler below; embryo-mark distinct, hardly exceeding the middle of the grain. Pedicelled spikelet male or neuter, early deciduous, subulate-lanceolate to linear, acutely acuminate, 6-3 mm. long, pale greenish often tinged with red or purple; lower involucral glume 9-, upper 5-nerved.

**Distribution** : Nileland, Mozambique District, Natal, the Comoros, Seychelles, Madagascar, the Mascarenes. Introduced into India as Tabucki grass, also to Australia, Polynesia, and the West Indies.

## 2. SORGHUM ROXBURGHII Stapf.

*Sorghum Roxburghii* Stapf in Fl. Trop. Afr. IX (1917) 126.

**Description** : Annual. Culms stout, tall, often slightly waxy, pruinose below the nodes. Leaf-sheaths softly pubescent at the nodes; ligules very short, scarious, hairy from the back; blades linear to linear-lanceolate from a broad clasping base, long-attenuated upwards, UD to over 45 cm. long and up to 37 mm. wide, usually hairy to tomentose inside above the ligule - and outside at the junction with the sheath, otherwise glabrous.

\*Panicle oblong to ovoid-oblong, rarely subobovate or elliptic in outline, erect, contracted and dense (rarely lax) in flower, somewhat to much loosened when mature; branches slender, flexuous, whorled or semiverticillate, the longest undivided for up to 12-25 mm. (rarely more) from the base, more or less ciliate towards the base and often villous at the junction with the nodes, otherwise like their divisions glabrous or nearly so, finely scabrid upwards. Racemes tough, up to 4- (rarely 5-) noded, 8-12 mm. long; joints slender, 2-3.3 mm. long, distinctly and often densely ciliate, cilia white or purplish; pedicels similar but more slender of about the same length or more often shorter with very slightly thickened tips. Spikelet ovate, acute, with a small fine point, sometimes flattened on the back when young but soon convex, about 5-3 mm. by 2-7-3-3 mm. permanently pale or dull straw-coloured, tawny, at length slightly glossy; callus-beard white. Involucral glumes equal, coriaceous, lower about 10-13-nerved, finely and often obscurely 2-keeled towards the tips with the keel slightly scabrid, transversely constricted at the base, more or less white-strigillose (to aim tomentose) when young at length more or less glabrescent on the back, upper 7-9-nerved, finely keeled upwards, tip usually straight. Floral glumes distinctly ciliate, cilia up to 7-nerved, long, lower broad-oblong, as long as the glumes, upper broad-ovate, 3-3-4 mm. middle nerve much thickened from the middle upwards, running out into a short straight mucilage gland to it almost all along. Anthers 2-7 mm. long. Grains elliptic or ovate-elliptic in outline 3-8-4-8 mm. by 2-7-3-3 mm., dull white (in the African specimens). Pedicelled spikelet usually neuter, linear or linear-lanceolate, up to 4-2 mm. long, more often much reduced and quite small, persistent; lower involucral glume, if well developed, up to 9-nerved upper 5-nerved.

Of this species Stapf describes two varieties which also occur in India.

### VAR. SEMICLAUSUM Stapf.

*Tar. semiclausum* Stapf in FL Trop. Afr. IX (1917) 127.

*Hohus Sorghum minus et Sisna* Wall. Cat. 8777F. A.

*Andropogon Sorghum, subsp. sativus, var. Roxburghii* (?) and *tatnt*\* Hack Monn & A J (1889) 510 and 512.

*A. Sorghum var. Usorum* (?) Stapf in Dyer FL Cap. VII, 348, *in nota*: Medley W n ^ x r \* , PL II (1907) t. 120, (*non Koern. neque* Hack.).  
7 Wood, Natal

**Etymology** : *Semiclausum* alludes to the fact that the involucral riimu\* ni« \*.  
so that only its top or upper half is visible. g l U m e s c l f t B P the grain

**Description** : Panicles fairly dense, also when mature. Involucral glumes less coriaceous towards the tips and more or less showing the nerves in that portion, permanently more or less strigillose, their margins clasping the grain so that only its top or upper half is exposed.

**Distribution** : Nileland of tropical Africa, Mozambique District, Natal, Madagascar, India.

VAB. HIANS Stapf.

*Tar. hians* Stapf 1. c 127.

*Holcus Sorghum nitidum* Wall. Gat. 8777D.

*Andropogon Sorghum* var. *hians* Stapf in Hook. f. EL Brit. Ind. VII (1896) 184.

*A. Sorghum* var. *Roxburghii* K. Schum. in Engl. Pfl. Ost.-Afr. B, 48; O. t. IV, F-H; Büsse & Filger in Engl. Jahrb. XXXII, 184 (*partim*).

**Etymology** : *Hians* means gaping, referring to the margins of the involucral glumes being involute, thus exposing the whole grain.

**Description** : Panicles more or less loose with very flexuous and often drooping branches. Involucral glumes coriaceous to the tips with the nerves quite obscure, subglabrous and somewhat glossy on the back when mature, their margins involute, exposing the whole grain, which is often placed with its back and front parallel to the median line of the spikelet.

**Distribution** : Mozambique District; also in India.

### 3. SORGHUM BICOLOR Moench VAB. OBOVATUM. Stapf.

*Sorghum bicolor* Moench Meth. (1794) 207, var. *obovatum* Stapf in Fl. Trop. Afr. IX (1917) 127.

*JS. bicolor* Willd. Enum. Hort. Berol. (1809) 1036.

*JS. nigrum* Roem. & Schult. Syst. II, 837..

*S. vulgare bicolor* Pers. Syn. I (1805) 101.

*JS. vulgare*, var. *obovatum*, subvar. *nigrum* Rendle in Cat. Afr. PL Welw. II, 151.

*S. rubens* Willd. Enum. Hort. Berol. (1805) 1036.

*Holcus bicolor* Linn. Mant. Alt. (1771) 301.

*H. Sorghum* Mieg in Act. Helv. VIII, 129, t. 4, fig. 4.

*H. niger* Ard. in Sagg. sc. e lett. acad. Padova, 1, 134, t. 5.

*H. saccharatus* Gaertn. Fruct. II (1788-91) 3, t. 80, fig. 2 (?), [*non aliorum quctorum*].

*Andropogon niger* Eunth Enum. I (1838) 501.

*A. rubens* Eunth 1. c. 502.

*A. Sorghum*, subsp. *sativus*, var. *obovatus* Hack. Monogr. Androp. (1889) 514.

*A. Sorghum* var. *bicolor* Eoern. in Bull. Herb. Boiss. II, 226.

**Etymology** : *Bicolor* means two-coloured.

**Description** : An annual. Culms stout, up to 4 m. high, many-noded. Leaf-sheaths mostly overlapping, finely pubescent at the nodes; ligules short, ciliate from the back; blades linear to lanceolate-linear from a broad and rounded or slightly narrowed base, up to 50 cm. long and 7-5 cm. broad, pubescent to tomentose inside above the ligules and less so or glabrous on the back at the junction with the sheath.

Panicles erect, contracted and more or less dense, or loose and oblong or oblong-ellipsoid or obovate to oblanceolate in outline 7\*5-25 cm. by 5-9 cm.; branches erect or obliquely erect, rather rigid, finally sometimes slightly drooping, the longest often more than half the length of the panicle and undivided for 12 mm. to 7\*5 cm. from the base, like the branchlets very rough, spinously ciliolate or ciliate, particularly upwards, slightly hairy, rarely villous at the base. Eacemes tough, compact, frequently 3- or 4- (rarely 5-) noded; joints somewhat stout, flattened, 1-6-2-7 mm. long, shortly whitish or fulvously ciliate; pedicels similar, about 1 mm. long. Sessile spikelet more or less broadly obovate even in flower with very short broad and depressed tips, 4-8-5-8 mm. by 3-3-4-2 mm., straw-coloured to tawny, finally darker, often with red or brown or purple spots or blotches or turning altogether fuscous, chestnut-brown or quite black, closed when mature or only slightly gaping, usually awned; callus-beard scanty. Involucral glumes equal, firmly coriaceous except at the papery to membranous tips, unevenly strigillose particularly and mostly persistently on the tips or almost glabrous; lower up to 16-nerved, nerves very faint, keels short, usually obscure, tips very short, broadly triangular with a hyaline point, depressed; upper broad, 9-nerved, obscurely keeled clde to the tip, otherwise broadly rounded on the back. Floral glumes ciliate, lower broad-elliptic, about 4-2 mm. long, upper broad-ovate, 3-3 mm. long, 2-lobed, awn about 10-6 mm. long, sometimes much reduced. Anthers up to 4-2 mm. long. Grain tightly enclosed in the glumes or the top slightly exposed, obovate-oblong in outline, 3-3-3-8 mm. by 2-1-2-4 mm., brown; embryo-mark distinct; nerves obliterated. Pedicelled spikelet neuter,

persistent, lanceolate to linear-oblong, acute, about 4½ mm. long, reddish; lower involucral glume 9-10-, upper about 7-nerved.

Distribution : Lower Guinea. Occasionally cultivated in the Mediterranean region from Madeira to India, also introduced into Australia, the West Indies and Brazil.

#### 4. SORGHUM DUBRA Stapf.

*Sorghum Durra* Stapf in Fl. Trop. Afr. IX (1917) 129.

*Holcus Durra* Forsk. Fl. Aeg.-Arab. (1775) 174.

*H. Buna* (sphalm.) Gmelin Syst. 173.

*Andropogon Sorghum* var. *aegyptiacus* Eoern. in Aschers. & Schweinf. III. FL Egypte (1887) 164\*

*A. Sorghum*, subsp. *sativus*, var. *Durra et aegyptiacus* Hack. Monogr. Androp. (1889) 516.

*A. Sorghum*, subsp. *sativus* > var. *Durra* Ghiov. in Ann. Istit. Bot. Roma, VIII, 24.

*A. Sorghum* var. *niloticus et Schweinfurthianus* Koern. in Aschers. & Schweinf. 1. c. 778, 779.

*A. Sorghum* var. *arabicus et rubrocernuzts* Koern. in Bull. Herb. Boiss. II, App. II, 12<sup>6</sup> (*p\*obabiliter*).

Etymology : *Durra* is the name of the plant in Egypt.

Description : An annual. Culms stout, up to 4 m. high and even more, 20-40-noded-Leaf-sheaths finely pubescent at the nodes; ligules very short, shortly ciliate; blades up to 40 cm. by 5 cm., quite glabrous (? always).

Panicle usually quite compact, ovoid or ellipsoid, erect or sometimes recurved, 10-15 cm. by 5-10 cm.; branches erect, more or less flexuous, rather slender, rough to spinulously ciliate, particularly upwards, ciliate to subvillous at the base the longest up to one-half or one-third the length of the panicle, divided from very low down. Racemes compact, tough, about 8-5 mm. long (in flower), mostly 3- or 4-noded; joints somewhat stout, flattened, 1 to almost 2 mm. long, whitish-ciliate; pedicels similar, but still shorter. Sessile spikelet rhombic-obovoid, subacute (in flower), greenish or straw-coloured, with greenish tips, ultimately whitish or variously brown, dark red or black, awned or awnless, callus-beard scanty. Involucral glumes equal, coriaceous up to beyond \ or §, then papery, unevenly strigillose, particularly at the tips and sides; lower with a broad triangular greenish strongly nerved tip, about 12-nerved with 3 or 4 finer nerves interspersed, 2-keeled upwards (keels rough), more or less flattened out and very broad to rotundate when mature with the tips worn off and the back glossy; upper broad, 9-nerved with some additional finer nerves, slightly keeled upwards. Floral glumes ciliate; lower ovate-elliptic, over 4½ mm. long; upper broad-ovate, 2-toothed, 4-2 mm. long, awn up to 10-5 mm. long, mostly much shorter and then hardly twisted and differentiated into column and bristle or quite suppressed. Anthers over 2 mm. long. Grain subglobose, slightly compressed, with a broad rounded much exposed top, white, yellow or variously reddish, 5-3 by 5-3 mm., nerveless, embryo-mark faint. Pedicelled spikelet neuter (? always) persistent, lanceolate to linear-oblong, subacute, up to 6-3 mm. long, greenish or reddish, lower 11-, upper 7-nerved.

Distribution : Nileland of tropical Africa, Arabia, Afghanistan, India.

#### 5. SORGHUM PAFYBASCENS Stapf.

*Sorghum papyrascms* Stapf in Fl. Trop. Afr. IX (1917) 131.

Etymology : *Papyrascens* means resembling paper.

Description : Only mature panicles were known to Stapf. Culms up to 17 mm. across at the base of the panicle.

Panicle erect, oblong to oblanceolate in outline, contracted, dense, up to over 30 cm. by 10-13 cm.; branches more or less whorled, often many to a whorl, erect, the longer slightly arching, rather robust, like the branchlets rough to spinulously ciliate upwards and softly ciliate or pubescent in addition, villous at the base or 12 mm. above it, following (longest) up to 15 cm. long and undivided for 5-7J cm. from the base. Racemes tough, up to 4-noded and 18 mm. long, dense, much crowded; joints moderately slender, up to over 3-3 mm. long, shortly white-ciliate; pedicels similar 1-2-7 mm. long. Sessile spikelet oblong (in flower)] at length ovoid or oblong-ovoid, tight or somewhat inflated, closed, up to 9-5 mm. long, permanently pale straw-coloured or reddish; callus-beard very short. Involucral glumes equal, papery and transparent throughout; lower up to 16-nerved with numerous transverse veins, very obscurely keeled upwards or keel-less, nerves raised from the base upwards, softly pubescent to almost villous, very imperfectly glabrescent or at length almost glabrous, hairs white; upper broad, about 13-nerved, very obscurely keeled upwards, much less hairy. Floral glumes conspicuously ciliate; lower broad-elliptic, 5-3 mm. long; upper broad-ovate entire and awnless or shortly 2-lobed, with a mucro or an awn up to 6-3 (rarely 10-6) mm. long, usually

slightly bent and hardly twisted. Lodicules densely ciliate. Grain completely enclosed by the glumes or partly exposed by their breaking up, obovate to orbicular-obovate in outline, compressed, biconvex, dull white or orange; embryo-mark faint, elliptic, slightly exceeding the middle of the grain. Fedicelled spikelet neuter, reduced to the involucreal glumes, persistent, linear or linear-lanceolate, acute, pale straw-coloured or reddish, 6-3-8-5 mm. long, lower 11-13-, upper 9-nerved, shorter.

**Distribution** : Nileland of tropical Africa. Also known from India.

#### 6. SORGHUM GEBNUM Host.

*Sorghum cernuum* Host Gram. Austr. IV, t. 3; Reichb. Ic. 71. Germ. (1845) t. 80, fig. 406; Stapf in Fl. Trop. Afr. IX (1917) 136.

*Hdcus Sorghum* Linn. Sp. Pl. (1753) 1047 (*partim*), Mant. II, 500.

*H. Dora* Mieg. in Act. Helv. VIII (1777) 125, t. 4, fig. 3.

*H. cernuus* Ard. in Saggi sc. e lett. Acad. Padova 1,128, t. III, figs. 1 and 2.

*H. compactus* Lam. Encycl. III, 140.

*Andropogon compactus* Brot. El. Lus. I (1804) 88.

*A. cernuus* Roxb. Fl. Ind. I (1832) 270.

*A. Sorghum var. cernuus* Koern. in Koern. & Wern. Handb. Getreideb. I (1885) 314.

*A. Sorghum, subsp. sativus, var. cernuus* Hack. Monogr. Androp. (1889) 515.

**Etymology** : *Cernuum* means nodding.

**Description** : An annual. Culms stout, 3-4 m. high and more, 20-30-noded. Leaf-sheaths minutely pubescent at the nodes; ligules very short, densely ciliate from the back; blades linear-lanceolate, over 30 cm. by 6 cm., pale green, pubescent to tomentose inside above the ligule and outside at the junction with the sheath. Panicle erect or recurved, ovoid to oblong, very compact or somewhat loose, 10-25 cm. by 5-7\*5 cm.; branches rather stout below, rigid, spindously ciliate, particularly upwards, softly ciliate to villous at the base, branches divided almost from the base, the longest 5-7-5 cm. long.

Racemes compact, up to 3- or 4-noded, up to 106 (rarely 12-7) mm. long; joints rather stout, compressed 1 mm. long, more or less white-silky-villous; pedicels very similar, of about the same length. Sessile spikelet ovate with rather broad tips, 5-3 mm. by 3-3-6 mm., pale straw-coloured with greenish tips, whitish when mature, awned. Involucreal glumes equal, coriaceous about up to the middle or at the base only, otherwise papery and often partly spongy, white-silky-villous all over or glabrous on the coriaceous portion of the back; lower 12-nerved (with the nerves distinct upwards and sometimes with a few very delicate additional nerves interspersed), sharply 2-keeled upwards with the keels spinulosly ciliate and abruptly ending, forming minute teeth between which the hyaline end of the tip protrudes; upper very broad, about 12-nerved, slightly keeled upwards. Floral glumes very densely ciliate; lower broad-ovate, 2-lobed, 4-2 mm. long, upper broad elliptic-oblong; awn about 8-5 mm. long with the bristle half the length of the long-exserted column or more or less reduced. Anthers 3-3 mm. long. Grain equalling the glumes or more or less exserted, orbicular or orbicular-obovate in outline, more or less compressed, 4-2-5-3 mm. by 4-2 mm., white, dull; embryo-mark indistinct. Pedicelled spikelet neuter, linear-lanceolate, 4\*2 mm. long, pubescent, lower involucreal glume 11-, upper 10-nerved.

**Distribution** : Upper Guinea, North Central tropical Africa, N. Africa, the Orient to Turkestan and N. India as far as Manipur.

#### 27. CLEISTACHNE Benth.

Tall, rather coarse grasses, annual according to Stapf, perennial according to Hook. f. Leaves long, narrow, flat, with stout midribs. Panicles narrow, more or less contracted, greyish or fulvously hairy. Spikelets solitary, all alike, hermaphrodite, pedicelled on the tough rachis of racemously arranged or paniced racemes, falling entire from the thickened tips of the pedicels.

Florets 2, lower reduced to an empty valve, upper hermaphrodite. Involucreal glumes equal, very similar, with involute margins, more or less coriaceous, delicately 7-9-nerved, muticous. Floral glumes hyaline, lower 2-nerved, upper 2-dentate or subentire, 3-nerved, with a twisted flexuous awn from the sinus or tip; palea very minute, ciliate. Lodicules 2, broad-cuneate, sparingly ciliate. Stamens 3. Stigmas laterally exserted, plumose. Grain oblong to obovoid-oblong, very obtuse or truncate; embryo half the length of the grain.

Species 3. Western India; tropical Africa.

## 1. CLEISTAOHNE STOCKSII Hook. f.

## PLATE 39.

*Cleistachne Stocksii* Hook, f. Fl. Brit. Ind. VII (1896) 163; Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 408.

**Etymology** : *Cleistachne* is derived from *kkistos*, shut, and *achna*, chaff, husk, alluding to the involucre glumes completely enveloping the floral glumes.—J. E. Stocks (1822-54), belonged to the Bombay Medical Staff. Travelled and collected in Sind, Baluchistan.

**Description** : Stem tall, stout, simple. Leaves 30-40 cm. by 12 mm. finely acuminate, softly hairy, midrib stout, margins slightly thickened, ciliolate, sheath terete, ligule oblong, coriaceous.

Panicle 15-20 cm. long, long-peduncled, suberect; rhachis and branches sparsely ciliate, pedicels of spikelets strigose with bright yellow hairs. Spikelets 5 mm. long, crowded, dark brown, callus short, bearded. Lower involucre glume dark brown, obscurely many-nerved, hirsute, shining, upper like lower, but narrower, nearly glabrous. Lower floral glume ^-nerved, margins infolded, tip hispid, upper a twisted awn, 16-25 mm. long, dilated at the base into a hyaline, entire, 3-nerved membrane, embracing the minute, ovate, obtuse:

pal3a.

**Locality** : Konkan : Tungar forest, Bassein (Bhide!).

**Distribution** : So far only found in Malabar on the Bababoodan Hills.

**Explanation of Plate 39** : *Cleistachne Stocksii* Hook, f.

1. Part of rhachis.
2. Spikelet.
3. Lower invol. glume.
4. Upper invol. glume.
5. Lower floral glume.
6. Upper floral glume.
7. Palea of upper floral glume and lodicules.
8. Ligule.



## 28. VETIVERIA Thouars.

Coarse, perennial, glabrous grasses; rhizomes stout; culms stout, more or less compressed below. Leaf-blades firm to hard, conduplicate in bud, then flattening out, at least upwards, gradually passing into the sheath; lower sheaths much compressed, flabellate-imbricate.

Panicles erect, long, of many-rayed whorls of slender simple or rarely compound racemes, glabrous except for the frequently bearded calli. Spikelets 2-nate, of each pair subsimilar, differing in sex, one sessile, the other pedicelled, on the articulate fragile rhachis of copiously whorled (rarely panicle) peduncled 3- to many-jointed racemes, the sessile spikelets falling ~~with the contiguous joint and the accompanying pedicelled spikelet or at least the accompanying pedicel~~; joints and pedicels slender, slightly and gradually thickened upwards. Florets 2, lower reduced to an empty glume, upper hermaphrodite in the sessile, male in the pedicelled spikelets. Sessile spikelet laterally slightly compressed, awned or awnless. Involucral glumes equal, lower more or less coriaceous or chartaceous with a broad rounded back and subinflexed margins, usually muticous, upper boat-shaped, keeled upwards, with broad hyaline ciliate, margins, muticous, mucronate or aristulate. Floral glumes hyaline, of lower floret 2-nerved, of upper minutely 2-dentate, nmticous or mucronulate or with a perfect or imperfect awn from the sinus. Palea minute, hyaline, nerveless. Lodicules 2 glabrous. Stamens 3. Stigmas laterally exerted; styles subterminal. Grain oblong, slightly oblique at top. Pedicelled spikelet dorsally compressed; involucre glumes much thinner than in the sessile, like the floral ~~glumes usually awnless.~~

Species about 7 Tropics of the Old World, one introduced into the New World.

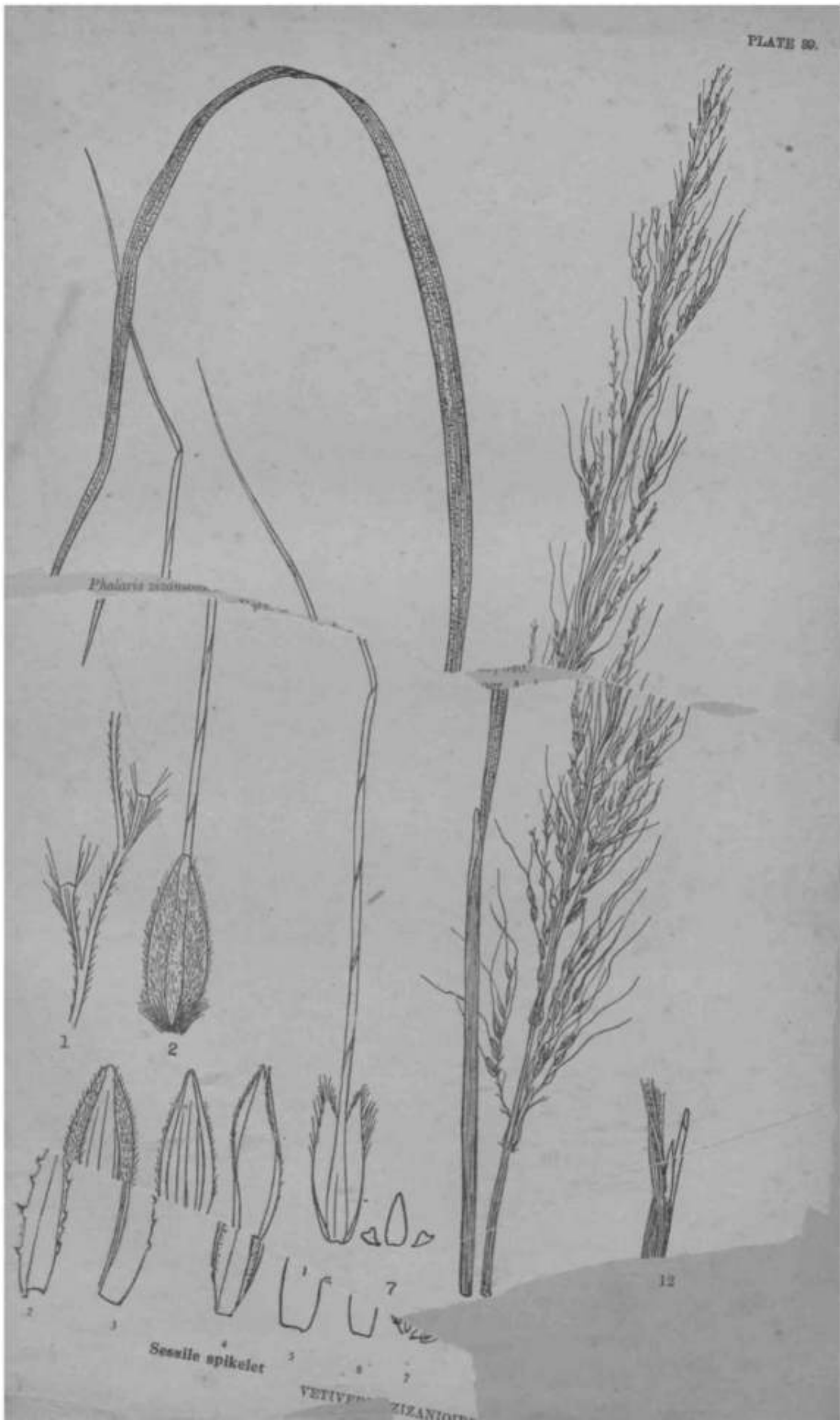
1. Leaves 5-13 cm. long. Panicle 15-18 cm. long . . . 1. *V. Lawsoni*.
2. Leaves 30-90 cm. long. Panicle up to over 30 cm. long 2. *V. zizanioides*.

## 1. VETIVERIA LAWSONI Blatter &amp; McCann.

*Vetiveria Lawsoni* Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 409.  
*Andropogon Lawsoni* Hook; f. Fl. Brit. Ind. VII (1896) 187.

**Etymology** : *Vetiveria* comes from *Vetiver*, the Tamil vernacular name of the plant.—M. A. Lawson (1840-96) was Director of the Bot. Department of Ootacamund and contribute to the Fl. Brit. Ind.





*Phalaris zizanioides*

1

2

12

Sessile spikelet

VETIVER ZIZANIOIDES



**f**



Sessile Spikck:!  
VETIVER KraAOTOIDI STAFF.

**Description** : Bootstock stout, horizontal. Stem erect, simple, slender, internodes vein<sup>^</sup> long. Leaves chiefly subradical, 5-13 cm. by 5 mm., exactly linear, rigid, curved, acute or obtuse, tips serrulate, base not contracted, margins ciliate, nerves 4-8, strong; sheaths compressed, of lower very short, of cauline very long, striate; ligule a ridge of hairs.

Panicle 15-18 cm. long, narrow, elongate, branches or peduncles of spikes opposite and fascicled, branchlets slender, puberulous with a white scurf. Spikes 6-12 mm. long, pale reddish, erect; joints 6-8, very obliquely truncate, tips obscurely ciliate, pedicels nearly equalling the spikelet, slender, compressed. Sessile spikelets 4 mm. long, linear-lanceolate, callus bearded with silky hairs. Lower involucral glume linear, rigid, coriaceous, tip obtuse, bristly, keels muricate, scaberulous margins inflexed, upper involucral glume cymbiform, tip 2-keeled; awn longer than the glume, base ciliate, keel pectinately ciliate above the middle. Lower floral, glume oblong, ciliate, nerveless, upper arched, linear, obtusely 2-dentate, awn very slender. Palea oblong, ciliate, nerveless. Anthers long. Pedicelled spikelets, male, longer and narrower than the sessile, callus naked; lower involucral glume 3-nerved, awned, keels pectinately ciliate, upper acuminate, awned. Floral glumes oblong, obtuse, ciliate,

**Locality** : S. M. Country: Dharwar District, very common (Sedgwick 2170 !); Dharwar (McCann A277 !).

**Ecology** : Very abundant and the main constituent of pastures in the Mallad tract of the Carnatic.

**Distribution** : S. Marátha Country, Mysore.

## 2. VETIVERIA ZIZANIOIDES Stapf.

### PLATE 40.

*Vetiveria zizanioides* Stapf in Kew Bull. (1906) 346-49, 362; in Fl. Trop. Afr. IX (1917) 157.

*F. odorata* Virey in Journ. de Pharm. 1 ser. XIII, 499.

7. *arundinaea et muricata* Griseb. Fl. Brit. W. Ind. (1864) 599, 500.

*Phalaris zizanioides* Linn. Mant. Alt. (1771) 183.

*Andropogon muricatus* Retz. Obs. III (1783) 43; Roxb. Fl. Ind. I (1832) 265; Grah. Cat. Bomb.

PL (1839) 238; Griff. Ic. PL As. 1.139, fig. 57, 1.155, fig. 1; Dalz. & Gibs. Bomb. Fl. (1861)

302; Duthie Grasses N. W. Ind. (1883) 90, Fodder Grasses N. Ind. (1888) 36, t. 24.

*A. Festucoides* J. S. Presl in O. B. Presl Reliq. Haenk. I (1830) 340.

*A. squarrosus* Hack; (*non* Linn, f.) var. *genuinus* Hack. Monogr. Androp. (1889) 542-44.

*A. squarrosus* Hook. f. (*non* Linn, f.) in Fl. Brit. Ind. VII (1896) 186.

*A. squarrosus* Cooke (*non* Linn, f.) in Fl. Bomb. II (1908) 991.

*Agrostis verticillata* Lam. III. Gen. I, 162.

*Anatherum muricatum* Beauv. Agrost. Expl. Planch. (1812) 15.

J. D. Hooker and Cooke and many others have followed Hackel in calling this plant *Andropogon squarrosus* Linn, f. Stapf (in Kew Bull. 1906, 347) has explained that this name applies to quite a different plant: "No notice was taken of Scheuchzer's description or of Petiver's and Du Bois's specimens, and when Linnaeus, about 1770,<sup>1</sup> received the grass from Koenig he described it as something new under the name *Phalaris zizanioides*. Koenig, however, also sent specimens of the grass to Retzius, who published it as *Andropogon muricatus*<sup>2</sup> in 1783. This name, which was suggested by Koenig himself, was subsequently adopted by Roxburgh and most other botanists. More recently,<sup>3</sup> however, it has been replaced by *Andropogon squarrosus*, a name adopted by the younger Linnaeus<sup>4</sup> for a plant, also communicated by Koenig, who found it "circa Zeylonam natans supra stagna profundiora" and entirely distinct from *Andropogon muricatus*. The specimen is still in Linnaeus' herbarium and was correctly identified by B. Brown<sup>5</sup> with his *Panicum abortivum*, that is *Chamaeraphis spinescens*, a characteristic floating grass of the Indo-Malayan region. Retzius<sup>6</sup> himself is responsible for the erroneous reduction of *Andropogon squarrosus* to *Andropogon muricatus* which recently has been revived, although Roxburgh<sup>7</sup> long ago drew attention to the confusion. 'Zizanioides' being the earliest specific epithet, it will have to be adopted for the 'Khas Khas,' so that its name under *Vetiveria* must be "V. zizanioides."

**Vernacular names** : Vala, Ushir, Valo, Bala, Khas-Khas of the Anglo-Indians.

**Etymology** : *Zizanioides* means resembling *zizania* or the Greek *zizanon* which, with the ancients, was a weed in cornfields.

<sup>1</sup> Linnaeus, Mant. Alt. (1771) 183.

\* Retz. Offrev., III (1783) 43,

<sup>3</sup> Hackel, Andropog. D. C. Monogr. Pliancr., V 1 (1889) 542.

• Linn, f. Suppl. (1781) 433.

\* R. Brown, Prodr. Fl. Nov. Holl. (1810) 193.

• Rete., l.c., V (1780) 21.

» Roxburgh, Fl. Ind. M. Carey & Wall., I (V>20) 270.

**Description** : A densely tufted perennial grass. Bootstock branching with spongy a7 tomatic roots. Culms stout, up to over 1-8 m. high, usually sheathed all along. Leaf-sheath compressed, especially the lower which are sharply keeled and fan-like, imbricate, very smooth, firm ; ligules reduced to a scarious rim; blades narrowly linear, acute, 30-90 cm. long, 4-2-10\*6 mm. wide, erect, rigid, firm or somewhat spongy, usually glabrous, rarely more or less hairy downwards on the face, pale green, midrib slender, lateral nerves close, 6 or more on each side, rather stout, slightly prominent, margin spinulously rough.

Panicle oblong, up to over 30 cm. long, usually contracted; rhachis stout, smooth; whorls 6-10 with up to 20 rays; branches oblique to suberect, naked for up to 5 cm., filiform, slightly rough. Racemes up to 5 (rarely 7-5) cm. long, very slender; joints about as long as the sessile spikelets or sometimes distinctly exceeding them, smooth or more or less rough, minutely and unequally ciliolate at the slightly oblique tips; pedicels similar, but shorter. Sessile spikelet linear-lanceolate to almost linear, acute or subacute, 4\*2-4\*8 mm. long yellowish, olive- or violet-brown or purplish to almost black; callus obtuse, under 1 mm. long, glabrous. Involucral glumes acute, coriaceous, lower muriculate all over the back, 5-nerved, lateral nerves close, very fine; upper spinulously muricate on the keel. Lower floral glume as long as the involucral glumes, acute, reversedly ciliolate, upper up to 3\*3 mm. long, narrow, oblong-lanceolate, mucronulate, eciliate. Lodicules 2, quadrate and conspicuous, though small. Styles and stigmas short. Stigmas purple. Anthers 2-3\*3 mm. long. Pedicelled spikelet sparingly aculeolate or almost smooth; upper floral glume entire, acute.

**Locality** : *Gujarat*: Boad to Lasandra (Ghibber!); Daman (Bhide!); Ahmedabad, common in damp valleys (Sedgwick!).

*Konkan*: Ghatkopar, Horse-shoe Valley (McCann 9957 !).

*N. Kanara*: Dandeli (Talbot 2209!).

Cooke l. c. classes this species amongst non-indigenous plants. We are of opinion that it is indigenous in most parts of the Presidency.

**Ecology** : Common on the banks of rivers and in rich marshy soil.

**Distribution** : Practically over the whole of India and eastwards to Burma. Occasionally cultivated. Lower Guinea in tropical Africa. Throughout the Malayan region only cultivated or as an escape. Introduced into the Mascarenes, the West Indies and Brazil.

**Economic uses** : The roots are woven into screens and tatties to be hung over doors or set in windows, in hot weather, when sprinkled with water, they cool and perfume the air. The root in the powdered state enters into the composition of an Abir or perfumed powder used by the Hindus at the Holi festival (Watt).

" The distillation of Vetiver oil in India seems to be of very limited extent and there is hardly any export." (Stapf).

**Medicinal uses** : See Dymock Pharmacographia Indica, III, 571; Dutt Materia Med. Hind. (1900) 321.

**Early History** : See Stapf Eew Bull. (1906) 346-47.

**Explanation of Plate 40** : *Vetiveria zizanioides* Stapf.

- |                                      |   |                   |
|--------------------------------------|---|-------------------|
| 1. Pedicelled and sessile spikelets. | } | Sessile spikelet. |
| 2. Lower invol. glume.               |   |                   |
| 3. Upper invol. glume.               |   |                   |
| 4. Lower floral glume.               |   |                   |
| 5. Upper floral glume.               |   |                   |
| 6. Palea of upper floral glume.      |   |                   |
| 7. Stamens, ovary, and styles.       |   |                   |

29. CHRYSOPOGON Trin.

Perennial (at least in the Old World). Leaf-blades narrow.

Panicles usually lax, of whorls of simple or basally divided filiform branches, rarely the branches 2-nate or solitary. Spikelets in threes at the ends of the branchlets of terminal panicles, one sessile, the other 2 pedicelled, the three falling entire from the thickened, nearly always bearded, oblique tips of the peduncles; exceptionally 2-nate in 2-jointed racemes, one sessile, the other pedicelled, each sessile spikelet falling with the contiguous joint and its pedicelled companion, pedicels and joints, if present linear-filiform, never longitudinally grooved or appendaged. Florets 2, lower reduced to an empty glume, upper hermaphrodite in the sessile, male or neuter in the pedicelled spikelet. Sessile spikelets usually laterally compressed, awned.\* Involucral glumes subequal; lower coriaceous or chartaceous, involute with a rounded back or complicate and more or less keeled upwards, upper boat-shaped, more or less keeled. Floral glumes hyaline, lower 2-nerved, upper linear, entire or 2-dentate with a usually perfect awn from the sinus. Palea 0 or small, hyaline, nerveless. Lodicules 2

small, glabrous. Stamens 3. Stigmas exerted laterally low down. Grain linear, laterally compressed; embryo half the length of the grain; scutellum linear-oblong. Pedicelled spikelet dorsally compressed, awnless or aristulate.

Species about 18.—Hot parts of the Old World, only a few entering the temperate zone. One in Florida and Cuba.

Cooke (II, 984-986) describes 4 species of *Andropogon* belonging to the section *Chrysopogon*: *A. aciculatus* Retz., *A. lancearius* Hook, f., *A. monticola* Schult., and *A. Aucheri* Boiss.

To these we add 4 species not noted from the Presidency before: *Chrysopogon Wightianus* Nees, *Oh. asper* Heyne, *Oh. polyphyus* Blatter & McCann, and *Oh. GryUus* Trin.

- A. Pedicels of the upper spikelets half as long as the sessile spikelets or longer.
- I. Pedicels of upper spikelets glabrous or nearly so.
1. Stems erect. Leaves 15-45 cm. long . . . . . 1. (*Oh. GryUus*).
  2. Stems creeping below. Leaves 2-13 cm. long . . . . . 2. *Oh. aciculatus*.
- II. Pedicels of upper spikelets villous with rusty rarely pale hairs.
1. Lower involucral glume of pedicelled spikelets long-awned, upper not or very shortly awned.
    - a. Callus long villous all round . . . . . 3. *C. asper*.
    - b. Callus glabrous in front . . . . . 4. *C. lancearius*.
  2. Involucral glumes of pedicelled spikelets both awned. . . . . 5. *C. Wightianus*.
- B. Pedicel of upper spikelets not half as long as the sessile spikelets.
- I. Lower sheaths compressed. . . . . 6. *Oh. montanus*.
- II. Lower sheaths terete.
1. Leaves, peduncle and branches of panicle glabrous. . . . . 1. *Oh. polyphyus*.
  2. Leaves, peduncle and branches of panicle not glabrous. . . . . \* 8. *Oh. Aucheri*.

#### 1. CHRYSOPOGON GBYLLUS Trin.

##### PLATE 41.

*Chrysopogon GryUus* Trin. Fund. Agrost. (1820) 188; Nees Gen. Fl. Germ. Monocot. I, t. 93 ; Benth. Fl. Austral. VII (1878) 537.

*Andropogon GryUus* Linn. Cent. Pl. II, 33; Hack. Monogr. Androp. (1889) 550; Host Gram. Austr. II, 1, t. 1; Sibth. Fl. Graec. 1.1. 67; Duthie Grasses N. W. Ind. (1883) 22, Fodder Grasses N. Ind. (1888) 40; Hook, f. Fl. Brit. Ind. VII (1896) 187; Collett Fl. Siml. (1902) 602, fig. 191.

*A. echinulatus, glabratus et Royleanus* Steud. Syn. Pl. Glum. (1855) 395, 397.

*Chrysopogon. glabratus* Trin. in Mem. Acad. Petersb. ser. 6, II (1833) 318.

*Rhaphis GryUus* Desv. Opusc. (1831) 69.

*22. echinulata* Nees in Eoyle III. Bot. Himal. 417.

*Pollinia GryUus* Spreng. Pugill. II, 10; Beichb. Ic. Fl. Germ. t. 54.

*Aplu&a GryUus* Presl Cyp. & Gram. Sic. (1820) 55.

*Hoteus gryUus et pallidus* Br. Prodr. (1810) 199.

Etymology : *Chrysopogon* is derived from *chrysos*, gold, and *pogon*, beard.

Description : Stems simple, forming dense hard tufts, erect, 15 cm. to 1\*5 m. high; nodes smooth. Leaves 15-45 by 4-8 mm., linear, acute, glabrous or hirsute, margins serrulate ; sheath keeled above, glabrous or pubescent.

Panicle large, 12-20 cm., rachis angular, scabrid, axil bearded, branches long, 5-10 cm., capillary, spreading, simple or branched, usually very many in a whorl and bearing 2-4 spikes, tips obliquely truncate and densely bearded. Sessile spikelets 5-8 mm., callus straight, acute. Lower involucral glume coriaceous, 2-toothed, dorsally rounded with 2 muricate or mamillate keels or channels, shining, smooth or scab^rulous, margins broadly involute, upper chartaceous, hyaline, lanceolate, mucronate or aristulate, awn equalling the spikelet or shorter, keel and sides bristly above the middle. Lower floral glume linear oblong, obtuse, nerveless, upper linear, minutely 2-toothed, awn minute or 12-35 mm. long. Palea small, oblong, glabrous. Pedicelled spikelets rather longer than tho. sessile, terete, lanceolate, acuminate; pedicels glabrous or ciliate. Lower involucral glume acuminate or aristulate, 5-9-nerved, keels ciliate above, upper lanceolate, acuminate, ciliate. Floral glumes narrower, ciliate, awn of upper \$ the size of tibp glume.

**Locality** : A<sup>7</sup>. *Kanara*: Halyal (Talbot 2088!).

**Distribution** : Temperate Himalaya from Kashmir to Sikkim, 4,000-9,000 ft. Khasia Hills, 4,000-5,000 ft., westwards to K Africa and S. Europe, Australia.

**Economic uses** : Considered to be a good fodder grass in Australia.

**Explanation of Plate 41** : *Chrysopogon Gryttus* Trin.

- |                                      |   |                   |
|--------------------------------------|---|-------------------|
| 1. Pedicelled and sessile spikelets. | } | Sessile spikelet. |
| 2. Lower invol. glume.               |   |                   |
| 3. Upper invol. glume.               |   |                   |
| 4. Lower floral glume.               |   |                   |
| 5. Stamens, ovary and styles.        |   |                   |
| 6. Upper floral glume.               |   |                   |

### 2. CHBYSOPOGON ACICULATUS Trin.

*Chrysopogon aciculatus* Trin. Fund. Agrost. (1820) 188 ; Duthie Grasses N. W. Ind. (1883) 22 (*acicularis*), Fodder Grasses N. Ind. (1888) 39; Benth. EL Hongk. (1861) 424, EL Austral. VII (1878) 538.

*Andropogon aciculatus* Ketz. Obs. V (1789) 22 ; Eöxb. Fl. Ind. I (1832) 262 ; Grah. Cat. Bomb. PL (1839) 238; Hack. Monogr. Androp. (1889) 562; Hook, f. FL Brit. Ind. VII (1896) 188 ; Cooke FL Bomb. II (1908) 984.

*A. acicularis* Willd. Sp. PL IV, 906.

*Rhaphis acicularis* Desv. Opusc. (1831) 69.

*R. trivalvis* Lour. FL Coeliincl. (1790) 553 ; Trin. Sp. Gram. Ic. t 8, 9,

*Centrophorum chinense* Trin. Fund. Agrost. (1820) 106, t. 5.—Rheede Hort. Mai. XII, t. 43.

**Description** : Bootstock woody, creeping; stems erect or ascending, 30-60 cm. long, slender, leafy chiefly at the base; lower internodes very short, the upper elongate; nodes glabrous. Leaves densely tufted, 2-5-12-5 cm. by 3-5 mm., linear, obtuse or subacute, flat or with undulate margins, glaucous, usually glabrous, the margins more or less distantly spinulose ; sheaths not auricled, the lower short, the upper elongate with a more or less hairy mouth, ligule a very short membrane.

Panicles 2-5-7\*5 cm. long, narrowly oblong, pale green or purplish ; rachis strict, filiform ; branches short, spreading, at length erect, capillary, bearing few spikelets. Sessile spikelets 3 mm. long, dorsally compressed ; callus elongate, decurrent on the peduncle and with it laterally fulvously bearded. Glumes 4; lower involucral glume chartaceous, narrowed from a broad base to the usually bimucronulate tip, dorsally convex, glabrous on the back, the keels ciliate with short stiff erect hairs, obscurely 2-3-nerved ; upper involucral glume as long, lanceolate, acuminate or aristulate, 1-nerved, the keel setosely ciliate; lower floral glume shorter, linear-ovate, obtuse, 2-nerved; upper floral glume narrow, hyaline, ciliate; awn terminal, about 5 mm. long, not twisted. Pedicellate spikelets reaching 5 mm. long, lanceolate, cuspidately acuminate, purplish ; pedicels nearly as long as the sessile spikelets, flattened, glabrous except for a small tuft of hairs at the base; lower involucral glume thin, lanceolate, acuminate, 3-nerved; upper involucral glume a little shorter, acuminate, 3-nerved, ciliate; lower floral glume hyaline, oblong, acuminate, shorter than, the involucral glumes, nerveless ; upper floral glume smaller, broader, 3-nerved, ciliate. Anthers 1-4 mm. long.

**Locality** : *Konkan*: Alibag, sandy shore (Ezekiel!).

*N. Kanara*: Karwar, seashore (Sedgwick & Bell 5070 !); Jog, hills (Hallberg & McCann A272 !).

**Distribution** : More or *lps*& throughout India, Ceylon, tropical Asia, Australia, Polynesia.

**Economic uses** : According to Haines the leaves which lie close to the ground escape to a large extent the lips of cattle. The plant is a pest on account of the sharp callus and small awns sticking to the clothes.

### 3. CHBYSOPOGON ASPER Heyne.

*Chrysopogon asper* Heyne ex Wall. Cat. no. 8784.

*Andropogon asper* Heyne in Herb. Bottler ex Hook. f. Fl. Brit. Ind. VII (1896) 189.

**Etymology** : *Asper* means rough.

**Description** : Stem 30-90 cm., leafy below, very slender above. Leaves distichous, 30-45 dtn. by 12-18 jnm., broadly linear, acute, cordate, coriaceous, flat, smooth, 11-nerved, midrib very slender, spinulose beneath, margins spinulosely serrulate, and with a few long tubercle-based cilia towards the broad semiamplexical base ; sheaths broad, compressed, laxly hirsute, lower ones 12 inin, broad, keeled, armed with scattered tubercle-based hairs.

Panicle 18 cm. long, narrow, of many whorls of short, unequal, simple, smooth, erect anches lamina- vnlihirv nirely 2 erect spikes, tips very shortly bearc'ed. Sessile spikelets



CHRYSOPOGON GRYLLUS TRIN.

Delin: H. K. B&sdot.



Sessile spikelet  
CHRYSOPOGON MONTANUS TRIN.

Delin.



6 mm. long, pale, coriaceous, callus up to 2 mm., long, villous all round. Lower involucre glume hispid beneath, the tip strongly compressed above; upper with the keel and sides more or less hispid above the middle awn as long as the glume or shorter. Lower floral glume shorter than the upper involucre, narrow, obtuse, 2-nerved, ciliate, upper consisting of the linear, hyaline, 3-nerved base of the awn, awn 35-50 mm. long. Pedicelled spikelets 8 mm. long, narrowly lanceolate, 7-nerved, pale shining, keels ciliate; pedicels very shortly rufous-villous on both margins, excised at the tip in a semicircle; lower involucre glume thin, tip 2-dentate, nerves strong, subequidistant, or the 3 lateral on each side submarginal, margins narrowly incurved, keels ciliate from base to tip, upper lanceolate, acuminate, 3-nerved\* ciliate. Lower floral glume linear-oblong, 2-nerved, ciliate, upper narrowly lanceolate, 1-nerved.

**Locality** : N. Kanara: Tinai (Talbot 2564!).

**Distribution** : Madras: Pulicat Hills, N. Kanara.

#### 4. CHRYSOPOGON LANCEARIUS Haines.

*Chrysopogon lancearius* Haines in Haines Bot. Bih. and Or. (1924) 1036.

*Andropogon lancearius* Hook. f. Fl. Brit. Ind. VII (1896) 190; Cooke Fl. Bomb. II (1908) 985.

**Description** : Stem 60-90 cm. high or more, leafy upwards; nodes glabrous. Leaves 30-35 cm. by 8-13 mm., lanceolate, acuminate, narrowed from below the middle to the base, smooth on both surfaces, flat, midrib broad, white above, margins minutely serrulate; sheaths keeled, quite glabrous; ligule a row of fine short hairs.

Panicle 15 cm. long, narrow, of many whorls of simple smooth erect branches bearing solitary erect racemes. Sessile spikelets 6 mm. long; callus about 1.5 mm. long, glabrous in front. Glumes 4; lower involucre glume nearly 6 mm. long, oblong, chartaceous, truncate or notched, obscurely 5-nerved; upper involucre glume 5 mm. long, oblong, chartaceous, shortly ciliate on the keels, otherwise glabrous, cleft at the apex into 2 acute lobes; lower floral glume 4 mm. long, linear-oblong, obtuse, hyaline; upper floral glume 2-5 mm. long, linear, hyaline; awn 4 cm. long, the column much twisted and densely hairy with reddish brown hairs. Pedicelled spikelets nearly 8 mm. long (not including the awn), lanceolate, acute, awned; pedicels nearly white, 4 mm. long, flattened, ciliate with long reddish brown hairs. Lower involucre glume lanceolate, acute, 2-toothed at the tip, with an awn about 2.5 mm. long, between the acicular teeth, 7-nerved, membranous, glabrous; upper involucre glume as long as the lower, lanceolate, acuminate, membranous, 5-nerved; lower floral glume shorter, linear-oblong, obtuse, ciliate, hyaline; upper floral glume hyaline.

**Locality** : W. Ghats : Panchgani (Blatter & Hallberg B1230 !); Castle Kock (Woodrow). Seems to be very rare in the Presidency.

**Distribution** : Sikkim Himalaya, Bihar, Chota Nagpur, Orissa, W. Peninsula.

**Economic uses** : A good fodder according to Haines.

#### 5. CHRYSOPOGON WIGHTIANUS Nees.

*Chrysopogon Wightianus* Nees ex Steud. Syn. PI. Glum. (1855) 397.

*Andropogon Wightianus* Steud. 1. c. 395; Hook. f. Fl. Brit. Ind. VII (1896) 191.

*A. aristulatus* Hochst. ex Steud. 1. c. 397; Hack. Monogr. Androp. (1889) 556.

*A. breviaristatus* Steud. 1. c. 396.

*Riftaphis orientalis* Desv. Opusc. (1831) 69.

*R. Wightianus* Nees ex Steud. 1. c.

**Etymology** : *Wightianus*. given in honour of Robert Wight (1790-1872), Superintendent of the Botanical Gardens, Madras, author of numerous botanical works.

**Description** : Very variable in habit. Stems short or long, erect or ascending from a short stout creeping stock. Leaves 7-25 cm. long, linear, acute, rigid, from glabrous to pubescent on both surfaces and with sometimes tubercle-based minutely serrulate; sheaths, glabrous, lower ones compressed; ligule very short, villous.

Panicle 7-13 cm. long, contracted, lower branches long, few in a whorl, rachis and branches minutely hairy; spikes solitary, green or brownish. Sessile spikelets subcylindric, 4 mm. long, callus long, densely bearded with rusty hairs all round. Lower involucre glume laterally compressed above, minutely truncate, glabrous below, hispid above, obscurely 4-nerved, tip 2-dentate, upper chartaceous, hispid above on the keel and sides, tip 2-lobed, awn as long as the glume or shorter. Lower floral glume linear-oblong, 2-nerved, ciliate, upper consisting of an awn with a narrowly dilated 2-lobed base, awn 50-65 mm. long, column hispid. Pedicelled spikelets nearly 12 mm. long, lanceolate, pubescent; pedicel truncate, margins shortly villous. Lower involucre glume glabrous or pubescent, 7-nerved, awn longer than the glume, keels ciliate, upper lanceolate, 3-nerved, awn as long as the glume or shorter. Lower floral glume oblong, 2-nerved, ciliate, upper very narrow, ciliate, nerveless.

**Locality** : *W. Ghats* ; Castle Bock (Bhide!).

*N. Kanara* : Jog to Siddhapur, open grass-land (McCann A273 !)

**Distribution** : Madras, Nilgiris, Burma, Assam. (Hackel mentions a specimen gathered in Ceylon but, according to Hooker f. it seems to be a starved specimen of *Ohryso Pogon zeylanicus*-Thw.).

#### 6. CHRYSOPOGON MONTANUS Trin.

##### PLATE 42.

*Chrysopogon montanus* Trin. in Spreng. Neue Entdeck. II (1820-22) 93 ; Haines Bot. Bib. and: Or. (1924) 1037.

*Andropogon monticola* Schult. Mant. (1824) 665; Eunth Enum. PL I (1838) 506; Steud. Syn. PI. Glum. (1855) 395; Hack. Monogr. Androp. (1889) 557 {*excl. var. velutinus*}; Hook. f. FL Brit. Ind. VII (1896) 192, *cum omnibus var.*; Cooke Fl. Bomb. II (1908) 985; Hole in Ind. Forest Mem. I (1911) 108.

*A. Sprengelii* Kunth Kev. Gram. (1829) 166.

*Pollinia fulva* Spreng. Pugill. II, 93.

*Andropogon Trinii* Steud. Syn. PI. Glum. (1854) 395; Hack. Monogr. Androp. (1889) 558.

*A. ciliolatus, caeruleus et increscens*, Steud. 1. c.

*Chrysopogon ciliolatus* Boiss. Fl. Or. V (1884) 458 {*excl. var. Aucheri* Boiss.}; Duthie Grasses-N. W. Ind. (1883) 22.

*C. caeruleus* Duthie 1. c. 23, Fodder Grasses N. Ind. (1888) 39, t. 60.

*C. increscens* Nees *ex* Steud. 1. c. 396.

*C. Wightianus* var. *leucanthus* Thw. Enum. PL Zeyl. (1864) 366.

*C. serrulatus* Trin. in Mem. Ac. Petersb. ser. 6, II (1833) 318, Spec. Gram. t. 331.

*C. Esenbechii* Arn. in Steud. Syn. (1855) 395.

*Rhaphis dliolata et coemlea* Nees *ex* Steud. 1. c. 396, 395.

This synonymy requires an explanation. *Chrysopogon montanus* Trin. as understood in this place comprises Hackel's two species *Andropogon monticola* Schult. and *A. Trinii* Steud., and is identical with Hook, f.'s *A. monticola* Schult. with all its varieties.

Hackel has two species and he distinguishes them by the following characters :

*A. monticola*: Upper involucre glume of sessile spikelet keeled, the keel from the base up to §-} of its length densely pectinate ciliate with long, rigid, rufous hairs, shortly white hispid in the upper J.

*A. Trinii*: Upper involucre glume of sessile spikelet keeled below the apex only, keel white-ciliate, the lower §-f not keeled and glabrous.

Hook. f. in F. B. I. makes of these species two varieties: *var. monticola proper* and *var. Trinii*, and includes them under *A. monticola* Schult., adding a third variety: *var. robustus*.

At the same time Hooker confesses : " I am unable to classify the varieties of this common and variable plant in accordance with geographical areas or other considerations. This, if possible, must be effected by field-botanists in India. There is every gradation from the coarsely hirsute keel of *monticola*, to the perfectly smooth of some states of *Trinii* ; from the awnless to long awned gl. I of the pedicelled spikelets, and from the glabrous to the pubescent of the same organ: the colour of which affords no character ; nor does its length, or that of the cilia on its keels."

Cooke (II, 985) has adopted the name *A. monticola* Schult. with Hooker's description and evidently also the latter's varieties. But his opinion does not count in this case as he has not seen any specimens from the Bombay Presidency and " was therefore " as he says himself, " unable to fix definitely the variety to which the Bombay species belong. They will probably belong to *var. Trinii*, H. f. " What induced Cooke to say that they probably belong to *var. Trinii*, we cannot understand, especially as Hooker came to the conclusion that he was not able to classify the varieties according to geographical areas.

We have examined a great number of specimens from all parts of the Presidency, except Siiid, Cutch and Eathiawar and we have been able to separate many into the two varieties. They exhibit almost the same distribution and often both are found in the same locality, with this exception that *var. Trinii* has not been observed in N. Eanara, Gujarat and the Eonkan. But we must also mention, and this is the most important point, that we saw many specimens all over the country which could not be classed under either variety, and it would require many new varieties if we wanted to give a name to all the different variations. And even then they would be forms only and not varieties.

Haines seems to have felt the same difficulty when he tried to classify the *montanus* material of Bihar and Orissa. He distinguishes 5 forms. If we wanted to follow the same method for our area, we doubt whether double the number of forms would yield satisfactory results.

Stapf describes the specimens from tropical Africa under the name of *C. montanus* Var *iremulus* Stapf. He calls it "one of the several races which constitute the rather polymorphic species *C. montanus* Trin., whose area includes Southern Africa, Madagascar and India. The var. *tremulus* approaches very closely the var. *elatior* Stapf, a large-spikeleted parallel to the var. *serrulatus* Stapf (*Chrysopogon semdatus* Trin.) and differs from it apparently only in the almost quite smooth rhachis and branchlets (a few sharp-pointed hairs may be found under a high power) and the pedicels, which are glabrous almost up to the middle, and not ciliate from the base." It seems to us (it may look like presumption on our part to criticise our veteran and highly merited agrostologist) that it is somewhat risky to find new varieties of a protean species on a few specimens only.

According to Hole all the 3 varieties mentioned by Hooker "appear to vary greatly, as regards their habit and vigour of growth, in response to the moisture conditions of the habitat and also according as whether, or not, the plants are habitually grazed, cut for fodder, or periodically burnt. The colour of the cilia of glume II of the sessile spikelet (pale or white in *robustus* and rufous in *monticola*), accordingly, appears to be the chief difference in the habit, and these forms appear to have different and fairly defined areas of distribution (*monticola* occurring chiefly in Central and Southern India, while *robustus* is mainly found in N. India, in the outer N. W. Himalayas and Sub-Himalayan tract." Hole who studied the varieties *robustus* and *Trinii* both from herbarium specimens and in the field has observed that the plant at Dehra Dun gradually and imperceptibly passes from the typical *robustus* to the typical *Trinii*. We are justified in stating that a similar transition takes place between *monticola* and *Trinii* in Western India. (Of Central and Southern India we have no experience.) We have therefore a gradual transition from *robustus* to *Trinii* at Dehra Dun, and from *Trinii* to *monticola* in W. India and, consequently, we are not allowed to consider Hooker's varieties as good varieties.

**Vernacular names:** Sunthia khad, Agiva, Gogar, Ghora, Dand, Pandhari kusal, Eare hullu.

**Etymology :** *Montanus* refers to hilly country liked by this plant.

**Description :** A very variable perennial grass. Stems usually slender, erect or geniculate ascending, glabrous, sometimes robust simple or branched, 30 cm. to 1½ m., but often attaining 2 m., slightly compressed, solid, developing usually axillary leafy and flowering branches from all the upper nodes except the one next below the panicle. (The branches growing within the sheaths push the latter away from the stem which often results in a characteristic fan-shaped appearance.) Blade of uppermost leaf of flowering stem usually mucronifonn, but attaining 8 cm., of lower leaves up to 43 cm. long and 8 mm. broad, linear acuminate, tapering from the base, scabrid on margins, sometimes also scabrid dorsally on midrib, and scaberulous above, especially towards the apex, often ciliate towards the base with tubercle-based hairs, at least when young; sheath glabrous, compressed, keeled, especially of the lower leaves, shorter or longer than the proper internode; ligule a minute membranous rim.

Panicle 5-15 cm. long, ovate to subcylindric, yellowish to purplish, of several whorls of few or many capillary flexuous very unequal branches bearing solitary spikes, branches of flowering panicle more or less horizontally spreading, of the fruiting panicle erect and closely appressed to the rhachis, rhachis and branches smooth or scaberulous. Spikelets in clusters of 3, a central sessile hermaphrodite one with 2 lateral pedicelled male ones, the clusters being terminal and solitary on the capillary branches of the panicle. Sessile spikelets laterally compressed, 4-7 mm. long, tip of peduncle brown-bearded, clavate, callus short, with oval scar and dense beard. Lower involucre glume laterally compressed, narrow-oblong, embracing the margins of the upper, chartaceous, 2-4-nerved, hispidly ciliate dorsally on keel towards the apex or almost glabrous, often scaberulous dorsally on nerves and minutely pubescent with appressed hairs dorsally near margin, apex subtruncate or 2-dentate. Upper involucre glume laterally compressed, broader than lower, obtusely keeled, subcoriaceous, 3-nerved, margins broad, hyaline, membranous, ciliate or not, very variable with regard to its hairiness, sometimes almost glabrous, at other times hispidly ciliate dorsally on keel with long white or rufous hairs more or less from base to apex, sometimes also pubescent, or minutely villous dorsally on keel and lateral nerves, awned, awn 2-5-6 mm. long, apex entire or 2-lobed. Lower floral glume the length of to subequal the upper involucre glume, linear, hyaline, ciliate, nerveless or indistinctly 1-3- or more-nerved, apex obtuse. Upper floral glume consisting of the narrow 3-nerved base of the awn, basal half or § hyaline, membranous, upper portion chartaceous, awn geniculate, 10-18 mm. long, but also reaching 37 mm. (including the twisted column), margins ciliate or not, apex entire or 2-lobed. Palea sometimes present, very narrow, 1-25 mm. long. Lodicules 2, cuneate, glabrous. Anther o, up to 3 mm. long, yellow or purple. Stigmas 2, laterally exerted at base of spikelet, yellow. Pedicelled spikelet dorsally compressed, subequal the sessile spikelet; pedicel less than half the sessile spikelet, usually about the spikelet, densely ciliate on both

margins with stiff rufous or white hairs, the upper of which are shorter than to subequal the spikelet. Lower involucral glume lanceolate, membranous, 5-7-nerved, minutely pubescent with appressed hairs dorsally, especially towards the apex, or almost glabrous, sometimes ciliate dorsally on midrib and marginal nerves, especially towards the apex, acute or shortly awned. Upper involucral glume subequal to the lower, 3-nerved, margins incurved, long ciliate, apex acute or mucronate, glabrous dorsally. Floral glumes linear, hyaline, ciliate, nerveless or indistinctly nerved. Palea sometimes present, as in sessile spikelet, but slightly longer, very narrow.

The flowers are much visited by small bees.

Locality : *Gujarat*: Mahal-Dangs, 800 ft., rainfall 100 in. (Sedgwick & Bell 5391!).

*Khandesh*: Tapti River (Blatter & Hallberg 5476!); Bhusawal (McCann 5224A i); Nandgaum, Bori River (Blatter & Hallberg 3827 !); Bori, Tapti Island (Blatter & Hallberg 5146 !); Amalner, Bori River (Blatter & Hallberg 4455 !).

*Eonkan*: Sion Creek (Sabins A231 !).

*W. Ghats*: Matheran (D'Almeida 9958!).

*Deccan*: Khandala to Karjat (Blatter & Hallberg A232 !); Kirkee (Talbot!); Pashan (Gammie!); Mangri, 8 miles E. of Poona (Gammie !); Katraj (Gammie!); Pasarni Ghat (Blatter & Hallberg B1209!).

*S. M. Country*: Dumbai (Talbot 2317 !); Badanii (Talbot 2926 !); N. W. of Dharwar (Sedgwick 3141!); Dharwar, dry pasture land, 2,400 ft., rainfall 34 in. (Sedgwick 1817 !); Konankeri, 1,800 ft., rainfall 35 in. (Sedgwick & Bell 4439 !); Haveri (Talbot 2189 !).

*N. Kanara*: Jog to Sidhapur, open grass-land (Hallberg & McCann A274 !).

Ecology : This plant forms patches of many individuals, or combines with different individuals to form associations of a few species. Found generally on dry sandy or stony soil with little capacity for holding water. See also Hole 1. c. 112-14.

Distribution : Throughout India, especially in hilly tracts, from the N. W. Himalaya southwards, ascending to 6,000 ft., extends to Ceyloft, Burma, Afghanistan, tropical and S. Africa, Madagascar.

Economic uses : In Bihar and Orissa this grass is considered to be a valuable fodder, and Hole, writing of the Siwalik Division, calls it one of the most valuable fodder grasses. In Mount Abu, according to Lisboa, it is reckoned as a good fodder grass and the grain is used as food by the natives. But the same writer, under the name of *Andropogon semdatus* Trin. (= *Chrysopogon montanus* var. *Trinii*) remarks : " Said to be good fodder, used much in Poona but reports from other places unfavourable." (J. C. Lisboa, List of Bombay Grasses. Bombay (1896), 81.)

The last statement might find an explanation by a suggestive note made by Hole (l. c. III) : " So far as the local (Dehra Dun) plant is concerned specimens with the more hairy glume II tend to occur in localities where there is a scarcity of available moisture, both on the dry ridges and slopes of the Siwalik Hills and also (rarely) on waterlogged soil, and the writer believes that the characters which have been utilized to define these varieties vary in response to the factors of the habitat and particularly in response to the available water supply. Provided that the development of the plants has not been interfered with by grazing, grass-cutting, or other agency, those plants with the more hairy glume II are usually less robust and less coarse or rank, than the others, and they are therefore as a rule most valued for fodder and are distinguished locally by the vernacular name of dhaula, whereas the coarser plants with smooth glume are called gurla. As this grass affords a valuable fodder and is sometimes cultivated, in consequence, it is important to determine the extent to which its characteristics are constant. If, as suggested above, they depend on the available moisture, it is obvious that cultivation of this grass on good agricultural land, with a large quantity of available moisture, would result in producing an inferior class of rank, coarse fodder."

Explanation of Plate 42 : *Chrysopogon montanus* Trin.

- |  |   |                   |
|--|---|-------------------|
| 1. Pedicelled and sessile spikelets.     | } | Sessile spikelet. |
| 2. Lower invol. glume.                   |   |                   |
| 3. Upper invol. glume.                   |   |                   |
| 4. Lower floral glume.                   |   |                   |
| 5. Upper floral glume.                   |   |                   |
| 6. Stamens, ovary, styles and lodicules. |   |                   |

#### 7. CHRYSOPOGON POLYPHYLLUS Blatter & McCann.

##### PLATE 43.

*Chrysopogon folyphyUus* Blatter & McCann in Joiirn. Bomb. Nat. Hist. Soc. 32 (1928) 41b

*Andropogon potyphytyus* Hack, ex Hook. f. Fl. Brit. Ind. VII (1896) 194.

A\* *Aucheri* var. *polyphyllus* Hack, in Herb. Duthie (ex Hook. f. 1. c.)

Etymology : *Polyphyllus* means many-leaved.



Sessile spikelet



CHBY60F0G0N iM!,V!>1,YU,rs BLATTKB & W i ANN

Delin: R. K. Bhide.



Sessile spikelet

CHRYSOFOGON ADOHERI STAFF.

Delin: U. S. Bhid\*.

**Description** : Stem 60-90 cm. high, as thick as a crow-quill or more, stiff, simple or fastigiate branched, quite glabrous. Leaves crowded or not, 15-25 cm. by 2-4 mm., narrow, rigid, acuminate, flat, pale glaucous-green, glabrous on both surfaces, coriaceous, midrib and nerves very slender, margins minutely scaberulous; sheaths terete, appressed, hard.

Panicle 10-13 cm. long, oblong, subsecund, dense-flowered, very pale; branches 6-12 mm., very unequal, in many closely approximate whorls, smooth, peduncle slender, quite glabrous. Sessile spikelets 4 mm. long, drooping, white or pale purplish, callus long, 1 mm. long, obtuse, bearded at the very base only with long fulvous hairs. Glumes as in *C. montanus*. Lower involucral glume obtuse, glabrous, keel ciliate towards the tip; upper not awned, keel glabrous or ciliate. Upper floral glume with an awn 3-8 mm. long, nearly straight, pale. Pedicelled spikelets narrowly lanceolate, acuminate, glabrous, 7-nerved, ciliate, not awned, rather longer than the sessile; pedicels naked, villous at the tip only.

Can easily be distinguished from *C. montanus* by the stout naked callus which is bearded at the base only, and by the naked pedicels which are long villous only at the tip.

**Locality** : *Kathiawar*: Porbandar (Bhide!).

*Gujarat*: Dohad (Bhide!); Watrak Kiver on rocks (Sedgwick 1165!); Daman (Bhide).

*Deccan*: Dhond, river-bank (Bhide!).

**Distribution** : Central Provinces, W. Peninsula.

**Explanation of Plate 43** : *Chrysopogon polyphyllus* Blatter & McCann.

- |                                      |                     |
|--------------------------------------|---------------------|
| 1. Pedicel.                          |                     |
| 2. Pedicelled and sessile spikelets. |                     |
| 3. Lower invol. glume.               | "\                  |
| 4. Upper invol. glume                | /                   |
| 5. Lower floral glume.               | } Sessile spikelet. |
| 6. Upper floral glume.               | J                   |

#### 8. CHRYSOPOGON AUCHERI Stapf.

##### PLATE 44.

*Chrysopogon Aucheri* Stapf in Kew Bull. (1907) 211.

*Andropogon Aucheri* Boiss. Diag. ser. 1, fasc. 5 (1844) 77; Hook. f. Fl. Brit. Ind. VII (1896) 195; Cooke Fl. Bomb. II (1908) 986.

*A. Aucheri* var. *genutiuc* Hack. Monogr. Androp. (1889) 560.

*Chrysopogon ciliolatus* var. *Aucheri* Boiss. Fl. Or. V (1881) 458.

**Etymology** : *Aucheri*, after Aucher Eloy a French Botanist who explored the Orient from 1830 onwards.

**Description** : Densely tufted; stems 15-45 cm. long, simple or sparingly branched, base thickened; nodes glabrous. Leaves 5-10 cm. by 2.5-4 mm., linear, acute or acuminate, more or less pubescent, sometimes undulate, pale green, often ciliate near the base with bulbous-based hairs; sheaths usually glabrous, very pale, with a few hairs at the mouth; ligule a hairy ridge.

Panicle 5-7\*5 cm. long; branches in whorls of 4-6, spreading, then suberect; racemes usually crowded, rarely 2-nate on a branch. Sessile spikelets 6 mm. long; callus 1\*5 mm. long, villous all over with long silky hairs; lower involucral glume 5 mm. long, linear, with 2 short acicular teeth at the apex, minutely ciliate on the margins, obscurely 5-nerved, chartaceous; upper involucral glume as long as the lower, oblong, obtuse, 1-nerved, dbaitaceous, with hyaline margins, the keel ciliate above the middle with long silky hairs, and with a slender awn 8 mm. long, the awn ciliate below the middle with long hairs; lower floral glume linear, obtuse, hyaline; upper floral glume represented by the dilated base of the awn; awn 2-2 cm. long, base hyaline, dilated. Pedicellate spikelets slightly longer than the sessile, linear-lanceolate, acute; pedicels cuneate, silky-villous from base to apex, less than half as long as the sessile spikelets; lower involucral glume lanceolate, acute, 6 mm. long, 7-nerved; upper involucral glume lanceolate, acuminate, 3-nerved; lower floral glume shorter, hyaline, obWg, acute; upper floral glume lanceolate, acute, 1-nerved, hyaline. Anthers 3 mm. long.

Stapf thinks that *G. Aucheri* comprises several geographical races and that the one from which the species was first described extends from Arabia through Southern Persia and Baluchistan to Sind. He characterises it by the lower glume of the pedicelled spikelet being usually awnless or in any case much more shortly awned than the upper, by the glume awns not being ciliate or ciliate only at the base, and by the longer beards of the pedicels.

**Locality** : *Sind*: Gizri (Sabnis B777!); Jemadar ka Landa, near Karachi (Stocks).

**Distribution** : Sind Baluchistan, Afghanistan, S. Persia, Arabia (not Africa).

**Explanation of Plate 44** : *Chrysopogon Aucheri* Stapf,

- |   |   |                   |
|---|---|-------------------|
| 1. Pedicelled and sessile spikelets.      | } | Sessile spikelet. |
| 2. Lower invol. glume.                    |   |                   |
| 3. Upper invol. glume.                    |   |                   |
| 4. Lower floral glume.                    |   |                   |
| 5. Upper floral glume.                    |   |                   |
| 6. Stamens, ovary, styles, and lodicules. |   |                   |

## 30. ABTHRAXON Beauv.

Annual or perennial slender grasses; stems decumbent, creeping and branching below. Leaves short, broad, cordate at the base; sheaths shorter than the internodes.

Eacemes 2-nate, digitate or fasciculate; rhachis very slender, articulate, fragile. Spikelets 1-flowered, secund, sessile, solitary or with an imperfect pedicellate spikelet, laterally compressed, deciduous at the internodes; callus bearded. Glumes 4; lower involucre glume lanceolate or linear-lanceolate, acute, thin or subcoriaceous, more or less muriculate or aculeate, margins hardly incurved; upper involucre glume narrower, lanceolate, acuminate, chartaceous, keeled; lower floral glume hyaline, paleate, empty; upper floral glume hyaline, awned or mucronate, bisexual; palea minute or 0. Lodicles 2, cuneate or quadrate. Stamens 1-3. Styles short; stigmas laterally exerted. Grain linear or narrowly fusiform.

Species about 20, in the tropical and subtropical regions of the Old World.

The species of this genus are purely monsoon grasses, vegetating during the rains and putting forth a profusion of flowers in late September, usually towards the end, or early October.

We are of opinion that the species of this genus are in need of revision. A study of the juvenile forms will throw much light on the subject as there appears to be a considerable amount of variation between the young and mature states.

We retain the 6 species mentioned by Cooke l. c. His *A. lanceolatus* Hochst. will be slightly restricted under the name of *A. serrulatus* Hochst., and the name *A. lancifolius* Hochst. will be substituted for *A. microphyllus* Hochst. and *A. quartinianus* Nash will take the place of *A. ciliaris* Beauv.

- |  |                             |
|--|-----------------------------|
| I. Awn of spikelets less than 2-5 cm. long; joints of rhachis of racemes rectangularly truncate.                                 |                             |
| A. Stamens 3; anthers nearly as long as the upper floral glume.  |                             |
| 1. Spikelets all sessile (not pedicellate) . . . . .   | 1. <i>A. inermis</i> .      |
| 2. Spikelets sessile and pedicellate.  |                             |
| a. Tall, reaching 90 cm. high; joints of rhachis sparsely hairy; lower involucre glume acuminate . . . . .                       | 2. <i>A. serrulatus</i> .   |
| b. A weak grass reaching 30 cm. high; joints of rhachis densely clothed with silvery hairs; lower involucre glume 2-fid. . . . . | 3. <i>A. Meeboldii</i> .    |
| B. Stamens 2 or 3; anthers not half the length of the upper floral glume.  |                             |
| 1. Lower involucre glume 2-fid . . . . .   | 4. <i>A. lancifolius</i> .  |
| 2. Lower involucre glume entire . . . . .  | 5. <i>A. quartinianus</i> . |
| II. Awn of spikelets 15 cm. or more long; joints of rhachis of racemes obliquely truncate. . . . .                               | 6. <i>A. jubatus</i> .      |

## 1. ABTHBAXON INERMIS Hook. f.

## PLATE 45.

*Arthraxon inermis* Hook. f. EL Brit. Ind. VII (1896) 145; Lisboa Bomb. Grasses (1896) 60; Cooke EL Bomb. II (1908) 968.

**Vernacular name:** Vanguaxia.

**Etymology** : *Inermis* means unarmed.

**Description** : Stems very slender, much geniculately branched, glabrous; nodes pubescent. Leaves 2-5-3-8 by 1-1-6 cm., ovate, broadly amplexicaul, caudate-acuminate with setaceous tips, glabrous or sparsely hairy on both sides, ciliate near the base.

Spikes often 3, short, green; peduncle slender, naked. Spikelets oblong-lanceolate, all sessile (none pedicellate), rather distant. Glumes 3 or 4; lower involucre glume dorsally con-





Sessile spikelet

ARTHRAOXON INRHIBIS HOOK. F.

IWin :: K.



Sessile spikelet  
*ATHIUXON SERRCLATUS* HOCHST.

vex, obtuse, oblong-lanceolate, strongly 7-9-nerved, the margins not incurved and as well as the nerves scabrid; upper involucre glume as long as the lower, obovate-oblong (when spread out), obtuse, emarginate, apiculate, 3-nerved, hardly keeled, nearly smooth; lower floral glume 0 (or palea of upper floral glume) shorter than the upper involucre glume, lanceolate; **awn** basal, twice as long as the spikelets. Anthers very large.

**Locality** : *Konkan*: Okda Forest, Thana Dist. (Ryan 718!); Wada Range, Thana Dist. (Ryan 692!).

*W. Ghats*: Matheran (Woodrow!); Khandala (McCann 9950!, 9740!); Marmagao (McCann!); Mahableshwar (Sedgwick & Bell 4513 !, Woodrow); Panchgani (Lisboa); Castle Rock (Gammie 15678!).

*Deccan*: Purandhar (McCann 5592 !).

*S. M. Country*; Derikop, woods (Sedgwick 1845!).

*N. Kanara* (Sedgwick).

**Ecology** : A subgregarious plant. In the Kanara forests above Ghats common.

**Distribution** : W. Peninsula, apparently endemic.

**Explanation of Plate 45** : *Arthraxon inermiss* Hook, f.

1. Spikelets.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Upper floral glume.
6. Stamens, ovary and styles.

## 2. ABTHRAXON SERRULATUS Hochst.

### PLATE 40.

*Arthraxon serrulatus* Hochst. in Flora (1856) 188; Stapf in FL Trop. Afr. IX (1917) 163.

*A. lanceolatus* Hack. Monogr. Androp. (1889) 348 (*excl. var. eehinatus*); Duthie Grasses N. W. Ind. (1883) 17; Hook. f. 71. Brit. Ind. VII (1896) 143 (*partim, excl. Batrathierum echinatum* Nees in Edinb. Phil. Journ. XVIII (1835) 181).

*Andropogon eehinatus* Heyne ex Steud. Nomencl. ed. 2 (1840) 91.

*Arihraxon eehinatus* Hochst. in Flora (1856) 188.

*Andropogon lanceolatus* Roxb. Fl. Ind. I (1832) 257; Cooke Fl. Bomb. II (1908) 968 (*partim*).

*A. lanceolatus, var. genuinus, subvar. serrulatus* Schweinf. in Bull. Herb. Boiss., 2 ser. II, 10.

*A. serrulatus* Link Hort. Berol. I (1809) 241 (*quoad specimen, descriptio partim erronea?*); A. Bich. Tent. Fl. Abyss. II (1851) 458.

*A. prionodes* Steud. Syn. Pl. Glum. I (1855) 383.

*Batrathierum lanceolatum* Nees in Edinb. New Phil. Journ. XVIII (1835) 181.

*B. serrulatum* Hochst. ex Steud. **1. c.**

**Vernacular names** : Harjala, Govinder.

**Description** : A perennial grass; rhizome short, emitting fascicles of closely set culms and innovation-shoots, which are more or less thickened below and covered with reddish silky cataphylls. Stems rather slender, up to 90 cm. high, many-noded, usually finely pubescent, sometimes glabrous, with vegetative branches below and usually solitary flowering branches above, the latter subfastigiata. Leaf-blades lanceolate to ovate-lanceolate, setaceously acuminate, with a caudate amplexicaul base, glaucous or greenish 2\*5-3 cm. long 12-18 mm, wide, margins cartilaginous, ciliate with the cilia springing from tubercles, smooth, very finely pubescent below or glabrous, primary lateral nerves about 8-11 on each side, fine, slightly raised below; ligule 1-2 mm. long, rounded, membranous; sheaths terete, tight, slightly shorter than the internodes or exceeding them in the leafy shoots, more or less hairy with tubercle-based hairs and often softly pubescent at the nodes, the uppermost frequently glabrous.

Racemes 2-5-nate, slender, greenish or suffused with purple or violet, 3 to over 5 cm. long on a short common axis, the fascicles borne on a slender peduncle, shortly or far exerted from the supporting bladeless or almost bladeless sheath; rachis fragile, shortly bearded at the nodes; joints narrowly linear, 3-3-6-3 mm. long, hairy on the back and sides, or the lowest almost glabrous, hairs increasing upwards to more than 2 mm.; pedicels very similar, but much shorter and more slender. Sessile spikelets narrowly lanceolate-linear to linear, slightly tapering upwards, up to 7-4 mm. long (not including the awn), glabrous; callus very short, puberulous. Glumes 4. Lower involucre glume chartaceous, 6 mm. long, lanceolate., with a minutely truncate hyaline tip, very convex on the back, which is smooth or more often muricate along the 4 indistinct or faintly raised inner, spinulose muricate along the outer nerves, margin hyaline,

comparatively wide; upper linear-lanceolate in profile, membranous, 3-nerved, glabrous or nearly so. Lower floral glume linear, acute, up to 4 mm. long, hyaline, nerveless or obscurely 1-nerved at the base; upper membranous at the base, hyaline upwards, narrowly lanceolate-linear in profile, 2-dentate, with the teeth minute, sometimes produced into short capillary bristles, delicately 3-nerved, awned from near the base, awn 8-15 mm. long, very fine, knee about the middle, twisted below. Anthers up to 3 mm. long. Grain bacilliform, about 4-2 mm. long. Pedicelled spikelet male, linear-lanceolate, acute, about 5 mm. long. Involucral glumes subequal, lower herbaceous-chartaceous, acute, scaberulous along the outer and slightly so on the 4-5 inner nerves or almost smooth, upper slightly shorter, membranous, otherwise as in the sessile spikelet. Lower floral glume as in the sessile spikelet, upper linear-oblong, obtuse, nerveless, mucicous.

This species includes all the material of the Nileland or tropical Africa, of tropical Arabia and the greater part of the Indian specimens which, up to now, were ranged under *Arthraxon lanceolatus* Hochst. as understood by most authors.

It has been pointed out by Stapf that *Arthraxon lanceolatus* Hochst., was founded on *Andropogon lanceolatus* Boxb., a Goromandel plant, which has larger and wider long-awned spikelets, with the lower involucral glume very minutely muricate towards the tips only. Neither of these names can, consequently, be mentioned as synonyms of *Arthraxon serrulatus*.

**Locality** : *Sind* (Stocks 642).

*Kathiawar*: Morvi (Woodrow).

*W. Ghats*: Lonavla (Woodrow); Panchgani (Blatter & Hallberg B1277 !); Kamalgad Fort (Fernandez 1767!).

*Deccan*: Pashan, tank (Gammie 1).

*S. M. Country*: S. W. of Dharwar (Sedgwick & Bell 4436!) ; Derikop (Sedgwick 2022!); Belgaum, Fort wall (Sedgwick 3013!).

**Ecology** : Subgregarious. Very common on banks in the Mallad tract of the Carnatic.

**Distribution** : More or less throughout India, tropical Arabia and tropical Africa (Nileland).

**Explanation of Plate 46** : *Arthraxon serrulatus* Hochst.

1. Ligule.
2. Spikelets.
3. Upper invol. glume.
4. Lower invol. glume.
5. Stamens, ovary, styles and lodicules.\*
6. Upper floral glume.

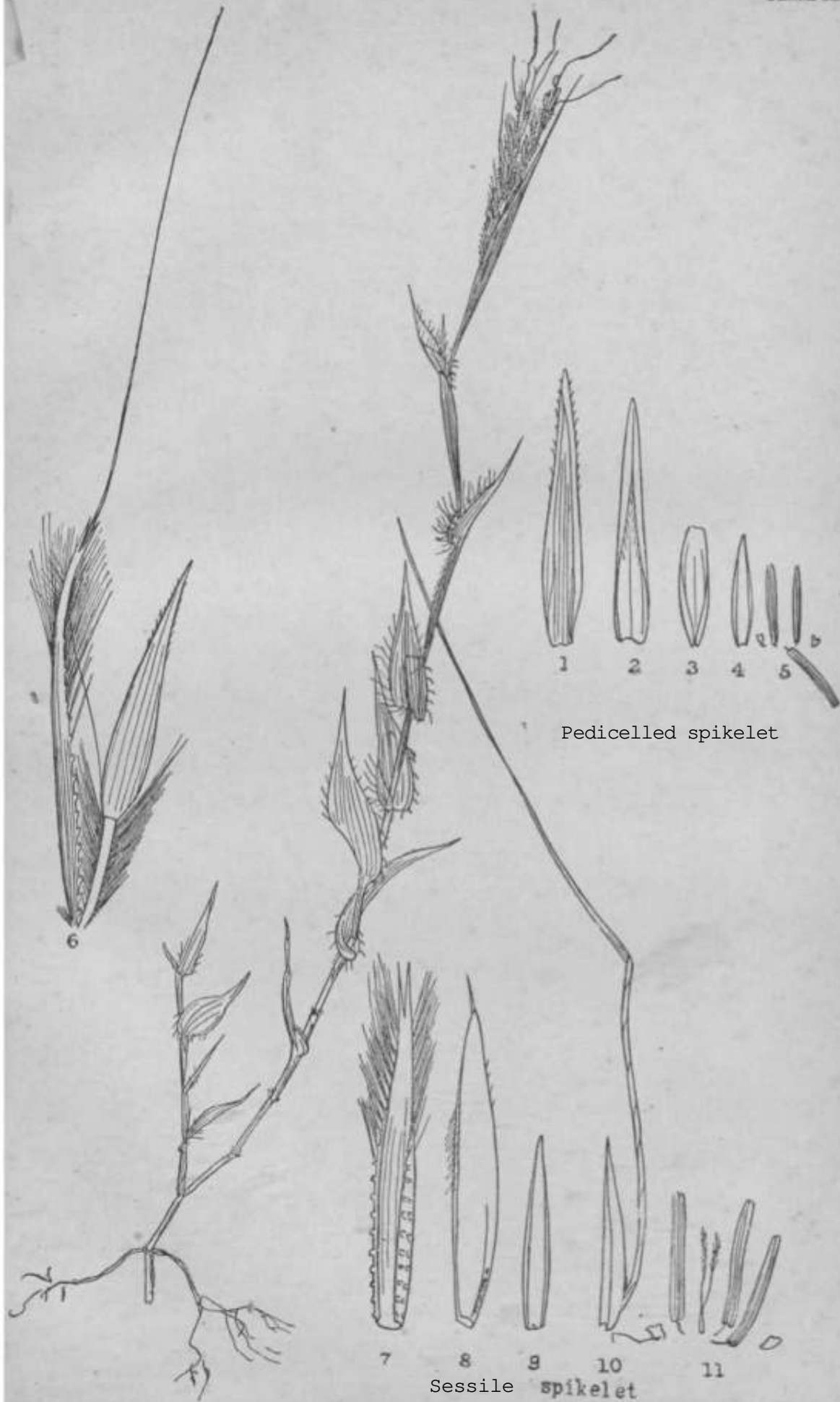
### 3. ARTHRAXON MEEBOLDII Stapf.

#### PLATE 47.

*Arthraxon Meeboldii* Stapf in Eew Bull. (1908) 449 ; Cooke Fl. Bomb. II (1908) 969.

**Description** : Annual; stems 2-3 from the base, shortly prostrate, ascending, 15-30 cm. long, slender, terete, quite glabrous, often tinged with purple; nodes pubescent. Leaves 2-5 by 0.6-2 cm., ovate lanceolate, finely acuminate, very sparsely hairy with slender bulbous-based hairs, green above, glaucous beneath, ciliate on the margins with bulbous-based hairs, base cordate, amplexicaul; sheaths of the lower leaves loose, the others close or the upper more or less tumid, at first enclosing the panicles, glabrous or with a few scattered hairs and more or less ciliate margins; ligule about 1-2.5 mm. long, quadrate, hyaline, shortly ciliate at the apex.

Inflorescence of paniculate racemes at the apex of the stems; branches 2-4, reaching 5 cm. long ; joints of the rachis about 4 mm. long, densely clothed with long silvery hairs ; pedicels 3 mm. long, broad. Sessile spikelets 6-10 mm. long, narrowly linear-lanceolate; callus minute, bearded. Glumes 4; lower involucral glume when young sometimes silky all over with a deciduous tomentum, linear-lanceolate, chartaceous, with a purplish 2-fid acumen with very narrow teeth and with incurved margins, keels serrately muricate from the base up to 1/2 of their length, the murications passing into tubercles which in the upper third of the glume, are ciliate with fine erect silky hairs; upper involucral glume oblong-lanceolate, setosely acuminate, membranous, equalling the lower one, 3-nerved, with hyaline margins ; lower floral glume empty elliptic-oblong, subobtuse, 4 mm. long, nerveless; upper floral glume linear-lanceolate, acute, rather more than 4 mm. long, hyaline, aristate from near the base, the awn 1-3 cm. long or more. Pedicellate spikelets closely appressed to the sessile ones, lanceolate, acute, chartaceous, shorter than the sessile spikelets; lower involucral glume with rigidly ciliate keels, otherwise glabrous, 9-nerved; upper involucral glume lanceolate, acute, 3-nerved; lower floral glume empty, ovate-oblong, hyaline, 4 mm. long; upper floral glume ovate, 2-dentate, ec) uniting the lower, mucroulate between the teeth, hyaline, male. Anthers 3 mm. long, bright yellow.



ANTHRAXOX MEKUOLDH STAPP.

Delin: B. K. Bhide.



Sessile spikelet

ABTHRAXON LANCTFOMUS HOCHST

*Delin: B. K. Bide.*

The development, of the spike let from it <sup>^</sup>first appear<sup>&</sup>noe within the Bjnthc to the mat<sup>ure</sup> condition shows a great amount of variatiou. The glume\* arts at first flat. Then as develop- ment progresses the margins of the lower involncral plume become in flexed. At first the entire <sup>^</sup>pikt'ti't is silky (silvery liniry), including the marffius of the glumcs, but with maturity the silky condition b lost. At this stage the murieattons ore not properly developed and appear as ehort tubercles surmounted by thin translucent hairs, sometimes as many as 3 or 4, but in the mature atato the unification is terminated by a single translucent hair. The condition of the tip of the hair too is very variable, not always j>^iu« 2-toothed as deacribtid.

Locality : W. Ghats: Khandala, common (McCann 99481. 9949!), in open (Trass-land on hillside, 2,000 ft. (BfeeboU 9132); Lonavia, common (Bhide !, McCannt) ; Panchgani (Blatfo & Hallberp BI226 ! 12381), Tableland (Blatter 38W !); Muhableswar (Scdgwick & Bell 4623 1).  
A\*. Kanara : Tinai (Tnlbot 2569!).

Distribution : W. Fenissala, apparently endemic.

Explanation of Plate 47 : *Arthraxm Meeboldii* Stapf

- |  |   |                        |
|--|---|------------------------|
| 1. Lower invol. glume.                   | } | Y Pedicelled spikelet, |
| 2. Upper invol. glume.                   |   |                        |
| 3. Lower floral glume.                   |   |                        |
| 4. Upper floral glume.                   | } | y Sessile spikelet.    |
| 5. Stamens and lodicules.                |   |                        |
| 6. IVilicelleti and sessile spikelets.   |   |                        |
| 7. Lower invol. glume.                   |   |                        |
| 8. Upper Envoi, 'Jume.                   | } | y Sessile spikelet.    |
| 9. Lower floral glume.                   |   |                        |
| 10. Upper floral glume.                  |   |                        |
| 11. Stamens, ovary, styles and lodicuks. |   |                        |

\*. AJWHBAXOK LIKCIFOUUS Hoochst.

#### PLATE 48.

- Atiliraxm lavcifoUvs* Hochat. in **PIOTB** 1856) 18 S; Stapf in *Tl*, Trop. Afr. IX (1917) 1C3.  
*A. micropkythts* Hoochst in Hora (1 s,jt) 18S ; *Rack*. JloEopr. Androp. (1839) 351, *ind. var.* *laixij'*!.....;HOk. t Bl Jirit, Ind. VII (1890) 147 ; Oooke *¥l*. Bomb. II (1908J 870 ; Hainea Bot. Bib. and Or. (1934) 1020.  
*A. Schtwdllii* Hoclisl. in Flora (1800) 189.  
*A. Vtiivr* Hoekst. 1. t. 1SS (*parthn*).  
*A. Sdimperi* Hochst. !. c. (*ptrim*).  
*A. moSe* Balf. f. Bot. Socotra (1888) 315.  
*A. ciltana* Henziq, in Bolet. Soe. Brot XIII, 133 (*non* Beauv.).  
*Awlropogon laicifoliuus* Trin. in Mem. Aead. Petersb., 6 aer., II (1833) 271.  
*A. molle* Duthie Grasses N. W. Ind. (1883) 17.  
*A. mdtiravlu* Steud. 8yn. PL Glum, 1 (1855) :t83.  
*Batraihcmm molk* Nees & Am. in Ediob. SOT PbiL Journ. XVIII (1835) 181; Ajtchis. Cat. Punj. PI 171.  
*B. Schimperi* Nees ex Hochst. 1.1. 170.  
*Psilopinfn Sehitrperi* Hoochst. *esc* A. Eich. Tent. Fl. Abyss. II (1851) 417.  
*PkntropilUw clliata* J. Schmidt Beifr. Fl. Cap. Veru. (1862) 152.  
*P. S/Mmperi* Reget ill Bull. Acad. Petersb. X (18GC) 869.  
*Lycaea ciliata* Steud. 1. o. 414.

Vernacular name ; Furadyaduie gai st.

Efymology : *Lancifidius* indii. <sup>ates that th-</sup> lwivta are lance-shaped.

Description : Annual; stem and branches filiform, 16-30 cm. long, straggling, glabrous or more or less obscurely pubescent below the spikea. Leaves 2-3-2 ran. by 4-JJ mm., ovate or elliptic, acuminate, membranous, very sparingly hnrv or nearly glabrous, base slightly auricled, marpim nuked or sparsely dliatt ospt^hilly towards the base; sheatba short, glabroua ; ligule fmall, hyaline.

Piinicle of 3-B aleuder branches; rhnchis ettpilkry; internodee shorter than the Blonde\* Bpikelctfl, OBUBHJ' eiHate with long erqct hairs (rarely glabrous). Spikclets solitary (rarely with a pedicellate one), • mm. long, oanowly laif •olate; callus nearly glabrous. Glumc < 4 • IUW.-T iin" hri.-,1 j.l.'i!"- 'lijl 1> membrsuons, lancei •late, 2-cuspidate, 5-7 • • • .l' dnhovot^s middle tlii; nerves naosSy soabiid ; upi«r invoiiv zal glumoo u long us tic lower, narrowly knceoUtel narrowbg out into-i very aim-like [.....•• •>^i-y% mm. long; lower florat glume much

shorter than the upper involucre glume, lanceolate, acuminate, epaleate; upper floral glume 1-25 mm. long, ovate-lanceolate, subacute, hyaline, with, an awn about 1 cm. long from near the base, the column of the awn brown, much shorter than the usually purplish capillary subulate portion.

Locality : *Gujarat*: Surat (Herb. Dehra Dun!, Cooke!).

*Konkan*: Tungar Hill, Thana Dist. (Herb. Econ. Bot. Poona!); Parel (Herb. Econ. Bot. Poona!); Eurla (Garade!); Salsette (Jacquemont 713).

*W. Ghats*: Castle Eock (Bhide!).

*Deccan*: Trimbak, Nasik Dist. (Herb. St. X. C. Bombay!).

*S. M. Country*: Belgaum, Fort walls (Sedgwick 3012!); W. of Dharwar, banks of road, in forest (Sedgwick 1851!).

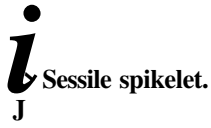
*N. Kanara*: Karwar (Talbot 1308!); Yellapur (Talbot 2084!).

Ecology : A plant growing sporadically. A zerophyte, often on walls.

Distribution : More or less throughout India, Ceylon to Tonkin and S. W. China', tropical Africa (Upper Guinea, Nileland).

Economic uses : Good fodder for cattle.

Explanation of Plate 48 : *Arihraxon hmcifolius* Hochst.

1. Spikelets.
  2. Lower invol. glume.
  3. Upper invol. glume.
  4. Lower floral glume.
  5. Upper floral glume.
  6. Stamens, ovary and styles. *J*
- 

#### 5. ABTHBAXON QUARTINIANUS Nash.

#### PLATE 49.

*Arihraxon quartinianus* Nash in North Americ. Fl. XVII (1912) 99 ; Merrill in Philipp. Journ.

Sc. Bot. VII (1912) 229; Stapf in Fl. Trop. Afr. IX (1917) 166.

*A. major* Hochst. in Flora (1856) 188,

*A. coloratus* Hochst. 1. c.

*A. plumbeus* Hochst. 1. c. 189.

*A. violaceus* Hochst. 1. c.

*A. Schimperii* Hochst. 1. c. (*partim*).

*A. ciliaris* Rendle in Cat. Afr. Pl. Welw. II, 138, (*non* Beauv.).

*A. ciliaris*, subsp. *quartinianus* Hack. Monogr. Androp. (1889) 356 (*exd. vars. Hookeri a glabrescens*).

*Alectoridia quartiniana* A. Rich. Tent. Fl. Abyss. II (1851) 448, t. 99.

*Lucaea major* Steud. Syn. Pl. Glum. I (1854) 414; Hochst. 1. c. 179.

*L. plumbea et violacea* Steud. 1. c.

*L. Schimperii* Hochst. in Flora (1856) 180 (the genuine).

*Pleuroplitis plumbea* Nees *ex* Steud. 1. c.

*P. violacea* Nees *ex* Steud. 1. c.

*P. major* Regel in Bull. Acad. Petersb. (1866) 369 (*partim*).

*P. quartiniana* Regel 1. c. 376 (*partim*).

*Andropogon violaceus* Heyne *ex* Steud. I.e.

*A. Alectoridia* Steud. 1. c. 983.

We wish to substitute *A. quartinianus* Nash in place of *A. ciliaris* Beauv. This latter species which was described in 1812 has been emended repeatedly since then, and that to such an extent that it is scarcely possible to recognise the original plant. Hackel made 5 subspecies: *Langsdorffii*, *submuticus*, *nudus*, *Quartinianus*, and *Vriesii*, and 9 varieties. The subspecies were arranged by him in two leading groups:

1. Joints of rhachis glabrous, or with a few scattered hairs towards the tip (*Langsdorffii*, *submuticus*, *nudus*).

2. Joints of rhachis, at least the upper, more or less ciliate (*Quartinianus*, *Vriesii*). To these two groups Hooker f. added a third one (F. B. I. VII, 146):

3. Spikes silkily villous, spikelets 5-7 mm. long, lower involucre glume entire or minutely 2-toothed, awn 12 mm. or more. (This is *Arthraxon cuspidatus* Hochst., considered by Hackel 08 a distinct species).

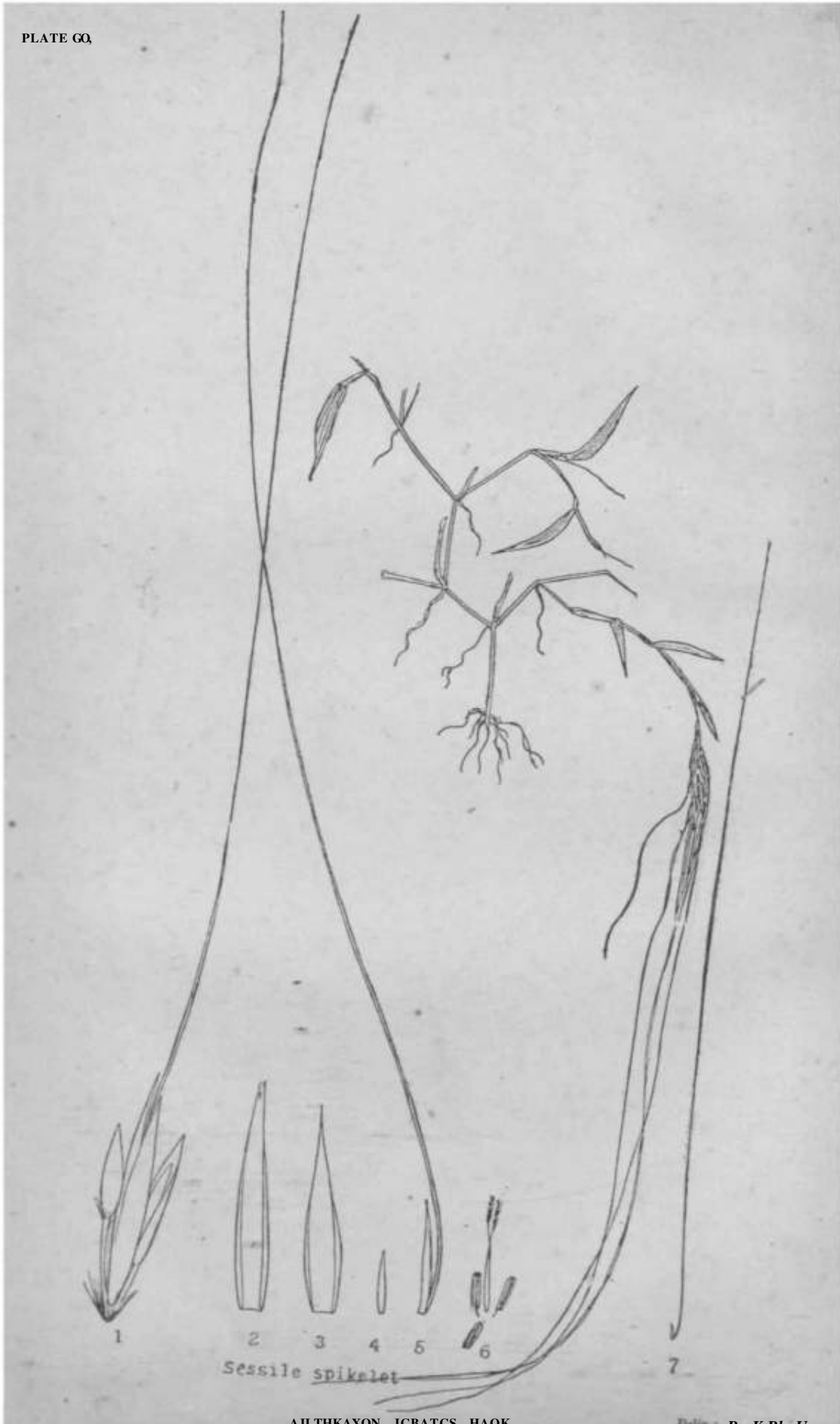
*Arihraxon quartinianus* Nash, and adopted by Stapf 1. c, covers part of the subspecies *Quartinianus* in Hackel's group 2, including var. *Quartinianus* s. str. and var. *coloratus* but excluding var. *Hookeri* and var. *glabrescens*. *Quartin*'s specimen no. 14, collected in Abyssinia





ARTHRAOXON QUARTINIANDS NABH.

Delin: R. K. Bhide.



Sessile spikelet

and representing a form with large spikelets, has, according to Stapf, to be considered as the basis of the species, whilst Schimper's 1532, the type of *Arthraxon coloratus*, stands for the other extreme.

*Arthraxon quartinianus* Nash includes all the material of the Bombay Presidency that has come under our observation.

The rest of *A. ciliaris* Beauv. *et auctorum* has to be studied separately, but as the material lies outside the Presidency we leave it to other botanists to work out their respective material.

**Etymology** : *Quartinianus* after the French botanist Quartin.

**Description** : Annual. Stems very slender, ascending from a branched, sometimes prostrate and rooting base, from 8-30 cm. high, smooth, glabrous or finely puberulous below the inflorescence, with solitary or 2- to 3-nate branches above, internodes mostly exerted. Leaf-blades ovate-lanceolate to oblong-lanceolate from a cordate amplexicaul base, finely acuminate, 25 to over 50 mm. long by 5-20 mm. broad, flaccid, with scattered tubercle-based hairs on both sides, ciliate towards the base, primary lateral nerves 3-4 on each side, very fine; ligules membranous, ciliolate, short, truncate; sheaths lax, the upper very often more or less inflated and beakless, more or less hirsute in the upper part with tubercle-based hairs and densely ciliate along the upper margins, nodes shortly bearded.

Racemes 1 to about 9, in fascicles, born on filiform, ultimately long exerted peduncles, 2-5-15 cm. long, very slender, flexuous; rachis fragile; joints 3-3 mm. long, usually shortly ciliate, but the uppermost cilia sometimes up to 1-6 mm. long, sometimes glabrous or nearly so; pedicels reduced to a minute point or subule. Spikelets solitary, sessile, oblong lanceolate in profile, somewhat oblique, laterally compressed, including the very minute glabrous or minutely puberulous callus, 3-3-4-2 mm. long. Involucral glumes subequal, lower subchartaceous, acute, scaberulous along the very slender 7-9 nerves or almost smooth towards the base, upper obliquely lanceolate to linear-lanceolate in profile, acute or minutely mucronate, 3- (rarely 5-) nerved, eciliate. Lower floral glume oblong, obtuse, hyaline, obscurely 2-nerved, shorter by \ than the involucral glumes, upper narrowly linear-lanceolate in profile, 2-2-7 mm. long, awn from near the base, usually 6-3 mm. long, more rarely down to 4-2 or up to 8-5 mm. long, very delicate, knotted and twisted below the middle. Stamens 2.

**Locality** : *Gujarat*: Chamargaon (Woodrow).

*Karnatak*: common (McCann!).

*Konkan*: very common (McCann 1).

*W. Ghats* : Mahabaleshwar (Sedgwick & Bell 4501!); Panchgani (Blatter & Hallberg B1244! B1252! B1257! B1266! B1273! B12901); Ehandala, very common (McCann!).

*S. M. Country*: S. W. of Dharwar (Sedgwick & Bell 4434!); Dharwar (Sedgwick 3098!); Gadag (Talbot 2304!); Belgaum (Ritchie 796A).

*N. Kanara*: Halyal (Talbot 2161!); Yellapur (Talbot 1057!).

**Ecology** : A subgregarious species. Very abundant in the Mallad tract of the Carnatic. A xerophyte, often on walls. A very common species on the Ghats, on rocks, banks and walls. Very variable in size. Flowers in September.

**Distribution** : From Bihar southwards to Ceylon, tropical Africa (Nileland, Upper and Lower Guinea, Mozambique Dist.), introduced into Jamaica and Guadeloupe.

**Explanation Of Plate 49** : *Arthraxon quartinianus* Nash.

- |                                      |   |                   |
|--------------------------------------|---|-------------------|
| 1. Fedicelled and sessile spikelets. | } | Sessile spikelet. |
| 2. Lower invol. glume.               |   |                   |
| 3. Upper invol. glume.               |   |                   |
| 4. Lower floral glume.               |   |                   |
| 5. Upper floral glume.               |   |                   |
| 6. Stamens, ovary and styles.        |   |                   |

#### 6. ABTHAXON JUBATUS Hack.

#### PLATE 60.

*Arthraxon jubatus* Hack. Monogr. Androp. (1889) 358; Hook f. Fl. Brit. Ind. VII, 147; Cooke FL Bomb. II (1908) 970.

**Etymology** : *Jubatus* means having a mane or crest.

**Description** : Annual; stems decumbent, then ascending, 10-30 cm. long, very slender, terete, quite glabrous, leafy almost to the apex. Leaves 2-2-4-5 cm. by 4-8 mm., lanceolate, acute, flat, thinly membranous, green, undulate, densely pubescent or almost villous on both surfaces, base subcordate, amplexicaul; sheaths lax, pubescent, the upper spathiform, leafless; ligule very short, truncate, hyaline, glabrous. Floral spathes 3-8-5 cm. long, linear-lanceolate, acuminate, green with membranous margins, pubescent or villous, enclosing the spikes.

Racemes 2-nate, on a commoii peduncle, a sessile and a pedicellate one; the pedicel slender, pubescent, fragile; joints \ as long as the spikelets and pedicels of upper spikelet clavate, compressed, pectinately ciliate. Spikelets 2-nate, a sessile and a pedicellate one at each joint, and a terminal male. Sessile spikelets 1 cm. long, linear-lanceolate; callus 1\*25 mm. long, bearded with hairs equalling itself. Glumes 4; lower involucral glume membranous, linear, acute, bimucronulate, 2-nerved, the margins hyaline, inflexed; upper involucral glume rather shorter than the lower, linear-lanceolate, mucronulate, much compressed, 1-nerved, with hyaline margins; lower floral glume 4 mm. long, narrow, linear, subacute, hyaline, nerveless, glabrous; upper floral glume \ as long as the uppei involucral glume, lanceolate, acute, glabrous, with a very long capillary awn reaching 15 cm. (or more) long, attached at the base; palea 0. Anthers 1-25 mm. long. Pedicellate spikelets 5 mm. long, not awned.

**Locality** : *Konkan* (Law, Stocks).

*W. Ghats*: Kori Fort, 12 miles south of Lonavla (Woodrow); Ehandala, dam rocks (Hallberg 9788 !j; Fitzgerald Ghat (McCann 3315! 3316!).

*Deccan*: Lohagad Fort, top (McCann 9789).

**Ecology** : Very common on perpendicular and overhanging rocks about *ty* miles down the Fitzgerald Ghat Road from Mahableshwar. Flowers in the latter part of September. The whole plant is not the common grass-green but is of a coppery tint. It apparently requires plenty of water as it was observed only in wet situations.

**Distribution** : W. Peninsula, apparently endemic.

**Explanation of Plate 50** : *Arthraxon jubatus* Hack.

1. Pedicelled and sessile spikelets.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Upper floral glume.
6. Stamens, ovary and styles.
7. Upper floral glume (natural size).



### 31. CAPILLIPEDIUM Stapf.

Annual or perennial grasses. Stems slender, simple or branched, sometimes very copiously, often bearded at the nodes. Leaf-blade with a rather conspicuous white midrib.

Panicles delicate, when much divided the branchlets at length more or less divergent. Spikelets small, 2-nate, one sessile, the other pedicelled, similar in shape but differing in sex, in 1-2- (rarely up to 8-) jointed racemes at the ends of the capillary primary and secondary and often tertiary or even quaternary branches of a loose panicle; joints and pedicels finely filiform, longitudinally grooved and hyaline in the groove, disarticulating horizontally; sessile and pedicelled spikelets deciduous, the former with the adjacent joint and pedicel. Florets 2 in the sessile spikelet, lower reduced to an empty valve or quite suppressed in the pedicelled spikelets, upper hermaphrodite one, male or neuter, in the pedicelled spikelet. Sessile spikelet dorsally compressed, awned, callus small, shortly bearded. Involucral glumes equal, membranous to subherbaceous; lower 2-keeled, with narrow inflexed margins; upper boat-shaped, 3-nerved, keeled, grooved on both sides along the obtuse keel. Lower floral glume hyaline nerveless, upper consisting of a hyaline, linear stipe, firmer upwards, passing into a slender awn. Palea 0. Lodicules 2, minute, glabrous. Stamens 3. Stigmas exerted laterally, longer than the styles. Grain oblong-ellipsoid or oblong, dorsally slightly compressed; embryo exceeding  $\frac{1}{2}$  of the grain. Pedicelled spikelet awnless, glume, if present, hyaline, nerveless.

Species 6. Tropical and subtropical Asia, Polynesia and Australia, tropical Africa.

Three species, described by: Cooke (II, 981, 982) under *Andropogon assimilis* Steud., *A. Hugelii* Hack., and *A. filiculmis* Hook. f. belong to this genus.

- I. Stems more or less suffrutescent below, stiff, erect.
  1. Nodes of stem glabrous or bearded; callus shortly bearded. . . . . 1. *C. assimile*.
  2. Nodes of stem bearded; callus densely villous . . . . . 2. *C. Hugelii*.
- II. Stems decumbent and interlaced, very weak, filiform . . . . . 3. *C. filiculme*.

### ] . CAPILLIPEDIUM ASSIMILE A. Camus.

#### PLATE 51.

*Capillipedium ammu* A. Camus Graminées in H. Lecomte Fl. GSn&ale de l'Indo-Chin\* 7 (1922) 314; Haines Bot. Bib. and Or. (1924) 1028 (*A. Camus prius fecit combinationem novam*).



1  
Sessile spikelet

CAPILLIPEDUM ASSIMILE A. UAMUS.

Delia: R. K. Bids.



Sessile spikelet

*CAPILLIPEDIUM HUQELII* BLATTER f. *MOOANN*

Delin: B. K. B. Hilde.

*Andropogon assimilis* Steud. in Zoll. Syst. Verz. (1854) 58; Syn. PL Glum. (1855) 397; Hook. f. FL Brit. Ind. VII (1896) 179; Cooke Fl. Bomb. II (1908) 981.  
*A. montanus* Benth. Fl. Hongk. (1861) 423, non Roxb., excl. syn.; Hack. Monogr. Androp. (1889) 490, excl. syn.  
*Chrysopogon pictus* Hance in Ann. Sc. Nat. ser. 5, V (1866) 252.  
*C. glaucopsis* Steud. Syn. PL Glum. I (1854) 397; Duthie Grasses N. W. Ind. (1883) 22.  
*Raphis repens* Nees ex Steud. 1. c.

**Etymology** : *Capillipedium* is derived from *capillus*, hair, and *pedium*, having a foot, or in other words, provided with a capillary foot; perhaps referring to the slender stems or more likely to the branches of the delicate panicle.—*Assimile* means similar to something, but this something is not known to us.

**Description** : Suffruticose, fastigiately branched from a decumbent base; stems 30-60 cm. long, hard, smooth and polished, as thick as a goose-quill at the base, often proliferously branched; nodes glabrous or bearded. Leaves 7\*5-20 cm. by 2-5-6 mm., linear-lanceolate, finely acuminate, glabrous or nearly so, with a strong white midnerve; sheaths usually glabrous except at the mouth which is sometimes bearded, the upper sheaths appressed, the lower open, often divaricate; ligule short, membranous, ciliate.

Inflorescence in lax panicles; branches slender, almost capillary, with long hairs in the axils. Spikelets few, rather distant, pale green; joints 1\*5 mm. long, with a translucent centre, sparsely ciliate. Sessile spikelets 2\*5 mm. long, ovoid-oblong; callus small, shortly bearded; lower involucral glume 2-5 mm. long, ovoid-oblong; shortly truncate, obscurely 4-6-nerved, ciliate chiefly in the upper half, not pitted; upper involucral glume as long as the lower, lanceolate acute; lower floral glume shorter, linear, obtuse; upper floral glume reduced to the scarcely flattened base of the awn; 1-1.3 cm. long, the lower half brown, the upper yellowish white. Pedicellate spikelets 4 mm. long, not awned; pedicels 1-5 mm. long, sparsely ciliate; lower involucral glume lanceolate, acute, the margins incurved and the keels ciliate in the upper part, 5-7-nerved; upper involucral glume slightly shorter, lanceolate, 3-nerved; lower floral glume obovate-oblong, ciliate at the apex, hyaline; upper floral glume 0. Anthers 1\*5 mm. long.

The old nodes alone are not bearded, but the young ones always are.

**Locality** : *Khandesh*: Toranmal, growing among *Strobilanthus* (McCann 9671!).

*Konkan*: Above Kanari Caves (McCann 9959!).

*W. Ghats*: In dry forest, between Mahableshwar and Panchgani, at 4,000 ft. (Sedgwick & Bell 4738!).

*N. Kanara*: Jugglepet, roadside, common (Talbot 1386!).

**Ecology** : This grass usually grows among other plants being supported by them when it reaches a very large size.

**Distribution** : Temperate Himalaya, Ehasia, Bihar, N. Bengal, Bajputana, Central India, W. Peninsula, Java, China, Japan.

**Explanation of Plate 51** : *Capillipedium assimilp* A. Camus.

1. Pedicelled and sessile spikelets.
2. Lower invol. glume. ^
3. Upper invol. glume, f Sessile spikelet.
4. Lower floral glume. f
- 5i Upper floral glume. J

## 2. CAPILLIPEDIUM HUGELII Blatter & McCann.

### PLATE 52.

*Capillipedium Hugelii* Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 420.

*Andropogon Hugelii* Hack. Monogr. Androp. (1889) 492; Hook. f. FL Brit. Ind. VII (1896) 180; Cooke Fl. Bomb. II (1908) 982.

**Etymology** : *Hugelii*, after Baron C. Huegel a botanical traveller in India about the middle of the last century.

**Description** : Stem often suffrutescent below, frequently red, branching from the base, the branches 75-105 cm. long; nodes bearded. Leaves 10-20 by 2-1-3 cm., linear-lanceolate, acuminate, flat, flaccid, green, narrowed to the base, the margins scaberulous or sometimes ciliate; sheaths bearded at the mouth, otherwise glabrous; ligule membranous, ciliate.

Panicle 5-9 cm. long; branches capillary with bearded axils; joints and pedicels ciliate. Sessile spikelets 3 mm. long, pale green or purplish; callus densely villous; lower involucral glume chartaceous, ovate, truncate, villous below the middle or glabrous, margins narrowly incurved, the keels ciliate with long hairs; upper involucral glume as long as the lower,

glabrous, narrowly truncate, shortly apiculate; lower floral glume 1-5 mm. long, hyaline, ovate, obtuse, glabrous; upper floral glume represented by the slender white not dilated base of the awn; awn reaching nearly 2-5 cm. long. Pedicellate spikelets 4 mm. long, lanceolate, green or purple; lower involucral glume subacute, 9-11-nerved, pubescent up the back and with ciliate keels; upper involucral glume as long as the lower, acuminate, the keels minutely ciliate; lower floral glume oblong, obtuse, hyaline, nearly as long as the upper involucral glume, nerveless; upper floral glume narrowly linear or 0.

The panicle soon crumbles to pieces after being pressed.

**Locality** : *KAandesh*: Toranmal (McCann 9672 !).

*Konkan*: Mulgaun (McCann 3664!).

*W. Ghats*: Khandala, St. Xavier's Villa (McCann 9423 !); dry forests between Mahableshtar and Fanchgani (Sedgwick 4738!); Fanchgani (Blatter & HaUberg B1321!, McCann!).

*S. M. Country*: Deciduous forests west of Dharwar (Sedgwick 4498 !).

*N. Kanara*: Halyal (Talbot 2082 !); Ecumbi to Mungod (HaUberg & McCann A288!).

**Ecology** : This grass is frequently rooting at the nodes.

**Distribution** : Rajputana, Central Provinces, Central India, W. Peninsula.

**Explanation Of Plate 52** : *Capillipedium Hugellii* Blatter & McCann.

- |   |   |                   |
|---|---|-------------------|
| 1. Pedicelled and sessile spikelet.     | } | Sessile spikelet. |
| 2. Lower invol. glume.                  |   |                   |
| 3. Upper invol. glume.                  |   |                   |
| 4. Lower floral glume.                  |   |                   |
| 5. -Upper floral glume.                 |   |                   |
| 6. Stamens, ovary, styles and lodicules |   |                   |

### 3. CAPILLIPEDIUM FILICULME Blatter & McCann.

*VapiUipedium filiculme* Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 420.

*Andropogon filiculmis* Hook. f. FL Brit. Ind. VII (1896) 181; Cooke Fl. Bomb. II (1908) 982.

**Etymology** : *Filiculme* is derived from *filum*, a thread, and *culmis*, a stem, referring to the very thin stem.

**Description** : Stems 60-90 cm. long, decumbent and interlaced, copiously geniculately branched, weak, filiform, quite glabrous; internodes long; nodes bearded. Leaves 5-10 cm. by 3-4 mm., linear-lanceolate, finely acuminate with a filiform tip, glabrous above, glabrous or sparsely hairy beneath, flaccid, suddenly narrowed at the base, pale green, the midrib and nerves slender; sheaths bearded at the very tip, otherwise glabrous, the lower sheaths open below; ligule membranous, ciliate.

Panicles 2-5-5 cm. long; branches few, filiform. Spikelets 2 or 3, pale green or white; pedicels of upper spikelets ciliate with long hairs. Sessile spikelets 3 mm. long, oblong-lanceolate, callus densely villous; lower involucral glume oblong-lanceolate, obtuse, membranous, 5-7-nerved, villous below the middle or all over, the keels ciliate; upper involucral glume thinly membranous, lanceolate, acute, shortly mucronate, 3-nerved, glabrous; lower floral glume small, ovate, obtuse, nerveless, hyaline; upper floral glume represented by an awn 13-16 mm. long, the lower half dark brown, the upper half yellowish white, the base not dilated, white for about 2 mm. Pedicellate spikelets as long as the sessile but narrower; lower involucral glume ovate-lanceolate, acute, 7-9-nerved, ciliate; upper involucral glume lanceolate, strongly 5-nerved; lower floral glume broadly oblong, obtuse, hyaline, nerveless, as long as the involucral glumes; upper floral glume 0.

**Locality** : *Konkan*: Trombay (McCann A286 !).

*W. Ghats*: Khandala to Karjat (Blatter & HaUberg A287 !); Igatpuri (Blatter & HaUberg 5117!).

*Deccan*: Poona, in rocky places (Jacquemont 310); Donshi, Mawal Dist. (Woodrow 26); Purandhar (McCann 5570 !).

*S. M. Country*: Forests near Dharwar (Sedgwick 1854 !).

**Ecology** : A weak grass with long stilt roots from the lower side of the nodes.

**Distribution** : W. Peninsula, apparently endemic.

### 32. AMPHILOPHIS Nash.

Perennial grasses. Stems slender, simple or branched, bearded or beardless at the nod

Panicles mostly subdigitate with a short primary axis, rarely the racemes on branches of the second order; racemes always shortly peduncled. Spikelets sessile, one sessile, the other pedicelled, similar in shape or the pedicelled reduced and smaller, the latter always



different in sex except sometimes the lowermost pair which may be homogamous (male or neuter), on the fragile rhachis of many-jointed shortly peduncled racemes ; joints and pedicels filiform longitudinally grooved and hyaline in the groove, disarticulating horizontally; sessile and pedicelled (always ?) spikelets deciduous, the former with the adjacent joint and pedicel. Florets 2 in the sessile spikelets, lower reduced to an empty glume, upper hermaphrodite, 2 or 1 in the pedicelled spikelet, the lower male or neuter, the upper neuter or usually quite suppressed. Sessile spikelet dorsally compressed, awned ; callus small, shortly bearded. Involucral glumes equal, thinly chartaceous to membranous ; lower 2-keeled, with narrow sharply inflexed margins; upper boat-shaped, 3-nerved, acutely keeled. Lower floral glume hyaline, nerveless, upper a hyaline linear stipe, firmer upwards, passing into a slender awn. Paleae 0 or very minute. Lodicules 2, minute, glabrous. Stamens 3. Stigmas exerted laterally usually low down, longer than the styles. Grain oblong, obtuse, dorsally slightly compressed ; embryo about half the length of the grain. Pedicelled spikelet awnless, glumes, if present, hyaline, nerveless.

Species probably over 25.—Mostly in tropical Asia.

Cooke (II, 97<sup>^</sup>-981) mentions 8 species which belong to the section *Amphilophis* of *Andropogon* : *Andropogon compressus* Hook, f., *A. Woodrovrii* Hook, f., *A. pertusus* Willd., *A. Kurdzeanus* Hack., *A. ensiformis* Hook, f., *A. concanensis* Hook, f., *A. intermedius* Cooke (non K. Br.); *A. odoratus* Dna. Lisboa. All these are now being transferred to the new genus *Amphilophis* Nash.

A. Bacemes digitate or fasciculate, the lower longer than the rhachis of the inflorescence.

I. Lower involucral glume of sessile spikelets villous below the middle.

1. Lower involucral glume not pitted.

- |                                       |   |                           |
|---------------------------------------|---|---------------------------|
| a. Upper involucral glume mucronulate | • | 1. <i>A. compressa</i> .  |
| b. Upper involucral glume obtuse      | • | 2. <i>A. Woodrovrii</i> . |

2. Lower involucral glume pitted	•	•	•	3. <i>A. pertusa</i> .
----------------------------------	---	---	---	------------------------

II. Lower involucral glume of sessile spikelets glabrous below the middle (sparsely silky in *A. ensiformis*).

- |                                  |   |   |   |                            |
|----------------------------------|---|---|---|----------------------------|
| 1. Nodes of stem densely bearded | • | • | • | 4. <i>A. Kuntzeana</i> .   |
| 2. Nodes of stem glabrous.       |   |   |   |                            |
| a. Leaves reaching 12 mm. broad  | • | • |   | 5. <i>A. ensiformis</i> .  |
| b. Leaves reaching 3 mm. broad   | • | • |   | 6. <i>A. concanensis</i> . |

B. Bacemes paniced, the lower branches shorter than the rhachis of the inflorescence.

- |                                   |   |   |   |   |                        |
|-----------------------------------|---|---|---|---|------------------------|
| I. Non-aromatic ; sheaths terete  | • | • | • | • | 7. <i>A. glabra</i> .  |
| II. Aromatic ; sheaths compressed | • | • | • | • | 8. <i>A. odorata</i> . |

1. AMPHILOPHIS COMPRESSA Blatter & McCann.

#### PLATE 53.

*Amphilophis compressa* Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 421.

*Andropogon compressus* Hook. f. Fl. Brit. Ind. VII (1896) 172 ; Cooke Fl. Bomb. II (1908) 977.

Etymology : *Compressa*, alluding to the compressed stem.

Description : A tall grass reaching 0.9-1.2 m. high ; stem as thick as a goose-quill at the base, erect, sparingly branched, leafy, nodes glabrous. Leaves 30-45 cm. by 6-10 mm., linear finely acuminate, flat, slightly scaberulous on both surfaces and on the margins, more or less hairy towards the base; sheaths strongly compressed and acutely keeled; ligule a glabrous membrane 2-5 mm. long.

Panicles 10-12\*5 cm. long, of many subcorymbosely arranged pale flexuous silky racemes 2\*5-5 cm. long ; joint 2-5 mm. long, slender, with a central translucent line, ciliate on 2 opposite sides with long silky hairs. Sessile spikelets 5 mm. long, ovate-lanceolate ; callus bearded with long hairs ; lower involucrial glume ovate-lanceolate, 5 mm. long, villous on the back below the middle, truncate or notched at the apex, with narrowly incurved margins and a hyaline tip, 5-7-nerved, not pitted ; upper involucral glume ovate, acute, mucronulate, as long as the lower; lower floral glume 4 mm. long, linear-lanceolate, obtuse, hyaline, nerveless ; upper floral glume represented by an awn reaching 16 mm. long, inconspicuously margined for 2-5 mm. at the base. Pedicellate spikelets: pedicels 3 mm. long, ciliate on 2 opposite sides with long silky hairs, very slender and with a central translucent line ; lower involucral glume 9-11-nerved; upper involucral glume 3-nerved ; lower floral glume oblong, obtuse, ciliate, hyaline, nerveless.

**Locality** : W. Ghats: Khandala, plain behind the Saddle (Hallberg 9657 I, Bhide !); Lonavla (McCann 9433!).

*Deccan* : Mawal (Woodrow!); Poona (Woodrow).

**Ecology** : This grass is strongly aromatic.

**Distribution** : W. Peninsula, apparently endemic.

**Explanation of Plate 53** : *Amphilophis compressa* Blatter & McCann.

- |   |   |                      |
|---|---|----------------------|
| 1. Lower in vol. glume.                   | } | Sessile spikelet.    |
| 2. Upper invol. glume.                    |   |                      |
| 3. Lower floral glume.                    |   |                      |
| 4. Filaments, ovary, styles and lodicules |   |                      |
| 5. Upper floral glume.                    |   |                      |
| 6. Pedicelled and sessile spikelets.      | } | Pedicelled spikelet. |
| 7. Lower invol. glume.                    |   |                      |
| 8. Upper invol. glume.                    |   |                      |
| 9. Lower floral glume.                    |   |                      |
| 10. Upper floral glume.                   |   |                      |
| 11. Stamens and lodicules.                |   |                      |
| 12. Ligule.                               |   |                      |

### 2. AMPHILOPHIS WOODROWII A. Camus.

*Amphilophis Woodrowii* A. Camus in Rev. Bot. Appliq. et d'Agricult. colon. I (1921) 305.

*Andropogon Woodrowii* Hook. f. Fl. Brit. Ind. VII (1896) 173; Lisboa Bomb. Grasses (1896) 65; Cooke Fl. Bomb. II (1908) 978.

**Etymology** : Woodrow, a horticulturist and professor of Botany at the former Science College, Poona.

**Description** : Rootstock woody ; stems tufted, 0.9-1.2 m. long, erect, compressed, thicker than a goose-quill at the base, obtusely 2-edged, solid, stiff, branched above ; nodes glabrous. Leaves 30-60 cm. by 3-4 mm., rigid, scaberulous on both surfaces and the margins; sheaths loose, keeled, quite smooth; ligule 2-5 mm. long, membranous, truncate, ciliate.

Racemes 3-5, pale, 1-3-2-5 cm. long, on slender, stiff, smooth proper peduncles 3-13 mm. long, erect, silky; joints of the rachis and the pedicels linear, with silky margins and a translucent centre, the hairs at the top half as long as the spikelet. Sessile spikelets 4 mm. long, oblong-lanceolate ; callus 0-8 mm. long, bearded; lower involucre glume coriaceous, not pitted, ovate-oblong, truncate and hyaline-tipped at the apex, many-nerved, margins narrowly incurved, keels ciliate; upper involucre glume chartaceous, 3-nerved, oblong, subobtusely, as long as the lower; lower floral glume 3 mm. long, ovate-oblong, obtuse, hyaline, nerveless ; upper floral glume reduced to an awn 16 mm. long with a hyaline flattened base 2-5 mm. long. Pedicellate spikelets rather narrower than the sessile, lower involucre glume glabrous on the back ; upper involucre glume narrow, linear, acute; awn 0.

**Locality** : *Deccan*: Khorbasa, Mawal Districts (Woodrow); Pand, 20 miles W. of Poona (Woodrow!).

**Distribution** : W. Peninsula, apparently endemic.

### 3. AMPHILOPHIS PERTUSA Stapf.

#### PLATE 54.

*Amphilophis pertusa* Stapf in Fl. Trop. Afr. IX (1917) 175 ; Haines Bot. Bih. and Or. (1924) 1030.

*Holcus pertusus* Linn. Mant. Alt. (1771) 301.

*Andropogon pertusus* Willd. Sp. PL IV, 922; Beauv. Agrost. (1812) 131, t. 23, fig. 2; Roxb. Fl. Ind. I (1832) 258; Hack. Monogr. Androp. (1889) 479 (*vars. genuinus et Wightii*); Duthie Grasses N. W. Ind. (1883) 21 (*excl. syn.*), Fodder Grasses N. Ind. (1888) 38, t. 25 ; Boiss. Fl. Or. V. (1881) 464 ; Balf. f. Bot. Scotra (1888) 316 ; Hook. f. Fl. Brit. Ind. VII (1896) 173; Cooke Fl. Bomb. II (1908) 978.

*Lepeocereis pertusa* Nees ex Steud. Syn. PL Gluig. I (1855) 364.

**Vernacular names** : Ghanga, Marvel, Payen, Palva, Palvan.

**Etymology** : *Pertusus* means perforated, having slits or holes, alluding to the lower involucre glume of the sessile spikelets which has 1 or 2 deep pits.

**Description** : Stem 30-60 cm. long, erect or geniculately ascending, leafy upwards, simple or sparingly branched ; nodes bearded with spreading hairs. Leaves up to 30 cm. by 3-4

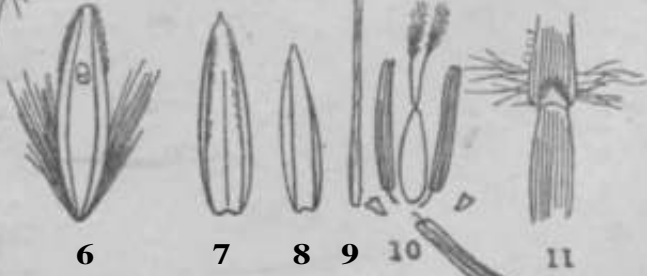
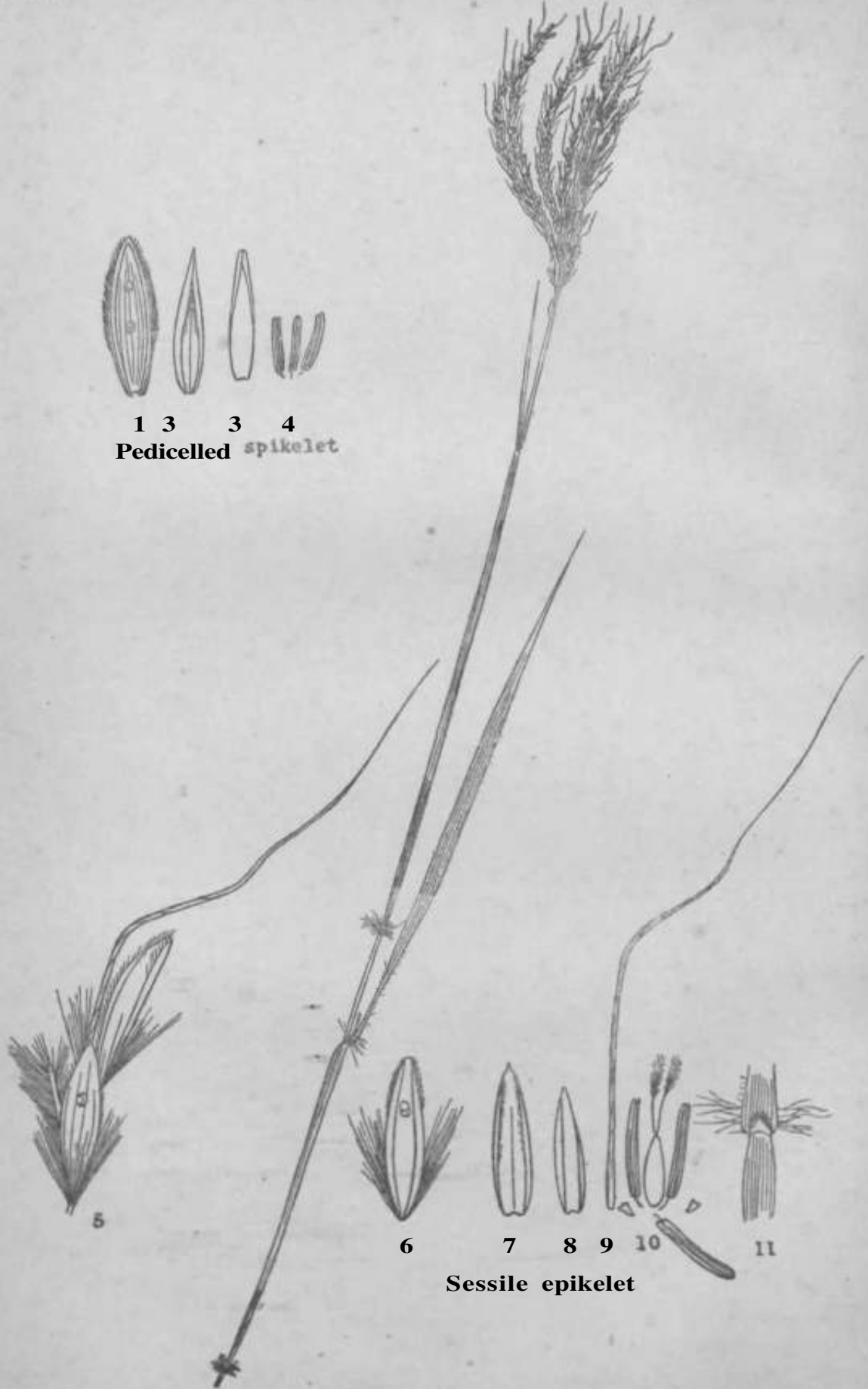


Sessile spikelet

Pedicelled spikelet



1 3 3 4  
Pedicelled spikelet



Sessile epikelet

AMI'JHLO'JMs; t'EHTUBA STAFJP

Drawn : B. K. Bhalu.

mm., narrowly linear, acute or acuminate, the lower often short and crowded at the base of the stem, glabrous or pubescent, or sometimes sparingly pilose, margins scabrid, base narrow, rounded; sheaths terete or slightly compressed, shorter than the internodes; ligule 2\*5 mm. long, membranous, truncate, ciliate.

Racemes 3-8, digitately fasciculate, 2\*5-5 cm. long, slender, silky, suberect, flexuous, on short usually glabrous peduncles which are often bearded in the axils; rachis very slender; joints and pedicels 2-5 mm. long, densely ciliate with long silky hairs, the central translucent band very narrow. Sessile spikelets 4 mm. long, oblong-lanceolate, acuminate by the projection of the point of the upper involucral glume, callus bearded; lower involucral glume elliptic-oblong, obtuse or truncate, sometimes slightly emarginate, with a deep pit above the middle (sometimes 2 pits when one is above, the other at or about the middle), subchartaceous, more or less hairy below the middle, 5-9-nerved, margins narrowly incurved, spinulosely ciliate; upper involucral glume lanceolate, acuminate, finely pointed at the tip, the point slightly projecting beyond the lower glume, 3-5-nerved, membranous, glabrous; lower floral glume 2-5 mm. long, linear-oblong, obtuse, nerveless, glabrous; upper floral glume reduced to a slender awn reaching nearly 2 cm. long, geniculate about the middle, the lower half brown, the upper yellowish white, with a narrow linear hyaline flattened base 2 mm. long which represents the glume; palea 0. Pedicellate spikelets like the sessile but narrower, not awned; lower involucral glume acute, very rarely pitted, 7-13-nerved, ciliate; upper involucral glume ovate-lanceolate, acute, 5-nerved, with incurved margins; lower floral glume linear-oblong, obtuse, hyaline, glabrous.

A very variable plant. We must confess we find it impossible to follow various authors, who have described a number of varieties. It would be easy to increase their number on merely morphological grounds, but the results would be highly unsatisfactory. It is only from genetical tests that we can expect to get an insight into the natural variations of this and other species of this genus.

**Locality :** *Gujarat:* Daman (Bhide!); Perim Isl., Gulf of Cambay (Blatter 3814!).

*Konkan:* Bombay, St. Xavier's College compound (McCann 9630! 96311) Ehandala, Campoli (McCann 9961!).

*W. Ghats:* Lonavla (Woodrow); Panchgani (Blatter & Hallberg B1236!) on edge of Tableland (Blatter 9962 I), on roadside, 4,000 ft. (Sedgwick & Bell 4699!).

*Deccan:* Nasik (Bourke 11!); Bahuri (Nana A278!); Pashan (Gammie!); Eirkee, Agricultural College (Bhide!); Poona (Cooke); Satara (Lisboa); Sholapur (Lisboa); Joonur (Talbot!).

*S. M. Country:* W. of Dharwar, 2,000 ft., rainfall 35 in. (Sedgwick & Bell 4494!); Dharwar, 2,400 ft., rainfall 34 in. (Sedgwick & Bell 4488!); Kunuj, 2,000 ft., rainfall 35 in. (Sedgwick & Bell 4953!); Badami (Talbot 2944!); Haveri (Talbot 2233 t); Gokak (Sheodye!).

*N. Kanara:* Halyal (Talbot 2080! 2106!).

**Ecology :** A sporadic grass. Very abundant in the Carnatic. According to Lisboa the inflorescence is scented.

**Distribution :** More or less throughout India, chiefly in the drier parts, Ceylon, Afghanistan, Arabia, tropical Africa (Upper Guinea, Nileland, Mozambique District).

**Economic uses :** "This grass . . . is universally esteemed as a good fodder grass, both for grazing and stacking. In Australia also it is highly valued, being regarded as one of the best grasses to stand long droughts, while it will bear any amount of feeding. It is useful also as a winter grass, if the weather is not too severe." (Duthie).

See also W. Burns, L. B. Eulkarni and S. B. Godbole: A Study of some Indian grasses and grasslands. Mem. Dept. Agr. in India XIV (1925) 47, 48.

**Explanation of Plate 54 :** *Amphilophis pertusa* Stapf.

- |   |     |
|---|-----|
| 1. Lower invol. glume.                    | " \ |
| 2. Upper invol. glume                     | "/  |
| 3. Lower floral glume.                    | ⊂   |
| 4. Stamens.                               | )   |
| 5. Pedicelled and sessile spikelets.      |     |
| 6. Lower invol. glume                     | ⌋   |
| 7. Upper invol. glume.                    | ⌈   |
| 8. Lower floral glume.                    | ⌋   |
| 9. Upper floral glume.                    | ⌈   |
| 10. Stamens, ovary, styles and lodicules. | ⌋   |
| 11. Ligule.                               | ⌈   |

## 4. AMPHILOPHIS KUNTZKANA Haines.

## PLATE 55

*Amphilophis Kuntziana* Haines Bot. Bili. and Or. (1924) 1031.

*Atidropogon Kunbunraa* Hack. Monogr. Androp. (1889) 478 ; Hook, f. Fl. Brit. Ind. TIT (1896) 175 ; Cook FL Bomb, n (1908) 979.

Etymology : *Kuidzeana* nEtr C, E. 0, Kunt'ze, a botanical writer of the second half of the 19th century.

Description : A tall grass 1-1.5 m. high ; stems ascending, as thick as a goose-quill below, with slender flowering branches above, terete, smooth ; nodes densely bearded. Leaves narrowly linear, 30 cm. by 3-8 mm., glabrous, glaucous, smooth, with crenulate margins, the upper glaucous leaves short, rigid.

Racemes 12-15, loosely fasciculate, slender, silky, purplish ; proper peduncles 4-8 mm. long, slender, glabrous ; joints and pedicels 2-5 mm. long, with a translucent centre, slender, densely clothed with very long erect hairs. Sessile spikelets 5 mm. long, linear-lanceolate ; callus sparsely bearded at the base with very long hairs ; lower involucral glume ovate-lanceolate, thin, glabrous, usually pitted, 7-9-nerved, 2-toothed at the apex, the teeth about 1-2 mm. long ; upper involucral glume as long as the lower, lanceolate, acuminate, mucronate, ciliate, lower floral glume 1 mm. long, linear-lanceolate, glabrous, hyaline ; awn 16 mm. long. The basal slightly flattened portion 2-5 mm. long. Pedicellate spikelets narrower than the sessile male ; lower involucral glume 9-11-nerved, tip entire ; upper involucral glume 5-nerved, conspicuously ciliate ; lower floral glume linear-oblong, hyaline, ciliate ; upper floral glume small, narrowly linear or 0.

Locality : Eonian (Stocks).

Decan : (Woodrow 153!) ; Mjwal (Woodrow).

Distribution : Biliar, Central Provinces, W. Peninsula,

Explanation of Plate 55 : *Amphilophis Kuntziana* Haines.

1. Ligule.
2. Pedicellate and sessile spikelet and joint of rachis.
3. Lower involucre glume.
4. Upper involucre glume.
5. Lower floral glume.
6. Stomach, ovary and style.
7. Upper floral glume.

} Sessile spikelet,

## 5. AMPHILOPHIS KUNTZKANA Haines.

*Amphilophis nutformis* Blatter \* MoCun in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 411.

*Andropogon aieiformis* Book, f. Fl. Brit. Ind. YII (1896) 176 ; Cooke Fl. Bomb. II (1908) 979,

Etymology : *Kmiformis* means sword-shaped, referring to the strict, rigid, linear-lanceolate leaves.

Description : Stems (1) terete and upwards, loosely tufted, stout, compressed, clothed with ciliate leaf-sheaths, the leaf glabrous. Leaves 20-25 cm. by 1-1.3 mm., erect, strict, rigid, linear-lanceolate, acuminately strongly nerved, glabrous or sparsely hairy, tips mucronate, margins ciliate, the lower glaucous, the lower, equitant ; ligule short, sericeous.

Racemes 15-17 mm. long, in an erect narrow thyrse 1-5 cm. long, pale purplish ; proper peduncles 4-6 mm. long ; joints and pedicels 2-3 mm. long, Very slender. Hat, with a translucent centre, densely bearded with long erect hairs. Sessile spikelets 5 mm. long, oblong-linear, acute ; callus small, densely bearded with long hairs 1 mm. long as the spikelet ; lower involucral glume 4 mm. long, onto-oblong, obtusely emarginate, acuminate, 6-7-nerved, not pitted, very sparsely silky-hairy below the middle, marginate, acuminate, VITV narrowly incurved, teeth acute ; upper involucral glume reaching 5 mm. long, ovate-oblong, acute, thickly mucronate, slightly exceeded by the lower, 3-nerved ; lower floral glume 1-2 mm. long, linear-oblong, acuminate, hyaline ; upper floral glume 1-2 mm. long, linear-oblong, acuminate, mucronate, ciliate ; awn 16 mm. long, representing the upper floral glume ; pedicellate spikelets as long as the sessile, oblong-linear, 9-11-nerved ; upper involucral glume 5-nerved ; lower floral glume as long as the *Btmaie* : *npu* linear glume.

Locality : W. Ghats : Lonav (Woodrow I).

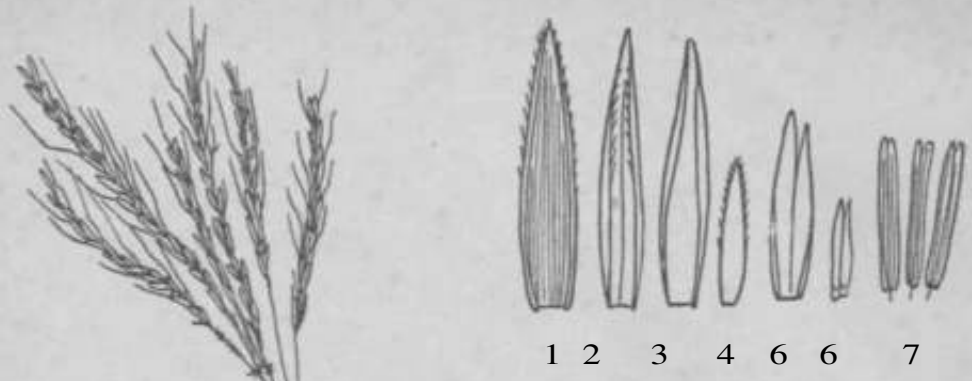
Distribution : W. Peninsula, apparently out of the range.



Sessile spikelet

AMPHILOPHIS KUNTIANA H. USK.

Delin: R. K. Bhide.



1 2 3 4 6 6 7

PediceUed spikeiet



9

10

U

12

13

14

Sessile spikeiet



## 6. AMPHILOPHIS CONCANENSIS Blatter &amp; McCann.

## PLATE 56.

*Amphilophis concanensis* Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 422.  
*Ajidropogon concanensis* Hook. f. El. Brit. Ind. VII (1896) 174 ; Cooke Fl. Bomb. II (1908) 980.

**Description** : Perennial; stems many from a nodose rootstock, 50-60 cm. high, firm, smooth, terete, leafy; nodes glabrous. Leaves 20-25 cm. by 2-3 mm., linear, finely acuminate, smooth on both surfaces; sheaths smooth, terete; ligule short, membranous, truncate, glabrous.

Racemes 5-8, loosely fasciculate, 5-7 cm. long, slender, flexuous, pale; rhachis and proper peduncles filiform, glabrous, the latter 13-20 mm. long, with slightly bearded axils; joints and pedicels 2 mm. long, compressed, hardly grooved and not translucent in the centre, the sides not thickened, ciliate with long silky hairs. Sessile spikelets less than 4 mm. long, ovate-lanceolate, narrowly truncate; callus bearded; lower involucral glume membranous, with incurved margins, glabrous, not pitted on the back, keels ciliate with short bristles, 7-9-nerved; upper involucral glume as long as the lower, lanceolate, acuminate, ending in a fine point which just appears above the tip of the lower glume, faintly 3-nerved; lower floral glume much shorter than others, oblong, obtuse, nerveless; upper floral glume a capillary yellowish awn reaching 2 cm. long with a slightly dilated base 2-5 mm. long. Pedicellate spikelets narrower than the sessile; lower involucral glume 9-nerved; upper involucral and lower floral glume as in the sessile spikelets; upper floral glume small, oblong, often unequally 2-fid, ciliate, nerveless.

**Locality** : *W. Ghats*: Matheran (Woodrow!); Yenna River, Lingmala, Mahableshwar, 4,000 ft., rainfall 200 in. (Sedgwick & Bell 4652 !); Lingmala, Mahableshwar (Blatter & Hallberg B1328 !); Khandala, in watercourses, common (McCann 9651!).

*Deccan*: Manmad, river-bed (Blatter A283 !).

*N. Kanara*: Kala-Nuddi River, Supa, on rocks, 2,000 ft., rainfall 100 in. (Sedgwick & Bell 4857 !); Halyal (Talbot 2221!); Ooond (Talbot 2202!); Gersoppa Falls, on rocks in river-bed (Hallberg & McCann A279!).

**Ecology** : Grows in large tufts in watercourses on rocks and sandy banks. The tufts look greyish, owing to a waxy substance covering the plant all over, but easily removeable.

**Distribution** : W. Peninsula, apparently endemic.

**Explanation of Plate 56** : *Amphilophis concanensis* Blatter & McCann.

- |                                      |   |                      |
|--------------------------------------|---|----------------------|
| 1. Lower invol. glume.               | } | Pedicelled spikelet. |
| 2. Upper invol. glume.               |   |                      |
| 3. Lower floral glume.               |   |                      |
| 4. Palea of lower floral glume.      |   |                      |
| 5. Upper floral glume.               |   |                      |
| 6. Palea of upper floral glume.      |   |                      |
| 7. Stamens.                          | } |                      |
| 8. Ligule.                           |   |                      |
| 9. Pedicelled and sessile spikelets. | } | Sessile spikelet*    |
| 10. Lower invol. glume.              |   |                      |
| 11. Upper invol. glume.              |   |                      |
| 12. Lower floral glume.              |   |                      |
| 13. Upper floral glume.              |   |                      |
| 14. Filaments, ovary and styles. ^}  |   |                      |

## 7. AMPHILOPHIS GLABBA Stapf.

*Amphilophis glabra* Stapf in Fl. Trop. Afr. IX (1917) 172.

*Andropogon glaber* Roxb. Fl. Ind. I (1832) 267 ; Steud. Syn. Pl. Glum. I (1854) 392.

*A. punctatus* Trin. Ic. t. 328 (non Roxb.).

*A. intermedius*, var. *punctatus*, subvar. *glaber* Hack. Monogr. Androp. (1889) 487.

*A. intermedius* K. Schum. in Engl. Pfl. Ost.-Afr. C. 98; Hook. f. Fl. Brit. Ind. VII (1896) 175 ;  
 Cooke Fl. Bomb. II (1908) 980.

*A. intermedius* var. *punctatus* Stapf in Dyer Fl. Cap. VII, 345.

*Amphilophis glabra* Haines Bot. Bih. and Or. (1924) 1028 (non Stapf et partim).

It will be seen from the above synonymy that Stapf considers *Andropogon glaber* Roxb. as the type of the species. Of *Andropogon intermedius* R. Br. as conceived by Hackel he includes only the var. *punctatus*, subvar. *glaber*. Haines in his Bot. Bihar and Orism 1028 adopts Stapf's name *Amphilophis glabra* with the following synonyms: *Andropogon intermedius* R. Br. inc. *A. glaber* Roxb., *A. punctatus* Roxb. and *A. montanus* Roxb. !

This is evidently not Stapf's *AjmphSopMs glabm*. Eaines includes *Aitdftypogon intermedium* R. BT., whilst Stapf confines his species to *far. pufictalvx*. Haines has *A. punctatti*\* Roxb. as a synonym. Stapf excludes it *r*'pi only.

Haines' description is much wider than that given by Stapf and includes Haukel's *van, genum. Hacnkei, punctatus* and *glaber*, and one of his own *vir. hirln*. He says in a foot-note (p. 1029): "These varieties are after Harkel and were described before I consulted Stapf's Gramineae in Fl. Trop. Africa, where he reduces Hackel's *intermedium* to Roxburgh's *ghber*. The names [*r.i.*], [*leninna*] in some cases have become inapplicable if Roxburgh's *ghber* is the type. Var. *Bui tuiet* is, I think, a distinct species and easily distinguished in the field. It should be called *AmptiUttj, is Hacnkei* L."

Haines seems to overlook the fact that Stapf's *glabra* is restricted to one of Hackel's varieties of *Nilropogon itilmiicdiu*, viz., [*sectatus*] and that, consequently not all of Hackel's names can be applicable.

In our opinion Haines is not justified in calling his species *Amphilophis glabra* Stapf. As it includes practically the whole of *An&ropogon intermedium* E. Br. taken in Hackel's sense he might have called it *AmpMophis intermedium* Haines if that name had not been preoccupied by Stapf (Fl. Trop. Ah. IX, 174).

We are not arguing the point whether Stapf or Haines is right in the treatment of *Aitdropogon intermedium* L. *Hi. tt auctorum*; good reasons can be adduced for both cases. All we wish to say is that Eaines' *AmphOophis ghbra* is not *A. glabra* Stapf.

Those who prefer to adopt Haines' *A. glabra* and Hackel's varieties might consider a remark made by Hackel himself (l. c. 487): "*A. fackularis* Thwaites Ennm. Pl. Zeyl. p. 437 non Roxb. *compUxtitar varietatet fit [Hanicel] tt B [puitetalus] fvrmitz ititermedm (tipiculis in eafam pa, icula mistia) conjutis, Eliam in Ba\gaaia ttanxUw tt ipsa uarietas [J [Haemkei] prewiniunt; in Himalaya, e. gr. pi. Simla/t formue inter? [puwArfto] el a [genuim] intermedia inveniantur."*

We adopt Stapf's conception of *A. glabra* together with his description. Dr. Stapf was kind enough to name some of our Bombay specimens.

Description: Perennial. Rhizome very short, barren, innovations extravaginal, cespitose, ovate to lanceolate, acute, hard, smooth. Stems tufted, erect or shortly ascending, to over 1 m. high, rather stout, below, glabrous, 5-7-noded, simple or very sparingly branched. Leaf-sheaths terete, glabrous, smooth, the inter-nodal shorter than the internodes, nodes glabrous or the upper bearded. Blades linear, long-tapering to a setaceous point, hardly broader, not or slightly contracted at the base, up to over 30 cm. by 8-5 mm. (mostly narrower), pale green, often turning reddish or purplish, glabrous, rarely with very fine, long, spreading, white hairs at and above the ligule, smooth except at the margins, midrib rather stout to very stout downwards, lateral nerves 3-4 on each side; keel truncate, very short, scarious.

Panicle narrowly oblong, 15-25 cm. by 25-38 mm., erect, primary axis much longer than the lowest racemes, somewhat stout and (at least when mature) stiff, smooth, shortly bearded at the branch axils, otherwise glabrous and smooth; branches whorled, up to 10 in a whorl or semiverticillate, 0.3-0.5 m. long, at base from the weaker internodes, straight, 26-75 mm. long, the long ones divided from the base, few to 7-noded, secondary branches simple. Racemes 12-38 mm. long, straight or flexuous, usually pinkish, inconspicuously white-villous; joints and pedicels 2-3 mm. long, dilate, uppermost cilium much longer than the rest, up to 1 mm. long. Sessile spikelets pale green or purplish throughout, bearing the small minutely bearded callus 5-3-3-8 mm. long. Involucral glumes equal; lower truncate, slightly concave on the back, cartaceous-membranous, hairy below the middle, more rarely glabrous, beels rigidly ciliate upwards, inter-nodal nerves 4-5, very fine, evanescent upwards with, or without a pit above the middle; upper lanceolate, acute, 3-nerved, keel naked upwards, margins sparingly ciliate. Lower floral plume oblong, 2-1 mm. long, hyaline, nerveless, ciliate, upper an awn 1.5-2-7 mm. long, brown below, joint above the base. Pedicelled spikelets shorter, mostly reduced to the glumes, narrowly linear-oblong to linear, 2-7-3-3 mm. long, glabrous, of the same colour as the sessile. Lower involucre rigidly and minutely ciliate, 5-9-nerved, often rolled in, not pitted, upper linear, nerveless, often minute.

Locality: *W. (H. McCann A282)*.

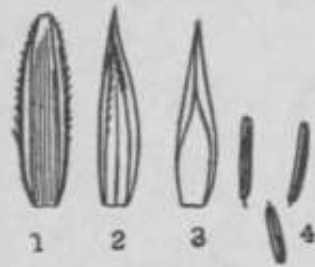
*W. (H. McCann A282)*: Lonavb (Hallberg 9955!); Khanditla, St. Monk's Ravine in the watercourse (J. L. L. McCann A282).

*Decan*: Pimpalgai; on the bank of a stream (Bhide!).

Ecology: Densely tufted, growing in damp places in clumps, also on rocks in streams.

Distribution: More or less throughout (India, tropical Asia, N. E. Australia, tropical Africa (Upper and Lower Guinea, Uftzunbiquie Diarrit, Nileland), Malagasy).

Economic uses: One of the common fodder grasses of the Deccan.



**Pedtcelled spiltelet**



**Sessile spikelet**

AMPIULOPHIS ODOIUTA A. CAMUS.

Delin: B. K. Bhide.

## 8. AMPHILOPSIS ODORATA A. Camus.

## PLATE 57.

*Amphilophis odorata* A. Camus in Rev. Bot. Appl. et d'Agric. Colon. I (1921) 305.

*Andropogon odoratus* Dna. Lisboa in Journ. Bomb. Nat. Hist. Soc. IV (1889) 123, *cum ic.* and VI (1891) 68, 203; Lisboa ^Bomb. Grasses (1896) 70; Hook. f. FL Brit. Ind. VII (1896) 177; Cooke Fl. Bomb. II (1908) 981.

Vernacular names : Vaidia-gavat, Usadhana, Bhos, Tambrut, GavatVedi.

Etymology : *Odoraia* in allusion to the highly scented inflorescence.

Description : Aromatic; stem erect, 0.9-1.2 m. high, as thick as a swan's quill at the base, sometimes branching below, leafy; nodes bearded. Leaves 30-60 cm. by 4-10 mm., linear-lanceolate, flat, acuminate, scaberulous on both surfaces and off the margins, bright green, with strong nerves; sheaths long, glabrous, smooth, compressed, the upper sheathing the base of the inflorescence; ligule small, membranous, truncate.

Racemes numerous, purplish, silky, suberect, slender, flexuous, densely fascicled, pedicellate, crowded at the end of a long peduncle and forming a dense panicle 5-10 cm. long; joints and pedicels flattened, with a translucent centre, silky-hairy, the joints 1-5 mm. long, the pedicels rather longer. Sessile spikelets purplish, 4 mm. long, oblong-lanceolate, acute; callus small, bearded with silky hairs; lower involucral glume thin, oblong-lanceolate, truncate, 7-nerved, softly hairy below the middle, rarely pitted; upper involucral glume very little longer than the lower and broader, thinly membranous, keeled; lower floral glume hyaline, oblong-lanceolate, shorter than the upper involucral glume, nerveless; awn 13-16 mm. long, slightly dilated towards the base. Pedicellate spikelets as long as or slightly longer than the sessile; lower involucral glume narrow, many-nerved, dorsally glabrous; upper involucral glume 3-nerved, ciliate; lower floral glume shorter, oblong, obtuse, nerveless.

The compressed sheaths, paniced racemes, villous lower involucral glume of the sessile spikelets, and aroma seem to distinguish this from *Amphilophis Kuntzeana*, which it strongly resembles in a dry state (Cooke).

Locality : Khandesh (Lisboa).

Konkan : Khardi (Mrs. Lisboa).

W. Ghats: Igatpuri (McCann A281!); Lonavla, abundant (Mrs. Lisboa, Bhide!).

Deccan: Plain at foot of Lohagad (McCann 9956 !); Pand, 20 miles west of Poona (Herb. Econ. Bot. Poona !); Mawal, Poona Dist. (Woodrow).

Ecology : At Lonavla and in the neighbouring villages the fields at the end of the rains present a beautiful purple colour (Lisboa).

\* Distribution : W. Peninsula, apparently endemic.

Economic uses : Contains an essential oil. (Lisboa.)

Explanation of Plate 57 : *Amphilophis odorata* A. Camus.

- |   |    |                      |
|---|----|----------------------|
| 1. Lower invol. glume.  | "\ |                      |
| 2. Upper invol. glume.  | f  | Pedicelled spikelet. |
| 3. Lower floral glume.  | C  |                      |
| 4. Stamens.   | )  |                      |
| 5. Lower invol. glume of sessile spikelet showing the occasional pit. |    |                      |
| 6. Pedicelled and sessile spikelets.                                  |    |                      |
| 7. Lower invol. glume.  |    | } Sessile spikelet.  |
| 8. Upper invol. glume.  |    |                      |
| 9. Lower floral glume.  |    |                      |
| 10. Upper floral glume.   |    |                      |
| 11. Filaments, ovary, styles and lodicules.                           |    |                      |
| 12. Ligule.   |    |                      |

## 33. DICHANTHIUM Willemet.

Perennial or annual. Stems simple or branched, usually many-noded, bearded or beardless at the nodes.

Panicles usually subdigitate with a short or very short primary axis, rarely the latter elongated; racemes always shortly peduncled. Spikelets small, 2-nate, one sessile, the other pedicelled, similar in shape, different in sex, except the lowermost 1 or 2 pairs (sometimes 3 or 4) of each raceme which are (with occasional exceptions in *D. annulatum*) homogamous (male or neuter), in many-jointed shortly peduncled subdigitate, rarely subpanioled or race\* mosely arranged, racemes, joints and pedicels filiform, solid, disarticulating subhorizontfily

except the lowest barren pairs; fertile sessile and pedicelled spikelets deciduous, the former with the adjacent joint and pedicel. Sessile spikelet dorsally compressed, awned except the basal homogamous ones; callus small, shortly bearded. Involucral glumes equal, thinly chartaceous, lower usually very obtuse, 2-keeled, with narrow sharply inflexed margins, upper boat-shaped, 3-nerved, acutely keeled. Lower floral glume hyaline, nerveless, upper reduced to the hyaline base of a slender awn; palea minute or absent. Lodicules 2, minute, glabrous. Stamens 3. Stigmas exerted laterally at or above the middle or near the tips. Grain oblong, obtuse, dorsally compressed; embryo rather more than half the length of the grain. Pedicelled spikelet awnless. Lower involucral glume oblong, many-nerved, upper flat with sharply inflexed margins closing over the hyaline lower floral glume if present and the stamens, upper floral glume usually 0, never awned.

Species 10.—Tropical and warm-temperate regions of the Old World.

So far 4 species were known from the Presidency and described by Cooke under *Andropogon armatus* Hook, f., *A. Codkei* Stapf, *A. caricosus* Linn, and *A. annulatus* Forsk. To these we have added 2 new species: *Dichanthium panchganiense* Blatter & McCann, and *D. McCannii* Blatter.

A. Racemes digitate (sometimes solitary in *D. caricosus*), 25 mm. long or longer.

I. Lower involucral glumes of pedicelled spikelets armed with marginal bulbous-based bristles.

1. Lower involucral glume of pedicelled spikelet always pitted.

1. *D. panchganiense*.

2. Lower involucral glume of pedicelled spikelet not pitted.

a. Ligule absent

2. *D. armatum*.

b. Ligule present

3. *D. McCannii*.

II. Lower involucral glumes of pedicelled spikelets not armed with marginal bristles.

1. Nodes of stem glabrous; ligule a shortly ciliate small membrane.

4. *D. caricosum*.

2. Nodes of stem bearded; ligule large, membranous.

5. *D. annulatum*.

B. Racemes solitary, less than 25 mm. long

6. *D. serrqfalcoides*.

1. *DICHANTHIUM PANCHGANIENSE* Blatter & McCann.

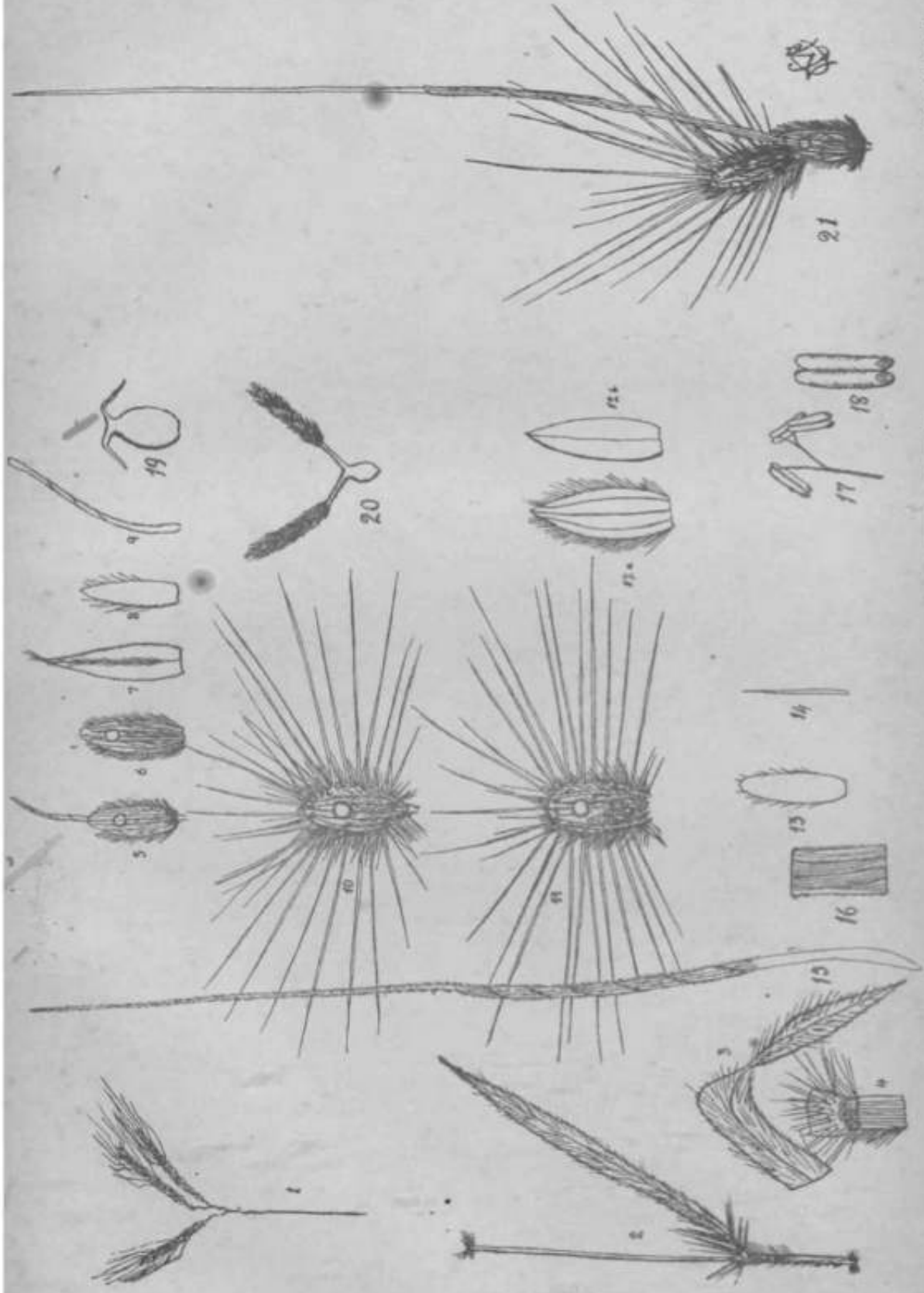
#### PLATE 58.

*Dichanthium panchganiense* Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1927) 357 ; 32 (1928) 425.

**Etymology** : *Dichanthium* is derived from *dicha*, meaning in two ways or parts, separately, and *anisos*, flower, very likely alluding to the binate spikelets.—Panchgani is a small town in the W. Ghats, Satara Dist.

**Description** : Annual, erect; stems up to 35 cm. long, slender, tufted or not, simple or branched from near the roots, smooth and shining; nodes bearded. Leaves up to 8 cm. by 4 mm., linear, acuminate, broadest in the middle, short-ciliate on the margins, with long, bulbous-based hairs on the surfaces, which are much longer at base of the blade for about 5 mm.; sheath lax, margins and upper two-thirds covered with bulbous-based hairs, mouth with much longer bulbous-based hairs; ligule narrow, membranous, lacerate.

Racemes digitate, 1-3, about 3 cm. long. One or two of the lowest pairs of spikelets male. Peduncles up to 8 mm. long, capillary; joints and pedicels slender, not grooved, terete, hairy. Spikelets about 18 pairs. Sessile spikelets 3 mm. long; callus very short, bearded with silky hairs; lower involucral glume thin, broadly oblong, subtruncate at apex, margins incurved, 7-nerved, always with a deep dorsal pit about  $\frac{1}{2}$  from the apex, hirsute throughout except on the pit and the area between the pit and the apex, upper involucral glume oblong-lanceolate, longer than the lower, subacute at apex, keeled, glabrous except on the hairy keel. Lower floral glume oblong, flat, hyaline, nerveless, acute or obtuse at apex, a few scattered hairs on the margins; upper represented by a slender awn about 20 mm. long and twisted in the lower part. Pedicelled spikelets 4 mm. long, broader than the sessile. Lower involucral glume slightly convex, many-nerved, armed with spreading marginal bulbous-based bristles up to twice as long as the glumes, hairy between the bristles and on the dorsal surface, with a smooth shallow pit; upper slightly longer than the lower, broadly oblong, acute, 3-nerved, ciliate on



DICHANTHIUM PANCHGANIENSE BLATTER & McCANN.

Dalziel: C. McCann.



Sessile spikelet

DICHANTHIUM ARMATUM H. B. K. in M. & A. DC. Prodr. 1: 117. t. 11. f. 1.

Delineavit K. B. Schum.

the margins. Lower floral glume oblong, obtuse, hyaline, nerveless, sparingly hairy; upper almost thread-like. Anthers yellow, filament forked, one branch bearing one anther, the other branch again forked.

**Locality** : *W. Ghats*: In the village and on Tableland of Panchgani (McCann!).

**Ecology** : The pits observed in the sessile spikelets contain a viscid substance. It is not impossible that the latter plays a part in pollination.

**Distribution** : Apparently endemic.

**Explanation of Plate 58** : *Dichanthium panchganicnse* Blatter & McCann.

1. Inflorescence.
2. Intemode and leaf.
3. Upper part of leaf.
4. Ligule and lower part of leaf.
5. Sessile spikelet.
6. Lower invol. glume.
7. Upper invol. glume.
8. Lower floral glume.
9. Part of upper floral glume.
10. Pedicelled spikelet.
11. Lower invol. glume.
- 12a. Upper invol. glume, ventral side.
- 12b. Upper invol. glume, dorsal side.
13. Lower floral glume.
14. Upper floral glume.
15. Awn.
16. Part of awn.
- 17 & 18. Anthers.
- 19 & 20. Pistil.
21. Sessile and pedicelled spikelets.

f a  
Seasille spikelet.

} Pedicelled spikelet.

## 2. DICHANTHIUM AKMATUM Blatter & McCann.

### PLATE 59.

*Dichanthium armatum* Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 425 with 1 plate.

*Andropogon armatus* Hook. f. FL Brit. Ind. VII (1896) 197 ; Cooke FL Bomb. II (1908) 987.

**Etymology** : *Akmatum* means armed, very likely alluding to the lower involucre glume of the pedicelled spikelet which is armed with bristles twice or thrice its own length.

**Description** : Annual, erect; stems 30-45 cm. long, tufted, slender, simple or branched above, glabrous and shining; nodes bearded. Leaves 10-15 cm. by 4-6 mm., linear, copiously hairy on both surfaces with long bulbous-based hairs at the base ; sheaths lax, glabrous except on the upper margins where they are more or less ciliate, the upper sheaths pale, spathiform ; ligule 0.

Racemes 1-3-3-8 cm. long, subdigitate, 2-5, flexuous; lowest pair of spikelets male; peduncles 4-8 mm. long, capillary, with whorls of long white hairs in their axils; joints and pedicels slender, not grooved, terete, ciliate with silky hairs. Spikelets 10-20 pairs. Sessile spikelets 3 mm. long; callus very short, bearded, with silky hairs; lower involucre glume thin, palea nerveless, silky below the middle, often with a deep dorsal pit, margins narrowly incurved, keels ciliate ; upper involucre glume ovate, acute, nerveless, subchartaceous, silky-villous on the back ; lower floral glume oblong or linear, obtuse, flat, hyaline, nerveless ; upper floral glume represented by a slender awn 2\*5 cm. long with an acute base. Pedicellate spikelets equalling the sessile but rather narrower; lower involucre glume armed with spreading sub-marginal bulbous-based bristles often 6 mm. long or more, slightly convex, quite smooth between the bristles, many-nerved, keels ciliate; upper involucre glume lanceolate, acute, 3-nerved, ciliate, lower floral glume oblong, obtuse, ciliate ; upper floral glume very narrow.

**Locality** : *Konhan*: Stocks (*teste* Hook. f.).

*W. Ghats*: Gira Hill, Khandala (McCann 9430! 9431!); Panchgani (Blatter & Hallberg B1212 !); Pasarni Ghat (Blatter & Hallberg B1304 !).

*Deccan*: Ealsabai Hills, Nasik Dist. (Patwardhan 1183!); Lohagad (McCann 3871!).

**Ecology** : This grass is usually found on exposed hill-tops growing among other plants on rather hard and stony soil.

**Distribution** : W. Peninsula, apparently endemic.



THE BOMBAY GPASSK&

**Explanation of Plate 59 : *Dickanthium armaium* Blatter & McCann.**

- 1. Pedicelled and sessile spiked.
- 2. Lower invol. glume.
- 3. Upper invol. glume.
- 4. Lower floral glume. } Sessile spikelet.
- 5. Upper floral glume.
- 6. Grain and styles.

3. DICHANTHIUM MCCAII Blatter.

PLATE 60.

*Dichanthium McCannii* Blatter in Journ. Bomb. Nat. Hist. Soc. 82 (1927) 357, *cum ic.*; 32 (1928) 425.

Description : An erect tufted grass ; stems up to 45 cm. long, slender, simple or branched from about the middle, glabrous, shining, nodes densely long-bearded ; internodes up to 7 cm. long. Leaves up to 10 cm. by 6 mm., linear-lanceolate, broadest at base, amplexicaul, covered all over with bulbous-based hairs which are much longer at the base for about 15 mm. ; sheaths lax, covering the internodes for ^ and more, glabrous except on the outer margin and the upper third of the whole sheath which are covered with bulbous-based hairs ; ligule narrow, 1 mm. broad, made up of bristles united at the base.

Racemes solitary or 2, up to 37 mm. long ; the 3 or 4 lowest pairs of spikelets all male and alike in shape ; peduncles of binate racemes about 1 cm. long, capillary ; joints and pedicels slender, of the lower 3 or 4 pairs of spikelets glabrous, of the rest a line of ciliate hairs all along on one side of joint and pedicel and with a few cilia on the opposite side. Spikelets up to 17 pairs. Sessile spikelets 4 mm. long ; callus very short, bearded ; lower involucrel glume pale, 7-nerved, the central nerve running only half way up, 4 mm. long, not keeled, stiff-hair in the upper two-thirds (no dorsal pit), margins much incurved, tip subobtusate, purplish ; upper involucrel glume slightly longer than the lower ; broadly lanceolate, acute, margin incurved, keeled on the back, otherwise nerveless, hairy towards the tip along the margin and on keel. Lower floral glume narrowly oblong, rounded at apex, flat, hyaline, nerveless ; upper represented by a slender awn, 23 nun. long, twisted in the middle third. Pedicellate spikelet 1 mm. longer than the sessile and broader. Lower involucrel glume 5 mm. long, narrowly ellipsoid, acute at apex, slightly convex, strongly 10-nerved, very narrowly winged in the upper third, wings purplish, spinous-serrate with stiff hairs, armed with spreading eubmarginal bulbous-based bristles which are often as long as the glume, otherwise glabrous ; upper involucrel glume broadly lanceolate, slightly longer than the lower, 3-nerved, apex acute, margins broadly incurved, outer side glabrous, inner side silky-hairy. Lower floral glume oblong, obtuse at apex, as long as the upper involucrel glume, hyaline, margins silky-hairy in the upper half, upper narrowly oblong-lanceolate, hyaline, slightly shorter than the lower, apex acute.

Locality : W. Ghats: East of the Third Tableland of Panchgani (McCann !).

Distribution : Apparently endemic.

Explanation of Plate 60 : *Dichanthium McCannii* Blatter.

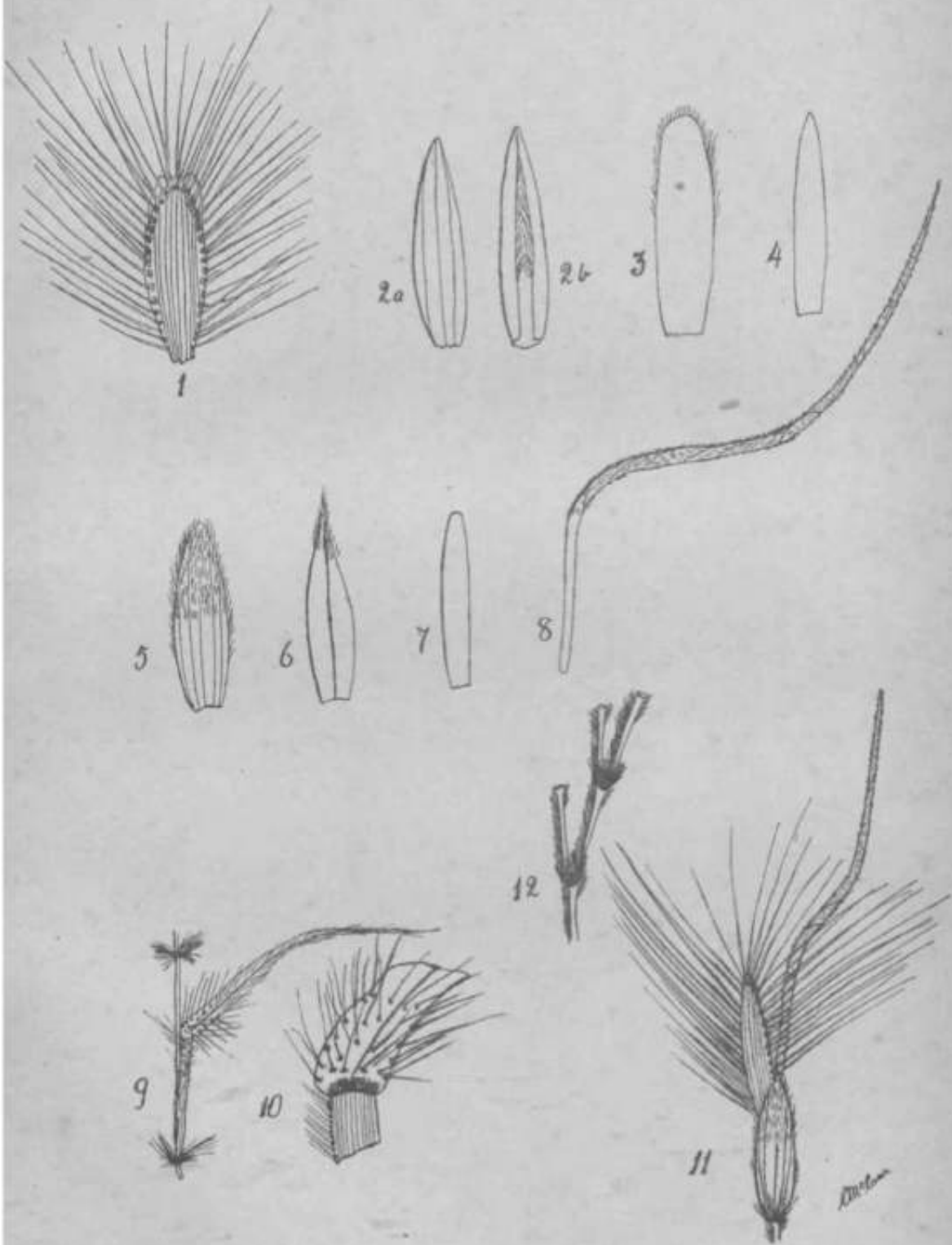
- 1. Lower invol. glume.
- 2a. Dorsal side of upper invol. glume,
- 2b. Ventral side of upper invol. glume. } Pedicelled spikelet.
- 3. Lower floral glume.
- 4. Upper floral glume.
- 5. Lower invol. glume. " \
- 6. UDDBI invol. glume. f ,, . . . . .
- 7. Lower floral glume. [ S-sessile spikelet.
- 8. Upper floral glume. ]
- 9. Internode and leaf.
- 10. Lower part of leaf with ligule,
- 11. Sessile and pedicelled spikelets.
- 12. Joint and pedicels.

4. DICHANTHIUM CARICOSUM A. Camus.

PLATE 8t,

*Dichanthium cametun* A. Camus in Bull. Mus. Hist. Nat. (Paris) 27 (1921) 519; Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 425.

*Anfrytogyon vitrico* Liim. Sj». Pl. ed. 2 (1768) 1180; Hatk. Monogr. Androp (1499) ~->A~ • Hook. f. Fl. Brit. Ind. VII (1896) 191 ; Cooke Fl. Bomb. II (1908) 57 ; Haines Bot. Jib. and Or. (1924) 1039.





DIOHANTHIUM CAIH usl M. A. CAMltf

Dellis: B. K. 1846

- A. tenelhis et binatus* Boxb. Fl. Ind. I (1833) 254, 255.  
*A. formosensis* Pers. Syji. I (1805) 103.  
*A. serratus* Retz. Obs. V (1789) 21; Triz\*. Fund. Agrost. (1830) 303.  
*A. australis* Poir. Encycl. Suppl. I, 585.  
*A. incurvatus* Koeji, e\$ Trin. in Spreug. Entdeck. II, 91.  
*A. Koenigii* Steud. Syn. PL Glum. (1855) 381.  
*A. mollicomus* Kunth Rev. Gram. I (1829) 365; Enum. PL I (1838) 497.  
*Heteropogon condnms* Tfcw. Enum. Pl. Zeyl. (1864) 368.  
*Lepeocercis digitatus* Royle III. Bot. Himal. 416,  
*Dichanthium nodosum* Usteri Ann. XVIII (1796) J1.  
*Piplasanthra lanomm* Pesv. Opus, (1831) 67, t, 5, fig. 1.

Three authors have made the new combination *Dichanthium caricosum*: (a) A. Camus l. c.; (b) Stapf in Ridley Fl. Malay Penins. V (1925) 310; (c) Haines in Bot. Bihar and Orissa (1924) 1039. A. Camus has therefore to be adopted as authority for *D. caricosum*.

We are not trying to describe varieties or forms of this very variable species.

**Vernacular names** : Marvel, Zinzvo, Telia, Jetara, Chaoria, Patang.

**Description** : Stems erect or ascending from a creeping base, forming tufts at the rooting nodes, 30-60 cm. high, stout or slender, grooved on one side, leafy; nodes usually glabrous, less frequently bearded. Leaves 15-20 cm. by 2.5-4 mm., linear, finely acuminate, flat, glabrous, sometimes ciliate at the base, the margins scaberulous; sheaths glabrous, compressed, the mouth not auricled; ligule a narrow shortly ciliate membrane.

Racemes 2.5-10 cm. long, solitary, 2-nate or subdigitately paniculate, 3-6 mm. broad, pale green or silvery, the lower sometimes stipitate; joints and pedicels about one-third as long as the sessile spikelets, ciliate on one margin. Sessile spikelets 4 mm. long; callus short, bearded; lower involucral glume 3 mm. long, obovate, concave, ciliate at the rounded or truncate apex, 7-9-nerved, subchartaceous; upper involucral glume longer than the lower, ovate-lanceolate, acute, often apiculate, subchartaceous, ciliate, 3-nerved; lower floral glume as long as the lower involucral glume, ovate-oblong, subacute, hyaline, nerveless, ciliate; upper floral glume represented by the hyaline not dilated base of the awn; awn 2-2 cm. long, the hyaline base about 3 mm. long. Pedicellate spikelets nearly as long as the sessile; upper involucral glume obovate, obtuse, with narrowly incurved margins and ciliate keels, many-nerved; upper involucral glume as in the sessile spikelet; lower floral glume ovate-oblong, subacute, hyaline, ciliate; upper floral glume nearly as long as the lower, linear-oblong, obtuse, hyaline. Anthers 2-5 mm. long.

This species can, according to Burns, and others<sup>1</sup> be distinguished from *D. annulatum* Stapf by the following characters :—

	<i>Dichanthium caricosum.</i>	<i>Dichanthium annulatum.</i>
Habit.	Big and tufted with terminal and axillary inflorescences.	Medium size with terminal inflorescences.
Nodal hairs on stem	Short.	Long.
Colour of inflorescence	Light purplish green.*	Purple.
Hairs of inflorescence	Short.	Long.

Haines l. c. believes there is no single character by which *D. caricosum* can be distinguished from *D. annulatum*. "I have," he says, "tested all those given in the F. B. I. and found they fail on specimens named by Sir J. D. Hooker himself; the key characters in Bengal Plants are also unworkable as applied to the same specimens, many of which have bearded nodes; and the character of spiral or subdistichous spikelets is difficult to apply. Linnaeus described *Andropogon caricosus* as with solitary spikes, and Willdenough (sic!) adds 'leaves with sparse hairs and sheaths hirsute at the base' (probably he refers to the nodes)."

In his key-characters Haines says that in *D. caricosum* the callus is glabrous. This seems to be a mistake. Hackel calls the callus "*brevissims barbatm*", Oooke has "bearded", RaitgctT ohariar describes it as "short and shortly hairy below". We have always found it bearded.

**Locality** : Gujarat: Surat, roadsides (Sedgwick 315!).

Khandesh: Toranmal (McOann 9869!); Tapti, N. B. of Bhusawal (Hallberg 5111!); N. slope of Chanseli (McCann 9968!).

<sup>1</sup>>V. Burns, L. B. KuUtarni and S. R. Godbole : A Study of Some Indian Grasses, in Mem. Depfc, Agr. Ind. XIV (1935) 46.

*Konkan*: Parsik, railway tract (McCann 9633 !).

*W. Ghats*: Panchgani (Blatter 3803 !, Blatter & Hallbeig B1223 !); between Mahableshtar and Panchgani, 4,000 ft. (Sedgwick & Bell 4743 !).

*Deccan*: Junnar (Mamlatdar of Junnar!); Shevgaon (Mamlatdar of Shevgaon!); Lohagad, half-way up (McCann 9627 !); Agricultural College Farm, Poona (Herb. Econ. Bot. Poona!); Khed (Mamlatdar of Khed!); Purandhar (McCann 5570!); Bairawadi, Purandhar (McCann 5075!).

*S. M. Country*: Dharwar, 2,400 ft., rainfall 34 in. (Sedgwick 1828 !).

*N. Kanara*: Halyal (Talbot 2427 !).

**Ecology** : A subgregarious species, very abundant in the Mallad tract of the Carnatic. Banks second to *Thelepogon elegans* in monsoon grass headloads. A most delicate tall grass\* often appearing in hedges.

**Distribution** : India, Burma, Ceylon, Mauritius, China.

**Economic uses** : A good fodder grass.

**Explanation of Plate 61** : *Dichanthium caricosum* A. Camus.

- |  |   |                   |
|--|---|-------------------|
| 1. Pedicelled and sessile spikelets.     | } | Sessile spikelet. |
| 2. Lower invol. glume.                   |   |                   |
| 3. Upper invol. glume.                   |   |                   |
| 4. Lower floral glume.                   |   |                   |
| 5. Stamens, ovary, styles and lodicules. |   |                   |
| 6. Upper floral glume.                   |   |                   |

#### 5. DICHANTHIUM ANNULATUM Stapf.

##### PLATE 62.

*Dichanthium annulatum* Stapf in Fl. Trop. Afr. IX (1917) 178; Haines Bot. Bill, and Or. (1924) 1039; Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 426.

*Andropogon annulatus* Forsk. Fl. Aeg.-Arab. (1775) 173; Duthie Fodder Grasses N. Ind. (1888), 33, t. 20; Hack. Monogr. Androp. (1889) 570; Lisboa Bomb. Grasses (1896) 82; Hook. f. Fl. Brit. Ind. VII (1896) 196; Cooke Fl. Bomb. II (1908) 988; Boiss. FL Or. V (1884) 463.

*A. Bladhii* Eetz. Obs. II (1781) 27; Roxb. Fl. Ind. I (1832) 259; Duthie Grasses N. W. Ind. (1883) 19.

*A. comosus* Link Enum. Hort. Berol. I (1827) 239.

*A. obtusus* Nees in Hook. & Am. Bot. Beech. Voy. 243 (excl. syn. Roxb.).

*A. scandens* Roxb. l. c. 258; Grah. Cat. Bomb. PL (1839) 238; Dalz. & Gibs. Bomb. Fl. (1861) 301.

*Lepeocercis annulata* Nees Fl. Afr. Austr. (1841) 98.

**Vernacular names** : Zinjoo, Handi daroya, Daroya, Dhrow, Zinzma, Jinjva, Marvel, Sheda, Sam-payen, Palvan-hullu, Marwalyan-hullu.

**Description** : Perennial, densely tufted; stem erect or ascending, usually simple, 15-90 cm. long; nodes usually bearded. Leaves 7.5-30 cm. by 3-6 mm., linear, finely acuminate, glaucous, glabrous or more or less sparsely hairy above with small bulbous-based hairs, the margins scabrid; sheaths bearded at the tip; ligule nearly 3 mm. long, oblong, obtuse, membranous, glabrous.

Racemes 2.5-6.3 cm. long, subdigitately fascicled, pinkish or nearly white; peduncles glabrous, 4-13 mm. long; joints and pedicels as long as the spikelets, sparingly ciliate. Sessile spikelets about 4 mm. long, but variable in length, elliptic-oblong, closely imbricating; callus thick, shortly bearded at the base; lower involucral glume elliptic-oblong, obtuse, ciliate at the rounded or truncate apex, thin, margins narrowly incurved, the keels ciliate, the back hairy or glabrous, 5-9-nerved, the nerves not reaching the tip; upper involucral glume equalling the lower but narrower, lanceolate, subacute, glabrous or ciliate, 3-nerved; lower floral glume as long as the upper involucral glume, linear-oblong, obtuse, nerveless, glabrous; upper floral glume represented by the flattened white base of a scabrid slender awn 2 cm. long! Pedicellate spikelets about equalling the sessile, male or neuter; lower involucral glume elliptic-oblong, obtuse, 7-11-nerved, the keels bristly; upper involucral glume narrower, 3-nerved; lower floral glume ciliate; upper floral glume small or obsolete.

**Locality** ; *Sind*: Jamesabad (Sabnis B972 !); Mifpurkhas (Sabnis B1028 ! B1185 !) • Hyderabad (Sabnis Btfl !); Pad-Idan (Sabnis B515!); Larkana (Sabnis B462!); Nasarwan (Sabnis B1140 !); Tatta, Kullian Kote Lake (Blatter & McCann D667 !); Tatta, tombs (Blatter & McCann D668!).

*Gujarat*: Kabirwad (Chibber!); Nadiad Farm (Herb. Econ. Bot. Poona 1).



Sessile spikelet

DICHANTHIUM ANNULATUM STAFF.

Delin: R. E. Blake.



Sessile spike] et

*Khandesh*: Amboli, Bori Biver (Blatter & Hallberg 5148 !); Dadgaum (McCann 96651); Toranmal (McCann 9670!); Bor, Bori River (Blatter & Hallberg 4428!); Umalla, Tapti Bank (Blatter & Hallberg 5228 !).

*Konkan*: Sion (McCann 3672 !); Sewn (McCann 3587 !); Parsik, railway line (McCann 9654!); Campoli (McCann 5356 !).

*W. Ghats*: Khandala, very common (McCann 5297 !).

*Deccan*: Eirkee to Poona, railway line (Garade 83 I); College garden, Poona {Garade!}; Chattarshinji Hill, Poona (Ezekiel); Trimbak (Chibber!); Manmad (Blatter 9970 !); Purandhar, north, foot (McCann 9421!).

*S. M. Country*: Derikop, 1,800 ft., rainfall 40 in. (Sedgwick 3984!).

*N. Kanara*: Halyal (Talbot 2081!); Kulgi (Talbot 2299 !).

**Ecology** : Often grows in hedges and on roadsides, but chiefly on old pasture grounds. Rangachariar calls it " another common grass flourishing in cultivated fields and gardens and seems to like sheltered places." See also Burns, Eulkarni and Godbole: A Study of Some Indian Grasses and Grasslands (1925) 45-47.

**Distribution** : Tropical Africa (Nileland, Mozambique Dist.), from Morocco through N. Africa, the Orient and India to China and Australia, Pacific Islands.

**Economic uses** : A good fodder grass. " It is also the opinion of the cattle who will sort these species (*Dichanthium annulatus* and *caricosus*) out of a mixture and eat them first." (Burns). Lisboa calls it an excellent fodder grass either in the green or dry state. " It yields a considerable amount of fairly good fodder which is largely made use of." (Duthie). Rangachariar says that cattle eat the grass eagerly both when young and in flower.

**Explanation of Plate 62** : *Dichanthium annulatum* Stapf.

- |                                      |   |                   |
|--------------------------------------|---|-------------------|
| 1. Pedicelled and sessile spikelets. | } | Sessile spikelet. |
| 2. Lower invol. glume.               |   |                   |
| 3. Upper invol. glume.               |   |                   |
| 4. Lower floral glume.               |   |                   |
| 5. Stamens, ovary and styles.        |   |                   |
| 6. Upper floral glume.               |   |                   |

6. DICHANTHIUM SERRAFALCOIDES Blatter & McCann.

#### PLATE 63.

*Dichanthium serrafalcoides* Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 426.  
*Andropogon Coolcei* Stapf ex Woodrow in Journ. Bomb. Nat. Hist. Soc. 13 (1898) 438 (*nomen tantum*); Cooke Fl. Bomb. II (1908) 986 (*descriptio*).

A. (*Dichanthium*?) *serrafalcoides* Cooke et Stapf in Ew Bull. (1908) 450.

The systematic position of this species is somewhat doubtful. Cooke already found that it does not agree with Hackel's subgenus *Dichanthium*, but he adds: " it is the only subgenus into which it will fit at all." Cooke and Stapf, when describing the same species under a different name, remark: "*Ob spiculas secundarias infimas saepissime neutras caeterum eadem forma <wfentiles si vis ad Dichanthium referendus, sed nulli speciei arete affinis, spiculis maiusculis in racemos spiculis Serrafalci haud dissimiles congestis insignis.*"—Following this suggestion we have put it under *Dichanthium*.

**Etymology** : *Serrafalcoides* is derived from *serra*, a saw and /ate, a sickle, meaning a sickle-like saw. What this alludes to exactly we are unable to say.

**Description** : A weak straggling much-branched annual; stems reaching 60 cm. long, very slender, smooth, quite glabrous; nodes glabrous. Leaves 7-5-15 cm. by 3-6 mm., flaccid, finely pointed, sparsely clothed with bulbous-based hairs on both sides, scaberulous; sheaths glabrous; ligule hyaline, ovate, ciliate.

Racemes 13-20 mm. long, solitary on the apices of the steins and branches; joints between the 2 or 3 lowest nodes continuous, short, cylindric, glabrous, the others about 1-7 mm. long, disarticulating, subclavate, densely ciliate on one side with long silky hairs which equal or exceed the pedicels; lowest pedicels very short, glabrous, the others 2 mm. long, ciliate on one side with long silky hairs, dilated into an oblique sac-like mouth above, and produced into a projecting flat horn. Spikelets closely imbricate, straw-coloured, scarious. Sessile spikelets 2-sexual (except the lowest which is very often neuter); lower involucral glume 8 mm. long, oblong or elliptic-oblong, acute, or shortly bifid, or sublacerate at the apex, the margins narrowly infolded, rigid, the keels deeply winged with subequal scarious wings about 1\*25 mm. deep and more or less toothed on the margins, 7-9-nerved between the keels, the keel-nerve running into the points of the wings; upper involucral glume shorter than the lower, oblong-lanceolate, obtuse, apiculate, 3-nerved, chartaceous, margins narrowly incurved, keels glabrous; lower floral glume 4 mm. long, oblong, obtuse, hyaline, nerveless, glabrous; upper floral glume



reduced to the white flattened lanceolate base of the awn; awn 2 cm. long, the column much twisted. Pedicellate spikelets longer than the sessile, obliquely lanceolate; lower involucre glume nearly 13 mm. long, acute, unequally winged, many-nerved, upper involucre glume 4 by 2 turn., lanceolate, acute, 5-nerved, chartaceous; lower floral glume 3 mm. long, oblong, obtuse, hyaline; upper floral glume 2-5 mm. long, oblong, obtuse, hyaline. Anthers 1-5 mm\* long. Grain 4 mm. long, oblong, compressed.

Locality: W. Ghats: Lonavla (Bhide!); Khandala, Echo Point (McCann 9403!); Ealanbai Hills (Patwardhan!); Sakar-Pathar near Lonavla (Woodrow!); Mahableshwat (McCann!); Panchgani (McCann!, Blatter & Hallberg B1250!).

Ecology! A weak straggling gregarious species usually growing in shaded or partially shaded localities. Occupies situations which are protected from too strong breezes. It roots at the nodes below. The spike is bent over and pendulous. It begins to flower late in September.

Distribution: W. Peninsula, apparently endemic.

Explanation of Plate 63: *Dichanthium serrafalcoides* Blatter & McCann.

- |                                      |                     |
|--------------------------------------|---------------------|
| 1. Ligule.                           |                     |
| 2. Pedicel.                          |                     |
| 3. Pedicelled and sessile spikelets. |                     |
| 4. Lower invol. glume.               | } Sessile spikelet. |
| 5. Upper invol. glume.               |                     |
| 6. Lower floral glume.               |                     |
| 7. Upper floral glume.               |                     |
| 8. Grain.                            |                     |

### 34. EREMOPOGON Stapf.

Perennial, rarely annual, grasses with slender culms, simple below, more or less branched above, the branches often gathered in fastigate bundles, each supported by a bladeless sheath and terminated by a solitary raceme.

Spikelets small, 2-nate, one sessile, the other pedicelled, similar in shape, different in sex, on the fragile rachis of many-jointed solitary spatheate racemes which are frequently gathered in fastigate bundles, rarely the lowermost 1-3 pairs homogamous; joints and pedicels filiform, compressed, solid or slightly grooved, disarticulating horizontally; spikelets deciduous, the sessile with the adjacent joint and pedicels. Florets 2 in the fertile spikelets, the lower reduced to an empty floral glume, the upper hermaphrodite; 1 (the lower) in the pedicelled spikelets male or neuter, the upper quite suppressed, or both suppressed. Sessile spikelet dorsally compressed, awned; callus small, shortly bearded. Involucral glumes equal, thinly chartaceous to membranous, lower 2-keeled, with narrow inflexed margins, upper boat-shaped, 3-nerved, acutely keeled. Floral glume of lower floret hyaline, nerveless, of upper floret reduced to a hyaline upwards firmer linear stipe passing into a slender awn. Stamens 3. Stigmas exerted laterally near the middle of the spikelet, longer than the styles. Grain unknown. Pedicelled spikelet awnless; floral glume if present hyaline, nerveless.

Species about 5.—Tropical and warm-temperate parts of the Old World.

Cooke knew 1 species from the Presidency which he described under the name of *Andropogon foveolatus* Del. We add *Eremopogon Paranjpyeanum* Blatter & McCann.

- |   |                              |
|---|------------------------------|
| 1. Lower involucre glume of sessile spikelet 4-nerved           | 1. <i>E. foveolatus</i> .    |
| 2. Lower involucre glume of sessile spikelet faintly 5-7-nerved | 2. <i>E. Paranjpyeanum</i> . |

### 1. EREMOPOGON FOVEOLATUS Stapf.

#### PLATE 64.

*Eremopogon foveolatus* Stapf in Fl. Trop. Afr. IX (1917) 183; Blatter & McCann in Jouin. Bomb. Nat. Hist. Soc. 32 (1928) 427.

*Andropogon foveolatus* Del. Fl. d'Egypt. (1812) 160, t. 8, fig. 2; Duthie Grasses N. W. Ind. (1883) 20, Fodder Grasses N. Ind. (1888) 34, t. 21; Lisboa Bomb. Grasses (1896) 64; Hack. Monogr. Androp. (1889) 402; Hook. f. Fl. Brit. Ind. VII (1896) 168; Cooke Fl. Bomb. II (1908) 977.

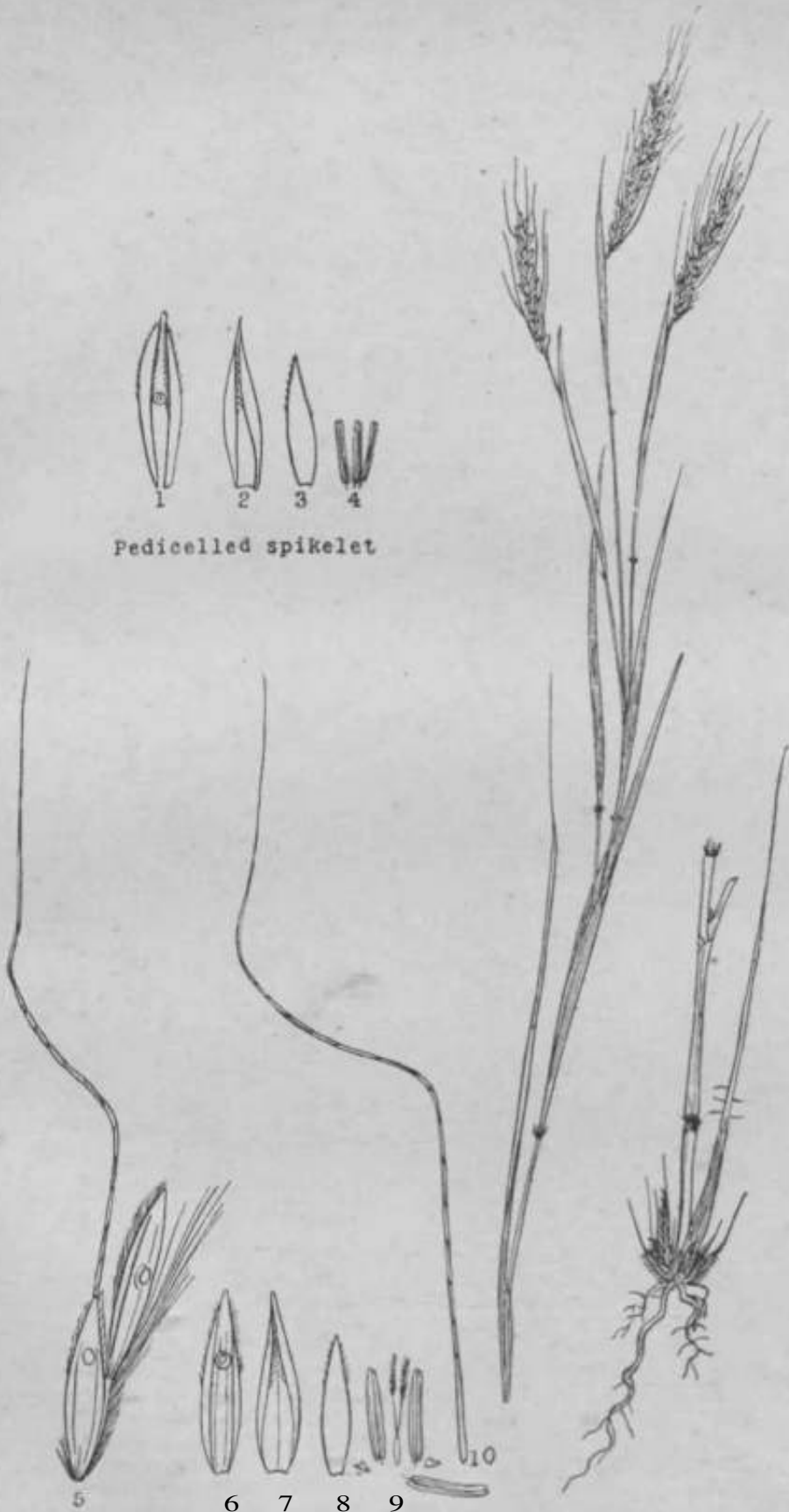
*A. strictus* Roxb. Fl. Ind. I (1832) 260.

*A. Orthos* Schult. Mant. II, 455.

*A. monostachyus* Spreng. Pug. II, 9.

*A. foveolatus* var. *plumosus* Terracino in Ann. Istit. Bot. Roma V (1894) 94.

Vernacular names: Ghandel, Marvel, Boari, Kard.



Pedicelled spikelet

Sessile spikelet

EREMOPOUOX FOVEOLATUS STAPF.

ZWin ; B. K. Bhatt.

**Etymology** : *Eremopogon* is derived from *eremos*, empty, and *pogon*, heax&.—*Foveolatus* means pitted and refers to the pitted lower involucral glume.

**Description**: Stems 30-60 cm. long, densely tufted, usually decumbent at the base, then geniculately ascending, very slender, glabrous; nodes bearded. Leaves 7-5-15 cm. by 1-2-2-5 mm., linear, scaberulous beneath; sheaths shorter than the internodes, scabrous or glabrous, the basal sheaths silky-villous; ligule short, truncate, hyaline, ciliate.

Racemes 2-5-3-8 cm. long, solitary; peduncles capillary, erect, usually far exerted beyond the slender spathe; joints and pedicels slender, ciliate on 2 opposite sides with long silky hairs, shorter than the sessile spikelets. Spikelets 4 mm. long (the sessile and pedicellate equal), oblong-lanceolate, glabrous, purplish; callus small, shortly hairy at the base; lower involucral glume 4 mm. long, flat, lanceolate-oblong, subobtusate, with narrowly involute margins, 4-nerved, usually marked with a deep pit above the middle; upper involucral glume equal to the lower, lanceolate, acute, obscurely 3-nerved; lower floral glume much shorter, oblong-lanceolate, glabrous, nerveless; upper floral glume reduced to an awn 13-16 mm. long, the column about equalling the subulate portion. Anthers 2-5 mm. long. Pedicellate spikelets; pedicels 2-5 mm. long. Glumes 2; lower involucral glume 4 mm. long, lanceolate, acute, with slightly incurved margins, the keels above aculeately scabrid, 5-nerved, pitted or not; upper involucral glume equalling the lower, linear-lanceolate, acute, 3-nerved.

**Locality** : *Sind*: Sehwan to Laki, foot of hills (Sabnis B651!).

*Cutch*: Bhuj Hill (Blatter 3765!).

*Gujarat*: Road to Lasandra (Ghibber!).

*Khandesh*: Umflla, Tapti Bank (Blatter & Hallberg 5222!); Bhusawal (McCann 4243!); Bor, Bori River (Blatter & Hallberg 4309!); Naradana (Blatter & Hallberg 5180!).

*Konkan* : Parel, poor specimen (McCann 5373!).

*W. Ghats* : Panchgani (Blatter & Hallberg B1245!), roadside, 4,000 ft., rainfall 60 in. (Sedgwick & Bell 4735!).

*Deccan* : Yeola (Herb. Econ. Bot. Poona!); Arangaon, Ahmednagar (Ryan!); Chattarshinji Hill (Ezekiel!); Deolali (Blatter 4550!); Manmad (Blatter A261!).

*S. M. Country*: Dharwar, 2,400 ft., rainfall 34 in. (Sedgwick 1825!); Haveri (Talbot 2229!).

**Ecology** : A sporadic grass. Very abundant on barren uplands in the Dharwar Dist. On rocky ground in the Deccan (Lisboa).

**Distribution**:- Tropical Africa (Upper Guinea, Nileland), Canaries, from Egypt and tropical Arabia to the drier parts of India.

**Economic uses** : A good fodder grass.

**Explanation of Plate 64** : *Eremopogon foveolatus* Stapf.

- |  |   |
|--|---|
| 1. Lower invol. glume*.                  | * |
| 2. Upper invol. glume.                   | ^ |
| 3. Lower floral glume.                   | r |
| 4. Stamens.                              | • |
| 5. Pedicelled and sessile spikelets.     | J |
| 6. Lower invol. glume.                   | } |
| 7. Upper invol. glume.                   |   |
| 8. Lower floral glume.                   |   |
| 9. Stamens, ovary, styles and lodicules. | } |
| 10. Upper floral glume.                  |   |
- Pedicelled spikelet.  
Sessile spikelet.

2. EREMOPOGON PARANJPYEANUM Blatter & McCann.

*Eremopogon Paranjpyeanum* Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 427. *Andropogon Paranjpyeanum* Bhide in Journ. and Proc. Asiat. Soc. Beng. Ser. VII (1911) 514.

**Description** : A delicate-looking grass. Stems slender, erect, 30-45 cm. high; upper nodes pubescent; leaves 2-5-7\*5 cm. by 2 mm., subcordate at base, long-hairy on both sides, the margins thickened and minutely irregularly repand and spinulosely serrulate; sheaths glabrous; ligule a short erose membrane.

Racemes solitary, 12-25 mm. long (without the awns), on a very slender peduncle. Sessile spikelets 3 mm. long. Lower involucral glume oblong, obtuse, faintly 5-7-nerved, glabrous, margins narrowly incurved, keels shortly ciliate at the apex, upper just a little longer than the lower, 3-nerved, oblong, apiculate. Lower floral glume shorter than the involucral glumes, hyaline and with ciliate margins, epaleate, upper floral glume consisting of the narrow base of the awn, just a little more than half as long as the lower involucral glume, obscurely margined and 1-nerved with 2 obscure narrow lobes at the apex, and an interposed slender, twisted,

scabrid awn about 4 cm. long, bearing a bisexual flower. Pedicelled spikelets about 1 in. long. Lower involucre glume oblong, obtuse, 7-9-nerved, margins incurved and broadly winged at the keels, wings shortly ciliate towards the apex, upper involucre glume a little shorter than the lower, oblong, acute, 3-nerved, margins ciliate. Lower floral glume shorter than the upper involucre, hyaline, ciliate, faintly 3-5-nerved, epaleate, male. Joints and pedicels compressed, obliquely truncate, | - | as long as the sessile spikelets and ciliate with short white hairs on both sides.

**Locality** : *W. Ghats*: Castle Bock (Bhide!).

**Distribution** : So far endemic.

### 35. SCHIZACHYBIUM Nees.

Annual or perennial grasses, rarely suffrutescent, never very tall. Stems slender. Leaf-blades folded in bud, usually narrow. False panicles varying from very loose and scanty to densely fasciated; spathes mostly very narrow, scarious, membranous or lower down herbaceous.

Spikelets 2-nate, of each pair differing in sex and mostly also more or less in shape and size, one sessile, the other pedicelled, on the articulate fragile rachis of many-jointed solitary racemes terminating the culms and their branches, supported by spathes and often collected into a false panicle, the sessile spikelets falling with the contiguous joint and the accompanying pedicelled spikelet; joints and pedicels thickened upwards, often rather stout with a scarious cupuliform and more or less dentate terminal appendage. Sessile spikelets dorsally compressed or sometimes in their lower half almost terete, awned; callus short with a short beard at the very base. Involucre glumes equal or subequal, lower chartaceous to subcoriaceous, more or less convex or flat on the back with, at least from the middle upwards, sharply inflexed and mostly narrow margins, 2-keeled, the keels running out into teeth or mucros, upper thinner to membranous, narrowly boat-shaped to dorsally flattened, keeled (at least upwards), 1-3-nerved, the delicate margins ciliolate. Floral glumes ciliolate, hyaline, lower membranous downwards and often purplish, 2-nerved, upper usually 2-fid or 2-dentate, rarely entire, awned, awn from the sinus or continuing the entire valve. Falea 0 or a microscopic hyaline, scale. Lodculus 2, minute, glabrous. Stamens 3, rarely 2. Stigmas laterally exerted low down, styles terminal. Grain narrowly linear in outline or tapering upwards, subterete; embryo short. Pedicelled spikelet similar to the sessile, but usually relatively broader and flatter, or more or less reduced and then sometimes quite small. Involucre glumes more or less membranous, the lower aristulate or mucous. Floral glumes, if present, hyaline, ciliate, mucous.

Species about 50.—Tropics of both hemispheres.

#### 1. SCHIZACHYRIUM BBEVIFOLIUM Nees.

*Schizachyrium brevifolium* Nees Agrost. Bras. 332; Miq. Fl. Ind. Bat. III, 495; Stapf in Fl. Trop. Afr. IX (1917) 187; Haines Bot. Bih. and Or. (1924) 1042.

*Andropogon brevifolius* Sw. Prodr. Veg. Ind. Occ. (1788) 26, Fl. Ind. Occ. I, 209; Hack. Monogr. Androp. VI (1889) 363 (*exd. var. fragilis*); Duthie Grasses N. W. Ind. (1883) 19, Fodder Grasses N. Ind. (1888) 34; Hook. f. Fl. Brit. Ind. VII (1896) 165.

*A. obtusifolius* Poir. Encycl. Suppl. I, 583.

*A. parviflorus* Koxb. Fl. Ind. I (1832) 274.

*A. teneuos* Presl Bel. Haenk. I (1830) 335.

*A. debilis* Eunth Enum. Pl. I 0838) 488.

*A. floridus* Trin. in Mem. Acad. Petersb., 6 ser. II (1833) 265.

*Pollinia brevifolia* Spreng. Syst. I (1825) 288.

**Etymology** : *Brevifolium* means short-leaved.

**Description** : Annual. Stems weak, up to 60 cm. long, usually ascending from a decumbent base, rarely erect, many-noded, branched from most of the nodes; branches often 2-4-nate and dividing again, very slender to filiform, geniculate, glabrous, the lower internodes usually much compressed. Leaf-blades linear, constricted at the junction with the sheath, the lower and those of the primary branches obtuse or subobtuse or suddenly narrowed to a sharp point, 25-38 mm. long and 2-6-3 mm. wide, the upper and those of the secondary and tertiary branches much narrower and more acute, often glaucescent, smooth except along the margins and the lower side of the midrib, nerves very fine. Ligules membranous, very short, ciliolate. Sheaths compressed, the lower keeled, somewhat lax, glabrous, smooth, the uppermost spathe-like; leaves like the spathe of the inflorescence ultimately turning reddish.

Spathes on subcapillary curved or flexuous branchlets, very narrow, acute, reaching to the base of the racemes or slightly exceeding them; racemes borne on filiform upwards clavate peduncles, slender, from less than 12 mm. to slightly over 25 mm. long, 5-11-jointed.

2-2-7 mm. long, widening upwards from a slender base, tips 2-dentate, glabrous, smooth; pedicels as long as the joints, very slender and only slightly thickened upwards. Sessile spikelets linear-lanceolate, acuminate, more or less convex on the back, pale green, about 3-3 mm. long including the minute callus, which is more or less shortly bearded, at least on the sides. Involucral glumes equal, lower thinly chartaceous, 2-dentate, scaberulous along the keels, with very fine intracarpal nerves, smooth or very minutely scaberulous on the back; upper boat-shaped, acute, 1-nerved, ciliolate. Lower floral glume elliptic, obtuse, hyaline, nerveless, ciliolate, upper 2-fid almost to the base, 1-6 mm. long, segments linear-oblong, subobtusate, sparingly ciliolate, awn 8-5-12-7 mm. long. Anthers 0-5 mm. long, deep red or purple. Grain sublinear, tapering upwards. Pedicelled spikelet reduced to a minute glume, often passing indistinctly into the pedicel and produced into a bristle-like awn, about 4-2 mm. long.

**Locality** : 8. *M. Country*: Badami (Talbot 2930 !).

**Ecology** : A very delicate species, growing in pasture land amongst hills.

**Distribution** : Widely distributed throughout the tropics.

### 36. ANDROPOGON Linn.

After the restoration of Hackel's subgenera to the rank of genera, the general characters of *Andropogon* itself must be modified in many ways :

Mostly perennial grasses of various habit. Spikelets 2-nate, the sessile and pedicelled differing from one another in sex and more or less heteromorphous, all pairs similar, or if the lowest sessile spikelet male or imperfect then resembling the others. Spikes (spiciform racemes) many-jointed, fragile, paired (very rarely solitary) or corymbose (digitate or subdigitate) on terminal peduncles, embraced below by a spathe-like leaf (spatheole), frequently 2 or more pairs with their spathes subtended, by a common spathe and so on to more composite branching, the whole forming a false panicle; the sessile spikelets falling with the contiguous joint and the accompanying pedicel; joints and pedicels filiform or thickened upwards and then the tips frequently more or less cupular or auricled. Sessile spikelets dorsally or laterally compressed, nearly always awned; callus short, mostly quite obtuse, shortly bearded. Involucral glumes equal or subequal, subcoriaceous to membranous, lower flat or concave or channelled on the back with at least from the middle upwards sharply inflexed margins, 2-keeled; upper more or less boat-shaped, keeled upwards, 3-1-nerved, sometimes aristulate. Floral glumes ciliate or ciliolate, rarely glabrous, lower hyaline, 2-nerved, upper 2-fid or 2-dentate, hyaline or firmer and sometimes substipitate or below the insertion of the awn. Palea a hyaline nerveless scale or 0. Lodicules 2, minute, glabrous. Stamens 3. Stigmas laterally exerted; styles terminal. Grain narrowly lanceolate to oblong in outline, subterete to plano-convex; embryo about half the length of the grain. Pedicelled spikelets often very different from the sessile in shape and less so in size, always more or less compressed dorsally, never concave or channelled on the back, sometimes reduced and then often small or quite suppressed. Involucral glumes herbaceous-chartaceous to membranous, the lower muticous or very rarely aristulate\* Floral glumes, if present, hyaline, ciliate, muticous.

Species about 100.—Mostly in the tropics of both hemispheres.

### 1. ANDROPOGON PUMILUS Roxb.

#### PLATE 65.

*Andropogon pumilus* Roxb. Fl. Ind. I (1832) 273; Steud. Syn. PL Glum. (1855) 388; Hook. f. Fl. Brit. Ind. (1896) VII, 170; Cooke Fl. Bomb. II (1908) 976; Haines Bot. Bih. and Or. (1924) 1044.

*A. demissus* Steud. I.e.

*A. pachyarthrus* Hack. Monogr. Androp. (1889) 449; Duthie Grasses N. W. Ind. (1883) 21, Fodder Grasses N. Ind. (1888) t. 39.

**Vernacular names** : Zinzvo, Baerki, Gondwal, Lalgavat, Tambrut, Gondal, Ghiman chara, Malakava.

**Etymology** : *Andropogon* is derived from *aner*, *andros*, a man, and *pogon*, beard, i.e., man's beard, alluding to the appearance of the spikes.

**Description** : Annual; stem 15-45 cm. high, slender, suberect or geniculate and decumbent below, quite glabrous. Nodes glabrous. Leaves 7-5-12-5 cm. by 2-5-4 mm., linear, finely acuminate, glabrous; sheaths compressed, keeled, quite glabrous; ligule short, truncate, membranous, glabrous.

Racemes 1-3-2 cm. long, in nearly equal pairs on a very slender peduncle which arises from a narrow flattened glabrous spathe 6-13 mm. long; joints 2-5 mm. long, very slightly

clavate (almost linear), flattened, glabrous and often led on the back, with densely ciliate margins and a cup-shaped 2-3-toothed apex. Sessile spikelets reaching 5 mm. long; callus glabrous. Glumes 4; lower involucrel glume 5 mm. long, linear-lanceolate, acuminate, membranous, 2-cuspidate, the keels strong, running into the slender awns about 8 mm. long; upper involucrel glume as long as the lower, narrowly, lanceolate, mucronate, coriaceous, 1-nerved; lower floral glume hardly 3 mm. long, linear-lanceolate, subacute, hyaline; upper floral glume 2-5 mm. long, narrowly linear, hyaline, cleft at the apex into 2 subulate lobes with an awn in the sinus between them; awn reaching 16 mm. long, geniculate about the middle; the lower half brown, the upper white. Anthers 2 mm. long. Pedicellate spikelets not awned; pedicels 3 mm. long with ciliate margins. Glumes 3; lower involucrel glume 4 mm. long, ovate-lanceolate, acuminate, 5-nerved.

Locality : *Gujarat*: Nadiad farm (Herb. Econ. Bot. Poona !); Surat (Dalzell).

*Khandesh*: Bhusawal (McCann 5451!); Bor, Bori- River (Blatter and Hallberg 5116 !); to Naradana (Blatter and Hallberg 5207 !).

*W. Ghats* : Panchgani (Blatter and Hallberg B1268 ! B1274 ! B1326 !).

*Deccan* : Pashan (Gammie !); Bairawadi, Purandhar (McCann 5064!); Manmad (Blatter A262 !); Shinda (Sabnis A263 !).

*S. M. Country* : Haveri (Talbot 2230 !); Dumbai (Talbot 2318 !); Harsol (Sedgwick 1083!).

*N. Kanara* : Karwar (Lisboa).

Ecology : A subgregarious species. Common on poor soil of the MaUad tract of the Carnatic. Very common in Poona, according to Lisboa, where large tracts of ground flatter red owing to the colour of the bracts. May be found the whole year round.

Distribution : Nepal, Bihar, Rajputana, Central Provinces, W. Peninsula.

Economic uses : Considered to be a good fodder especially before the flowering time. Duttie says that it is good for cattle but not for horses.

Explanation of Plate 65 : *Andropogon pumilus* Roxb.

- |                                      |   |                   |
|--------------------------------------|---|-------------------|
| 1. Pedicelled and sessile spikelets. | } | Sessile spikelet. |
| 2. Lower invol. glume.               |   |                   |
| 3. Upper invol. glume.               |   |                   |
| 4. Lower floral glume.               |   |                   |
| 5. Upper floral glume.               |   |                   |
| 6. Stamens, ovary, and styles.       |   |                   |
| 7. Lower portion of spikes.          |   |                   |

### 37. CYMBOPOGON Spreng.

Perennial, densely tufted and usually aromatic grasses. Leaves often very coarse.

Panicles frequently much compound and contracted, spatulate. Spikelets 2-nate, those of each pair differing in sex and more or less in shape—except those of the lowest pair of the lower or of both racemes which are homogamous (male or neuter)—one sessile, the other pedicelled on the articulate fragile rhachis of many-jointed paired racemes, terminating the culms and their branches; raceme-pairs supported by a spatheole, collected into often decompound or supra-decompound spatulate panicles; the fertile spikelets falling with the contiguous joint and the accompanying pedicel; joints and pedicels filiform or linear with frequently more or less cupular or aurled tips, those of the lowest pair (raceme-base) often conspicuously swollen, oblong or barrel-shaped and hard. Sessile spikelets (above the lowest) female or hermaphrodite, dorsally, rarely laterally, compressed, awned (normally); callus very short, obtuse, shortly bearded. Involucrel glumes equal or subequal, more or less chartaceous, lower almost flat or slightly depressed or narrowly grooved on the back, with at least from the middle upwards sharply inflexed margins, 2-keeled, upper more or less boat-shaped, keeled upwards, usually 1-nerved. Floral glumes ciliate or ciliolate (sometimes obscurely), lower entire, hyaline, 2-nerved, upper 2-fid or 2-lobed, hyaline, rarely firmer and almost stipe-like below the insertion of the awn; column of awn, if any, smooth. Palea 0. Lodicules 2, minute, glabrous. Stamens 3. Stigmas laterally exerted; styles terminal. Grain oblong in outline, subterete to planoconvex in cross-section; embryo about half the length of the grain. Pedicelled spikelets usually slightly different in shape and size from the sessile, but never depressed or grooved on the back. Involucrel glumes mucicous, lower chartaceous to subchartaceous, upper thinner. Lower floral glume hyaline, 2-nerved, upper 0, but usually a male flower present.

Species about 36, in the tropical/more rarely in the subtropical regions of the Old World.

Cooke mentions 1 indigenous (*Andropogon Jwarancusa* Jones) and 1 cultivated species (*Andropogon Schoenanthus* Linn.) belonging to this genus. We add another indigenous species and two cultivated ones.

- A. Blades long; hard, rough-edged throughout, filiform to linear; lower involucre glume of sessile spikelet flat or concave between the keels.
- I. Raceme-joints villous all over, hairs long, more or less concealing the sessile spikelets; awn usually a straight, very short bristle.
1. Basal leaf-sheaths in dense tufts, tightly clasping, thickened below; blades more or less filiform and flexuous, except when very short; raceme-fascicles more or less simple . ^ . 1. *C. Schoenanthus*.
2. Basal leaf-sheaths ultimately loosened and curled; blades flat; raceme-fascicles compound. 2. *C. Jwarancusa*.
- II. Raceme-joints bearded along the sides, but hairs not concealing the sessile spikelets; fertile spikelets awnless. 3. *C. citratus*.
- B. Blades flat, 5-30 mm. wide, rounded to subcordate and stem-clasping at the base of a soft texture, with smooth edges, at least in the lower part; lower involucre glume of sessile spikelet with a narrow groove from the middle downwards corresponding to a keel inside.
- I. Blades 10-30 mm. wide (rarely under 10 mm.), somewhat fat, rich green, at least above; panicles 10-30 cm. long, turning reddish when mature . 4. *C. Martini*.
- II. Blades 2-6 mm. wide, thin, glaucous; panicles 10-20 cm. long, glaucous or straw-colour when mature • 5. *C. caesius*.

1. CYMBOPOGON SCHOENANTHUS Spreng.

PLATE 66.

- Cymbopogon Schoenanthus* Spreng. Fug. II (1815) 15 (*non* Schult.); Stapf in Kew Bull. (1906) 303-313, 352-353, in FL Trop. Afr. IX (1919) 268.
- C. arabicus* Nees ex Steud. Syn. PL Glum. I (1855) 387.
- C. Arriani* Aitch. Cat. Panj. PL (1869) 174.
- C. circinnatus* Hochst. ex Hack. Monogr. Androp. (1889) 599.
- Andropogon Schoenanthus* Linn. Sp. PL (1753) 1046 (*non* Hackel et plurimorum auct.).
- A. bicornis* Forsk. FL Aeg.-Arab. (1775) 173 (*non* Linn.).
- A. laniger* Desf. Fl. Atl. II (1800) 379; Boiss. FL Or. V (1881) 465; Balfour Bot. Socotra (1888) 316; Hack. Monogr. Androp. (1889) 598; Benth. in Hook. Ic. PL 1.1871.
- A. Olivieri* Boiss. Diagn. PL Or. ser. I, fasc. V (1844) 76.
- A. circinnatus* Hochst. et Steud. Syn. PL Glum. I (1855) 387.
- A. Arriani* Edgew. in Journ. Linn. Soc. VI (1862) 208.
- A. Iwarancusa* subsp. *laniger* Hook. f. FL Brit. Ind. VII (X896) 203; Cooke FL Bomb. II (1908) 976 (*var. tantum*).
- Gijmnanihelia lanigera* Anders, in Schweinf. Beitr. FL Aethiop. (1867) 306 (*nomen tantum*).
- For a discussion of the foundation of this species see Stapf in Kew Bull. (1906) 303-305.

**Vernacular names** : Khavi, Ghatyari, Iskir (Arabic name of the grass as sold in the bazaars).

**Etymology** : *Cymbopogon* is derived from *kymhe*, a boat, and *pogon*, a beard.—*Schoenanthus* is *schoinu anthos*. Hippocrates (460-357 B. C.) mentions *schvinus* among the aromata; *unthus* means flower.

**Description** : Perennial, compactly caespitose, with numerous intravaginal innovations, 15-45 cm. high. Culms erect, slender, few- to 4-noded and simple below the inflorescence, terete, glabrous, very rarely with a few small hairs at the nodes. Leaf-blades semiterete, filiform, wiry, flexuous, very firm and often circinate upwards, rounded on the back, channelled on the face, or those of the culms somewhat flatter and shorter, up to more than 23 cm. long, 1 mm. in diam., glabrous, finely scaberulous on the nerves below, though often smooth to the touch, pale, glaucous, evenly 7-9-nerved, the midrib showing only above as a broad, white band. Ligules membranous to scarious, oblong, truncate, dilate, up to 3-3 mm. long. Sheaths

very firm, smooth, glabrous, tight, those of the innovations and base of the culms widened at the base, very tough and long-persistent, straw-coloured, up to 13 cm. long.

Spatheate panicle narrow, 8-30 cm. long, few- to 7-noded, lower internodes 5-7.5 cm. long, upper rapidly decreasing in length, slender, glabrous; lowest primary branch rarely undivided at the base, 3-2-noded and up to 15 cm. long, usually forming up to 4-rayed tiers; lowest subtending sheaths with foliaceous blades; rays finely filiform, 2-5-3-7 cm. long, rarely to over 5 cm., glabrous; spathes narrowly lanceolate, subherbaceous, often tinged with pale purple, with a short blade or the upper bladeless and produced into a setaceous point, 3\*7-4\*3 cm. long, glabrous. Spatheoles very narrow, acute or with a setaceous point, 12-25 mm. long, pale or straw-coloured; peduncles finely filiform, widened upwards 3-3-4-2 mm. long, tips truncate. Racemes 2-nate, more or less divaricate, at length epinastically deflexed, 1-2 mm. long, white-villous, pale or tinged with purple, one subsessile, the other with a bare base, 1-2 mm. long, bases puberulous to pubescent in the fork, ciliate-bearded upwards, with minutely cupular and denticulate tips, that of the subsessile raceme as well as the adjacent pedicel stout, elliptic to elliptic-oblong in outline and convex on the back, ultimately more or less glabrescent and glossy; fertile joints filiform, slightly widened towards the oblique subcupular auricled tips, 2-7-3-3 mm. long, densely hairy to villous from the back and the angles; adjacent pedicels similar to the joints but more slender. Homogamous pair of spikelets 1 at the base of the sessile or of both racemes; the sessile spikelet of the lowest but one of the sessile raceme intermediate and imperfectly awned. Fertile spikelets linear-lanceolate, more or less acuminate, acute, including the callus 5-3-6-3 or even 7-4 mm. long, glabrous, pale green below, reddish upwards; callus short, obtuse, shortly bearded. Involucral glumes equal, chartaceous, lower nerveless and shallowly concave between the acute scaberulous keels, minutely 2-denticulate, upper lanceolate-oblong in profile, acute, slightly curved on the back, 1-nerved, margins broadly hyaline upwards, ciliate. Lower floral glume linear-oblong, nerveless, hyaline, ciliate, slightly shorter than the involucral glumes, upper very narrow, shortly 2-fid, cuneate-linear and chartaceous below the insertion of the awn, less than 3-3 mm. long, lobes broadly lanceolate, ciliate, awn up to 1 cm. long, very fine, more or less keeled at and slightly twisted below the middle; column smooth. Anthers 2 <sup>TMTM</sup> long. Fedicelled spikelets male, linear-oblong, 4\*2-6-3 mm. long, glabrous, more reddish than the sessile; involucral glumes subchartaceous, with 5-9 evenly distant intracarinal nerves, the upper thinner, 3-nerved; lower floral glume linear-oblong, sub-2-nerved, ciliate, 4-2 mm. long; upper floret reduced to a male flower, or its glume present as a microscopic scale.

**Locality** : *Sind*: (Stocks 816, Woodrow); Jemadar ka Landa, near Karachi (Stocks).

**Ecology** : This is a characteristic desert plant requiring very little water.

**Distribution** : From Morocco through N. Africa, Arabia, Persia, Afghanistan, Baluchistan, Punjab, Sind.

**Economic uses** : Eaten by cattle, especially when young.

On oil and other products of this plant see Stapf in Kew Bull. (1906) 305-313, and Gilde-meister und Hoffmann: Die ath.erisch.en Oele. 1899, and in translation : Kremers, The Volatile Oils, Milwaukee, 1890.

• **Explanation Of Plate 66** : *Cymbopogon Schoenanthus* Spreng.

1. Pedicelled and sessile spikelets.
2. Lateral view of upper invol. glume.
3. Lower invol. glume.
4. Upper invol. glume.
5. Lower floral glume.    ^    S    ^    8 P<sup>i</sup>kelet.
6. Upper floral glume.
7. Stamens, ovary, styles and lodicules.

## 2. CYMBOPOGON JWABANCUSA Schult.

### PLATE 67.

*Cymbopogon Jwarancusa* Schult. Mant. II (1824) 458; Stapf in Eew Bull. (1906) 354; Haines Bot. Bih. and Or. (1924) 1045.

*Androyogon Juarancusa* Jones in Asiat. Research, IV. (1795) 109; Cooke Fl. Bomb. II (1908) 976.

*A. Iwarancusa* var. *genuinus* Hack. Monogr. Androp. (1889) 599.

*A. Titarancusa* subsp. *Iwarancusa proper* Hook. f. Fl. Brit. Ind. VII (1896) 203.

*4. laniger* Duthie Fodder Grasses N. Ind. (1888) t. 23.

**Vernacular names** : Jwarankusa, Khavi.

**Etymology** : *Jwarancusa* means fever-restrainer and is composed of *Jwara*, fever and *ankasa*, the hook used by the elephant-driver to restrain his elephant.





• sessile splkelet

OniBOPOGON JWARANCUBA SCHULT

Delin: B. K. Bhide.

**Description** : Usually a tall grass, up to 1.8 m. high, with very aromatic roots, densely tufted, the stems from clusters of firm, persistent, finally loose and open and tortuous leaf-sheaths, more or less widened below. Leaves flat, up to 60 cm. long and 5 mm. broad, narrowly linear, filiform above and ending in a long capillary tip, ligule 0.5 mm. long, membranous.

Panicles long, narrow, interrupted, with very compressed, short, fascicled branches bearing spathes about 5 cm. long and spatheoles 6-18 mm. long. Eacemes 14-1\*8 cm. long, often 5-jointed, joints half as long as the uppermost villi. Spikelets 3-4 pairs, green, half hidden by the 5 mm. long villi on the joints and pedicels. Sessile spikelets 5 mm. long; lower involucre flat or concave between the keels, which are neither winged nor margined (omitting, of course, the ordinary inflexed margins of the glume common to the genus) or sometimes narrowly margined, scabrid or ciliolate, nerves 2-4 or 0 between the keels. Joints of rachis and pedicels subclavate, with toothed tips. Pedicelled spikelets equal or rather longer than the sessile, narrowly lanceolate, purplish; lower involucre glume 7-9-nerved.

**NOTE.**—This species is nearly related to *C. Schoenanthus* and the two, as pointed out by Tackel (l. o. p. 600), are not always distinguishable with certainty. "At high altitudes," says Stapf (l. c. 314), "as in Kumaon and Spiti, or in the dryer parts of the Punjab, it (*C. Jawarancum*) becomes dwarfed and narrow-leaved and forms a 'transition state' to *C. Schoenanthus*. The latter is a characteristic desert plant, able to exist with a minimum supply of water. On the other hand, *C. Jwarancusa* is dependent on an, at least temporarily, abundant supply of water, and prefers the neighbourhood of rivers, or actually grows in the beds of torrents. It is not impossible, that the distinguishing characters of *C. Jatcarancusa* as compared with *C. Schoenanthus*, that is the robust state, the long, flat and relatively broad leaves, and the more composite panicles, are mainly due to eolaphic conditions."

**Locality** : *Sind*: Karachi (Dalzell & Gibson); Bholari (Bhide!); Shikarpur (Bhide!); Umarmot, sandy plains (Sabnis B1082!); Gharo (Blatter & McCann D669! D670!); Ghulamalla (Blatter & McCann D671!).

*Gujarat*: Ahmedabad (Dalzell & Gibson).

**Distribution** : Outer hill-zone of the United Provinces, Kumaon, Garhwal (up to 10,000 ft. or over) and westwards as far as Peshawar, Jodhpur and Jaisalmer States, Sind, Bihar.

**Economic uses** : This grass is probably used for oil along with the previous species.

**Explanation of Plate 67** : *Cymbopogon Jwarancusa* Schult.

- |  |   |                   |
|--|---|-------------------|
| 1. Pedicelled and sessile spikelets.     | } | Sessile spikelet. |
| 2. Lower invol. glume.                   |   |                   |
| 3. Upper invol. glume.                   |   |                   |
| 4. Lower floral glume.                   |   |                   |
| 5. Upper floral glume.                   |   |                   |
| 6. Stamens, ovary, styles and lodicules. |   |                   |

### \*3. CYMBOGON CITRATUS Stapf.

*Vymbopogon citratus* Stapf in Kew Bull. (1906) 357, in FL\* Trop. Afr. IX (1919) 282.

*Andropogon Schoenanthus* Linn. Syst. ed. X (1759) 1304, not of Sp. PL; Eoxb. Fl. Ind. I (1832) 274.

*A. citratus* DC. Cat. Hort. Monsp. (1813) 78; Nees in Allgem. Gartenz. III (1835) 266.

*A. citriodorum* {sic !} Desf. in Tabl. Ecole Bot. II (1815) 15.

*A. Roxburghii* Nees in Wight Cat. (1833) no. 1699 {*nomen tantum*}; Steud. Syn. PL Glum. I (1855) 395.

*A. ceriferus* Hack, in Mart. FL Bras. II, pt. III (1883) 281.

*A. nardus* var. *ceriferus* Hack. Monogr. Androp. (1889) 605.

*Schoenanthus arnboenicum* Rumph. Herb. Amboin. V, 181, t. 72.

For the taxonomic position of this species see Stapf in Kew Bull. (1906) 330-333.

**Vernacular names** : Oleu cha, Hirva cha, Lili cha, Vasane-hullu, Kavance hullu, Majjige hullu, Lemon Grass.

**Description** : A tall perennial, throwing up dense fascicles of leaves from a short, oblique, annulate, sparingly branched rhizome, usually barren, but occasionally giving rise to a stout erect culm up to over 1\*8 m. high, 7-8-noded and simple below the panicle. Leaf-blades linear, long-attenuated towards the base and tapering upwards to a long setaceous point, up to over 90 cm. long by 16-18 mm. wide, very firm, glaucous-green, glabrous, smooth or more or less rough upwards and along the margins; midrib somewhat stout below, whitish on the upper side; primary lateral nerves 4-6 on each side, raised particularly above with 2-4 secondary nerves between them. Ligules very short, scarious, rounded or truncate. Sheaths terete, those of the barren shoots much widened at the base, and tightly clasping each other, narrow and separating upwards, with rounded shoulders at the mouth, 10-30 cm. long, subcoriaceous, quite glabrous and smooth, more or less cinnamon-coloured or russet on the inside, of the culms tight, shorter than the internodes, finely pubescent or velvety at the node.

Spatheate panicle decomposed to subdecomposed, loose, 30 to over 60 cm. long, nodding; internodes 4 to over 6, the longest up to 20 or 22 cm. long, rapidly decreasing in length upwards; lowest primary branches undivided at the base, up to over 45 cm. long, and up to 5- or 6-noded, the following forming mixt tiers of *very* unequal variously compound and simple rays, ultimate tiers up to 4-rayed; rays filiform and glabrous; spathes narrow-lanceolate, acute or acuminate, 2-5-5 cm. long, with narrow membranous margins. Spatheoles very narrow, linear-lanceolate to almost subulate when inrolled, 14-18 mm. long, acute or finely acuminate, reddish to rich russet. Peduncles 6-10 mm. long, glabrous. Racemes 2-nate, finally spreading at right angles or epinastically deflexed, moderately dense, 14-25 mm. long, pale, variously tinged with dull purple, loosely villous, one subsessile, the other with a slender filiform bare base, almost 2 mm. long and hairy, the pedicel of the homogamous pair also slender, though short; fertile joints filiform, slender, 2-3 mm. long, ciliate on both sides, tips obliquely auriculate and cupular; adjacent pedicels very similar. Homogamous pair of spikelets 1 at the base of the sessile raceme, its sessile member usually slightly differing in shape from the fertile spikelets. Fertile spikelets linear to linear-lanceolate, acutely acuminate, 5-6 mm. long, reddish, glabrous; callus short, obtuse, minutely bearded. Involucral glumes subequal, lower subchartaceous, slightly depressed towards the base, otherwise flat on the back, keels acute, scaberulous above, intracarpal nerves 0 or 1, short or indistinct, upper boat-shaped, slightly curved on the back, acute, keeled upwards. Lower floral glume hyaline, linear oblong or almost linear, sub-2-nerved, ciliolate above, slightly shorter than the involucral glumes, upper narrowly linear, acute, about 4 mm. long, usually entire and awnless, rarely more or less 2-fid with a small bristle from the sinus. Anthers 2 mm. long. Pedicelled spikelets male or neuter, linear to subulate-lanceolate, as long as the sessile, reddish, glabrous; lower involucral glume 5-9-nerved, upper 3-nerved; lower floral glume shorter to much shorter than the involucral glumes, hyaline, ciliolate, upper very narrowly linear, nerveless if present at all.

**Locality** : Gardens in Bombay.

**Distribution** : This grass is only known in the cultivated state. Probably of Indian origin, and now widely distributed over the tropics of both hemispheres. See Stapf in Eew Bull. (1906) 334.

**History and uses** : See Stapf in Eew Bull. (1906) 322-330, 334 and authorities given under *Cymbopogon Schoenanthus*.

#### I. CYMBOGON MARTINI Stapf.

*Cymbopogon Martini* Stapf in Kew Bull. (1906) 359; Haines Bot. Bih. and Or. (1924) 1046,

*C. Martininus* Schult. Mant. II (1824) 459.

*Andropogon Martini* Roxb. Fl. Ind. I (1820) 280.

*A. pachnodes* Trin. in Mem. Acad. Petersb. ser. 6, II (1833) 284, and Spec. Gram. Ic. (1836) tab. 327.

*A. Calamus aromaticus* Boyle, Essay Antiq. Hind. Med. (1837) 33 (*nomen tantum*), IUustr. Bot. Himal. (1840) tab. 280.

*A. nardoides* Nees Fl. Afr. Austr. (1841) 116.

*A. Schoenanthus* Fluck. & Hanb. Pharmacogr. (1874) 660 (*non* Linn.).

if *Schoenanthus* var. *genuinus* Hack. Monogr. Androp. (1889) 609 (*partim*).

*A. Schoenanthus* var. *Martini* Hook. f. in Fl. Brit. Ind. VII (1896) 204 (*exclus. synonym. referentibus ad plantas Africanas*).

For the foundation of this species and its synonymy see Stapf in Kew Bull. (1906) 335-337.

**Vernacular names** : Geraffium grass, Eusa grass, Rohisha, Rosem, Rusa, Gandh-bel, Mirchia gandh, Tikhari, Bohish, Roshegavat, Rhonse, Rauns, Eunthi hullu, Khasi hullu.

**Description** : A tall, perennial, sweet-scented grass 1-5-2-4 m. high. Stems glabrous, straw-coloured, leafy. Leaves flat, usually broad, rounded or subcordate at the base, more or less glaucous beneath, those below the inflorescence rarely under 23 cm. long by 1 cm. wide at the base, but often 2-5 cm. wide below, tapering from a little above the base or from the middle to a firm tip, glabrous except for the scabrid margins, margins sometimes smooth near the base.

Spikes 2-nate, 12-18 mm. long, oblique or divaricate or less often deflexed. Peduncle about half the length of the 18-25 mm. long spatheole, several spatheoles and their peduncles from a spathe of a lower order, these arranged in long usually narrowly oblong panicles not more than 3-5-5 cm. wide, but sometimes panicle with many branches and broader. Joints and pedicels slenderly clavate (excluding the much thickened lowest), about half *SB* long as the sessile spikelets, tips with a lanceolate tooth or 3-toothed, margins long-villous 3-5-5 mm. long. Lower involucral glume (above the lowest spikelet) with lanceolate centre becoming



Sessile spikelet

CYMBOPQGON 9GHOKNAN TIM'S SPRESO

Delin: R. K. Bhida.



Sessile spikelet

ANDROPOGON PUMILUS ROXB.

Delin: B. K. Boidé.

oblanceolate or oblong from the keels being membranously winged above the middle, back with a vertical median depression below the middle corresponding to a ridge inside; upper cymbiform with the dorsal keel winged above, minutely ciliate below.

**Locality** : *Cutch* : Bhuj, Rhodir-Maka (Blatter 3749 !); Anjar (Blatter 3741!).

*Kathiawar* : Junagad (Blatter 3783 !).

*Gujarat*: Champanir (Chibber !); Ahmedabad, dry hills (Sedgwick 310!).

*Khandesh* : Road to Chinchpada (Chibber !); Toranmal (McCann A285 !).

*Konkan* : Wada Range (Ryan 488 !); Gokhirva, Bassein (Ryan 41!); Keltan (Ryan 392 !); St. Xavier's College compound (McCann 4461!).

*W. Ghats* : Igatpuri (Blatter & Hallberg 4432!); Kasara, Igatpuri Ghat (McCann 4343A!); Khandala, very common (McCann!); Panchgani (Blatter & Hallberg B1248 ! B1282 ! B1297 ! B1324 !).

*Deccan*: Ganeshkhind Botanic Gardens (Garade 435!); Purandhar (McCann 6010 !); Pashan (Gammie !); Modasa (Sedgwick & Saxton!).

*S. M. Country*: Haveri (Talbot 2180!); Dharwar (Talbot 2616!); Badami (Talbot 2928!).

Stapf excludes also the outer slopes of the Western Ghats, but the localities given above show that the grass is well represented in that region.

**Ecology** : According to Malcolmson " the Rusa grass in the Deccan affects particularly the trap, more or less avoiding the granite, so much so that he was able to trace the greenstone dykes across the granite by the luxuriance of the grass." (*ex* Stapf).

This species frequently occupies large areas of open grass-land often to the exclusion of everything else. It is often densely tufted. During the rains growth is enormous, the plant often exceeding the height of a man. At this period the plant develops large broad leaves which are strongly aromatic when crushed. The monsoon form with broad leaves dies down during the dry months and a fresh crop of culms appears in dense tufts which do not attain the same dimensions. The leaves are often very narrow with the margins often recurved during the hottest part of the day. Frequently the monsoon crop is destroyed by fire and soon after a fresh crop appears which is typically the hot weather form.

**Distribution** : From the Afghan frontier to the Rajmahal Hills in Bengal and from the subtropical zone of the Himalaya to about 12° N., excluding the desert region of the P. njab and the greater part of the northern Carnatic.

**History and uses** : The Ruscifolia grass oil (*Oleum Palmarosae sen Geranii Indici*, Palmarosa oil) is produced from this plant. See Stapf in Ew Bull. (1906) 338-341.

##### 5. CTMBOGON CAESIUS Stapf.

*Cymbopogon caesius* Stapf in Kew Bull. (1906) 360, in Fl. Trop. Afr. IX (1919) 287.

*Andropogon caesius* Nees in Wight Cat. (1833) nos. 17006 (*rumen tantum*) and in Hook. & Arn.

Bot. Beech. Voy. 244 *cum descriptione (partim)*.

*A. Schoenanthus var. caesius* Hack, in Monogr. Androp. (1889) 610; Schweinf. in Bull. Herb. Boiss. II, App. II, 14; Hook. f. Fl. Brit. Ind. VII (1896) 205, *exclus.fere omnibus synonym.*

For foundation of this species see Stapf in Kew Bull. (1906) 344.

**Etymology** : *Caesius* means bluish grey.

**Description** : A perennial, tufted grass, up to 1 m. high, with intra- and extravaginal innovation-shoots from a short rhizome. Culms erect or geniculate-ascending, slender, more or less wiry, frequently branched below, the branches often in fascicles from the knees, often many-noded, terete, glabrous, smooth. Leaf-blades linear from a scarcely narrowed rarely slightly rounded base, tapering to a long setaceous point, those of the culms up to over 15 (sometimes almost 30) cm. long, 2-6 (sometimes 10) mm. broad, of the innovations usually much shorter, flat, bluish-glaucous, glabrous, smooth, midrib slender, primary lateral nerves very fine, 3-4 on each side. Ligules very short, rounded, scarious. Sheaths rather firm, tight, the lowest mostly short, those placed at branching nodes at length thrown aside, inrolling or deciduous, glabrous, smooth, usually much shorter than the internodes.

Spathaceous panicle narrow, mostly 7-15 cm. long, rarely much longer, sometimes reduced and small, dense or interrupted; internodes usually 4-6, the lowest rarely exceeding a third of the panicle, the following gradually decreasing; lowest primary branch shortly exerted from its sheath, undivided at the base, or like the following forming mixed or (upwards) simple-rayed tiers; rays of ultimate tiers 5-3, finely filiform, 6-8 mm. long, glabrous; lowest subtending sheaths with foliaceous blades; spathes lanceolate, acuminate. 2-5-2 cm. long, subherbaceous, glaucous, sometimes turning reddish. Spatheoles narrowly lanceolate, acuminate, 14-16 mm. long, subherbaceous to scarious, turning dirty straw-colour or slightly reddish; peduncles filiform. 5-6 mm. long, glabrous. Racemes 2-nate, obliquely erect, 12-14 mm. long, greenish, more or less white-villous, one subsessile, the other with a bare base, over 2 mm. long, finely

pubescent on the inner side, ciliate and thickened upwards, base of the sessile raceme swollen, hard, fused with the equally swollen and hard adjacent pedicel; fertile joints filiform, about 2 mm. long, glabrous on the back, densely ciliate on the sides, cilia snow-white, tips often cupular with a crenulate margin or auricle; adjacent pedicels very similar. Homogamous pair 1 at the base of the sessile raceme. Fertile spikelets oblong, slightly wider above the middle, subobtuse, 4 mm. long, greenish, glabrous; callus very small, obtuse, minutely bearded. Involucral glumes equal, subchartaceous, lower minutely truncate, flat on the back with a fine median groove in the lower half, keels narrowly winged from the middle upwards, intracarpal nerves 1 on each side towards the keels, very fine; upper narrow in profile, very acute, very narrowly winged above the middle, with 1 delicate nerve on each side near the margin. Lower floral glume delicate, oblong, minutely truncate, ciliolate, nerveless, upper substipitiform, almost 3 mm. long, 2-fid to the middle, segments subulate, ciliolate, awn very fine, 10-14 mm. long, bent at and twisted below the middle. Anthers almost 2 mm. long. Pedicelled spikelets male, linear to lanceolate-oblong, subobtuse, 4 mm. long, green, glabrous; lower involucral glume slightly convex on the back, subherbaceous, about 10-nerved, the inner 6 nerves prominent, upper subhyaline, 3-nerved; floral glume oblong, truncate, sub-2-nerved, almost 4 mm. long.

**Locality** : *Gujarat*: On sandy and gravelly hills and banks, Ahmedabad and Prantij.

**Distribution** : Throughout the Carnatic, Gujarat, Arabia, Somaliland.

**History and uses** : See Stapf Eew Bull. (1906) 342-345.

### 38. HETEKOPOGON Pers.

Perennial or annual grasses, with simple or more often upwards branched culms; branches few to many, mostly flowering and gathered into a spatheate panicle.

Eacemes conspicuously dorsiventral, the bases of the male (or neuter) spikelets subimbricate on the back of the raceme, their upper parts bending forward around the sides, forming a hollow in which the fertile spikelets are enclosed, with their awns exerted anticously and often intertwined. Spikelets 2-nate, those of the lower (1 to many) pairs alike in sex and shape, male or neuter, of the upper pairs differing in sex and shape, one of each pair sessile, the other pedicelled on the many-jointed rhachis of solitary racemes, terminating the culms and their upper branches; rhachis tough or upwards tardily disarticulating and glabrous between the homogamous pairs, readily disarticulating above them; homogamous pairs long-persistent, the spikelets of the heterogamous pairs falling separately, the pedicelled with the pedicel, the sessile with the adjacent joint and the adjacent pedicel or its base. Sessile spikelets subcylindric, awned; callus long, pungent, densely bearded upwards. Involucral glumes equal, the lower coriaceous, rarely chartaceous, more or less tightly involute, quite keelless, nerves obscure, often connected by few transverse nerves in the upper part; upper with a deep longitudinal groove on each side, coriaceous, rarely chartaceous, between them, thinner towards the margins, membranous at the tips, 3-nerved. Lower floral glume hyaline, nerveless, upper stipitiform from a hyaline very slender base, cartilaginous upwards and passing into a usually stout geniculate awn. Palea small or absent. Lodicles large or more or less reduced, to very minute. Stamens 3, often rudimentary or absent. Stigmas exerted terminally or laterally. Grain more or less linear in outline, subterete, slightly dorsally compressed; embryo somewhat exceeding the middle of the grain. Pedicelled spikelets male or neuter, dorsally flattened, usually slightly asymmetric, and often somewhat twisted, muticous, imbricate. Lower involucral glume herbaceous, many-nerved, winged upwards from one or both keels; upper membranous, lanceolate-oblong, acute, 3-nerved. Floral glumes hyaline, 1-nerved, well-developed or more or less reduced. Stamens 3 or 0.

^ Species about 6.—Tropical and subtropical regions of the whole world.

Cooke describes 4 species under *Andropogon*, viz., *A. polystachyos* Roxb., *A. triticeus* E. Br., *A. Ritchiei* Hook, f., and *A. contortus* Linn. We transfer these to *Heteropogon* and add *Heteropogon oliganthus* Blatter & McCann.

A. Not more than 30 cm. high.

I. Upper involucral glume of pedicelled spikelet 1-3-nerved . . . . . 1. *H. oliganthus*.

II. Upper involucral glume of pedicelled spikelet 5-nerved . . . . . 2. *H. polystachyos*.

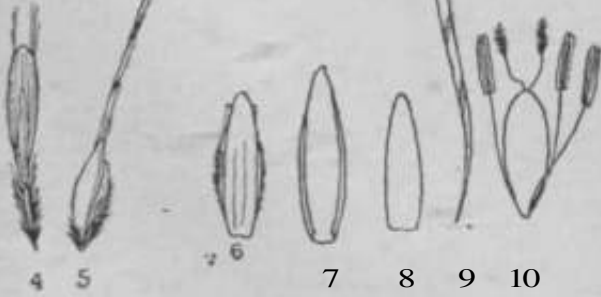
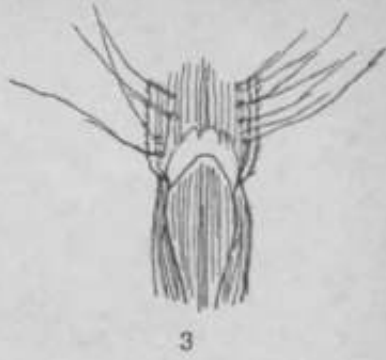
B. More than 40 cm. high.

I. Lower involucral glume dorsally deeply grooved . . . . . 3. *H. insignis*.

II. Lower involucral glume not dorsally grooved.

1. Ligule of several narrow membranous segments . . . . . 4. *H. Ritchiei*.

2. Ligule truncate, ciliolate . . . . . 5. *H. contortus*.



Sessile spikelet



## 1. HETEROPOGON OLIGANTHUS Blatter &amp; McCann.

## PLATE 68.

*Heteropogon oliganthus* Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 623.

*Andropogon oliganthus* Hochst. ex Steud. Syn. PL Glum. (1855) 368; Hack. Monogr. Androp\* (1889) 591; Hook. f. EL Brit. Ind. VII (1896) 202.

**Etymology** : *Heteropogon* is derived from *heteros*, different, and *pogon*, beard, alluding to the pedicelled spikelets which are quite unlike the sessile.—*Oliganthus* is derived from *oligos*, few, and *anthos*, flower.

**Description** : A dwarf annual. Stems 7-15 cm. high, tufted, slender, sometimes creeping below, geniculate. Leaves 5-7.5 cm. long, quite flat, subensiform, acuminate, softly hairy, margins thickened, cartilaginous, sheaths compressed; ligule very short, membranous.

Spikes usually very shortly exerted from the long, narrow, glabrous spathes; peduncle curved, puberulous. Spikes 8-16 mm. long, with 3-6 pairs of glumes, lower spikelets neuter. Joints and pedicels about half as long as the sessile spikelet, long ciliate. Sessile spikelet 5 mm. long, oblong; callus short, obtuse. Lower involucre glume obtuse, chartaceous, dorsally villous toward the base, not dorsally channelled, shining, faintly nerved, with narrowly involute margins, ciliolate towards the truncate tip, callus bearded, upper involucre glume obtuse, apiculate. Lower floral glume very short, broadly oblong, ciliate, upper with a shining awn 3-4 cm. long, column of awn glabrous. Palea very small. Anthers 1 mm. long. Pedicelled spikelet neuter, larger than the sessile, ovate-oblong. Lower involucre glume herbaceous, obovate-oblong, truncate, distinctly 9-13-nerved, submarginate, keels scabrous, margins ciliolate, hardly incurved, upper shorter by  $\frac{1}{2}$ , membranous, oblong, obtuse, 1-3-nerved, ciliate. Palea of upper floral glume very small.

Hackel, l. c. is of opinion that this species is intermediate between *Dichanthium* and *Heteropogon*, but comes nearer the *Heteropogons*, because the sessile spikelets differ from the pedicelled ones in shape, nervation and the dorsal furrow.

**Locality** : *W. Ghats* : Mahabaleshwar, open edge above the precipices looking from Dhobi's Waterfall path to Elphinstone Point, 4,500 ft., rainfall 270 in. (Sedgwick & Bell 4608 !); Panohgani (Blatter & Hallberg B1221!, McCann!).

*Deccan* : Kalsubai (Patwardan!).

**Ecology** : Purely a monsoon plant, coming into flower in late September and early October. A very aromatic species; the air on the Tableland at Panchgani is impregnated with its odour at the time when it appears. The odour is completely lost in dry material.

**Distribution** : Nilgiris.

**Explanation of Plate 68** : *Heteropogon oliganthus* Blatter & McCann.

- |                                |                    |                      |
|--------------------------------|--------------------|----------------------|
| 1. Lower invol. glume.         | "                  |                      |
| 2. Upper invol. glume.         | f-n j- n - . . , M |                      |
| 3. L <sup>^</sup> le.          | ^                  | Pedicelled spikelet. |
| 4. Spikelet with pedicel,      | j                  |                      |
| 5. Spikelet.                   |                    |                      |
| 6. Lower invol. glume.         | }                  | Sessile spikelet.    |
| 7. Upper invol. glume.         |                    |                      |
| 8. Lower floral glume.         |                    |                      |
| 9. Upper floral glume.         |                    |                      |
| 10. Stamens, grain and styles. |                    |                      |

## 2. HETEROPOGON FOLYSTACHYOS Blatter &amp; McCann.

*Heteropogon folystachyos* Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 623.

*Andropogon polystachyos* Boxb. FL Ind. I (1832) 261; Steud. Syn. PL Glum. (1855) 367; Hook. f. FL Brit. Ind. VII (1896) 989; Dalz. & Gibs. Bomb. Fl. (1861) 301; Cooke Fl. Bomb. II (1908) 989.

**Description** : A dwarf erect grass 15-25 cm. high; stems slender, leafy above, corymbosely branched. Leaves 5-10 cm. by 1-2-1-6 mm., the lower flat, the upper convolute, erect, hairy on both sides with long slender hairs, the margins thickened; sheaths hairy; ligule a short ciliate membrane.

Racemes solitary, 1-3-2-5 cm. long, on very slender peduncles 5-10 cm. long, with a very slender sheath and a small leaf about the middle, the 5 or 6 lower pairs of spikelets neuter; joints 2 mm. long, terete. Sessile female spikelets dark brown, 5 mm. long; callus bearded on one side with brown hairs; lower involucre glume oblong when opened out, obtuse, with membranous tip and infolded margins, 7-9-nerved, pubescent on the back; upper involucre glume linear-oblong with a coriaceous centre and broad hyaline margins; lower floral glume shorter, oblong, ciliate; upper floral glume represented by the acute base of the awn; awn

3-8-5 cm. long, hairy. Pedicellate spikelets 6 mm. long; pedicels 1-2 mm. long, glabrous; lower involucrel glume with a coriaceous many-nerved centre and broad hyaline wings; upper involucrel glume lanceolate, ciliate, 5-nerved. Neuter spikelets : lower involucrel glume like the pedicellate but broader, 2-toothed at the tip.

**Locality** : *W. Ghats*: Ehandala (Woodrow); Mahableshwar, western side of hill (Dalzell & Gibson). We have not seen this species.

**Distribution** : Peninsular India.

### 3. HETEROPOGON INSIGNIS Thw.

#### PLATE 69.

*Heteropogon insignis* Thw. Enum. PL Zeyl. (1864) 437; Benth. Fl. Austral. VII (1778) 517.  
*Andropogon triticeus* R. Br. Prodr. (1810) 201; Hack. Monogr. Androp. (1889) 588; Steud. Syn. PL Glum. (1855) 368; Hook. f. FL Brit. Ind. VII (1896) 200; Cooke FL Bomb. II (1908) 989.

*A. ischynanthus et liananthus* Steud. 1. c. 367.

**Vernacular names** : Bhale kusal, Kali kusal, Mothi kusal, P&tang.

**Etymology** : *Insignis* means important, alluding very likely to the tall stout stem.

**Description** : Perennial; roots of very stout tortuous fibres; stem 1-2-2.4 m. high, as thick as a swan's quill below, hard, smooth, polished, leafy, simple or branched below. Leaves 30-60 cm. by 6-20 mm., narrowly linear, acuminate, glaucous, sparsely hairy, margins scabrous; sheaths compressed, keeled, smooth; ligule a rounded scarcely ciliolate membrane.

Racemes 7-5-15 cm. long; rachis inarticulate except the 4-6 upper nodes, glabrous; spikelets very many, all, except the few terminal, closely imbricating, subsecund, awnless, male or neuter with\* a short glabrous callus. Upper sessile spikelets long-awned, 8 mm. long; callus long, acute, densely bearded with dark brown hairs; lower involucrel glume linear-oblong, subterete, rigidly coriaceous, with an obtuse rounded membranous ciliolate tip, dorsally deeply grooved, the margins involute, not winged; upper involucrel glume slightly longer than the lower, linear, subterete, rigidly coriaceous, scaberulous, with pale sigmoidly incurved chartaceous margins, obtuse, with membranous truncate or minutely 3-toothed tip; lower floral glume short, oblong, truncate, hyaline, nerveless; upper floral glume represented by the flattened white base of the awn; awn very stout, hirsute, 5-7-5 cm. long. Upper pedicellate spikelets reaching 2 cm. long, neuter; pedicels very short, subclavate, glabrous; lower involucrel glume more or less twisted, lanceolate, acuminate, many-nerved; upper involucrel glume rather shorter than the lower, linear-lanceolate, acuminate, ciliate, chartaceous, 3-nerved; lower floral glume shorter than the involucrel glumes, lanceolate, acuminate, ciliate; upper floral glume narrowly oblanceolate, 1-nerved, ciliate near the apex. Lower spikelets 1-3-2 cm. long, neuter or male, like the pedicellate ones.

**Locality** : *Konkan* : Above Kanari Caves (McCann 9634 !).

*W. Ghats*: Ehandala, very common on open hillside composed of rock fragments (McCann 9425 !); Igatpuri (McCann 4338 !).

*Deccan*: Around Vital Hills, Poona (Bhide 782!); Chattarshinji Hill, Poona (Ezekiel!); Mawal, Poona Dist. (Woodrow).

*S. M. Country*: Manoli (Talbot 3978 !).

*N. Kanara* : Anmod, bare hillsides, 2,000 ft., rainfall 200 in. (Sedgwick 3324 !).

**Distribution** : Burma, Central Provinces, W. Peninsula, Ceylon, Malaya, Australia.

**Explanation of Plate 69** : *Heteropogon insignis* Thw.

- |                                      |                     |
|--------------------------------------|---------------------|
| 1. Pedicelled and sessile spikelets. |                     |
| 2. Lower invol. glume. *             | } Sessile spikelet. |
| 3. Upper invol. glume.               |                     |
| 4. Lower floral glume.               |                     |
| 5. Upper floral glume.               |                     |
| 6. Ovary and styles.                 |                     |

### 4. HETEROPOGON RITCHIEI Blatter & McCann.

#### PLATE 70.

*Heteropogon Ritchiei* Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 623.  
*Andropogon Ritchiei* Hook. f. FL Brit. Ind. VII (1896) 201; Cooke Fl. Bomb. II (1908) 990.

**Etymology** : Dr. Ritchie collected many plants in Belgaum and Kanara.

**Description** : Stems stout, erect, rigid, 1-2 m. and more high. Leaves 45 by 1 cm. linear from a narrow base, bluntly acuminate, flat, rigid, shortly hairy on both sides with based hairs, the margins spinulose serrulate; sheaths glabrous; ligule 6 mm. long membranous, divided almost to the base into numerous narrow acute segments.



Sessile sp-ikelet

HETEHOPOQON INSICMs THW.

Delin: R. K. Blake.



Sessile spikelet

Pedicelled spikelet

Racemes 2-5-5 cm. long, green, hispid, the lower 1-2 pairs of spikelets homogamous. Sessile spikelets rather more than 6 mm. long; callus nearly 2-5 mm. long, densely bristly with brown hairs; lower involucre glume broadly ovate when opened out, bluntly acuminate, truncate, hairy on the back, the margins narrowly incurved, keels bristly, not channelled, dorsally obscurely nerved; upper involucre glume linear-oblong with rounded and shortly apiculate apex, 3-nerved, with a coriaceous hispid centre and membranous margins; lower floral glume 4 mm. long, narrowly linear, subacute, hyaline, nerveless; upper floral glume represented by the acute not dilated base of the awn; awn more than 3-8 cm. long, tortuous, with a dark brown more or less pubescent column, the upper part very slender. Pedicellate spikelets 13 mm. long; pedicels short, glabrous; lower involucre glume lanceolate, acute, the margins equally winged and infolded, the keels with a row of long tubercular-based golden-yellow bristles; upper involucre glume as long, lanceolate, 3-nerved; lower floral glume 10 mm. long, narrowly oblanceolate, hyaline; upper floral glume shorter, narrowly linear, acute.

**Locality** : *W. Ghats* : Panchgani, W. slope of Third Tableland (McCann 1788 !).

*Deccan*: Eatraj Ghat, 11 miles S. E. of Poona (Gammie 1037!); hills near Poona (Woodrow).

*S. M. Country*: Belgaum (Ritchie *teste* Hcok. f.).

**Ecology** : A tall grass growing in open grass-land. Stout stiff roots from the lowest nodes.

**Distribution** : W. Peninsula, apparently endemic.

**Explanation of Plate 70** : *Heteropogon Ritchiei* Blatter & McCann.

- |  |   |                      |
|--|---|----------------------|
| 1. Lower invol. glume.                   | } | ^ Sessile ^pikelet.  |
| 2. Upper invol. glume.                   |   |                      |
| 3. Lower floral glume.                   |   |                      |
| 4. Upper floral glume.                   |   |                      |
| 5. Stamens, ovary, styles and lodicules. | } | ^                    |
| 6. Pedicelled spikelet.                  |   |                      |
| 7. Sessile spikelet.                     | } | pedicelled spikelet. |
| 8. Lower invol. glume.                   |   |                      |
| 9. Upper invol. glume.                   |   |                      |
| 10. Lower floral glume.                  |   |                      |
| 11. Stamens.                             |   |                      |
| 12. Upper floral glume.                  | } |                      |
| 13. Ligule.                              |   |                      |

#### 5. HETEROPOGON CONTORTUS Roem. & Sckolt.

##### PLATE 71.

*Heteropogon contortus* Roem. & Schult. Syst. Veg. II, 836; Duthie Grasses N. W. Ind. (1883) 19, Fodder Grasses N. Ind. (1888) 32, 1.19; Stapf in Fl. Trop. Afr. IX (1919) 411; Haines Bot. Bih. and Or. (1924) 1040.

*Andropogon contortus* Linn. Sp. Pl. (1753) 1046; Lam. Encycl. t. 840; Kunth Enum. Pl. I. (1838) 486; Hack. Monogr. Androp. (1889) 585 (*exd. A. polystachyus* Roxb.); Roxb. Fl. Ind. I (1832) 253; Grah. Cat. Bomb. PL (1839) 238; Dalz. & Gibs. Bomb. FL (1861) 300; Lisboa Bomb. Grasses (1896) 84; Hook. f. Fl. Brit. Ind. VII (1896) 199; Oooke Fl. Bomb. II (1908) 990.

*Heteropogon Urtus* Pers. II, 533; Balf. Fl. Socotra (1888) 316.

*H. glaber* Pers. 1. c.; Beauv. Agrost. (1812) 134, t. 23, fig. 8.

*JR. hirsutus* Beauv. 1. c.

*H. Allionii* Roem. & Schult. 1. c.; Reichb. Ic. Fl. Germ. I, t. 53, fig. 1496-7.

*H. polystachyus* Nees Agrost. Bras. 364.

*H. Roxburghii* Walk.-Arn. *ex* Nees in Nov. Act. Nat. Cur. XIX, Suppl. 1, 183.

*H. Hohenackeri* Hochst. *ex* Miq. Anal. Bot. Ind. II, 24.

*H. hispidissimus* Hochst. *ex* Steud. Syn. PL Glum. I (1855) 367.

*H. besukiensis* Miq. FL Ind. Bat. III, 494.

*Andropogon secundus* Willd. *ex* Nees Agrost. Bras. 364.

*A. firmus* J. S. Presl in C. B. Presl Rel. Haenk. I (1830) 334.

*A. firmus* Kunth Enum. PL I (1838) 486.

*A. messanensis* Bivona *ex* Guss. F. Sic. I (1827-8) 164.

*A. besukiensis* Steud. in Zoll. Syst. Verz. II (1854) 59.

*A. Bdlardii* Bubani in Nuovo Giorn. Bot. V, 317.

**Vernacular names** : Spear grass, Nani sunkhali, Sunkhali, Survalu, Eusali, Kusal, Sukhii kursali, Garyali, Pandri-suckali, Bal, Bale, Suckeri musauch, Suckal, Itali-suckal, Dakli-suckal.

**Etymology:** *Contortus* means twisted alluding to the awns in fruit.

**Description:** Perennial; stems 0.3-1.5 m. long, densely tufted, erect or decumbent below, slender, leafy chiefly at the base, simple or subfastigiate branched, compressed towards the base. Leaves 15-30 cm. by 2\*5-5 mm., linear, often shortly and abruptly (rarely long-) acuminate, flat, suberect, rigid, often sparingly ciliate towards the base, sometimes with scattered bulbous-based hairs above, scaberulous below; sheaths compressed, keeled, glabrous,, the mouth shortly auricled ; ligule short, truncate, ciliolate.

Racemes 3-8-7.5 cm. long; internodes very short, the lower inarticulate ; spikelets closely imbricating, subsecund, the lower 2-6 or more sessile, awnless, male or neuter, the upper sessile spikelets narrow, long-awned, female. Sessile (female) spikelets 6 mm. long; callus long, acute, pungent, bearded with reddish brown hairs; lower involucral glume linear-oblong, truncate, dark brown, many-nerved, hispidulous, margins strongly incurved (not winged), tip membranous; upper involucral glume linear, obtuse, concave, rigidly coriaceous, dark brown, hispidulous; lower floral glume short, oblong, truncate, nerveless; upper floral glume represented by the subulate white base of a hirsute awn which reaches 7.5 cm. or more long. Pedicellate spikelets much longer than the sessile (8-13 mm. long); pedicel very short; lower involucral glume lanceolate, usually obliquely twisted, herbaceous, dorsally hispid with long bulbous-based hairs, the margins more or less (often unequally) winged, the wings serrulate; upper involucral glume oblong-lanceolate, acuminate, 5-nerved, margins hyaline ; lower floral glume oblong, 1-nerved; upper floral glume obovate-oblong, ciliate, nerveless. Lower sessile spikelets like the pedicellate, more or less covered with bulbous-based hairs.

**Locality:** *Kathiawar:* Junagad (Blatter 3789 !).

*Gujarat:* Sevalia (Chibber !); road to Lasandra (Chibber!); Sungiri (Gammie 15586!).

*Khandesh:* Bhusawal (Gammie !); Toranmal (McCann 9640 !).

*Konkan:* Dake forests (Ryan 717 !); Osarvira forest, Mokhada Range (Ryan 190!); Malabar Hill (McCann 3620!); Mulgaum (McCann 4245!); Parsik, railway line (McCann 9655 !); Kanari Caves, above (McCann 9662 !).

*W. Ghats:* Igatpuri (McCann 4328!); Ehandala, very common all over the hills (McCann 9422 !); Panchgani (Blatter & Hallberg B1246 ! B1296 ! B1308 !); Castle Rock (Gammie 15686!).

*Deccan:* Katraj Ghat, 11 miles S. E. of Poona (Shevade !); Trimbak (Chibber!); Bairawadi, Purandhar (McCann 5059 !); Rahuri (Nana A264 !); Poona, Ghattarshinji Hill (Ezekiel!); Manmad, river-bed (Blatter A269 !).

*S. M. Country:* Dharwar, 2,400 ft., rainfall 34 in. (Sedgwick 1820!); Badami (Talbot 2925 !).

*N. Kanara:* Yellapur (Talbot 734 !).

**Ecology:** For an interesting account of this grass see W. Burns, L. B. Kulkarni and S. R. Godbole : A Study of Some Indian Grasses and Grasslands, p. 28-44.

**Distribution:** Mediterranean region and tropics, subtropics generally.

**Economic uses:** As to grass see Burns and others just cited. Considered a good fodder grass, especially when young and green. Used as a thatching material in some parts. On the other hand a very troublesome weed on account of the sharp callus of the spikelets.

**Explanation of Plate 71:** *Heteropogon contortus* Roem. & Schult.

1. Pedicelled and sessile spikelet.
  2. Lower invol. glume. ^
  3. Upper invol. glume.
  4. Lower floral glume.
  5. Upper floral glume. ~
- } **Sessile spikelet.**

#### VARIETIES.

Hackel (l. c.) distinguishes 2 varieties and, excluding *polystaohyus*, 5 subvarieties. His first variety *genuinus* is characterized by the male spikelets being more or less covered on the back or at least above or towards the margins with white, patent, tubercle-based bristles. This character together with the degree of ramification of the culms forms the foundation of 4 subvarieties: *typicus*, *Rooburghii*, *hispidissimus* and *secundus*.

The second variety *glaber* has the male spikelets glabrous. Both varieties are represented in India, and all the subvarieties except *secundus*.

To Hooker f. (l. c.) these varieties and subvarieties appear " to be too inconstant for definition ", and, according to Stapf (l. c.), the inconstancy of those characters " is so evident that it is not worth while to discriminate between the forms corresponding to them/ " Ha" too, has abstained from distinguishing varieties and forms.



1 2 3 4 5  
Sessile spikelet

HISTEROPOUDN CONTOBTOS ROEM. A SCHULT.

Delin : R. E. Bhidt.

Burns and others in the paper quoted above (p. 40) wrote in 1925 : " In our observations at Kalas and elsewhere we noticed variability within the species, and early came to the conclusion that there must be definite varieties of *Andropogon contortus*. We can say with confidence that there are at least two varieties, differing markedly in size, habit, longevity, and in morphological characters. One is small and annual, the other large and perennial." Since then Patwardhan and Hedge have published a paper<sup>1</sup> in which they describe in detail the morphology, anatomy, physiology and ecology of the 2 varieties.

Key to the varieties :—

- A. Lower involucre of pedicelled spikelet sparsely hairy with long tubercle-based deciduous hairs on the back, in the upper part and towards the margins ; lower part glabrous.—Perennial . . . . . (a) *var. genuinus, subv. typicus.*
- B. Lower involucre of pedicelled spikelet densely hairy with tubercle-based persistent hairs all over the back; hairs in lower part shorter than in upper.—Annual . . . . . (6) *var. genuinus, subv. hispidissimus.*

a. VAR. GENUINUS, SUBV. TYPICUS Blatter & McCann.

*Heteropogon contortus, var. genuinus, subvar. typicus* Blatter & McCann, *comb. nov.*

*Andropogon contortus, var. genuinus, subvar. typicus* Hack. Monogr. Androp. (1889) 586.

*Heteropogon hirtus* Pers. Syn. II, 533.

For detailed description see G. B. Patwardhan and G. R. Hedge in Journ. Ind. Bot. Soc. VI (1927) 213-216, and in Journ. Bomb. Nat. Hist. Soc. 32 (1928) 625.

6. VAR. GENUINUS, SUBV. HISPIDISSIMUS Blatter & McCann.

*Heteropogon contortus, var. genuinus, subvar. hispidissimus* Blatter & McCann, *comb. nov.*

*Andropogon contortus, var. genuinus, subvar. hispidissimus* Hack. Monogr. Androp. (1889) 587.

*A. besuhiensis* Steud. in Zoll. Syst. Veg. II (1854) 59.

*Heteropogon hispidissimus* Hochst. in Steud. Syn. Pl. Glum. I (1855) 367.

For description see Patwardhan and Hedge 1. c, and Journ. Bomb. Nat. Hist. Soc. 32 (1928) 625.

The former paper contains valuable ecological notes (pp. 216 and 217) on both varieties.

39. ISEILEMA Hack.

Small annual or perennial grasses; stems slender, compressed, many-noded. Leaves linear from a usually rounded equilateral base; sheaths compressed, keeled, shorter than the internodes.

Panicle usually occupying  $\frac{1}{2}$  the stem; branches usually fascicled and interspersed with scarious spathe-like bracts; proper spathes boat-shaped, acute, compressed, more or less herbaceous on the back, many-nerved, with scarious margins; racemes fasciculiform, solitary at the apex of the stem and branches, articulate with the peduncle below the lowest spikelets, at length all falling away from it. Spikelets dimorphous, the 4 lower whorled, male or neuter, forming an involucre round the inarticulate rhachis. Involucral spikelets pedicellate; pedicels short, flattened. Glumes 3; lower involucre glume oblong-lanceolate, 3-5-nerved; upper involucre glume similar, 3-nerved; floral glume hyaline, 1-nerved. Lodicules cuneate, retuse. Anthers violet. Pedicellate spikelets on long slender pedicels, similar to the involucre. Bisexual spikelets lanceolate or linear-lanceolate; lower involucre glume truncate or shortly 2-fid at the tip; upper involucre glume as long, mucous, hyaline, glabrous; lower floral glume small, sometimes wanting; upper floral glume an awn longer than the spikelet.

Species 5.—Indo-Malaya, Australia.

The essential points in the diagnosis of this genus are clearly brought out by R. S. Hole : The Indian Species of *Iseilema*, in Agricultural Journal of India. Special Indian Science Congr. number, 1917.

\* G. B. Patwardhan & G. R. Hedge, Two Varieties of *Andropogon contortus* Linn. Jn. Journ. Ind. Bot. Soc VI (1927) 213.





Cooke has described 2 species; *I. WigUii* Anders, and *I. laxum* Hack. We add a third one, *I. anthephoroides* Hack.

- A. Lower involucrel glume of hermaphrodite spikelet dorsally appressed hairy at base and ciliate on margins in basal £ . 1. *Z. anthephoroides*.  
 B. Lower involucrel glume of hermaphrodite spikelet glabrous dorsally at base and on margins in basal £.  
 I. Spathe and upper floral leaf not tubercled on keel . 2. *I. laxum*.  
 II. Spathe and upper floral leaf tubercled on keel . 3. *I. Wightii*.

1. **ISEILEMA ANTHEPHOROIDES** Hack.

PLATE 72.

*Iseilema anthephoroides* Hack. Monogr. Androp. (1889) 683 ; Hook. f. Fl. Brit. Ind. VII (1896) 219; Haines Bot. Bih. and Or. (1924) 1054.

**Description** : A much tufted annual grass, very leafy below, with many stems 30-80 cm. high, sometimes pink, nodes glabrous. Leaves mostly short, the longer ones about 13 cm. by 5 mm., subobtusate, ciliate at base and tip of sheaths, cilia with small tubercle-bases, blades with scabrid margins, nerves usually fine and uniform; ligule of short fine hairs.

Panicles long, rather strict, but some of the spatheoles divergent, lower spathe foliaceous, upper with shorter blades, base of blade and top of sheath with very long cilia, spathe often with many tubercles on the margins. Spatheoles cymbiform, not acuminate, smooth and glabrous or minutely tubercled and scaberulous, margins scarious, several spatheoles from each spathe or leaf-sheath. Peduncle of cluster very short, 2-5-5 mm. long. Cluster scantily bearded at the base. Involucrel spikelets broadly oblong, 4 mm. long, rounded at tip, not or very sparsely ciliate, their pedicels about 1 mm. long and nearly as broad at top, compressed, bearded. Glumes 2 only. Lower involucrel glume with narrowly inflexed margins, strongly 2-nerved on the back and almost sulcate on either side of midrib, 2 other partial nerves between the strong ones, upper involucrel glume nearly as long, flat, oblong, obtuse, 1-nerved; floral glume absent. Anthers yellow. Sessile spikelet 5-5 mm. long, the suddenly tapering part or beak rather longer than the lower broader part. Lower involucrel glume 2-cuspidate at tip, 4-nerved between keels, hispid-hairy on the back on the wider portion, the beak scabrid or scabrellous; upper involucrel glume as long, narrowly lanceolate with prominent ciliate keel on lower third, scabrellous above, margin inflexed. Lower floral glume very narrow, 2-nerved, ciliate, upper reduced to the membranous base of the awn, awn 12-14 mm. long, very slender, nearly smooth.

In general appearance this species is a stout plant of low growth with short leaves, while *I. Wightii* is a tall slender plant with long leaves. *I. laxum* is more or less intermediate in this respect between those two species.

The hairs of the pedicel of the involucrel spikelets are as long or longer than the pedicels. The hairs of the pedicel of the pedicelled spikelets reach almost f the length of the spikelet. The involucrel spikelets are frequently pink or purple. The upper pedicelled spikelet is often reduced.

**Locality** : *Khandesh*: Near Naradana (Blatter & Hallberg 5206 !).

*W. Ghats*: Panchgani (Blatter 1794!).

*Deccan*: Katraj Ghat (Gammie 929 !); Deolali (Blatter & Hallberg A316 !); Chattarshinji Hill, Poona (Ezekiel!); Pashan (Gammie !).

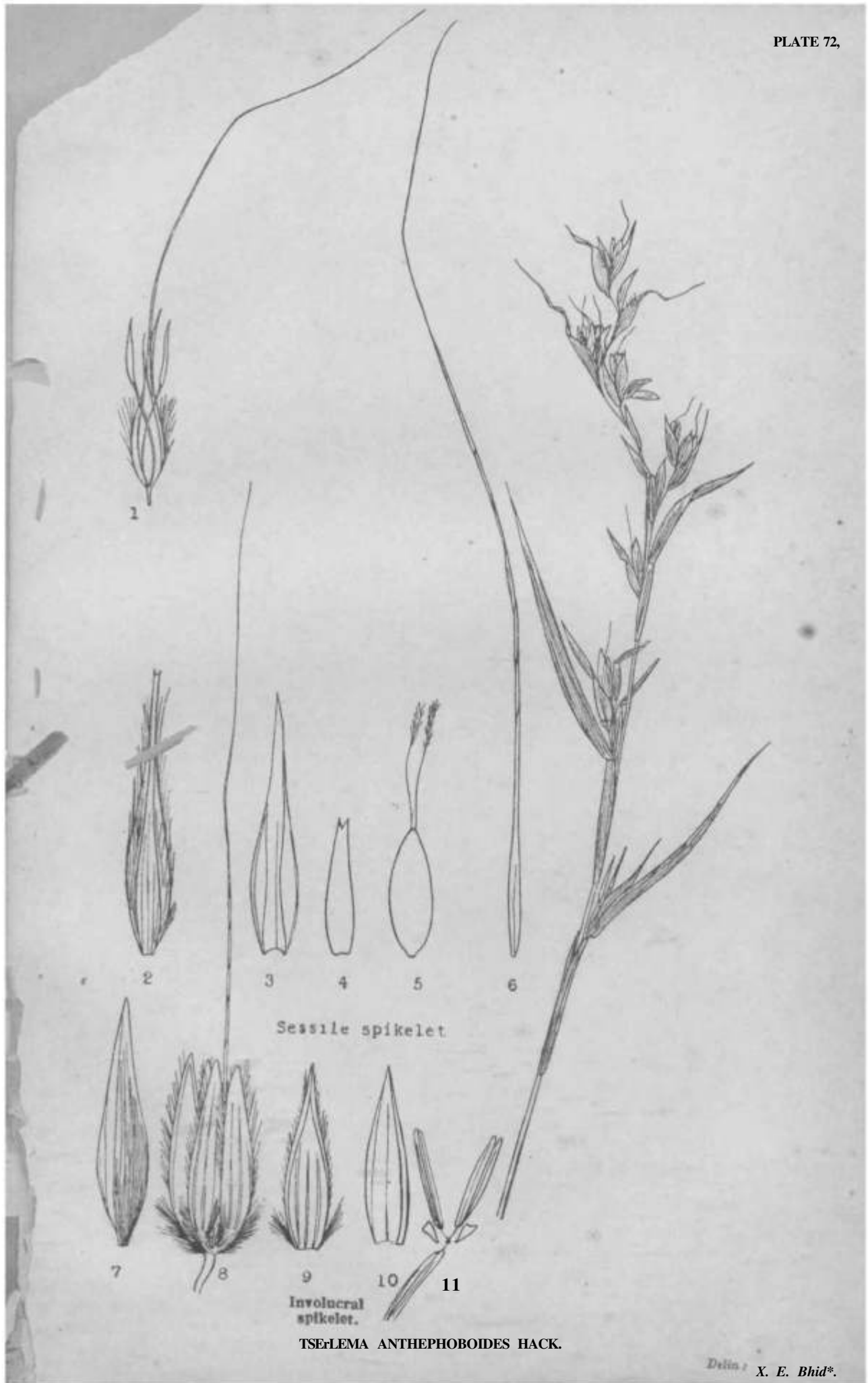
*S. M. Country*: Black soil fields E. of Hubli (Sedgwick & Bell 5295!);  
 • Yelvigi (Sedgwick 2085 !).

**Distribution** : W. India and Deccan.

**Economic uses**: A smaller yielder rind an inferior fodder plant than *I. laxum*. See W. Burns, Bull. 78, Dept. Agric. Bombay, p. 11.

**Explanation Of Plate 72** : *Iseilema anthephoroides* Hack.

1. Pedicelled and sessile spikelets.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Grain and styles.
6. Upper floral glume.
7. Bract.
8. Involucrel and sessile spikelets.
9. Lower invol/glume. ^
10. Upper invol. glume. > Involucrel spikelet.
11. Stamens and lodicules.)



TSErLEMA ANTHEPHOBIDES HACK.



I SKI L-KM A WIGHTII ANDERB

Dolin : B. K. Zhida

## 2. ISEILEMA LAXUM Hack.

*Iseilema laxum* Hack. Monogr. Androp. (1889) 682 ; Lisboa Bomb. Grasses (1896) 88 ; Duthie Fodder Grasses N. Ind. (1888) 43 ; Hook. f. PI. Brit. Ind. VII (1896) 218 ; Cooke FL Bomb. II (1908) 996.

*l. prostratum* Anders, in Nov. Act. Soc. Sc. Upsal. ser 3, II (1858) 251 *{excl. syn.}* t. 111.

**Vernacular names** : Shata, Gandwel, Tambit, Tambrut, Gandhi, Gandil, Change, Dangers, Masel.

**Etymology** : *Laxum*, lax, refers to the lax sheaths.

**Description** : Perennial; stems 15-50 cm. long, ascending from a stout hard sometimes shortly creeping rootstock, very slender, simple or sparingly branched ; root-fibres wiry. Leaves all cauline or the lower radical with equitant sheaths, 7\*5-15 cm. by 1-2-3 mm., linear, obtuse or subobtuse, glabrous, but often ciliate near the base, scaberulous above, smooth below, the margins scabrid; sheaths lax, quite glabrous ; ligule short, truncate, membranous, ciliate.

Panicle occupying \ the stem, racemiform, long, narrow, of distant axillary pedunculate fascicles 6-13 mm. long; outer spathes 0.6-2\*5 cm. long, narrowly lanceolate, glabrous or with a few hairs near the margin; proper spathes 8-13 mm. long, elliptic-lanceolate. Involucral spikelets truly whorled, 4 mm. long, pedicellate, oblong-lanceolate, acute; pedicels short, flattened, bearded at base; lower involucral glume acute, sparsely ciliate, 3-5-nerved; upper involucral glume oblong-lanceolate, acuminate, sparsely ciliate, 3-nerved; lower floral glume linear, glabrous, hyaline. Lodicules cuneate, retuse. Anthers long, narrow. Pedicellate spikelets on long ciliate pedicels, lanceolate, glabrous. Bisexual spikelets narrowly lanceolate, .5 mm. long, narrowed into a slender stipe, glabrous ; lower involucral glume chartaceous, 2-fid or truncate at the tip, margins scaberulous in the upper third, thin, faintly 3-5-nerved; upper involucral glume lanceolate, acuminate, 1-nerved, tip scaberulous; upper floral glume a very slender geniculate awn, -8-13 mm. long, the column equalling the subulate part.

**Locality** : *Khandesh*: Red upland near Talod (Sedgwick!); Bor, Bori River (Blatter & HaUberg 4429 !); Toner, Tapti bank (Blatter & Hallberg 5167 !); Dadgaum (McCann A322 !).

*Konkan*: Sion (McCann 3668 !); Thana (McCann 8728 !); Parsik Hill (McCann A321!); Bhandup, ricefield (McCann A323 !); Trombay (McCann A324 !).

*W. Ghats*: Grass-lands between Mahableshwar and Panchgani (Sedgwick & Bell 4742!).

*Deccan*: Nasik (Bourke !); Lohagad, half way up (McCann A320 !); Poooa (Jacquemont 439).

*S. M. Country*: Dastikop (Sedgwick 2059!); Dharwar (Sedgwick 1826 I); Belgaum (Ritchie 799).

*N. Kanara*: Halyal (Talbot 2087 !); Sirsi (Kulkarni!).

**Ecology** : The spikelets in this and the other species are carried away by the wind in a body.

**Distribution** : Upper Gangetic Plain, Orissa, Deccan, W. Peninsula.

**Economic uses** : Considered to be the best fodder grass in Central and S. India.

## 3. ISEILEMA WIGHTII Anders.

## PLATE 73.

*Iseilema Wightii* Anders, in Nov. Act. Soc. Sc. Upsal. ser. 3, II (1858) 251; Hack. Monogr. Androp. (1889) 679 ; Lisboa Bomb. Grasses (1896) 87 ; Hook. f. Fl. Brit. Ind. VII (1896) 218 ; Cooke Fl. Bomb. II (1908) 996.

*Anthistiria prostrata* Willd. Sp. PL IV, 901 ; Roxb. Fl. Ind. I (1832) 250.

*A. dmicina* Edgew. in Journ. As. Soc. Beng. (1852) 182; Duthie Grasses N. W. Ind. (1883) 24.

*A. Wightii* Nees *ex* Steud. Syn. PL Glum. (1855) 400.

*Andropogon prostmtus* Linn. Mant. (1767) 304.

*Cymbopogon glandulosus* Spreng. Pug. II, 14.

**Vernacular names** : Achi grass, Sona, Tambrut, Tambit, Gondwal, Ganni, Mussan, Mabil, Moshi, Gandhi, Gandeli.

**Description** : Perennial; stems often prostrate and rooting at base, then ascending 20-90 cm. long, rarely as thick at the base as a goose-quill; nodes more or less bearded. Leaves 10-20 cm. by 2-3 mm., linear, acute, glaucous or sometimes as well as the whole plant reddish, smooth or scaberulous, the floral leaves scabrid with tuberculate margins; sheaths lax, sometimes with bulbous-based hairs ; ligule short truncate, membranous, ciliate.

Panicle occupying \ the stem or more, linear-oblong, more or less compound, erect, spreading; rachis bearded at the nodes; lower branches 2, the upper as many as 5; proper spathes 8-13 nun. long, linear-lanceolate, with scarious margins. Involucral spikelets male

or neuter, 3 mm. long, shortly pedicellate, lanceolate-oblong, green or tinged with violet; lower involucre glume subacute, with 5 elevated ribs on the back, sulcate between the ribs; upper involucre glume glabrous with broadly infolded margins, 1-nerved; lower floral glume much shorter, oblong, 2-3-toothed, nerveless, glabrous. Anthers 1\*6 mm. long. Pedicellate spikelets on very slender pedicels. Bisexual spikelets 1-6-3 mm. long; lower involucre glume acute (not acuminate nor beaked), obscurely 4-nerved; upper involucre glume equalling the lower, elliptic-lanceolate, acute or subobtuse, often mucronate, obtusely keeled on the back, 3-nerved, glabrous; upper floral glume an awn, 6-13 mm. long, the column exceeding the subulate part.

**Locality** : *Kathiawar*: Morvi (Woodrow).

*Gujarat*: Kharaghoda (Saxton 503C!); in very marshy valley between Wastrapur and Thaltij (Sedgwick 322 !).

*Khandesh*: Antroli, Bori Biver (Blatter & Hallberg 5150 !).

*W. Ghats*: Panchgani (Blatter & Hallberg B1294 !).

*Deccan*: Poona (Woodrow).

*S. M. Country*: Kunnur (Sedgwick & Bell 4922 !); Ranibennur (Bhide !); Haveri (Talbot 2254!); Dharwar (Nana A325 !); Belgaum (Woodrow).

*N. Kanara*: Halyal (Talbot 2143 !).

**Ecology** : Common in the Carnatic in places where water stagnates. " In Bundelkhand and Central Provinces it is frequently the prevailing grass on the black soil, its reddish coloured stem rendering it a conspicuous object from a considerable distance." (Duthie).

**Distribution** : Throughout India.

**Economic uses** : A fair fodder.

**Explanation of Plate 73** : *Iseilema Wightii* Anders.

1. Spikelets and bract.
2. Node.
3. Ligule.

#### 40. THEMEDA Forsk.

Tall annual or perennial grasses. Leaves long, narrow.

Spikelets heteromorphous, clustered on the articulate fragile rhachis of short solitary racemes subtended by proper spathes and crowded in paniculate fascicles; lowest 2 pairs of each raceme closely approximate, male or barren, awnless, sessile or subsessile, usually persistent, forming a spurious tetramerous whorl enveloping the upper 1-3 pairs, each of which consists of a sessile hermaphrodite, and a pedicellate male spikelet, the latter much resembling those of the involucre. Florets 2, the lower reduced to an empty glume, the upper hermaphrodite in the sessile upper spikelets, male in the involucre and pedicellate spikelets or these more or less reduced or barren. Bisexual spikelets: involucre glumes equal or subequal; lower usually coriaceous, at length hardened and often dark brown to almost black; upper obtusely keeled, coriaceous and channelled along the keel, with membranous margins; lower floral glume hyaline; upper very narrow, passing from a hyaline base into a usually stout awn, very rarely linear and awnless. Palea obsolete or 0. Lodicules 2, cuneate, glabrous. Stamens 3. Stigmas laterally or subterminally exerted. Grain linear-obovoid, biconvex, with 2 grooves on the anterior side. Involucre and pedicellate spikelets: involucre glumes equal or subequal; lower herbaceous, dorsally flattened, 2-keeled, many-nerved; upper membranous, lanceolate, acute, 3-nerved, with ciliate margins; lower floral glume hyaline, 1-nerved or like the upper suppressed.

Species about 16.—Tropical and subtropical regions of the Old World, chiefly Indo-Malayan.

Grasses of open grass-land during the monsoon. They flower and die down with the approach of the dry season. Frequently the species are mixed in the same patch, but generally exclude everything else. Isolated specimens may be found at any time of the year in suitable localities.

Cooke describes 4 species : *T. imberbis* T. Ooque, *T. ciliata* Hack., *T. cymbaria* Hack., and *T. tremula* Hack. Following the laws of priority we have to substitute for the first two : *T. triandra* Forsk. and *T. quadrivalvis* O. Kuntze.

#### I. Involucre spikelets truly verticillate.

1. Involucre spikelets glabrous or more or less irregularly beset with tubercle-based hairs . . . . . 1. *T. triandra*.
2. Involucre spikelets always with a row of stiff bristles along the flexures near the tips, the bristles arising from coarse pale tubercles . . . . . 2. *T. quadrivalvis*.



Sessile spikelet  
THEMEDA TULWIKA FORSE.

Delin: B. K. Hilde.

## II. Involucral spikelets in closely superposed pairs.

- |   |                         |
|---|-------------------------|
| 1. Inflorescence a decomposed thyrsoform panicle. Lower involucral glume of bisexual spikelets not channelled | 3. <i>T. cymbaria</i> . |
| 2. Inflorescence a racemiform panicle. Lower involucral glume of bisexual spikelets deeply channelled         | 4. <i>T. tremula</i> .  |

## 1. THEMEDA TRIANDRA Forsk.

## PLATE 74.

*Themeda triandra* Forsk. Fl. Aegypt.-Arab. (1775) CXXIII et 178; Schweinf. in Bull. Herb. Boiss. II, Append. II, 16, 95; Stapf in Fl. Trop. Air. IX (1919) 416, *pattern tantum nostrae spe dei amplexens*.

*T. Forskalii* Hack. Monogr. Androp. (1889) 659 (*exd. syn. Anthistiria Mspida* Thunb. *quae est Tristachya leucothrix* Trin. *sec. Stapf*) ; Duthie Fodder Grasses N. Ind. (1888) 43; Stapf in Kew Bull. (1907) 212.

*Anthistiria imberbis* Retz. Obs. III (1783) 11; Desf. in Journ. de Phys. XL, 293, t. 1; Kunth Enum. I (1838) 481; Steud. Syn. Pl. Glum. I (1855) 401; Stapf in Dyer Fl. Cap. VII, 366; Hook. f. Fl. Brit. Ind. VII (1896) 211; Trim. Fl. Ceyl. V, 248; Prain Beng. PL 1207.

*A. glauca* Desf. Fl. Atlant. II, 380, t. 254 (*exd. syn. Stipa paleacea* Vahl); Coss. & Durieu Expl. Scient. Alger. II, 52.

*A. Desfontainei* Kunth Rev. Gram. I (1829) 161.

*A. ciliata* Retz. I. c. (*non* Linn, f.); Lamk. III. t. 841, fig. 2; Cav. Ic. 5, t. 459; Nees in Linnaea VII, 284 *et in* Fl. Afr. Austr. (1841) 121; Oliv. in Trans. Linn. Soc. XXIX, 176; Roxb. Fl. Ind. I (1832) 247; Grah. Cat. Bomb. PL (1839) 239; Dalz. & Gibs. Bomb. FL (1861) 304; Thw. Enum. PL Zeyl. (1864) 366; Benth. FL Austr. VII (1878) 542.

*A. Forskahlia* Kunth Rev. Gram. I (1829) 162, Enum. PL (1838) 481.

*A. vulgaris* Hack, in Engl. & Prantl. Naturl. Pflanzenfam. II, pars 2 (1887) 29.

*A. punctata* Hochst. *ex* A. Rich. Tent. FL Abyss. II (1851) 448.

*A. paleacea* Ball, in Journ. Linn. Soc. Bot. XVI, 734.

*A. australis* R. Br. Prodr. (1810) 200.

*A. cuspidata* Anders, in Nov. Act. Upsal. 2 (1856) 229.

*A. caespitosa* Anders. I. c. 241.

*A. argentea* Nees Fl. Air. Austr. (1841) 124.

*A. depauperata* Anders. I. c. 243.

*A. syriaca* Boiss. Diagn. PL Or. ser. I, fasc. 13, 72.

*Themeda polygama* Gmel. Syst. 149.

*Stipa arguens* Thunb. Prodr. 20 (*non* Linn.).

*Calamina imberbis* Roem. & Schult. Syst. II (1817) 810.

*Themeda imberbis* T. Cooke in Cooke Fl. Bomb. II (1908) 993.

*T. imberbis* Haines in Bot. Bih. and Or. (1924) 1049.

Vernacular names : Batani, Bundun, Bungrat, Marar, Musani, Bhoru, Karad.

Etymology : *Themeda* was formed from the Arabic name of the plant *Thaemed*.

Hooker f. who deals with this species under *Anthistiria* Linn, says in a preliminary remark (F. B. I. VII, 211): "The species of this Genus are most difficult of discrimination, of which the best proof is the irreconcilable conclusions of two excellent botanists, both experts in the order of *Gramineae*, Anderson (in Nov. Act. Upsal. III, II (1856) and Hackel (Monogr. Androp.)."

He then criticises Hackel for having restored Forskahl's name of *Themeda* ' because of its having four years of priority, and of Linnaeus' description of *Anthistiria* being very inaccurate<sup>9</sup>. He admits the claim of priority, but as to the other reason he rightly adds that, if inaccurate description has to be considered, a host of the genera of old authors would have to be invalidated. Hooker finally decides in favour of *Anthistiria* because this genus ' had for upwards of a century been adopted by all botanical writers.' This reason, however, does not hold good in view of the present rules of nomenclature. Hackel restored *Themeda* in 1889 and since then most systematists have followed his example. It was easy to settle this point, but the real difficulty comes in when we have to define and give a name to all the material gathered by Hackel (I. c. 659-664) under his *Themeda Forskalii*, and by Hooker f. under *Anthistiria imberbis* Retz. (F. B. I. VII, 211).

A glance at Hackel's synonymy and localities shows that he has included all the forms of this highly variable grass which are found in the tropical, subtropical and sometimes in the temperate regions of the Old World. The same applies to Hooker's *A. imberbis*, except

that he separated Hackel's *var. dubia laxa* and restored it to its former specific rank of *A. laoda* Anders. But this is of minor importance in this connection. It does not change the fact that both Hackel and Hooker describe the same material and of the same area though under different names.

Hackel justifies the adoption of the specific name *Themeda Forskalii* in this way : "*Themeda triandra* Forsk. Fl. aeg.-arab. p. 178, *Anthist. Forskalii* Kunth Revis. Gram. 1, p. 162, *generis typus, a Forskalio prope Bulgose in Arabia felici lecta, probabiliter etiam varietas est Th. Forskalii meae ; sed descriptio rem dubiam relinquit, specimina auihentica desiderantur. Ne hucusque ullam hujus generis speciem in Arabia felici lectam vidi, etsi probabile est, Th. Forskalii varietates in Syria Abyssiniaque crescentes etiam in Arabia inveniri. JLtajque nomen speoificum " triandra " tamquam dybium et rem indicans quae in hoc et plerisque Oraminearum generibus nullius est momenti, seposiui, " Forskalii " a Kunthio datum non minus quidem dybium, sed generis auctorem commemorans recejri."*

Hooker does not agree with Hackel, "*the earliest names of this plant are Themeda triandra, Forsk., and Anthistiria imberbis Retz. Hackel has abandoned both, substituting first Antliistiria vtdgaris, and then %hemeda Forskahlii, on the ground that A. imberbis was perhaps not Forskahl's T. triandra (why then call it Forskahlii ?) of which no type specimen exists, and because triandra indicates a character of no individual value in grasses. In so doing he overlooked Gmelin's name of T. polygama (Syst. 149). Having regard to the wide range of A. imberbis, from Australia to Africa, its presence in Arabia might wel] be anticipated; and that it is a native of that country is now proved by Schweinfurth's finding Hackel's var. glauca in that country. This makes the var. (which is local, and not Indian) the type of the species, and if Forskahl's name of Themeda is to be retained, necessitates a rearrangement of the varieties. To me it appears most expedient to retain Retz's name which applies\* to the prevalent, form over the area of distribution as the specific one "*

Hooker's reasons against Hackel's view are certainly valid, but his own *Anthistiria imberbis* does not rest on a firmer foundation. *The fact that the var. is local and not Indian should not prevent us from making it the type of the species, and the other circumstance that a rearrangement of the varieties will become necessary if the name Themeda is retained, can only be a reason of expediency.*

So far we come to the conclusion that Hackel and Hooker deal with the same material, but that neither name is satisfactory.

We come now to the latest publication affecting our question. Stapf 1. c. has adopted the name *Themeda triandra* Forsk. (1775) instead of *T. Forskalii* (1889), "*as there is no doubt that the type of Forskal's species, which apparently has been lost, was one of the forms covered by the description given by Stapf " {see Schweinfurth in Bull. Herb. Boiss. II, App. II, 16).*

But here Stapf creates a new difficulty. His description applies only to the 'African share of Hackel's *T. Forskalii* '. In order not to be open to misstatements we quote the whole passage in which Stapf explains his position : "*The species, as defined here, is, however, taken in a sense somewhat narrower than Hackel's; this restriction requires a short explanation. Hackel in his monograph of the Andropogoneae distinguishes 11\* varieties and as many sub-varieties or forms within his T. Forskalii, whilst other authors have at various times described more than a dozen species, all of which come within the compass. There can be no doubt as to the close affinity of these forms and the question of their status i3 mainly one of expediency. A careful examination of the large amount of material at Kcw and the British Museum has led to the conclusion that for the present it will be most useful to detach, firstly, those forms that are fairly uniform, and at the same time exclusive, over a large area ; and secondly, those that, though of a limited range, stand out from the remainder by some character or characters. This leaves a residuum much less homogeneous than any of the segregates just referred to. It consists apparently of viore or less fixed races, mutants, hybrids and edaphic forms which from herbarium material are the less separable because they are to a high degree independent of geographical areas. At the same time, however, they are all African with an ; xtension into Arabia, Syria and the south-eastern corner of Asia Minor, and, taken as a whole, represent practically the African share of Hackel's T. Forskalii. It is to this aggregate that the description and synonymy given above apply."*

From the above it is evident that Stapf's *T. triandra* Forsk. is not identical with Hackel's *T. Forskalii* and Hooker's *A. imberbis* Retz. as it comprises only the African element including "*an extension into Arabia, Syria, and the south-eastern corner of Asia Minor "*. Stapf's synonymy leads to the same conclusion, except for the inclusion of *T. imberbis* T. Cooke (FL Bomb. II, 993). The Australian element *Anthistiria australis* R. Br. has been separated by the same author as *Thqpfieda australis* Stapf. It seems to us that Stapf's treatment of *T. triandra* is somewhat arbitrary. We quite agree that the name should remain and that it is the only correct name, but we cannot agree to its being restricted to the African element only, and it is difficult to understand why the Indian specimen should not go by the same



name. If we could distinguish groups of varieties or forms that are confined to more or less definable geographical areas, it would be admissible to speak, *e.g.*, of an African group and call it *T. triandra*, because Arabia exhibits one of those African forms, or of an Indian or Australian group, and name them accordingly. But experience shows that with regard to the material under review there are no such geographical areas which contain a group of varieties or forms that are peculiar to one area exclusively. A glance at the localities given by Hackel under the different varieties and subvarieties will confirm our statement.

We are, therefore, of opinion that the name *Themeda triandra* Forsk. should embrace all the material that was described by Hackel under *T. Forskalii*, by Hooker under *A. imberbis*, and by Cooke under *T. imberbis*.

Haines describes the material from Bihar and Orissa under the name of *T. imberbis* T. Cooke, and adds in brackets 'partly'. His species, therefore, is not Cooke's *T. imberbis*, but must be given some other specific name as long as Cooke's name stands. But if botanists adopt our *T. triandra* Forsk. Haines' name will be merged in it, and his material may be treated as a form or group of forms under that species.

**Description** : Perennial, densely tufted; stem 30-90 cm. high, stout or slender, erect, or geniculate and ascending, subsimple or branched, glabrous, polished; node glabrous. Leaves 7-5-20 cm. by 2-5-5 mm., narrowly linear, finely acuminate, coriaceous, flat, rather rigid, margins scabrid; sheaths compressed, keeled, smooth; ligule a narrow ciliolate membrane.

Panicle narrow, racemiform, 7-5-20 cm. long, sparingly branched; branches solitary or the upper 2-3-nate, filiform, bearing capituliform usually dense distant fascicles of racemes; spathes lanceolate, obtusely acuminate, about 2-5 cm. long, usually bearded at the base, glabrous or sparsely hairy, greenish or tinged with red; racemes 1-3-2 cm. long. Involucral spikelets whorled, sessile, persistent, lanceolate, acute or acuminate, 6-16 mm. long, glabrous, or with short bulbous-based hairs, male; glumes 3. Pedicellate spikelets linear-lanceolate, glabrous, on short glabrous or subglabrous pedicels. Bisexual spikelet solitary, 6 mm. long; callus reaching 3 mm. long, pungent, bearded with coloured hairs. Lower involucral glume obtuse or notched, smooth except the tip, dark brown, not dorsally channelled, obscurely 7-9-nerved; upper involucral glume glabrous; lower floral glume glabrous, rather shorter than the involucral glumes; upper floral glume awned; awn 3-8-6-3 cm. long with a stout hispid column. Anthers 2 mm. long. Grain 2-5 mm. long, oblong, grooved ventrally.

This species is distinguished from *T. quadrivalvis* by its greater size and by the clusters of spikelets (partial panicles) being more distant, more globose and more pendent. The callus is densely bearded with long brown hairs. The lower involucral glume is shining and glabrous, but about the upper  $\frac{1}{2}$  is minutely hispid. At first the glume is pale, but eventually turns a rich brown. The callus is articulate on the pedicel and easily comes away with the spikelet. The spikelet, too, is articulate with the callus, but it requires a little force to disarticulate it.

**Locality** ; *Gujarat*: Ahmedabad (Gammie 16391!).

*Khandesh*: Toranmal (McCann 9813 !).

*Konkan*: Mokhada Range (Ryan 2626!); Mahaluxmi (Sabnis A297 !); Bhandup (McCann 9810 !); Bassein (McCann 4475 !).

*W. Ghats*: Igatpuri (McCann 4322 !); Khandala, common (McCann A291 !); Panchgani (Blatter 3806 !, Blatter & Hallberg B1326 !); Castle Rock (Gammie 15728 !); Dud-sagar Falls (McCann A298 !).

*Deccan* : Ganeshkhind Botanic Gardens (Garade !); Bairawadi, Purandhar (McCann 5069 !); Poondra (Talbot 4307 !).

*S. M. Country*: Devarayi, 1,800 ft., rainfall 90 in. (Sedgwick & Bell 4427 !); Dharwar (Nana A289!).

**Ecology** • This species is the commonest of this genus throughout the Presidency. It sometimes covers large patches of land to the exclusion of almost every smaller plant. Generally it is subgregarious or gregarious.

**Distribution** : Africa, Indo-Malaya, Australia.

**Economic uses** : A very good fodder and hay.

**Explanation Of Plate 74** : *Themeda triandra* For&k.

1. Involucral spikelet.
2. Pedicellate spikelet.
3. Spikelets in bract.
4. Lower invol. glume.
5. Upper invol. glume.
6. Lower floral glume.
7. Upper floral glume.
8. Spikelet.



Sessile spikelet.

J

## 2. THEMEDA QUADMIVALVIS O. Euntze.

*Themeda quadrivalvis* O. Kuntze Rev. Gen. PL II (1891) 794; Stapf in Fl. Trop. Afr. IX (1919) 420; Haines Bot. Bill, and Or. (1924) 1050.

*Andropogon quadrivalva* (err. typog.), Linn. Syst. ed. 13, 758.

*Themeda ciliata* Hack, in Monogr. Androp. (1889) 664; Cooke Fl. Bomb. II (1908) 994.

*Anthistiria ciliata* Linn. f. Suppl. (1781) 113; Gaertn. Fract. II, 465, t. 175; Lam. 111. t. 841, fig. 1; Beauv. Agrost. (1812) t. 23, fig. 7; Kunth Emim. I (1838) 481; Steud. Syn. PL Glum. I (1855) 401; Baker Fl. Maurit. (1877) 448; Bait f. Bot. Socotra (1888) 317 (*partim*); Duthie Grasses N. W. Ind. (1883) 42; Hook. f. Fl. Brit. Ind. VII (1896) 213; Stapf in Dyer Fl. Cap. VII, 368.

*A. scandens* Eoxb. Fl. Ind. I (1832) 248; Duthie Fodder Grasses N. W. Ind. (1886) t. 61.

*A. semiberbis* Nees FL Afr. Austr. (1841) 125.

*Andropogon nutans* Linn. Mant. II (1767) 303.

**Vernacular names** : Bongrut, Bhathu, Bhati, Zini bathi, Mothi bathi, Bhatharu.

**Etymology** : *Quadrivalvis* means having 4 glumes, referring to the bisexual spikelet.

**Description** : Annual; stems suberect or geniculately ascending and rooting from the lower nodes, very slender, terete, 30-90 cm. high, glabrous, simple or branched. Leaves 15-30 cm. by 4-6 mm., linear, acute, flat, flaccid, glabrous or hairy; sheaths glabrous or the upper with scattered bulbous-based hairs towards the mouth; ligules membranous, rounded, 2 mm. long, glabrous.

Panicle suberect, occupying £-§ of the stem, usually dense; lower branches solitary or 2-3-nate, filiform, glabrous, undivided often to the middle, then bearing at equal distances usually shortly pedunculate dense clusters of racemes; spathes linear to subulate from a broad lanceolate base, 1-7-2\*5 cm. long, glabrous or with scattered bulbous-based bristles; racemes 8-13 mm. long, erect. Involucral spikelets whorled, sessile persistent, linear-lanceolate, acute or acuminate, 4-6 mm. long, reddish, barren or imperfectly male; lower involucral glume beset along the winged keels with stiff bristles from large tubercular bases, otherwise glabrous. Pedicellate spikelets narrow, not winged, glabrous. Bisexual spikelet solitary, not exerted from the involucre, 4-5 mm. long, narrow, linear-lanceolate; callus very short, subobtuse, bearded with short reddish hairs; lower involucral glume obtuse, brown, shining, obscurely 6-7-nerved; upper involucral glume glabrous; lower floral glume shorter than the involucral glumes, sometimes 2-toothed; upper floral glume awned; awn 2\*5-3\*8 cm. long, slender. Anthers 1 mm. long.

The lower involucral glume of the bisexual spikelet is shining, but beset all over with rather stiff hairs, those in the upper \ being stronger than those covering the other parts of the glume (the remarks regarding the articulation of the glume, callus and pedicel given under *T. triauidra* apply also here). Callus densely bearded with long brown hairs. Lower involucral glume brown when mature.

**Locality** : *Gujarat*: Ahmedabad (Gammie 16391!).

*Khandesh*: Toranmal (McCann 9817 !).

*KonJcan*: Parsik, railway line (McCann 9808!); Alibag, water works (Ezekiel!); S. Konkan (Stocks *teste* Cooke, Law); Salsette (Jacquemont 717 *teste* Cooke).

*W. Ghats*: Road, Mahableshwar to Pratapgad (Bhide 1170!); Panchgani (Blatter & Hallberg B1311! B1325 !); Castle Bock (Gammie 15729 !).

*Deccan*: Pashan, near Poona (Gammie!); Purandhar (McCann 5571), Bairawadi (McCann 507A!).

*8. M. Country* i Konankeri, 2,000 ft., rainfall 40 in. (Sedgwick & Bell 4943 !); Dharwar, 2,400 ft., rainfall 34 in. (Sedgwick & Bell 4486 !); Dastikop, 2,500 ft., rainfall 35 in. (Sedgwick & Bell 2060 !); Belgaum (Ritchie 886 *teste* Cooke).

*N. Kanara*: HSIyal (Talbot 2115 !).

**Ecology** : A very common species during the monsoon, but it also flourishes during the dry weather. Common in the Carnatic, especially in the Mallad tract.

**Distribution** : N. W. India, Bengal, Central Provinces, W. Peninsula, Tenasserim. Introduced in tropical and S. Africa.

## 3. THEMEDA CYMBABIA Hack.

*Themeda cymbaria* Hack, in Monogr. Androp. (1889) 668; Cooke Fl. Bomb. II (1908) 994.

*Anthistiria cymbaria* Eoxb. Hort. Beng. (1814) 6, *et* Fl. Ind. I (1832) 251 (*excl. syn.*); Kunth Enum. PI. I (1838) 482 (*excl. syn.*); Grah. Cat. Bomb. PI. (1839) 219; Dalz. & Gibs. Bomb. Fl. (1861) 304; Hook. f. Fl. Brit. Ind. VII (1896) 215.

**Vernacular names** ? Earar, Ful-gavat.

**Etymology** : *Cymbaria* is derived from *cymba*, a boat, therefore boat-shaped, alluding to the proper spathes.

**Description** : Perennial; stems 0.9-2.4 m. high, as thick as a swan's quill below, erect, branched, smooth, clothed at the base with broad strongly compressed equitant leaf-sheaths together 3-8.5 cm. across > internodes long; nodes glabrous or puberulous. Leaves 5-10 cm. by 4-8 mm., linear, finely pointed, glaucous beneath, green above, glabrous or ciliate at the base, scaberulous above, smooth beneath, margins scabrid; sheaths subcompressed, keeled, smooth, usually bearded at the mouth, the lower 13 mm. broad at the base; ligule reddish, membranous, glabrous.

Panicle 30-60 cm. long, occupying nearly half the stem, supra-decompound; branches loaded with small shortly pedunculate oblong fascicles 13-20 mm. long, of nearly glabrous racemes; proper spathes 13-17 mm. long, linear-lanceolate, boat-shaped, acuminate, finely pointed, glabrous or with hairy margins. Involucral spikelets 4-6 mm. long, contiguous in superposed pairs, glabrous. Pedicellate spikelets with glabrous pedicels. Bisexual spikelets solitary (rarely 2), subsessile; callus short, bearded with white hairs; lower involucral glume 6 mm. long, dorsally convex, not channelled, smooth, polished, dark brown; awn 13 mm. long, slender, smooth.

**Locality** : *Khandesh*: Dadgaum (McCann 9815 !); Toranmal (McCann 9818 !).

*Konkan* : Common (Cooke), I am doubtful (McCann).

*W. Ghats*: Lonavla (Garade!); Castle Bock (Gammie 15634!).

*N. Kanara*: Mirjan (Hallberg & McCann A295 !).

**Ecology** : Generally found amongst bushes on hills, very common.

**Distribution** : W. Peninsula, Ceylon.

**Economic uses** : A coarse grass eaten by cattle. Also fit for hay.

#### 4. THEMEDA TREMULA Hack.

##### PLATE 75.

*Themeda tremula* Hack. Monogr. Androp. (1889) 667; Lisboa Bomb. Grasses (1896) 89; Cooke EL Bomb. II (1908) 995.

*Anthistiria tremula* Nees ex Steud. Syn. PL Glum. (1855) 401; Hook, f. Fl. Brit. Ind. VII (1896) 214.

*Androscepiya tremula* Anders, in Nov. Act. Upsal. ser. III, II (1856) 247.

**Vernacular names** : Bhatandi, Bungrat, Barki, Gundi.

**Etymology** : *Tremula* means trembling.

**Description** : Annual ? ; stems erect or ascending from a creeping rootstock, 0.3-1.2 m. high, stout or slender, leafy, subterete, simple or branched, smooth, polished, brown. Leaves 10-50 cm. by 4-8 mm., finely acuminate with setaceous tips, rigid, suberect, green, glabrous or nearly so, margins scabrid; sheaths slightly compressed, smooth; ligule reduced to a very narrow membrane.

Panicle 30-60 cm. long, occupying 1/3-1/2 the stem, racemiform; fascicles of racemes rather distant, on capillary flexuous peduncles 1.3-7.5 cm. long, subflabelliform or subglobose, 1\*3-3.8 cm. broad, sometimes reduced to a few spathes and spikelets; outer spathes longer than the fascicles, 2.5-3.8 cm. long, more or less hairy with simple or bulbous-based hairs; proper spathes 13-20 mm. long, lanceolate, acute, compressed, glabrous or with some bulbous-based hairs, margins scarios. Involucral spikelets in contiguous superposed pairs reaching 8 mm. long, green tinged with red, lower involucral glume linear-lanceolate, acuminate, covered with long often bulbous-based bristles, many-nerved; upper involucral glume oblong-lanceolate, acuminate, 1-nerved, ciliate above the middle, margins inflexed; lower floral glume as long, very narrowly linear, hyaline, 1-nerved. Lodicules cuneate. Anthers 2-5 mm. long. Pedicellate spikelets like the involucral, but nearly glabrous. Glumes 3; lower involucral glume winged on one margin, nerveless, the other two as in the involucral spikelets. Bisexual spikelets 2, sessile, 4 mm. long, linear-oblong, obtuse; callus small, with a short reddish beard; lower involucral glume scabrid, deeply channelled dorsally, nerveless, tip hispid, narrowly truncate; awn 1.3-2.5 cm. long.

**Locality** : *Konkan*: Trombay (McCann A293!); Ghatkopar, Horse-shoe Valley (McCann A327!).

*W. Ghats*: Igatpuri (Blatter & Hallberg 5484 !); Ehandala (McCann 5359 !); Castle Bock (Gammie 15687 !).

*Deccan*: Purandhar, northern foot (McCann 5041!); Poona (Woodrow *teste* Cooke).

*M. Country*: Devarayi, 1,800 ft., rainfall 90 in. (Sedgwick & Bell 4428 !).

*N. Kanara*: Devimane Ghat (Kulkarni!); Jugglepet (Talbot 1568 !); Tinai Ghat (Sedgwick & Bell 3196 !); Sirsi to Siddhapur (Hallberg & McCann A294!).

**Distribution** : From the Central Provinces and the Eonkan southwards, Ceylon.

**Economic uses** : Considered to be a good fodder.

**Explanation of Plate 75** : *Themeda Iremula* Hack.

- |   |   |                   |
|---|---|-------------------|
| 1. Involucral spikelets (not all in one bunch). | } | Sessile spikelet. |
| 2. Spikelet.                                    |   |                   |
| 3. Lower invol. glume.                          |   |                   |
| 4. Upper invol. glume.                          |   |                   |
| 5. Lower floral glume.                          |   |                   |
| 6. Upper floral glume.                          |   |                   |
| 7. Pedicelled spikelet.                         |   |                   |

#### 41. PSEUDANTHISTIBIA Hook. f.

Annual grasses. Leaves narrow.

Panicle leafy; branches slender, filiform, each bearing a single raceme clothed by a proper spathe, the racemes subumbellate, the umbel subtended by a common spathe. Proper spathes lanceolate or linear-lanceolate, acuminate, keeled. Spikelets within each proper spathe usually consisting of 1 sessile 2-sexual spikelet with 1 pedicellate male and a second sessile 2-sexual spikelet with 2 pedicellate males. Sessile 2-sexual spikelets with a short callus; lower involucral glume chartaceous, truncate, with inflexed margins, 4-7-nerved, the nerves apparent only towards the apex; upper involucral glume equalling the lower, linear-lanceolate, glabrous, 3-nerved, membranous; lower floral glume small, quadrate; upper floral glume represented by the hyaline base of a long capillary geniculate awn. Lodicules cuneate. Pedicellate male spikelets on slender pedicels; lower involucral glume thin, about 9-nerved, margins narrowly incurved; upper involucral glume 3-nerved; lower floral glume very small, oblong. Stamens 3; anthers linear. Styles short; stigmas short exserted. Grain small.

Species 4.—Indian.

Cooke has described 1 species: *P. hispida* Hook. f. We add two others: *P. umbellata* Hook. f. and *P. heteroclita* Hook. f.

#### I. Ligule exauriculate.

- |  |                            |
|--|----------------------------|
| 1. Ligule a truncate glabrous membrane, much divided to the base, the tips minutely ciliolate. Sessile spikelets glabrous. | 1. <i>P. hispida</i> .     |
| 2. Ligule short, membranous. Sessile spikelets not glabrous.   | 2. <i>P. heteroclita</i> . |

#### II. Ligule auricled. 3. *P. umbellata*.

#### 1. PSEUDANTHISTIRIA HISPIDA Hook. f.

*Pseudanthistiria hispida* Hook. f. Fl. Brit. Ind. VII (1896) 219; Cooke Fl. Bomb. II (1908) 992.

**Vernacular name** : Pokalya.

**Etymology** : *Pseudanthistiria* means false *Anthistiria*, a nearly related genus. *Anthistiria* is derived from *antistas*, one who stands opposite or who offers resistance, referring to the stiff tough stems.

**Description** : Annual; stem 30-60 cm. high, rather stout, erect, glabrous and polished; nodes glabrous. Leaves 5-12.5 cm. by 3-6 mm., linear, finely acuminate, sometimes with a bristle-point, hairy on both surfaces with bulbous-based hairs, more or less subspinulose ciliate on the margins, strongly nerved; sheaths hairy on the upper part with bulbous-based hairs, usually glabrous below; ligule a truncate glabrous membrane much divided to the base into narrow segments, the tips minutely ciliolate.

Panicle elongate, simple; branches very slender, reaching 7-5 cm. long, often in pairs; fascicles 2 cm. broad, copiously hirsute with bulbous-based hairs; outer spathes 3-8 cm. long or more; proper spathes much longer than the racemes, all hirsute on the margins with strong bristles from tubercular bases. Sessile spikelets 4 mm. long; callus shortly bearded; lower involucral glume 4 mm. long, oblong, truncate at the membranous ciliolate apex, with narrowly infolded margins and obscure nerves, glabrous; upper involucral glume as long as the lower, oblong, obtuse, 3-nerved with hyaline margins; lower floral glume small, quadrate; upper floral glume represented by the very acute base of the awn; awn 2-5-3-2 cm. long. Pedicellate spikelets lanceolate, hairy; pedicels finely hairy.

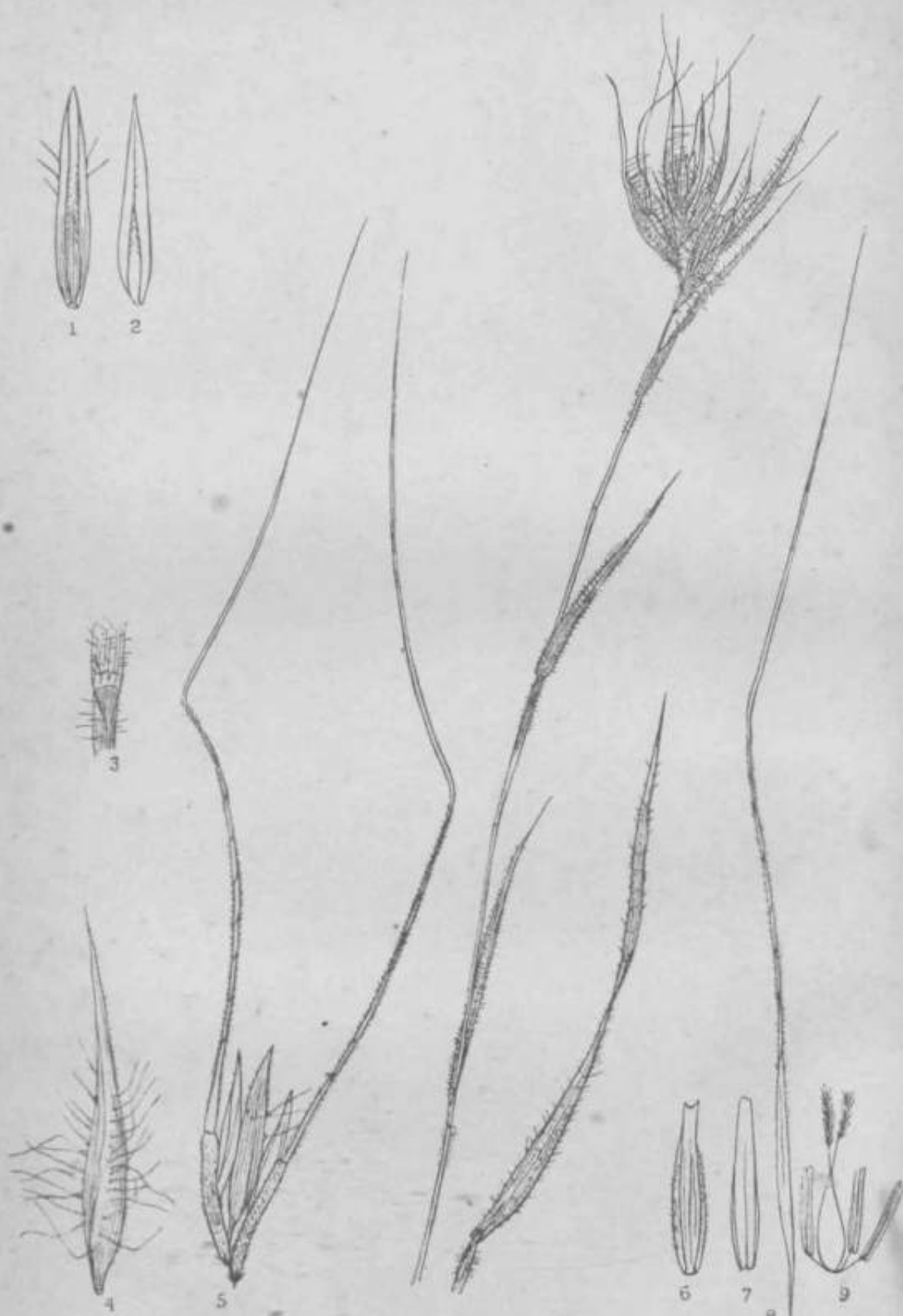
**Locality** : Gujarat: Surat (Garade!).

**Konkan**: Dahe Forest (Ryan 705!); Ghatkopar, Horse-shoe Valley (McCann A3261); Sion (McCann 5247!); Bombay, St. Xavier's College compound (McCann 4524 !); Kalyan (Woodrow).



THEMRUEA TRKMILA JACK.

*Ddir : II, K. Ibid.*



Sessile spikelet

*W. Ghats*: Matheran (D'Almeida A329!); Lonavla (Gammie!); Igatpuri Ghats (McCann 4343 !); Khandala, common, railway line (McCann A331!); Panchgani (Woodrow); Castle Rock (Gammie 15634!, McCann A328 !); Londa (Gammie 15863 !, Woodrow).

*Deccan* : Purandhar Fort (Gammie 1010 !).

8. *M. Country* : Derikop (Sedgwick 2061!).

*N. Kanara*: Bitchy (Talbot 2096!); Yellapur (Talbot 1522 !); Devimane Ghat (Kulkarni!).

**Distribution** : Central Provinces, W. Peninsula.

## 2. PSEUDANTHISTIRIA HETEOCLITA Hook, f.

### PLATE 76.

*Pseudanthistiria heteroclita* Hook. f. Fl. Brit. Ind. VII (1896) 219; Lisboa Bomb. Grasses (1896) 88.

*Andropogon heteroclitus* Nees Fl. Afr. Austr. (1841) 115; Steud. Syn. Pl. Glum. (1855) 389; Hack. Monogr. Androp. (1889) 400.

*A. monomeros* Hochst. in Hohen. Pl. Ind. Or. no. 183.

*Anthistiria heteroclita* Roxb. Fl. Ind. I (1832) 249.

**Etymology** : *Heteroclita* is derived from the Greek *heteroklitos*, meaning otherwise declined.

**Description** : Stems 30-80 cm. high, geniculate, slender, terete, smooth, subsimple or branched. Leaves linear, 15-30 cm. long, 3-5 mm. broad, glabrous or more or less ciliate on both surfaces, nerves distinct, margins with long, tubercle-based hairs or nearly glabrous; sheaths much shorter than the internodes, quite glabrous; ligule short, membranous, exauriculate.

Panicles 20-30 cm. long, leafy, compound, with many shortly peduncled fascicles, fascicles of spikes about 12 mm. broad, proper spathes 7-10 mm. long, hardly longer than the spikes, towards the margin with long, tubercle-based bristles; spikes 6-8 mm. long. Sessile spikelets 3-4 mm. long, linear-oblong, hispidulous all over. Lower involucral glume furrowed. Upper floral glume awned, awn 18-24 mm. long, thin. Pedicelled spikelets lanceolate, with a few long, tubercle-based bristles, keel ciliate.

A densely tufted species. In the dry state the spathes turn reddish and are then very characteristic.—The panicles are much denser than those of the other species.

**Locality** : Konkan (Law ex Hook. f.).

*Deccan*: Poona (Lisboa).

**Ecology** : In Poona said to be common on hilly ground. Roxburgh calls it a native of newly-made pasture ground.

**Distribution** : Bengal, Konkan, S. Kanara.

**Economic uses** : Used chiefly for thatching.

**Explanation of Plate 76** : *Pseudanthistiria heteroclita* Hook f.

- |                               |   |                      |
|-------------------------------|---|----------------------|
| 1. Lower invol. glume.        | ^ |                      |
| 2. Upper invol. glume.        | ∠ | Pedicelled spikelet. |
| 3. Ligule.                    | C |                      |
| 4. Bract.                     | ) |                      |
| 5. Spikelets.                 |   |                      |
| 6. Lower invol. glume.        | " |                      |
| 7. Upper invol. glume.        | ∠ | Sessile spikelet.    |
| 8. Upper floral glume.        | C |                      |
| 9. Stamens, grain and styles. | J |                      |

## 3. PSEUDANTHISTIRIA UMBELLATA Hook. f.

*Pseudanthistiria umbellata* Hook. f. Fl. Brit. Ind. VII (1896) 220.

*Andropogon umbeUatus* Hack. Monogr. Androp. (1889) 401.

**Description** : A very slender, glabrous plant with filiform, prostrate, creeping branched stems, rooting at the nodes, stems 30-60 cm. long, compressed. Blade 2-5 cm. long, distant, linear-oblong, acute, rounded at base, sessile or short-petioled, nerves distinct, very slender, with a few scattered cilia on both surfaces, nearly smooth; sheaths shorter than the blade, often with tubercle-based hairs above, rarely glabrous; ligule passing at the sides into 2 short, herbaceous, fimbriate auricles of the sheath\*.

Panicle leafy, very lax, interrupted, 12-20 cm. long; fascicles of spikelets few, axillary, 6-12 mm. broad, glabrous or with a few tubercle-based cilia on simple, rarely branched capillary peduncles shorter than the leaves; lower peduncles sometimes elongate 2-5-7-5 cm. long and bearing several fascicles; outer spathes 8-25 mm. long. Spikes 3-6 in a fascicle, **proper**

spathe 10-12 mm. long, rather longer than the spikes, glabrous or towards the margin with a few bulbous-based hairs. Sessile spikelets 3-4\*5 mm. long, linear, scaberulous. Lower involucre glume dorsally concave; awn of upper floral glume 12-14 mm. long, very thin. Pedicelled spikelets linear-lanceolate, naked, awn 12-18 mm. long.

Much like *P. heterodita* in appearance, but with a much laxer inflorescence. Here, too, the dry spathes are reddish. The awn often reaches 25 mm. The ligule and the bulbous-based hairs separate it from the foregoing species. One may possibly be a variety of the other.

Locality : *W. Ghats*: Londa (Gammie 15869!).

*N. Kanara*: Birchy (Talbot 2073 !).

Distribution : Deccan and W. Peninsula, Ceylon.

### TRIBE III: Paniceae.

Spikelets in usually continuous spikes, racemes or panicles. Involucral glumes herbaceous or membranous, the lower generally smaller, very small or suppressed. Lower floral glume generally resembling the involucre glumes in structure and nervation, the upper fertile firmer, at length rigid, often chartaceous to crustaceous, awnless, very rarely mucronate (*Urochloa*, *Alloteropsis* sp.) or finely awned (*Alloteropsis* sp.).

See key page *xk*

#### 42. SPCSIEFEX Linn.

Dioecious gregarious much-branched rigid littoral bushes; stem and branches woody. Leaves narrow, rigid, involute, spreading and recurved, thickly coriaceous.

Inflorescence of large terminal globose bracteate heads, with radiating spike-like racemes, the male with many spikelets on each spike, the female with one only. Male spikelets 1-2-flowered, distichous, articulate on short pedicels. Glumes 4, chartaceous, acute, strongly nerved; involucre glumes empty; lower floral glume paleate, empty or 3-anded; upper floral glume paleate, 3-anded, the paleae of both floral glumes acuminate, as long as the glumes. Anthers linear. Female spikelets narrower than the male, erect, lanceolate, 1-flowered. Glumes acute or acuminate, strongly nerved, the lower involucre glume the longest; lower floral glume empty; upper floral glume thin, dorsally compressed; palea linear-oblong, acuminate. Lodicules 2, large, connate below, strongly nerved. Styles long, connate below; stigmas long, penicillate, exerted at the top of the glume. Grain clavate, tipped by the long rigid style, free within the hardened glume and palea.

Species 4.—1 in India, 3 in Australia.

#### 1. SPINIFEX SQUARROSUS Linn.

#### PLATE 76A.

*Spinifex squarrosus* Linn. Mant. (1771) 300; Lam. 111. t. 840; Duthie Grasses N. W. Ind. (1883) 11; Benth. Fl. Hongk. (1861) 415; Hook. f. EL Brit. Ind. VII (1896) 63; Grah. Cat. (1839) 240; Prain Beng. PL 1168; Cooke Fl. Bomb. II (1908) 913; Haines Bot. Bih. and Or. (1924) 1010.

*Stipa littorea* Burm. f. Fl. Ind. (1768) 29.

*Stipa spinifex* Linn. Mant. I (1767) 84.

Rheede Hort. Mai. XII, L 75.

Etymology : *Spinifex* means one that produces spines.—*Squarrosus* means rough with spreading and outstanding processes.

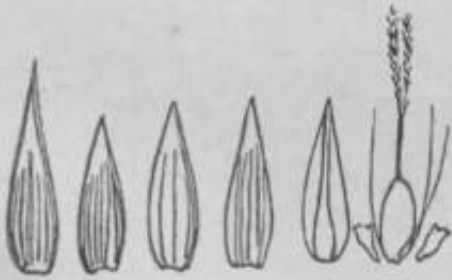
Description : A pale grey or glaucous squarrose shrub, 60-120 cm. high and broad, forming an impenetrable thicket; stem as thick as the little finger below, smooth, solid. Leaves 10-15 cm. long, spreading and recurved, smooth, tapering from the base to the tip, concave-convex, base not dilated, margins scaberulous; sheath 1-3\*2\*5 cm. long, smooth, with naked margins; ligule a ridge of stiff hairs.

Male inflorescence reaching 15-20 cm. diam.; bracts shorter than the spikes, lanceolate, aristately pungent, flat, chartaceous, the midrib very prominent beneath; racemes (male) 2-5-7-5 cm. long, longer than the stout angular peduncles; rachis angular. Spikelets 13 mm. long, smooth, straw-coloured. Glumes 4; lower involucre usually shorter than the upper, ovate, acute, pungent, conspicuously 7-9-nerved; upper involucre similar but usually longer; floral glumes longer than the involucre glumes, subequal, 5-7-nerved. Female inflorescence reaching 25 cm. diaiff.; bracts nn in the male but smaller; peduncle thickened towards the base. Spikelets 13-17 mm. long, narrowly lanceolate. Glumes 4; lower involucre glume oblong-lanceolate, many-nerved, scaberulous; upper involucre glume rather shorter, 7-nerved *i*

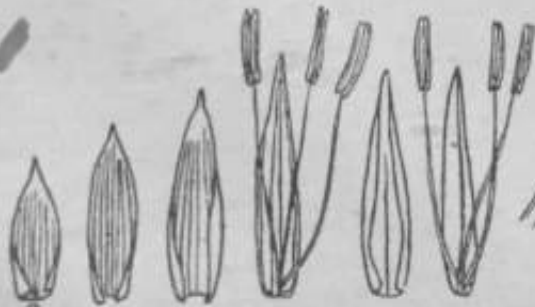




1



2 3 4 5 6 7  
Female spikelet



8 9 10 11 12 13  
Male spikelet



14



DIQITARIA TKH.WIA BTAPP.

Delin: B. K. Mid\*.

lower floral glume empty, the palea 0 or imperfect, upper floral glume ovate-lanceolate, 5-nerved; palea shorter than the glume, acute.

**Locality :** *Gujarat:* Near Domas (Cooke).

*Konhan:* Vengurla (Chibber !); Juvem (J\*OW J^hu) (McCann 4263 !); Versova (McCann 9827!); *Bandra* (Blatter!); sandy shores near *Bandra* (Graham); *Shrivardhan* (Woodrow).

*N. Kanara:* Karwar, sandy seashore (Sedgwick & Bell 5056 ! 5057 !); *Kumpta*. (Chibber !, Woodrow); *Honavar*, very common (McCann !, Chibber !, Talbot 1073 !).

**Ecology :** Essentially a maritime species, growing on sandy shores just above high water mark. Easily recognized by its thick stiff recurved leaves, long creeping stems rooting at the nodes, and the large spherical spiny inflorescence, which may often be seen rolling about the beach in the direction of the wind.

When the seed is ripe the long head is detached and blown by the wind. A specimen was kept by us in a pot with red earth for over a year. The plant grew well enough, but it was not so robust as the shore specimens. It was greener in colour, but it never flowered. At *Honavar* (*N. Kanara*) it seemed to be in general flowering from December to January.

**Distribution :** India, Ceylon, Java, China.

**Economic uses :** A valuable sand-binding plant.

**Explanation Of Plate 76a. :** *Spinifex squarrosus* Linn.

- |   |    |                      |
|---|----|----------------------|
| 1. Female spikelets.                          | "^ |                      |
| 2. Lower invol. glume.                        | I  |                      |
| 3. Upper invol. glume.                        | j  |                      |
| 4. Lower floral glume.                        | }  | } > Female spikelet. |
| 5. Upper floral glume.                        |    |                      |
| 6. Palea of upper floral glume.               | }  |                      |
| 7. Ovary, styles and lodicules.               |    |                      |
| 8. Lower invol. glume.                        | }  | } Male spikelet.     |
| 9. Upper invol. glume.                        |    |                      |
| 10. Lower floral glume.                       |    |                      |
| 11. Palea of lower floral glume, and stamens. |    |                      |
| 12. Upper floral glume.                       |    |                      |
| 13. Palea of upper floral glume, and stamens. |    |                      |
| 14. Male spikelets.                           |    |                      |

43. DIGITARIA Hall.

Annual or perennial grasses. Leaves linear or lanceolate.

Spikelets usually 2-3-nate, in digitate or racemose spikes, jointed on the pedicel but not thickened at the base; lower floret barren, reduced to the floral glume and a very minute palea; upper floret hermaphrodite. Glumes very dissimilar, normally 4; the lower involucrel glume usually hyaline, sometimes absent or present in the same species; the upper involucrel glume membranous, 1-5-nerved or nerveless; floral glumes equal or subequal, the lower like the upper involucrel glume, usually 7-9-nerved, the nerves close, parallel straight, prominent; upper floral glume chartaceous or subchartaceous, usually 3-nerved. Palea of upper floret subequal to the glume, and of same texture, 2-nerved. Lodicules 2, minute, broadly cuneate. Stamens 3. Styles distinct; stigmas plumose, laterally exerted near the apex of the floret. Grain oblong, slightly dorsally compressed, free, but tightly enclosed between the hardened glume and the palea.

Species more than 100.—In the warm parts of the whole world, but chiefly in the Old World.

Cooke (II, 940-942) describes 6 species. All are retained in this place, but the name of *Digitaria sangwinalis* will be replaced by *D. marginata*.

A. Spikelets 2-5 mm. long or longer.

- |   |                          |
|---|--------------------------|
| I. Spikelets with clavate hairs . . . . . m . . . . . | 1. <i>D. ternata</i> .   |
| II. Hairs on the spikelets not clavate.               |                          |
| 1. Spikelets bearded; spikes few . . . . .            | 2. <i>D. marginata</i> . |
| 2. Spikelets subsilky; spikes many . . . . .          | 3. <i>D. pennata</i> .   |

B. Spikelets less than 2-5 mm. long.

- |   |                                |
|---|--------------------------------|
| I. Bhachis capillary, trigonous . . . . .                           | » 4. <i>D. jHsiicettarid</i> . |
| II. Ehachis narrowly winged. *                                      |                                |
| 1. Spikelets subsilky with slender (not clavellate) hairs . . . . . | b. <i>D. longiflora</i> .      |
| 2. Spikelets with clavellate hairs . . . . .                        | 6. <i>D. Roylearia</i> .       |

## 1. DIGITARIA TERNATA Stapf.

## PLATE 77.

*Digitaria ternata* Stapf in Dyei Fl. Cap. VII, 376, et in Fl. Trop. Afr. IX (1919) 462 ;  
Cooke Fl. Bomb. II (1908) 910.

*Paspalum ternatum* Hook. f. Fl. Brit. Ind. VII (1896) 17 ; Lisboa Bomb. Grasses (1896) 4.

*Panicum ternatum* Hochst. in Flora XXIV (1841) I, Intell. 19; Hack, in Oest. Bot. Zeitschr. (1901) 331.

*P. Phaenocarpum* var. *gracOe* Nees FL Afr. Austr. (1841) 23.

*Cynodon ternatum* A. Rich. Tent. Fl. Abyss. II (1861) 406.

**Etymology** : *Digitaria* refers to the mostly digitate inflorescence.—*Ternata* means, 3-nate, alluding to the 2-3-nate pedicels.

**Description** : Annual; stems tufted, erect from a geniculate base, slender 16-45 cm. long, glabrous or nearly so. Leaves 5-16 cm. by 6 mm., linear-lanceolate, acute, glabrous; sheaths glabrous, striate, the mouth ciliate; ligules short, truncate, membranous.

Spikes 2-3 (or more), subdigitate, erect or spreading, silvery white; rhachis narrowly winged. Spikelets 2-3-nate, 3 mm. long, elliptic, subacute, closely appressed to the rhachis, pale; pedicels unequal, up to 2-5 mm. long, shortly hairy towards the tips. Lower involucral glume usually obsolete; upper involucral glume tender, 3-nerved, the sides villous with clavate hairs; floral glumes subequal, the lower prominently 5-nerved, densely and appressedly silky-villous with clavate hairs, the upper chartaceous, ovate-oblong, subacute, dark brown (nearly black). Occasionally long fine hairs are found on the peduncles.

**Locality** : Deccan: Purandhar Fort (Bhide !).

S. M. Country: Belgaum (Herb. Bot. Gard. Calc).

**Distribution** : India (Ehasia Hills, Burma, W. Peninsula), Yunnan, tropical and S. Africa.

**Explanation of Plate 77** : *Digitaria ternata* Stapf.

1. Upper invol. glume.
2. Lower floral glume.
3. Upper floral glume.
4. Hair on spikelet.

## 2. DIGITARIA MARGINATA Link.

*Digitaria marginata* Link Hort. Berol. I; 229; Stapf in Fl. Trop. Afr. IX (1919) 439.

**Description** : Annual, 30 cm. to 1 m. high. Stems tufted, usually ascending from a geniculate or prostrate base, simple or branched from the lower nodes, glabrous, few- to many-noded. Leaves 5-15 cm. by 4-8 mm., linear or linear-lanceolate from a slightly contracted and rounded base, acute, flat, flaccid, glabrous or sparingly hairy particularly towards the mouth, margins finely cartilaginous, rough and often crisp, midrib very slender, whitish; sheaths thin, subherbaceous, loose, glabrous, or more or less beset with spreading tubercle-based hairs often forming a loose beard at the base ; ligules truncate, membranous, up to over 1 mm. long.

Spikes mostly 4-9, sessile, subdigitate, solitary or 2-3-nate on a short, scaberulous common axis, erect or spreading, rather slender, strict or slightly flexuous, 5-15 cm. long, often finely pubescent at the base; rhachis almost straight, triquetrous, lateral angles winged, herbaceous, scabrid, internodes up to more than 2 mm. long. Pedicels 2-nate, one very short, the other up to 1-5 mm. long, angular, scabrid. Spikelets appressed, lanceolate, acutely acuminate, 2-4 mm. long, pale greenish, rarely tinged with purple, variously hairy, rarely quite glabrous. Lower involucral glume an ovate, obtuse to subacute membranous scale, usually not over 0-3 mm. long, sometimes obsolete or quite suppressed; upper ovate-lanceolate, acute, equalling or considerably exceeding half of the upper floral glume, rarely distinctly shorter, 3-nerved, with fine lines of hairs between the nerves and along the margins, rarely quite glabrous. Lower floral glume corresponding in outline and size to the spikelet, firmly membranous, 7-nerved, rarely quite glabrous, usually with fine lines of hairs between the inner side-nerves (of each half) and along the margins; upper floral glume oblong-lanceolate, acutely acuminate, almost as long as the spikelet, thinly chartaceous, pale or slightly purplish, brownish when ripe. Grain oblong, planoconvex, whitish scutellum less than half the length of the grain.

This species is not identical with *Paspalum sanguinale* Lamk. of the F. B. I. or with *Digitaria sanguinalis* Scop, in Cooke's Flora or in Haines' Bot. of Bihar and Orissa. \**D. sanguinalis* Scop, {sensu stricto} is a plant of S. Europe and has not been found either in India or tropical Africa, as was pointed out by Pilger (in Engl. Jahrb. XXX, 118) and Stapf. Most of the numerous synonyms given by Hoo] f. in the F. B. I. would have to be mentioned under the different varietid. Here we have to deal only with one variety which was described by Cooke as *var. ciliaris* Prain and which was called *var. fimbriata* by Stapf.



*DIGITARIA MARGINATA* LINK VALL. *FIMHHMTA* STAPP.

Delin. - H. K. Bhida.



D) K: IT ARIA PENNATA CHIOV

Datin : B. K. Thid,

## VAR. FIMBSIATA Stapf.

## PLATE 78.

*Digitaria marginata* var. *finbriata* Stapf I.e. 440.

*D. fimbriata* Link Hort. Berol. I, 226.

*D. commutata* Schult. Mant. II, 262.

*D. chrysoblephora* Kg. & De Not. in Mem. Ace. Tor. ser. II, XIV, 364.

*D. sanguinalis* var. *ciliaris* Bendl. in Cat. Afr. PI. Welw. II, 163, and in JOUTEL Linn. Soo. Bot. XL, 228.

*D. sanguinalis* var. *ciliaris* Prain Beng. PL 1181; Oooke Fl. Bomb. II (1908) 940.

*Panicum ciliare* Retz. Obs. IV (1786) 16; Kunth Enum. I, 82; Roxb. Fl. Ind. I (1832) 290; A. Rich. Tent. Fl. Abyss. II (1851) 360; Dalz. & Gibs. Fl. Bomb. (1861) 290; Duthie Indig. Fodder Grasses (1886) t. 9.

*P. fimbriatum* Presl Rel. Haonk. I (1830) 298; Kunth Enum. I, 81.

*P. sanguinale* var. *ciliare* Franch. Contr. FL Congo Franc. 46.

*P. sanguinale* var. *blepharanthum* Hack, in Durand & Schintz Consp. FL Afr. V, 762.

*P. sanguinale* var. *macrostachyum* Hack. Lc. 763.

*Paspalum sanguinale* var. *ciliare* Hook. f. FL Brit. Ind. VII (1896) 15.

**Vernacular names** : Tara, Shikaol or Arotaro, Chansarieu, Tarō, Modhan, Fakria, Kurad, Suka, Revga, Dinohi, Shikar koli, Kalam hullu, Shimpigyan hullu.

**Etymology** : *Fimbriata* refers to the fringes on each side of the spikelet at maturity.

**Description** : Upper involucre glume usually much exceeding the middle of the fertile floret and frequently equalling *i* of its length. Indumentum of spikelets uniform or more often more or less varied in the same inflorescence; hairs of the upper involucre glume and lower floret partly in fine lines, all of one kind, very fine, thin-walled, obtuse-tipped, partly more thick-walled with slightly clavate tips, and up to 1 mm. long, spreading out at maturity and forming a rigid double fringe on each side of the spikelet, the inner fringe often mixed with a varying number of tubercle-based acute yellow bristles which ultimately also spread out at right angles.

It is well to remember what Stapf says in a note, Lc. 441: "The peculiar indumentum of the spikelets, which in the mature state leads to the formation of spreading fringes, may extend to all spikelets alike or it may be, at least in its perfect development, confined to the long-pediced member of each pair of spikelets or only to some of them, in which case the indumentum of the fringeless spikelets approaches more or less that of var. *Linkii*." Var. *Linkii* Stapf is Hooker f.'s var. *commutatum* of *Paspalum sanguinale* in F. B. I. VII, 15.

**Locality** : *Sind*: Sanghar (Sabnis B903!); Mirpurkhas, in cultivated fields (Sabnis B1209!); Bughar, Indus River (Blatter & McCann D686!); Ghulamalla, garden (Blatter & McCann D687!).

*Cutch* (Blatter 8742!).

*Gujarat*: Ahmedabad (Herb. Econ. Bot. Poona!).

*Khandesh*: N. slope of Chanseli (McCann 95351); Bor, Tapti Island, on sand and mud (Blatter & Hallberg 5463 !); Muravat, Tapti bank (Blatter & Hallberg 3839 I); Umalla (Blatter & Hallberg 5178 !); Amalner (Blatter & Hallberg 4443 !); Sumit (Blatter & Hallberg 5188 !); Bor, Bori River (Blatter & Hallberg 5213!); Dadgaum (McCann 9531!).

*Konkan*: Victoria Gardens, Bombay (McCann 9831!); Malabar Hill (McCann 4300!); very common throughout the Islands of Bombay and Salsette (McCann!); Versova, Salsette (McCann 4308); Parsik, railway line (McCann 9530!); Bassein (McCann 4485!); Alibāg, sandy shore (Ezekiel!).

*W. Ghats* : Igatpuri (9833 !); Khandala (McCann 3650!); Fanchgani, Maratha Well (Blatter & Hallberg B1233 !).

*Deccan*: Purandhar (McCann 5606!); Chattarshinji (Ezekiel!); Pashan (Gammie!); Deolali (Blatter & Hallberg 4556 !); Gangapur (Blatter & Hallberg 4581!).

*S. M. CouiUry*: Haveri, dry ground, compound of P. W. D. (Talbot 2228!); Dharwar (Sedgw'ck!); Belgaum (Herb. Bot. Gard. Calc.).

*V. Kamra*: Karwar (Talbot 1294!); Halyal (Talbot 2153!); Kulgi (Talbot 2279!).

**Ecology** : Common in cultivated soil, often a bad weed in lawns

**Distribution** : Tropics of both hemispheres, rarely found beyond the tropics.

**Economic uses** : Considered to be a good fodder grass.

**Explanation of Plate 78** : *Digitaria marginata* Link var. *fiwbnuta* Stapf.

1. Lower and upper floral glumes of lower spikelet.
2. Part of rachis showing lower and upper spikelets in position.
3. Upper invol. glume.
- 1. Lower floral glume.

5. Upper floral glume.
6. Palea of upper floral glume,
7. Staminodes and styles.

## 3. DIGITARIA PENSATA Cliv.,

## PLATE 76.

*Digitaria pensata* Cliv. in Result. Silent. Miss. Steftmini Paoli I, 183; *Fl. Rnmh.* 1 (1908) 911. *erronee ascribens nomen Hookero f.*; Stapin "Fl. Trop. Afr. IX I (1919) 472.

*Panicum pennatum* Hodist. in Flow XXXV111 (1856) li 7; Schweinf. in Bull. Herb. J. J. 11. A, p. II, 18.

*Paspalum pennatum* Hook. f. FL Brit. Ind. All. (1896) W.

Description : Stems 60 cm. long, tufted, leafy. Leaves 5-15 cm. by 3-6 mm., linear or linear-lanceolate, finely acuminate, glabrous or sparsely hairy, distantly ciliate with IOM; fine, involucre long, striate, glabrous or with a few scattered hairs; ligule long, oblong, membranous.

Spikes several, racemes 7-6-16 cm. long; rachis (bis) very slender, trigonous with anthers long. Spikelets erect, solitary OT 2-nate, 3 mm. ICIIIJ, narrowly lanceolate, acute, sub silky. Glumes normally 5; lower involucre glume minute, ovate, acute (rarely absent); upper floral glume lanceolate, acute, membranous; lower floral glume similar to the upper floral glume; upper floral glume elliptic, lanceolate, acuminate, nearly equal to the lower.

Locality : *Stm*: *Stm*: *Stm*: (Stocks test Book, f.); Jemadar ka Laiula, near Kaiaboi (Stocks); Tatta, Kullan Kote (Blatter & McCann 1-684 1); Tatta (Blatter & McCann D060 1).

*Ra&imear*: Porbandar (Eht. i. 1); Marvi (Woodbrow).

Distribution : Baluchistan, tropical Arabia and Africa.

Explanation of Plate 79 : *Digitaria pensata* Cliv.

1. Upper involucre glume,
2. Lower floral glume.
3. Upper floral glume,
4. Palea of upper floral glume,
5. Staminodes and styles.
6. Spikelet, on rachis.

## 4. DIGITARIA PEDICELLARIS Pr.iii.

## PLATE 80.

*Digitaria pedicellaris* Pr.iii. Praei Beuj., PL (1903) 1181; Cooke Fl. Bomb, II (1908) 941; Haints Bot. Bid. and Or. (1924) 1000.

*Paspalum pedicellare* Trin. \*r Stcud. Nom. ed. 2 (1841) 272; Hook. f. Fl. Brit. Lid. VII (1896) VI.

*P. fidicellatum* Sees & Arn. in Wight Cat. 2310; Duthie Grasses N. W. Ind. (1883) I  
*Digitaria pedicellaris* Roxb. VI Ind. I (1832) 315 (ex J. syn. Burm.).

Description : Stems tufted, branched, leafy. Leaves 5-15 cm. by 2-5-4 mm., linear-lanceolate, finely acuminate.

Spikes 10-15, alternate, racemes singly or on a very slender peduncle, suberect or spreading, 5-10 cm. long; rachis, pedicels, trigonous; pedicels 1-3 mm. long, those of the upper spikelet longer than the lower; spikelets 2-5-nate, 1-2-6 mm. long elliptic, acute. Lower involucre obsolete; upper involucre glume elliptic, acute, very slightly hairy, 5-nerved, thin, membranous (almost hyaline); lower floral glume similar; upper floral glume elliptic, acuminate, thickly membranous, pale.

Locality: *Koitan*: *Koitan* (McCann 1725 1); Jion (St. X. C. Herb. 11; Mulgduni (McCann 3663 1).

*Decoan*: Chattarshinji Hill, Poona (Ey.ek. 1 1).

*S. 1/1. CowUry*: Hubli, 2,000 ft., rainfall, 30 in. (Sedgwick & Bell 4229 1).

Distribution : Throughout India,

Explanation of Plate 80 : *Digitaria pedicellaris* Pr.iii.

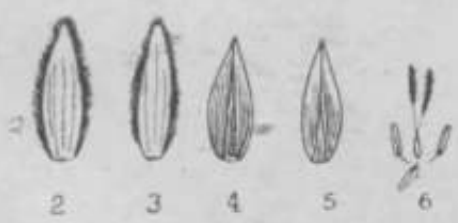
1. Part of rachis.
2. Spikelet.
3. Upper involucre glume.
4. Lower floral glume.
5. Upper floral glume.





MGTAIUA PKDICEIAtji T'ILUN.

Delin: B. K. Blide.



DIGITARIA LOXGIFLOKA PERS.

Delin r 5. ff. Bhdz.

## 5. DIGITARIA LONGIFLORA PeTS.

## PLATE 81.

*Digitaria hngiflora* Pers. Syn. I (1805) 85 (*non* Trin.); Cooke Fl. Bomb. II (1908) 941; Stapf in Fl. Trop. Afr. IX (1919) 469; Haines Bot. Bih. and OP. (1924) 1008.

*D. Pseudo-Durva* Schlechtend. in Innaea XXVI, 458.

*D. linearis* Schult. f. Mant. II, 264 (*non* Roem. & Schult.).

*D. tenuiflora* Stapf in Dyer Fl. Cap. VII, 380 (*non* P. Beauv.).

*JPaspalum longiflorum* Retz. Obs. IV (1786) 15 (*non* Trin.); Baker Fl. Maurit. (1877) 431; Hook. f. Fl. Brit. Ind. VII (1896) 17 (*partim*).

*P. brevifolium* Fluegge Gram. Monogr. (1810) 150.

*P. Pseudo-Durva* Nees Fl. Afr. Austr. (1841) 21.

*P. filiculme* Nees ex Thw. Enum. PL Zeyl. (1864) 358.

*Panicum longiflorum* Gmel. Syst. 158.

*P. parvulum* Trin. Pan. Gen. 117.

*P. argyrotichum* Duxand & Schintz Consp. Fl. Afr. V, 741 (*non* Anders.).

*Milium filiforme* Roxb. Fl. Ind. I (1832) 314.

*Digitaria tenuiflora* P. Beauv. given as a synonym by Cooke seems to be a different species. It is apparently a perennial of erect habit and with long narrow leaves.

**Description** : Annual or perennial; stems many, tufted, slender, creeping and rooting, or ascending or suberect, 15-45 cm. long, glabrous, with many nodes, often branched, leafy. Leaves 1-3-10 cm. long, linear-lanceolate, acute, spreading, flat, or, in short-leaved states, stiff and pungent, glabrous (rarely hairy); sheaths smooth or hairy; ligule very short, membranous.

Spikes 2-5, terminal, very slender, 2-5-10 cm. long, erect or spreading; rhachis narrowly winged, glabrous; pedicels 2- (rarely 3-) nate, unequal, short. Spikelets 1-2-1-6 mm. long, appressed to the rhachis, elliptic, obtuse, acute or subacute, pale or purplish, glabrous, or subsilky with wrinkled hairs. Lower involucrel glume 0 or rudimentary; upper involucrel glume 3-7-nerved; lower floral glume similar and subequal to the upper involucrel glume, 3-5-nerved; upper floral glume subchartaceous, ovate-oblong, slightly shorter than the lower, pale brown, smooth; palea with inflexed (not auricled) flaps.

**Locality** : *Deccan*: Deolali (Blatter & Hallberg 9835!).

*S. M. Country*: Dry uplands, Dharwar, 2,400 ft., rainfall 34 in. (Sedgwick 2653!); Belgaum (Herb. Bot. Gard. Calc).

*W. Ghats* : Londa (Bhide !); Panchgani (McCann 2799 !).

*N. Kanara*: Halyal (Talbot 2310 !).

**Distribution** : Throughout India, Ceylon, tropical and S. Africa, Madagascar, Mascarenes, Malaya.

**Explanation of Plate 81** : *Digitaria hngiflora* Pers.

1. Part of rhachis.
2. Upper invol. glume.
3. Lower floral glume.
4. Upper floral glume.
5. Palea of upper floral glume.
6. Stamens, ovary and styles.
7. Ligule.

## 6. DIGITARIA EOYLEANA Prain.

## PLATE 82.

*Digitaria Royleana* Prain Beng. PL (1903) 1181; Cooke Fl. Bomb. II (1908) 942; Haines Bot. Bih. and Or. (1924) 1008.

*Paspalum Royleanum* Nees ex Thw. Enum. PL Zeyl. (1864) 358; Hook. f. Fl. Brit. Ind. VII (1896) 18; Trim. Fl. Ceyl. V, 125; Duthie Grasses N. W. Ind. (1883) 1.

*Panicum puberulum* Kunth Eev. Gram. I (1829) 32, Enum. PL I (1838) 81.

*Digitaria puberula* Link Enum. Hort. Berol. I (1827) 223.

*Milium ovatum* Heyne ex Wall. Cat. no. 8752.

**Description** : Perennial; stems 30-60 cm. long, tufted, slender, erect, leafy. Leaves 10-23 cm. by 3-6 mm., erect, linear, acuminate, flat, glabrous or sparsely ciliate towards the base; sheaths glabrous or with few scattered hairs; ligule short, rounded, membranous.

Spikes 3-15, erect, subdigitate or alternate, 7-5-15 cm. long, on the top of a slender peduncle, very slender; rhachis filiform, very narrowly winged, glabrous; pedicels often much longer than the spikelets, usually setulose with long hairs. Spikelets secund, 1-2-1-6 mm. long, broadly elliptic, tomentose with minute clavellate hairs. Lower involucrel glume 0 or reduced to a tuft of hairs; upper involucrel glume usually much smaller than the floral glumes or reduced to

hairs; lower floral glume thinly membranous, broadly elliptic, strongly 5-nerved, as long as and broader than the upper floral glume; upper floral glume thinly coriaceous, ovate, acute, striolate, polished and shining, dark brown or nearly black; palea with inflexed flaps.

**Locality** : *Konkan* : St. Xavier's College compound (McCann 4533 !); Mulgaum, Salsette (McCann 9523!).

*W. Ghats*: Khandala (McCann 3651!); Lonavla (Herb. Econ. Bot. Poonal); Panchgani, slopes below Third Tableland (Blatter & Hallberg B1229!); Panchgani, Maratha WeU (Blatter & Hallberg B1224 !, B1281!); Mahableshwar, in a garden, 4,500 ft., rainfall 270 in. (Sedgwick & Bell 4584 !); Suvasni Ghat (Woodrow).

*Deccan* : Purandhar Fort (Bhide !); Lina Hill, Nasik Dist. (Blatter & Hallberg 4542!); Lohagad, way up (McCann 9512!); Katraj Ghat, 11 miles S. E. of Poona (Bhide!).

*S. M. Country* : Dharwar, 1,600 ft., rainfall 34 in. (Sedgwick 2843 !); Belgaum (Herb. Bot. Gard. Calc.).

*N. Kanara* (Talbot!).

**Ecology** : Very abundant in high level ricefields in the Carnatic, but not confined to hilly districts.

**Distribution** : Hilly districts throughout India, Ceylon, apparently not in tropical-Africa.

**Explanation of Plate 82** : *Digitaria Royleana* Prain.

1. Part of rhachis with spikelets.
2. Upper invol. glume.
3. Lower floral glume.
4. Upper floral glume.
5. Palea of upper floral glume.
6. Stamens, ovary and styles.

#### 44. ALLOTEROPSIS Presl *emend.* Hitchcock.

(*Axonopus* Beauv.).

Stapf (Fl. Trop. Afr., 483) explains why he adopts *Alloteropsis* Presl as emended by Hitchcock. "As Hitchcock (Contrib. U. S. Nat. Herb. XII, 210) has pointed out, Presl's description and analyses of *Alloteropsis* are based on a composition of a Panicoid and an Andropogonoid grass, whilst the original in Presl's herbarium is undoubtedly the plant described here as *A. semialata*, and so is also the habit figure (1) in Presl's plate. The genus is therefore accepted here with Hitchcock's emendation.

"Another member of this genus, *A. cimicina*, was included by Palisot de Beauvois (Agrost. 12) in his genus *Axonopus* under its earliest synonym *Milium cimicinum* and as "*A. cimicinum* V<sup>o</sup>" on p. 154, and this led J. D. Hooker (Fl. Brit. Ind. VII, 64) to use the name *Axonopus* in preference to *Alloteropsis*, a view which was adopted by myself in Fl. Cap. VII, 418. From P. Beauvois' diagnosis, however, and from the fact that he quotes in the first place "*Milium compressum*" as example for *Axonopus*, there can be no doubt that he had primarily *Milium compressum* in view when establishing his genus *Axonopus* and it is in that sense that the genus is understood in this work. *A. cimicina* also forms the basis of another genus, *Coridochloa*, Nees in Edinb. New Phil. Journ. XV, 381. A. Chase (in Proc. Biol. Soc. Washington, XXIV, 157) maintains this genus as distinct from *Alloteropsis*, and I followed her when drawing up the key of the genera of Tropical African grasses (p. 13); but I have since come to the conclusion that the species referable to these two groups are so similar in the peculiar structure of their spikelets that they are better merged into one genus for which *Alloteropsis* has priority over *Coridochloa*."

We have, therefore, to add the characteristics of the genus as given by Stapf :

Perennial or annual. Leaf-blades flat or more or less convolute ; ligules membranous ciliate or ciliolate, short or reduced to a mere rim.

Racemes sessile or peduncled, often more or less compound towards the base, digitate or subdigitate on a more or less elongated common axis. Spikelets ovate or elliptic to lanceolate-oblong, acute or acuminate, mostly awned, slightly or conspicuously compressed from the back, falling entire from the pedicels, 2-nate or fascicled, subsecund and abaxial on the triquetrous rhachis of more or less spiciform racemes. Lower floret usually male, upper hermaphrodite. Involucral glumes unequal, lower smaller, membranous to hyaline, 3-1-nerved, very acute, often mucronulate, upper equal or subequal to the spikelet, membranous to chartaceous, 5-nerved, with the outer nerves submarginal, densely ciliate along them. Lower floral glume resembling the upper involucral glume, but ciliate. Palea short, deeply 2-fid with conspicuously auncled flaps, upper floral glume chartaceous, glabrous, cloli«iMv i-ilinl\*+» n1>-



DIGITARIA NOYLEANA PRAIN.

*Vilia: H. K. fl.*



*ALLOTEROPSIS CIMICINA* STAPF.

*Delin: B. K. Bhal.*

wards, 5-nerved, produced into a straight awn or mucronate, palea equal to the glume, 2-keeled, with broadly auricled flaps. Lodicules 2, broadly cuneate. Stamens 3. Styles distinct, stigmas\* laterally exerted. Grain enclosed by the glume and palea, elliptic-oblong, dorsally much compressed; scutellum about half the length of the grain; hilum basal, punctiform.

Species about 5. In the tropics and the warm temperate zone of the Old World, 2 in India. In the Bombay Presidency there is only one species.

## 1. ALLOTEROPSIS CIMICINA Stapf.

## PLATE 83.

*Alloteropsis cimicina* Stkpf in FL Trop. Afr. IX (1919) 487; Haines Bot. Bih. and Or. (1924) 1009.

*Milium dmidnum* Linn. Mant. Alt. (1771) 184.

*Panicum dmidnum* Eetz. Obs. III (1783) 9; Roxb. FL Ind. I (1832) 291; Steud. Syn. PL Glum. I (1855) 43.

*P. conjugatum* Dalz. & Gibs. Bomb. Fl. (1861) 291.

*Axonopus cimicinus* (?) Beauv. Agrost. (1812) 12; Hook. f. FL Brit. Ind. (1896) VII, 64; Hook. f. in Trim. FL Ceyl. V, 166; Cooke FL Bomb. II (1908) 925.

*Vrochha cimicina* Kunth Rev. Gram. I (1829) 31, 1.103; Dalz. & Gibs. Bomb. Fl. Lc. 289.

*Coridochloa cimicina* Nees in Edinb. N. Phil. Journ. XV (1833) 381; A. Chase in Proc. Biol. Soc. Wash. XXIV, 158.

*C. fimbriata* Nees ex Wight Cat. no. 1656; Aitchis. Cat. Panjab PL (1869) 158.

**Vernacular name :** Sinri.

**Etymology :** *Alloteropsis* is derived from the Greek *allos*, belonging to another, foreign, inconsistent, and *opsis*, a countenance, appearance, therefore a plant having the appearance of another. *Cimidna* is the adjective formed from *dmex*, a bug.

**Description :** A tufted grass; stems 30-60 cm. long, erect, or decumbent at the base \ nodes hairy. Leaves 2\*5-7\*5 cm. by 10-16 mm., ovate-lanceolate from a broad cordate base, acute, flat, glabrous or hairy, ciliate on the margins with stiff bulbous-based hairs; sheaths glabrous or hairy; ligule of short hairs.

Inflorescence in spike-like racemes, 3-10 on the top of a slender smooth glabrous peduncle 5-15 cm. long, with sometimes- a fascicle of 2 or more lower down on the peduncle; peduncle naked in the lower part; rhachis of raceme angular, scaberulous, slender. Spikelets (including a slender scaberulous awn about 3 mm. long) 6-8 mm. long, subsecund, solitary or 2- (rarely 3-) nate, erect, readily disarticulating from the pedicel; pedicels unequal, scaberulous, cupular at the tip. Glumes 4; lower involucre glume rather more than 2-5 mm. long, narrowly ovate-lanceolate, aristately acuminate, hyaline, with 3 slender green nerves, of which the 2 lateral arch to join the midrib below the tip; upper involucre glume 5 mm. long, broadly ovate,, cuspidately acuminate, thinly membranous, 5-nerved, the 3 central nerves slender, green, the 2 lateral nerves marginal, bristly with long coarse purplish hairs which reach 2-5 mm. long; lower floral glume 4 mm. long, ovate-oblong, obtuse, male, paleate, the palea small, 2-partite; upper floral glume 6 mm. long (or more), including the awn, which is nearly as long as the glume, ovate, acute, coriaceous, often faintly ciliolate and with slightly incurved margins; palea a& long as the glume, coriaceous, elliptic-oblong, subobtuse.

**Locality :** *KonJan*: Sewri (McCann 3586 !); Mulgaum (McCann 3654!).

*W. Ghats* : Panchgani (Hallberg !).

*Deccan* : Sinhadgad forests (Bhide !); Lina Hill, Nasik Dist. (Blatter & Hallberg 4583!).

*S. M. Country*: Dharwar (Sedgwick 2032 !, Woodrow); Gokak (Shevade!); Badami (Woodrow).

*N. Kanara* : Halyal (Talbot 2294 !); Kulgi (Talbot 2434!).

**Ecology :** Growing chiefly on ground that has\* lately been under cultivation. A sporadic grass. Very common in the Carnatic.

**Distribution :** Tropical Africa, Madagascar, throughout India to Java\*

**Explanation of Plate 83 :** *Alloteropsis cimicina* Stapf.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Palea of lower floral glume.
6. Upper floral glume.
7. Palea of upper floral glume.
8. Stamens, ovary and styles.

45. PSEUD<sup>^</sup>CHINOLAENA Stapf.

Annual. Culms very slender with a prostrate rooting base. Leaf-blades lanceolate, soft.

Spikelets very irregularly armed or quite unarmed, obliquely ovoid, laterally compressed and mostly conspicuously gaping, falling entire from the pedicels, binate or more often sub-solitary or solitary, secund on the flat or subtriquetrous slender rhachis of spiciform racemously arranged racemes. Involucral glumes herbaceous, of about the same length and almost as long as the spikelet, or the lower distinctly shorter, heteromorphous. Lower more or less flat, 3-nerved, smooth or almost so; upper boat-shaped, gibbous downwards, 7-nerved, with longitudinal rows of more or less transparent spots between the nerves and with or without shorter or longer, stout, hooked hairs or bristles from the centre of the spots. Lower floret male or barren, as long as the spikelet; glume oblong-lanceolate with a minutely truncate tip, laterally compressed but rounded on the back, chartaceous, with membranous margins and a delicate hyaline area at the base, smooth, palea almost as long as the glume, more or less convolute, faintly 2-nerved. Upper floret hermaphrodite, shorter than the lower; glume broad-lanceolate to oblong, subacute, very convex on the back, chartaceous, faintly 5-nerved, pataa similar to the valve in texture, tightly clasped by it when mature. Lodicules 2, cuneate. Stamens 3. Styles free at the base, capillary; stigmas plumose, subterminally exerted. Grain oblong in face-view, semi-obovate in profile, back very convex; scutellum elliptic, almost half the length of the grain; hilum subbasal, punctiform.

Species 1.—Tropics of the whole world.

The only species of this genus was originally described under *Echinochlaena*. This genus, however, is exclusively American which, according to Stapf, differs from *Pseudechinolaena* in many ways, " as in its densely packed spikes, the many-nerved lower glume, the 'eglandular' always unarmed upper glume, the uniformly papery 5-nerved lower valve [ lower floral glume ] which is accompanied by a sharply 2-keeled flat valvule [palea ], the basally appendaged fertile valve [ upper floral glume ] and the acutely auricled or toothed flaps of its valvule [palea], and finally the flatter grain which is marked with a panduriform line on the face extending through its full length and possesses a slender linear hilum."

## 1. PSEUDECHINOLAENA POLYSTACHYA Stapf.

*Pseudechinolaena polystachya* Stapf in Fl. Trop. Afr. IX (1919) 495.

*Echinolaena polystachya* H. B. & K. Nov. Gen. & Sp. 1,119, VII, t. 679 ; Kunth Enum. I (1838) 172, Suppl. 127 ; Hitchcock Mex. Grass, in Contr. U. S. Nat. Herb. XVII, 223, A. Chase in Proc. Biol. Soc. Wash. XXIV, 118.

*E. Trinii* Moritzi Syst. Verz. Zoll. (1845-6) 102.

*Lappago aliena* Spreng. Neue Entdeck III, 15.

*Jpanicum uncinatum* Eaddi Agrost. Bras. 41 ; Trin. Gram. Panic. 240, and Sp. Gram. Ic. t. 216 ; Kunth Enum. I (1838) 172 ; Steud. Syn. PL Glum. I (1855) 60 ; Hook. f. Fl. Brit. Ind. VII (1896) 58 ; Trim. Handb. Fl. Ceyl. V, 160.

*P. glandulosum* Nees ex Trin. Gram. Pan. 174, and Agrost. Bras. 128.

*P. nernorosum*, (3 Trin. 1. c.

*P. heteranthum* Link Hort. Berol. I, 212 ; Eunth 1. c. 92.

*P. echinatum* Willd. ex Doell in Mart. Fl. Bras. II, II, 193.

*P. polystachyum* E. Schum. in Engl. Pfl. Ost-Afr. G. 103 (*non aliorum*).

**Etymology** : *Pseudechinolaena* means false *Echinolaena*, a genus of grasses; *echinolaena* is derived from the Greek *echinos*, a hedgehog and *laena*, a double woollen cloak worn over the pallium or the toga for warmth, alluding to the shape of the spikelet.

**Description** : Perennial, Culm about 60 cm. long, of which about half is rising above ground, and the other half prostrate, giving off numerous short or long branches, growing into secondary culms, their bases often, finely filiform, all many-noded and rooting from the nodes near the ground; erect or ascending portion above the last branch 5-8-noded with as many perfect leaves; internodes exerted, terete, glabrous. Leaf-blades lanceolate from a shortly contracted or rounded and usually slightly oblique base, acutely acuminate, from less than 12 mm. (lovest) to up to over 6 cm. by 4-12 mm., dark green, glabrous, with scattered or very fine stiff hairs above, finely and appressedly pubescent underneath, midrib very fine, whitish or straw-coloured, lateral nerves fine, numerous, crowded. Sheaths tight, terete, strongly striate, more or less appressedly hairy and ciliate along the margin or only ciliate. Ligules thin, membranous, rounded or truncate, ciliolate, under 2 mm. long.

Inflorescence up to over 15 cm. long, with up to 6 or even 8 racemes, mostly much shorter and with fewer racemes, occasionally reduced to a solitary raceme; common axis subterete, almost smooth, glabrous Q-5 mm. diam.; racemes appressed to the common axis or obliquely spreading, the lowest up to 35 mm. long, sometimes quite short; rhachis filiform, triquetrous, minutely puberulous; pedicels filiform, angular, pruinously scaberulous, lateral up to 2 mm!



long, often much shorter. Spikelets often unequally developed, the lower of each raceme or the lower (secondary) of each pair often reduced in a varying degree, if perfect about 4 nun. long. Involucral glumes dull or brownish green; lower oblong- to ovate-lanceolate, acuminate, as long as the spikelet or shorter, glabrous or sparingly and minutely scaberulous, nerves stout; upper semiovate in profile, acute with the tip laterally compressed, armature very variable in the same raceme, from short asperities to sharply pointed hairs bent at a right angle near the base, then appressed and directed forwards, or short or long (to over 1 mm.) cylindrical or stoutly subulate protuberances bearing terminally at a right angle a fine very sharp bristle pointing mostly forwards, outermost lateral nerves marginal. Lower floral glume pale, greenish only at the tip, very delicately scaberulous, hyaline basal area oblong, 1 mm. long; upper slightly over 2 mm. long, straw-coloured, smooth, shining. Grain 1.6 by 0.6 mm., palea.

**Locality** : *N. Kanara*: Siddhapur, evergreen forest (Talbot 1081!).

**Ecology** : A shade-loving forest grass.

## 46. ERIOCHLOA H. B. &amp; E.

Annual or perennial grasses. Leaves flat, lanceolate or ovate-lanceolate.

Spikelets 1-flowered, aristulate, secund on the spiciform branches of a raceme or panicle, the base thickened and articulate on the thickened apex of the short pedicel. Glumes 3; lower involucral glume (of *Panicum* etc.) absent; upper involucral glume subequal to the lower floral glume; upper floral glume paleate, rather shorter than the lower, apiculate, hardening in fruit. Lodicules truncate. Stamens 3; anthers linear. Styles 2, free; stigmas plumose, subapically exerted. Grain oblong, free between the hardened glume and the palea.

Species about 25.—In the warm parts of the whole world.

Cooke describes one species : *E. polystachya* H. B. & E. which name has to cede to 22. *ramosa* O. Euntze.

## 1. ERIOCHLOA RAMOSA O. Euntze.

## PLATE 84.

*Eriochloa ramosa* O. Euntze Rev. Gen. PL II (1891) 775; Hack, in Bull. Acad. Int. Bot. XVI, 19; Merrill in Philipp. Journ. Sc. I, Suppl. 348; Stapf in Fl. Trop. Afr. IX (1919) 498; Haines Bot. Bit. and Or. (1924) 1006.

*E. annulata* Eunth Rev. Gram. I (1829) 30, and Enum. I (1838) 73; Duthie List Grass. N. W. Ind. (1883) 2 > Benth. Fl. Hongk. (1861) 409; Hack, in Engl. Jahrb. VI, 233.

*E. polystachya* Duthie Hl. Indig. Fodder Grasses Ind. (1886) t. 41; Fodder Grasses N. Ind. (1888) 2; Hook. f. Fl. Brit. Ind. VII (1896) 20; Cooke Fl. Bomb. II (1908) 944; Rendle in Journ. Timi. Soc. Bot. XXXVI, 320 (wov H. B. & E.!).

*Milium ramosum* Retz. Obs. VI (1791) 22; Roxb. Fl. Ind. I (1832) 317; Griff. Notul. III, 15; Ic. PL Asiat. t. 139, fig. 60.

*Agrostis ramosa* Poir. Encycl. Suppl. I, 257.

*Paspalum annulatum* Fluegge Monogr. Pasp. 133; Trin. Sp. Gram. Ic. t. 133.

*Helopus laevis* Trin. ex Spreng. Neue Entdeck. II, 49, fig. 4.

*H. annulatus* Steud. Syn. Glum. I (1855) 99 (wov Nees).

*Pipatherum annulatum* Presl Rel. Haenk. I (1830) 221 (wov Raddi).

**NOTE**.—Masaja Honda in his *Bevisio Graminum Japoniae* (Bot. Mag. Tokyo 37 (1023) 113-124), is of opinion that *Eriochloa ramosa* O. Kuntze has to be partly amended and charged to the new species *Eriochloa Hachelii*. Details are wanting to form an opinion on this point.

**Etymology** : *Eriochloa* is derived from *mōw*, wool, and *chha*, a grass, referring to the involucral glume which is silky-hairy.—*Ramosa* means branched.

**Description** : Perennial, densely tufted, 0.6-1.5 m. high; rootstock short, creeping; stems leafy, ascending from a creeping base, stout or slender, simple or branched, glabrous except the nodes. Leaves 7.5-20 cm. by 4.5 mm., linear or linear-lanceolate, acuminate, glabrous; sheaths glabrous, ligule a villous ridge.

Panicles 5-12.5 cm. long; peduncles long or short; rhachis slender, angular, smooth; branches of panicle (spikes) alternate, 2.5-5 cm. long, suberect, angular. Spikelets silvery, 3-4 mm. long, loosely imbricate, shortly pedicellate, distichous, solitary or 2-nate, elliptic-lanceolate, acuminate. Lower involucral glume 0; upper involucral glume oblong-lanceolate, acuminate, obscurely 3-nerved, silky-hairy, membranous; lower floral glume similar to the upper involucral glume; upper floral glume much shorter than the lower, elliptic-oblong, obtuse, apiculate, thinly coriaceous, pale, shining; palea oblong with incurved margins. Anthers linear. Grain oblong, free within the hardened glume and palea.

**Locality** : *Sind*: Umarkot, in a garden (Sabnis B718 !); Jamesabad, on banks of a water-course (Sabnis B967 !); Bughar, Indus River (Blatter & McCann D691!); Tatta, Eullan Kote Lake (Blatter & McCann D692 !); Tatta (Blatter & McCann D693 !).

*Gujarat*: Ahmedabad (Gammie 16408 !).

*Eonkan*: Bassein (Bhide !); Antop Hill (McCann 3613 !); Alibag, ricefield (Ezekiel!); Bandra, on walls and in ditches (McCann!); Bombay (Hallberg A141!), near Mahim (Woodrow, Lisboa); Bhandup, in an old distillery compound, in a ditch (Hallberg A19!).

*S. M. Country*: Shiggaon, 2,000 ft., rainfall 34 in. (Sedgwick 2356 !); Kunnur, 2,000 ft., rainfall 35 in. (Sedgwick & Bell 4937 !); Ranibennur (Bhide !); Dharwar (Sedgwick!).

*N. Kanara* : Halyal (Talbot!).

**Ecology** : Subgregarius.. Found in wet places in the Carnatic.

**Distribution** : Tropics of the Old World, introduced into Ascension Island, St. Helena, Cuba.

**Economic uses**: In Australia it is used as fodder.

**Explanation of Plate 84** : *Eriochloa ramosa* O. Kuntze.

1. Spikelet and part of rhachis.
2. Upper invol. glume.
3. Lower floral glume.
4. Upper floral glume.
5. Palea of upper floral glume.
6. Stamens, ovary, styles and lodicules.

#### 47. BRACHIARTA Griseb.

(Sect. *Brachiaria* and part of sect. *Paspaloideae* of *Panicum* of the Fl. Brit. Ind.).

Perennial or annual. Leaf-blades linear to lanceolate, usually flat; ligules reduced to a narrow ciliate or ciliolate rim.

Racemes usually sessile and solitary on a common axis, sometimes bare at the base owing to the arrest of spikelets, rarely truly peduncled and paniced, simple or compound near the base, rarely to or beyond the middle; rhachis filiform, triquetrous or more or less flattened and herbaceous with, a wavy or zig-zag midrib which projects as a mostly acute keel on the face; pedicels solitary or in pairs, alternately to the right and the left of the facial angle or the midrib, if solitary all short or very short, if paired, the primary slightly to very much longer; spikelets closely appressed, always biseriata in the plane, but frequently becoming 1-seriate by the dovetailing of the alternate spikelets of the closely approximate ranks, more or less contiguous with their sides or imbricate, forming dense, spike-like racemes, or distant by almost their own length or more, glabrous or hairy. Spikelets more or less elliptic or oblong, more or less flattened or slightly depressed, convex on the base, falling entire from the pedicels, 1-2-, rarely more-nate, secund and adaxial (with lower involucral glume towards the axis and the convex side of the upper floral glume away from the axis), closely appressed to and 2-seriate on the triquetrous or flat rhachis of spiciform racemes; lower floret male or barren with a usually well developed palea, very rarely the latter suppressed. Involucral glumes dissimilar and mostly very unequal in length. Lower involucral glume shortest; upper resembling and more or less equalling the lower floral glume, 5-7- (rarely 9-) nerved. Lower floral glume 5-, rarely 7\*-nerved, the lateral nerves placed towards the margins and distant from the middle nerve; palea usually only slightly shorter than the valve with well-developed inflexed flaps, or the latter vanishing above the middle; upper floral glume oblong to elliptic in outline, emucronate, though sometimes contracted into an apiculus, -crustaceous or subcoriaceous with firm involute margins, faintly 5-nerved; palea almost as long as the glume, 2-keeled, its sides tightly embraced by the valve. Lodicules 2, small, broadly cuneate. Stamens 3. Styles distinct; stigmas plumose, laterally exerted from the upper part of the spikelet. Grain tightly enclosed by the glume and palea, more or less flattened on both faces; hilum subbasal, punctiform; -embryo half to over the length of the grain.

Species about 80. In the warm parts of the whole world, but chiefly in Africa.

Cooke mentions 3 species which belong to this genus : *Panicum Isachne*, *P. ramosum*, and *P. witicum*. To these we add *Brachiaria distachya* (*Panicum distachyum*).

- |   |                          |
|---|--------------------------|
| A* Spikelets 0.5 mm long or slightly more | 1. JB. <i>Isachne</i> .  |
| B. Spikelets 2-5-4 mm. long.              |                          |
| I. 90 cm. to 1.8 m. high                  | 2. <i>B. mulica</i> .    |
| IT. Less than 80 cm. high.                |                          |
| I Spikes 0-many                           | 3. <i>B. ramasa</i> .    |
| 2. Spikes 2-4.                            | 4. <i>B. distachya</i> . |





BRACHIARIA ISACHNE STAFF.

Delin: B. K. Hilde.

## 1. BRACHIARIA ISACHNE Stapf.

## PLATE 85.

*Brachiaria Isachne* Stapf in Fl. Trop. Afr. IX (1919) 552; Haines Bot. Bih. and Or. (1924) 1004 (*habet Both per errorem*).

*B. cruciformis* Griseb. in Ledeb. Fl. Ross. IV, 469.

*Panicum Isachne* Roth & Roem. & Schult. Syst. II, 458; Roth Nov. PL Sp. (1821) 54; Schult. Mant. II, 252; Steud. Syn. Pl. Glum. I (1855) 57; Hook. f. Fl. Brit. Ind. VII (1896) 28; Stapf in Dyer Fl. Cap. VII, 390; Cooke FL Bomb. II (1908) 931.

*P. cruciforme* Sibth. & Sm. Fl. Graeca I, t. 59; Baker FL Maurit. (1877) 434; Schweinf. in Ball. Herb. Boiss. II, App. II, 19; Duthie Grasses N. W. Ind. (1883) 3, Indig. Fodder Grasses (1886) t. 43, Fodder Grasses N. Ind. (1888) 6; Boiss. FL Or. V (1881) 437.

*P. caucasimm* Trin. Sp. Gram. Ic. t. 262.

*P. Wightii* Nees FL Afr. Austr. (1841) 29.

*P. pubinode* Hochst. ex A. Rich. Tent. FL Abyss. II (1851) 363.

*Echinochha cruciformis* Koch in Linnaea XXI, 437; Reichb. Ic. FL Germ. I, t. 29, fig. 1413.

**Vernacular names** : Shimpi, Wag-hakt.

Description: Annual; stems many, 30-60 cm. long, ascending from a decumbent or creeping and rooting base, geniculate, very slender, with villous nodes, otherwise glabrous, much branched below, simple above. Leaves 2-5-5 cm. by 2-5 mm. linear-lanceolate from a rounded base, acute, subpungent, glabrous or sparsely hairy with scaberulous margins; sheaths glabrous or hairy, ciliate on the upper part; ligule a fringe of hairs.

Inflorescence 5-7-5 cm. long, erect, consisting of 6-12 secund or subsecund racemosely arranged spikes 1-3-2-5 cm. long, longer than the internodes, sessile or shortly pedunculate, usually appressed to the triquetrous slender hairy rhachis. Spikelets 2-2-5 mm. long, secund, closely imbricate in 2 series, oblong, subacute or obtuse, softly hairy; rhachis of spikes triquetrous, hairy, about 0-5 mm. diam.; pedicels very short. Glumes 4; lower involucre glume minute, triangular, membranous, glabrous; upper involucre glume membranous, oblong, obtuse, 5-nerved, hispidly pubescent; lower floral glume narrower, 3-nerved, paleate, neuter or sometimes male, with hyaline palea; upper floral glume shorter, oblong, obtuse, dorsally flattened, coriaceous, glabrous, shining, 2-sexual, with coriaceous palea. Anthers 1 mm. long.

**Locality** : Sind (Herb. Econ. Bot. Poona!).

*Gujarat*: Surat (Ghibber!, Dalzell teste Cooke).

*Khandesh*: Sungiri (Gammie 16552 !); Dhulia Farm (Cbibber !); Chanseli (McCann A92 !); Nimb, Tapti Bank (Blatter & Hallberg 9571!); Dadgaum (McCann 9562 #); Tapti, Bhusawal (Blatter & Hallberg 5156!); Umalla village (Blatter & Hallberg 5159!); Bor, Bori River (Blatter & Hallberg 4424!).

*Konkan*: Clerk Bd., Bombay, along brackish water (Sabnis 9565 1); very common in Bombay and Salsette Islands (McCann!).

*W. Ghats*: Ehandala, common (McCann 9566!); Panchgani, below Sydney Point (Blatter & Hallberg 1271!).

*Deccan*: Yeola (Herb. Econ. Bot. Poona!); Mangiri, 8 miles east of Poona (Gammie !); Sholapur (D'Almeida A91!); Deolali (Blatter 9569 ! 9570 !); Purandhar, north foot (McCann 9568!).

*8. M. Country*; Nelogi, 1,800 ft., rainfall 30 in. (Sedgwick 2134!); Haveri (Talbot 2150!).

*N. Kanara*: Halyal (Talbot 2150!).

Ecology: A subgregarious species. Cooke says that it grows "in watery places", This is a mistake. It is more a dry land grass and is superabundant on the Carnatic black soil. It also occurs in wetter ground, but not so typically there.

**Distribution**: Throughout the plains of India in damp places, Ceylon, westwards to Italy and tropical and S. Africa.

**Economic uses** : Considered to be a good fodder.

**Explanation of Plate 85** : *Brachiaria Isachne* Stapf.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Palea of lower floral glume.
6. Upper invol. glume.
7. Palea of upper floral glume.
8. Ovary and style\*.

## \*2. BRACHIABIA MUTICA Stapf.

*Brachiaria mutica* Stapf in Fl. Trop. Afr. IX (1919) 526.

*Panicum muticum* Forsk. FL Aegypt.-Arab. (1775) 20; Link Hort. Berol. I, 206; Hook. L Brit. Ind. VII (1896) 34, and in Trim. Fl. Ceyl. V, 140.

*P. numidianum* Lam. 111. I, 172; Boiss. Fl. Or. V (1884) 438.

*P. purpurascens* Raddi ex Opiz in Flora (1822) 266.

*P. barbinode* Trin. Sp. Gram. Ic. t. 318; Duthie List Grasses N. W. Ind. (1883) 2.

*P. sarmentosum* Benth. in Hook. Niger Fl. (1841) 561 (wow Roxb.).

*P. equinum* Steud. Syn. PL Glum. I (1855) 73.

*P. molle* Griseb. FL Brit. West Ind. (1864) 547 (excl. syn.); Baker Fl. Maurit. (1877) 436.

In adopting Forskal's name '*muticum*' for this species Stapf, according to his own words, has relied on Ascherson's identification (Asch. & Schweinf. 111. Fl. Egypt., 160) of the type with the Algerian *P. numidianum*.

**Vernacular names** : Water Grass, Mauritius Grass, Para Grass, Scotch Grass, Buffalo Grass.

**Etymology** : *Mutica* means blunt, awnless.

**Description** : Perennial 1-2-5 m. high. Stems ascending from a sometimes prostrate and copiously rooting base, stout, terete, usually many-noded and sheathed high up, simple or sparingly branched, glabrous, often waxy pruinose below the nodes. Leaf-blades linear, up to 30 cm. long, 6-16 mm. broad, glabrous or rarely more or less hirsute, margins scabrid.

Panicle oblong to ovate-oblong in outline, subsecund or almost quaquaversal, 6-20 cm. long; common rhachis terete to semiterete, more or less deeply channelled or triquetrous upwards, scabrid along the angles, glabrous. Racemes numerous, solitary or irregularly approximate, sometimes paired or in false whorls, shortly peduncled or sessile, obliquely spreading, 7 (rarely 12) to 2-5 cm. long, mostly compound, glabrous, greenish or tinged with purple; rhachia flat, with a slender, raised midrib up to 1 mm. wide, villosulous at the base, otherwise glabrous; secondary racemes usually very short and 6-3-spiculate; pedicels solitary or paired, very short, or if paired then the longer up to 1 mm. long, frequently with a few setules. Spikelets laterally contiguous or discontinuous, those of the secondary racemes often imbricate, oblong or lanceolate-oblong, acute, 3-3-5 mm. long, glabrous. Involucral glumes dissimilar, lower broad-ovate, acute to subacute, from less than \ to not quite \ the length of the spikelet, faintly 3-5-nerved, often tinged with purple; upper corresponding in outline and size to the spikelet, 5-7-nerved. Lower floral glume as long as the upper involucral glume and similar to it; palea narrowly oblong, subacute, almost as long as the glume, with narrow flaps; anthers 2 mm. long; upper floral glume slightly shorter than the spikelet, mostly 3 mm. long, oblong, subacute or minutely apiculate, pale yellowish, glume and palea crustaceous, very finely transversely wrinkled or almost smooth. Stigmas blackish purple, very conspicuous.

**Locality** : Cultivated at Eirkee and Surat (Woodrow) and very likely in other places.

**Distribution** : A native of S. America and W. Africa, but introduced elsewhere (Stapf).

**Economic uses** : A fodder grass. See Eew Bull. (1894) 384.

## 3. BRACHIABIA RAMOSA Stapf.

## PLATE 86.

*Brachiaria ramosa* Stapf in FL Trop. Afr. IX, 542; Haines Bot. Bih. and Or. (1924) 1005.

*Panicum ramosum* Linn. Mant. (1767) 29; Steud. Syn. PL Glum. I (1855) 97; Hook. f. FL Brit. Ind. VII (1896) 36 (*partim*); Trim. FL Ceyl. V, 140; Prain Beng. PL 1175; Cooke FL Bomb. II (1908) 932.

*P. arvense* Kunth Rev. Gram. F(1829) 391, 1.109.

*P. Petiveri* Diss. II, 144 (*partim*); Baker FL Maurit. (1877) 434; Aitchis. Cat. Panjab PL (1869) 160; Duthie Grasses N. W. Ind. (1883) 6, Fodder Grasses N. Ind. (1888) 11; Boiss. Fl. Or. V (1884) 439.

*P. brachylachnum* Steud. 1. c. 62.

*P. cognatissimum* Steud. 1. c. 69.

*P. patens* Boj. Hort. Maurit. (1837) 365 (wow Linn.).

*P. pygmaeum* Boj. Lc.

*P. Helopus* Watt Diet. Econ. Prod. VI, part 1, 10 (*partim*).

*P. umbrosum* Retz. Obs. IV (1786) 16; Roxb. FL Ind. I (1832) 297.

**Vernacular names** : Chapar, Chapsura.

**Etymology** : *Ramosa* means much branching.

**Description** : Annual; stem 30-90 cm. long, erect or ascending from a shortly base, slender or rather stout, much branched from the base upwards, usually elabourate nodes pubescent. Leaves 5-12-5 cm. by 4-13 mm., linear-lanceolate, finely acuminate, thin,



BRACHIAHA \ I! x.Miw, STAFF.

Delin: B. E. Bhide.

flat, smooth, glabrous or pubescent beneath, with scaberulous margins, base rounded; sheaths glabrous or pubescent, ciliate or not towards the mouth; ligule a fringe of short hairs.

Panicle 5-15 cm. long, subpyramidal, with a long peduncle; rhachis angular; branches of panicle 5-10, distant, 2\*5-5 cm. long, alternate or the lower opposite, erect or spreading, shorter upwards; rhachis of racemes slender, angular, puberulous. Spikelets alternate, 2\*5-3 mm. long, close or distant, often in pairs (a sessile and a pedicellate one), ovoid, acute, pubescent, turgid, pale green or yellowish; pedicels with a few long hairs near the tip. Glumes 4; lower involucre glume half as long as the lower floral glume, ovate, acute, hyaline; upper involucre glume about equalling the lower floral glume, ovate, acute, cuspidate, 5-nerved; lower floral glume similar but slightly broader, with membranous palea, empty; upper floral glume coriaceous, ovoid-oblong, acute, rugulose, with coriaceous palea.

Stapf points out that this species occurs in a glabrous and a pubescent state, and that the original specimen in Linnaeus' herbarium represents the former. "The pubescence," he says, "if present, extends generally to the culms, the leaves, the axes of the inflorescence and the spikelets, the upper glume [upper involucre glume] and lower valve [lower floral glume]. On the blades it may be scanty and disappear with age. It does not seem to be correlated with any other character, and the area of the glabrous and pubescent states overlap completely, in fact both have been taken in the same collecting."

He mentions another curious modification in which the lower floral glume is more firmly membranous to crustaceous and faintly transversely rugose and thus more or less resembles the upper floral glume (not the upper involucre glume as is normally the case). It has been collected in India and W. Africa.

**Locality:** *Sind:* Ghachra (Mamlatdar of Ghachra!); Shahabander, (Karachi P. O. C. of Shahabander !); Sangarh (Sabnis B901! B887 !); Nasarpur, clayey soil (Sabnis B1057 !).

*Cutch:* Sumrasar (Blatter 3756 !).

*Gujarat:* Ahmedabad (Herb. St. X. C. 2165!); Mausari (Mamlatdar of Mausari!).

*Khandesh:* Taner, Tapti bank (Blatter & Hallberg 5172!); Antroli, Bori River (Blatter & Hallberg 5149 !); Toranmal (McCann A142 !).

*Konkan:* Malabar Hill (McCann!); Yersova (McCann 9588 !); Byculla (McCann 9586 !); Sion (McCann 8689 !); Bandra Hill, in fallow fields (Vakil A115 !).

*W. Ghats:* Ehandala (Sedgwick 2631!).

*Deccan:* Poona (Woodrow!); Lina Hill, Nasik Dist. (Blatter & Hallberg A145!).

*S. M. Country:* Dharwar, garden weed (Sedgwick 2651!); Haveri (Talbot 2231!); Badami (Woodrow *teste* Cooke).

**Ecology:** A subgregarious grass.

**Distribution:** Throughout India, Ceylon, Afghanistan, tropical Africa (Upper Guinea, Cape Verde Islands).

**Economic uses:** It is a good fodder.

**Explanation of Plate 86:** *Brachiaria ramosa* Stapf.

1. Lower invol. glume.
2. Upper invol. glume.
3. Lower floral glume and palea.
4. Upper floral glume.
5. Palea of upper floral glume.
6. Stamens, ovary and styles.
7. Spikelet.
8. Ligule.

#### 4. BBACKEARIA DISTACHYA Haines.

*Brachiaria distachya* Haines Bot. Bih. and Or. (1924) 1004 (*per errorem distachyum*).

*Panicum distachyum* Linn. Mant. I (1767) 138; Retz. Obs. III (1783) 17; Lamk. III, t. 43, fig. 2; Steud. Syn. Gram. (1855) 41; Aitchis. Cat. Panjab PL (1869) 159; Duthie Grasses N. W. Ind. (1883) 3, Indig. Fodder Grasses (1886) t. 42, Fodder Grasses N. Ind. (1888) 6; Benth. Fl. Austral. VII (1878) 478; Hook. f. Fl. Brit. Ind. VII (1896) 37.

*P. subquadriparum* Trin. Gram. Panic. 145, Sp. Gram. Ic. 1.186.

*IHgitaria distachya* Pers. Syn. I (1805) 85.

**Vernacular name:** Motia.

**Etymology:** *Distachya* means having 2 spikes.

**Description:** A slender, creeping grass, glabrous or panicle sparsely hairy. Stems 30-60 cm. high. Leaves linear or lanceolate or linear-lanceolate, acuminate, 5-15 cm. by 3-6 mm., widest at the rounded or amplexicaul base, flat; sheaths ciliate or not on the margins, mouth hairy.



Spikes 2-4, distant, 2-5-6-5 cm. long, rarely more than 10 cm., erect, at last spreading; rhachis slender, glabrous. Spikelets variable in size, pale green, 3-4 mm. long, solitary, sessile, spikately arranged in 2 (-1) series, ellipsoid, glabrous. Lower involucre glume embracing the spikelet and margins overlapping below,  $\frac{1}{2}$  to nearly  $\frac{1}{2}$  the spikelet, 5-7-nerved, obtuse or subacute; upper involucre glume ovate, acute, 7-nerved, paleate or not, palea if present narrow, neuter. Lower floral glume 5-nerved, upper ellipsoid, obtuse or rounded, 2 mm. long, brown and minutely transversely lineolate or obscurely rugulose when ripe.

**Locality** : *Gujarat*: Ahmedabad, banks and margins of fields around Ahmedabad (Sedgwick 239!).

*S. M. Country*: Dharwar (Sedgwick 2840!).

**Ecology** : A subgregarious species.

**Distribution** : India, Ceylon, China, Malaya, Australia.

**Economic uses** : Cultivated for fodder in Australia, produces great quantities.

#### 48. PASPALUM Linn.

Mostly perennial grasses of varying habit.

Spikelets orbicular to oblong, mostly decidedly plano-convex, falling entire from the short rudimentary pedicels, solitary or paired, second and abaxial on the dilated or narrow rhachis of spike-like racemes; lower floret barren, reduced to its floral glume; upper floret hermaphrodite. Involucral glumes: the lower typically suppressed, very rarely represented by a small scale; the upper more or less equal to the spikelet, rarely shorter or absent, convex, membranous, 3- or more-nerved. Lower floret: floral glume very similar to the upper involucre glume, but usually flat or at least less convex, rarely subconcave, the middle nerve sometimes suppressed. Upper floret: floral glume chartaceous to crustaceous, with firm margins, obtuse, emucronate, faintly nerved; palea subequal to the floral glume and similar in substance, tightly embraced by the narrowly involute margins of the floral glume. Lodicules 2, minute, broadly cuneate. Stamens 3. Styles distinct, stigmas laterally exerted near the tip of the floret. Grain tightly enclosed by the slightly hardened floral glume and palea, more or less biconvex; scutellum orbicular-elliptic, shorter than half the grain; hilum subbasal, punctiform.

Species over 200.—Chiefly in tropical America, only a few in the Old World.

Cooke describes 3 species: *P. scrobiculatum* Linn., *P. compactum* Both., and *P. distichum* Linn., to which we add *Paspalum dilatatum* Foir. *P. distichum* has to be replaced by *P. vaginatum* Sw., for reasons detailed below.

##### I. Leaves over 14 cm. long.

1. Plant 60-90 cm. high . . . . . 1. *P. scrobiculatum*.

2. Plant 1-1.5 m. high . . . . . 2. *P. dilatatum*.

##### II. Leaves less than 11 cm. long.

1. Leaves 2-5-7-5 cm. long, 8-12 mm. broad . . . . . 3. *P. compactum*.

2. Leaves 5-10 cm. long, 1-2.4 mm. broad . . . . . 4. *P. vaginatum*.

#### 1. PASPALUM SCROBICULATUM Linn.

##### PLATE 87.

*Paspalum scrobiculatum* Linn. Mant. (1767) 29; Eoxb. Fl. Ind. I (1832) 278; Grah. Cat. Bomb. PI. (1839) 234; Dalz. & G.Js. Bomb. Fl. Suppl. (1861) 97; Duthie Field and Gard. Crops 8, t. 27, Grasses N. W. Ind. (1883), Indig. Fodder Grasses (1886), t. 1, Fodder Grasses N. Ind. (1888); Hook. f. Fl. Brit. Ind. VII (1896) 10 (*excl. syn. P. orbiculare* Forst.); Cooke Fl. Bomb. II (1908) 943; Htines Bot. Bih. and Or. (1924) 1000.

*t. scrobiculatum vai. Commersonii* Stapf in Fl. Trop. Afr. IX (1919) 573.

*P. scrobiculatum var. frumentaceum* Stapf l. c. 575.

*P. scrobiculatum var. polystachyum* Stapf l. c. 576.

*P. alternans* Steud. Syn. PI. Glum. (1855) 26.

*P. auriculatum et cartilagineum* Presl Bel. Haenk. I (1830) 216, 217.

*P. borbonicum* Steud. l. c. 27.

*P. Commersonii* >L\*m. Illustr. I, 175.

*P. coromandelicum* Lam. l. c.

*P. dissectum* Linn. Syst. II, 86.

*P. dimidiatum* Linn. Syst. ed. X, 855.

*P. firmum* Trin. Gram. Panic. (1826) 106; Sp. Gram. lo., t. 1&J.

*P. jkxmsum* Klein ex Presl l. c. 215.

*P. jruntxtaceum* Bottb. ex Boem. & Schult. Syst. II (1817) 296.

- P. hirsutum* Retz. Obs. II (1781) 7.  
*P. Houttuynii* H. C. Hall ex de Vriese in PL Ind. Bat. Reinw. 113.  
*P. Kora* Willd. Sp. PL I, 332; Roxb. FL Ind. I (1832) 279; Grah. 1. c.; Duthie Indig. Fodder Grasses (1886) t. 2.  
*P. hngifolium* Roxb. FL Ind. I (1832) 280.  
*P. mauritanicum* Nees ex Steud. 1. c.  
*P. metabolon*, *Metzii et viollipilum* Steud. 1. c. 19, 21, 29.  
*P. polystachyum et pubescens* R. Br. Prodr. (1810) 188.  
*P. puberulum* Roem. & Schult. Syst. II, 316 (*Paspalus*).  
*P. sumatrense* Roth. Nov. Sp. (1821) 35.  
*P. Thunbergii* Kunth ex Steud. 1. c. 28.  
*P. venustum* Forst. f. ex Roem. & Schult. 1. c. 297.  
*P. ZoUingeri* Steud. 1. c.  
*P. dissectum* Nees FL Afr. Austr. (1841) 15 (*non* Linn.).  
*P. Jardini* Steud. 1. c. 18.  
*Panicum dissectum* Linn. Sp. PL (1753) 57.  
 Rheede Hort. Mai. XII, t. 84.

As can be seen from the above synonymy we are not following Stapf in distinguishing several varieties or rather forms. He takes the cultivated forms of India to be the original *P. scro\* biculatum* of Linnaeus and calls it *P. scrobiculatum var. frumentaceum*. All th? spontaneous forms of *P. scrobiculatum* as understood by most post-Linnaean authors are put by Stapf under *P. scrobiculatum* Linn. var. *Commersonii*, the type for this combination being *P. Commersonii* Lam. III. 1,175, t. 43, fig. 1. The third form *var. polystachyum* does not seem to occur in India.

Vernacular names : Kodra, Pakodi, Harrick, Dhone, Majore, Mana'kodra.

Etymology : *Paspalum* from the Greek term for a millet.—*Scrobiculatum* means being marked by minute or shallow depressions.

Description: Annual; stems 60-90 cm. long, tufted on a very short rhizome, erect (rarely ascending), leafy from the base upwards, glabrous. Leaves bifarious, erect or suberect, 15-45 cm. by 2-8 mm., finely acuminate, glabrous or sometimes softly hairy; sheaths 10-20 cm. long, compressed, loose, the mouth hairy, with very short membranous ligules.

Spikes 2-6, sessile, usually distant and spreading, 2-5-15 cm. long; rachis herbaceous, 2-3 mm. broad with ciliate margins. Spikelets usually 2-ranked, 2-3 mm. diam., sessile or shortly pedicellate, broadly elliptic or suborbicular, imbricate. Glumes 3; lower involucre glume 0; the upper convex, 3-7-nerved, membranous; lower floral glume flat, membranous, like the upper involucre glume; upper floral glume thickly coriaceous, brownish, shining, striolate; palea orbicular, tumid, thickly coriaceous like the upper floral glume, dorsally convex, ventrally strongly inflexed below the middle and forming 2 broad membranous auricles that embrace the grain.

We have found the inflorescence composed of even one spike; two spikes are fairly common.

Locality : *Sind*: Jamesabad, in bed of watercourse (Sabnis B979 !); Bohara (Blatter & McCann D689 !).

*Konkan*: Bombay, Victoria Gardens (McCann 4297 !); Mulgaum, Salsette (McCann 3607 !); Parsik, between stones of railway tract (McCann 9516 !); Vehar Lake, Salsette (McCann 9517 !).

*W. Ghats*: Khandala, in watercourse, on sandy soil (McCann 9824 !); Castle Rock (Gammie!).

*8. M. Country*: Konankeri, Dharwar Dist., 1,800 ft., rainfall 40 in. (Sedgwick & Bell 4966 !); W. of Dharwar, 2,000 ft., rainfall 40 in. (Sedgwick & Bell 4452 !); Dastikop, 2,500 ft., rainfall 35 in. (Sedgwick 2109 !); Dharwar (Garade!); Belgaum (Herb. Bot. Gard. Calc.).

*N. Kanara*: Halyal (Talbot 2297 !); Karwar (Herb. Econ. Bot. Poona 2297 1 618!).

Ecology : Well adapted for the poorest soils under favourable conditions of climate and rainfall. Specimens growing on rocky or hard soil have woolly bases.

Distribution : Tropics of the Old World.

Economic uses : In 1922-23 245,911 acres were under cultivation in the Presidency. The grain is used as food by a very large number of people, chiefly of inferior caste. The grain as well as the straw of Kodra frequently, if not always, contains a poisonous narcotic principle which causes vomiting and vertigo. For this reason care is taken at least in the Konkan to prevent cattle straying into Kodra fields. The poisonous principle is probably produced under unfavourable conditions of climate and season and the grain and straw are only poisonous in particular seasons. It is said that . . . . the narcotic property is to some extent neutralised by

steeping in cowdung and water, or by keeping the grain for a number of years. Though the poisonous and non-poisonous grain cannot usually be distinguished by ordinary people, yet cultivators in Gujarat claim that the diseased grain can be detected while threshing as then the effect of the poisonous dust is felt both by the threshing bullocks and their driver " (Mann).

According to Dr. Lisboa the symptoms of poisoning resemble those caused by *Datura*, and are severer in cattle than in man, due no doubt to their eating the grain and husk and also to the absence of vomiting.

**Explanation of Plate 87** : *Paspalum scrobiculatum* Linn.

1. Bhachis with one spikelet.
2. Upper invol. glume.
3. Lower floral glume.
4. Upper floral glume.
5. Palea of upper floral glume.
6. Grain.

•2. PASPALUM DILATATUM<sup>1</sup> Poir.

*Paspalum dilatatum* Poir. Encycl. V, 35; New South Wales Agric. Gaz. X (1899) 32, wilih plate ; Trin. Diss. 11,113, with plates ; H. H. Mann in Dept. Agric. Bomb. Bull. 77, 68.

*P. ovatum* Nees ex Trin. Gram. Panic. 113.

*P. pratense* Spreng. Syst. Veg. I (1825) 247.

*P. Bettoi* Spreng. ex Nees Agrost. Bras. 43.

**Vernacular names** : Golden Crown Grass, Hairy-flowered Paspalum, Large water-grass, Leichardt Grass.

**Description** : A tall, erect grass, about 1-1\*5 m. high. Culm developing from a thick rootstock with 3-5 leaves ; leaf at base of oulm often about 30 cm. long, 8-12 mm. broad, smooth on both sides, rugose along the margins.

Baceme 12-30 cm. long, having 5-10 somewhat spreading spikes, which are 7 cm. or more in length, 2-5-5 cm. apart, upper ones gradually shorter. Spikelets closely arranged in 4 rows, two on each side of the narrow and nearly straight axis in alternate pairs, 1-5-2 mm. wide, and 3-4 mm. long, ovate, acutely pointed, crowded and overlapping each other, compressed, margins clothed in silky hairs. Involucral glumes ovate, acute, 5-nerved, nearly smooth except the fringe of white hairs on the margin. Floral glumes thick, hard, and firm, very minutely punctate. Palea fitting inside the flowering glume and enclosing the stigmas and styles. Anthers linear. Styles 2 ; stigmas blackish-purple, plumose.

**Locality** : Cultivated. See Mann, 1. c.

**Ecology** : In other countries this grass thrives best upon rich moist land, and grows very luxuriantly in black alluvial soils. It is said to succeed also in sandy soils, even when a considerable proportion of salt is present. As it is a deep-rooted grass it has a remarkable capacity for withstanding conditions of drought. In Western Australia it is said to flourish in poor mountain soils.

**Distribution** : Virginia, Mississippi, Louisiana, Texas, S. America, especially Brazil. Introduced in many countries.

**Economic uses** : Opinions seem to differ on the value of this species as a forage grass. Hitchcock says that it has been tried as a forage grass in the Southern States of N. America, but that it has little to recommend it there. In the Hawaiian Islands, however, it gives much promise as a pasture grass. For dairying purposes it is of great value as it has great milk-producing properties. For hay, this grass is rather coarse, and usually has a bad colour when dry, but it is of excellent quality, and the yield is very large. See Eew Bull. (1902) 1-4.

ø. PASPALUM COMPACTUM Both.

PLATE 88.

*Paspalum compactum* Both Nov. PL Sp. (1821) 36 ; Kunth Enum. PL I (1838) 61 ; Steud. Syn.

PL Glum. (1855) 31 ; Hook. f. Fl. Brit. Ind. VII (1896) 12 ; Cooke FL Bomb. II (1908) 943.

*P. miliaria* C. Muell. in Bot. Zeit. XIX (1861) 325.

*P. Canarae* Steud. 1. c. 58.

*P. imperfectum* Boxb. ex Kunth 1. c.

**Etymology** : *Compactum*, which means compact, seems to allude to the rather turgid spikelets.

**Description** : riant 15-30 cm. high; roots stiff, wiry; stems terete, decumbent and branched below, leafy,<sup>h</sup> hairy. Leaves 2-5-7-5 cm. by 8-13 mm., elliptic-lanceolate, acute.

→ thank Mr. H. Biswas, the Curator of the Herbarium of the Rajah Botanic Garden, for most of the material under this species.

sparsely hairy on both sides, ciliate; sheaths densely hairy with fine bulbous-based hairs; ligule very short.

Spikes numerous, shorter upwards, spreading (often nearly horizontally), glabrous or nearly so, forming a pyramidal raceme 5-10 cm. long; rhachis slender, triquetrous. Spikelets 1-2-1\*6 mm. diam., hemispheric, rather turgid, close-set but not imbricate, pendulous by short filiform pedicels. Lower involucral glume 0; upper involucral glume broadly elliptic or sub-orbicular; lower floral glume narrower; upper floral glume subcoriaceous, concave, orbicular, rounded at the tip, white; palea not or obscurely auricled.

Locality : *Konkan*: Tiwari-Pada, Bassein (Herb. Econ. Bot. Poona 1690!).

*W. Ghats*: Matheran, to Louisa Point (D'Almeida A243!) •, Igatpuri, very common (McCann 4587 !); Khandala growing in gravelly soil, very common (McCann 9823 !); Panchgani, First Tableland (McCann B1265! B1300!), Second Tableland (McCann B1242 1 B1292 !); Mahableshwar (Cooke, Woodrow); Londa (Bhide !); Castle Eock, 1,900 ft., rainfall 250 in. (Sedgwick 2752 !).

*S. M. Country*: Belgaum (Hole 15!).

*N. Kanara*: Yellapur (Talbot 657 !); Tinai (Talbot 2566 !); Karwar, Bingy Ghat (a very villous form, McCann) (Talbot 1529 !); Devimane, 1,300 ft. (McCann A17 !).

Ecology : This plant is commonly found on gravelly soil and in the hollows of rocks where a little earth has collected. Specimens on rocks form large matted masses and those in gravelly soil grow erect among other plants. Plants from N. Eanara are exceptionally villous.

Distribution : W. Peninsula of India.

Explanation of Plate 88 : *Paspalum compactum* Both.

1. Bhachis.
2. Spikelets on rhachis.
3. Upper invol. glume.
4. Lower floral glume.
5. Upper floral glume with palea.
6. Stamens, ovary and styles.

#### 4. PASPALUM VAGINATUM SW.

#### PLATE 89.

*Paspalum vaginatum* Sw. Prodr. Veg. Ind. Occ. (1787) 21, FL Ind. Occ. I (1797) 135; Trin.

Gram. Pan. 94, Panic. Gen. 53, Sp. Gram. Ic. t. 120; Kunth Enum. I (1838) 52; Steud. Syn. PL Glum. I (1855) 20; Hitchcock & Chase in Contrib. U. S. Nat. Herb. XVIII, 307 (non P. Beauv. FL Owar); Stapf in FL Trop. Afr. IX, 570.

*P. vaginatum forma longipes* Lange in Vidensk. Medd. Naturh. Foren. Kjöbenh. (1854) 42, Pug. PL Hisp. I (1860) 28.

*P. distichum* N. L. Burm. FL Ind. (1768) 23; Gaertn. Fruct. II, 2, t. 80; Kunth L c.; Steud. 1. c. 29; Baker FL Maurit. (1877) 431; Benth. FL Austr. VII (1878) 460; Hack, in Forchungsr. S. M. S. "Gazelle" IV, 6; Hook, f. Fl. Brit. Ind. VII (1896) 12; Bendl in Journ. Linn. Soc. Bot. XXXVI, 319; Cooke Fl. Bomb. II (1908) 943; Ridley Mat. Fl. Mai. Pen. III, 124; Stapf in Dyer Fl. Cap. VII, 371; Merrill in Philipp. Journ. Sc. I, Suppl. I, 346 (non Linn.).

*P. distichum var. vaginatum* Griseb. Fl. Brit. W. Ind. (1864) 541.

*P. littorale* R. Br. Prodr. (1810) 188; Trin. Gram. Pan. 95, Sp. Gram. Ic. 1.112.

*P. kngiflorum* P. Beauv. FL Owar. II, 46, t. 85, fig. 2; Grah. Cat. Bomb. (1839) 234 (non Retz.).

*P. brachiatum* Trin. ex Nees Agrost. Bras. 62.

*P. foliosum* Kunth Rev. Gram. I (1829) 25.

*P. squamatum* Steud. 1. c. 21.

*P. inflatum* A. Rich, in Ram. de Sagra Fl. Cub. III (1853) 298.

*P. kleinianum* Presl Rel. Haenk. I (1830) 209.

*P. Boryanum* Presl 1. c.

*Digitariafoliosa* Lag. Gen. et Sp. Nov. 4.

*D. vaginata* Philippe FL d. Pyren. II (1860) 415.

2). *paspaloides var. longipes* Lange ex Willk. & Lange Prodr. FL Hisp. I, 45.

*Sanguinaria vaginata* Bub. FL Pyren. IV, 258.

To explain the change of name from *P. distichum* Linn, to *P. vaginatum* Sw., and to elucidate certain points of the above synonymy taken from Stapf, it will suffice to quote the short explanation given in the Fl. Trop. Air.; p. 572 : "Frequently confused with *Paspalum distichum* Linn. (Herb. Linn.!) which has broader and flatter leaves mostly sessile or subsessile lateral spikes and spikelets with firmer sides and a more convex upper glume, which is approaxedly and silky pubescent."

**Etymology** : *Vaginatium* means sheathed, alluding to the ascending part of the stem being entirely covered with the leaf-sheaths.

**Description** : Perennial; stem many-noded, sheathed throughout, ascending from a creeping, rooting, often very long and branched base. Leaves numerous, distichous, 5-10 cm. by 1-2.4 mm., linear-lanceolate, acuminate, involute or flat, spreading, membranous, or in short-leaved states, stiff and pungent, glabrous or nearly so; sheaths thin, glabrous except the usually bearded mouth; ligules very short, truncate.

Spikelets shortly pedunculate and articulate on the top of the stem; rhachis herbaceous, 12 mm broad. Spikelets sessile, solitary or 2-nate, elliptic-oblong, 2-4 mm. long, dorsally flattened, imbricate and appressed to the rhachis, glabrous, pale. Lower involucral acute, glume 0; upper involucral glume membranous, with a scarcely evident midnerve; lower floral glume like the upper involucral glume with a distinct midnerve; upper floral glume shorter, elliptic, concave, acuminate, subcoriaceous, smooth, nearly white; palea not or obscurely auricled. Anthers 1-2-1-6 mm. long.

**Locality** : *Gujarat*: Marshy edge of the Bokh, Prantij (Herb. Econ. Bot. Poona!).

*Konkan* : Marine Lines, Bombay (Hallberg 9514!); seashore, Bombay (Woodrow); Malabar Hill, Bombay (McCann 3609!); St. Xavier's College compound (McCann 9830!); Alibag, sandy shore (Ezekiel!); Malvan (Woodrow).

**Ecology** : The flowers open early in the afternoon; at that time the two spikes form a V. When the anthers have shed their pollen the two spikes begin to droop until they form a close fold y\ (Moses Ezekiel on sheet.) This may be due to the action of the sun. In fruit the spikes appear to become horizontal.—Grows along muddy coasts and banks of ditches.—Very common in a salt marsh near Sion where it forms dense mats on the surface of water with part of the stems above water. Plants collected in that locality during the rains are much bigger than the usual form. The spikes vary from 2-3 and are as much as 5 cm. long, pale yellow-green, almost white. The whole plant is glaucous. The styles are deep purple, turning black.

**Distribution** : Tropics of the whole world, mostly on the seashore; introduced into Galicia (Spain) and the Western and Central Pyrenees.

**Economic uses** : Where abundant it furnishes some forage.

**Explanation of Plate 89** : *Paspalum vaginatum* Sw.

1. Spikelets on rhachis.
2. Upper invol. glume,
3. Lower floral glume.
4. Upper floral glume.
5. Palea of upper floral glume.
6. Stamens, ovary, styles and lodicules.

#### 49. PASPALIDIUM Stapf.

(Sect. *Paspaloideae* in FL Brit. Ind., *partim*.)

Perennial, semiaquatic or terrestrial. Leaves linear, flat or involute. Ligule a ciliolate rim.

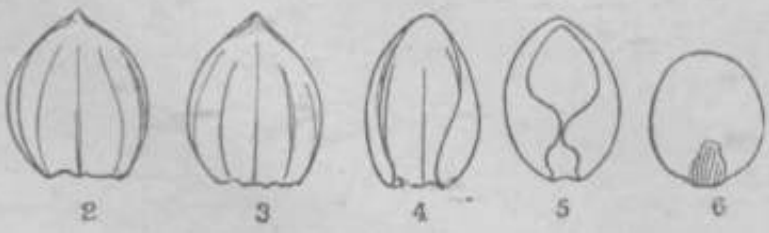
Racemes sessile or sessile and secund on the alternate notches of a triquetrous common axis of a false compound spike, more or less appressed to the more or less hollowed-out flanges of the latter. Rhachis ending in a subulate point. Spikelets mostly conspicuously 2-seriate, nearly always quite glabrous, ovate to ovate-oblong or ovate-lanceolate (when seen in front view), awnless, falling entire from the pedicels, solitary, secund and abaxial on the rhachis.

Involucral glumes mostly dissimilar and very unequal in length; lower reduced to a small scale or up to, rarely over, half the length of the spikelet, upper mostly almost equalling the spikelet, 5-7-nerved with the nerves evenly distributed, rarely both glumes much reduced. Lower floral glume similar to the upper involucral glume with the inner side-nerves more distant, palea if present only slightly shorter than its glume with well developed inflexed flaps; upper floral glume oblong to elliptic in outline, acute to apiculate, emucronate, crustaceous, with firm involute margins, faintly 5-nerved, palea almost as long as its glume, 2-keeled, its sides tightly embraced by the glume all along. Lodicules 2, small, broadly cuneate. Stamens 3. Styles distinct; stigmas plumose, laterally exerted from the upper part of the spikelet. Grain tightly enclosed by the more or less hardened glume and palea.

Species about 12.—In the warm countries of the whole world. 6 are confined to Australia and New Caledonia.

Cooke (II, 929) describes 3 species belonging to this genus: *Panicum flavidum* Retz., *P. punctatum* Burm. and *P. fluitans* Retz. We retain all, but substitute the older name *geminatum* *lox fluitans*.

- I. Lower spikes shorter than the internodes. Upper involucral glume shorter than the upper floral glume . . . . . 1. *P. flavidum*.



PASPALUM SCROBEC01/ATDM LINf.



PA3PAUJM COMPACTDM ROTH.

Delin. R. K. Bhide.



PASPALDM VAQINATOM BW.

Delin: H. K. Bhola.





PASPALIDIUM FLAVIDUM A. CAMUS.

Delin: H. K. Shida.

- II. Lower spikes as long as or longer than the internodes. Upper involucrel glume about  $\frac{1}{2}$  the upper floral glume . . . . . 2. *P. punctatum*.  
 III. Lower spikes as long as or shorter than the internodes.  
 Upper involucrel glume mostly as long as the upper floral glume. . . . . 3. *P. geminatum*\*

## 1. PASPALIDIUM FLAVIDUM A. Camus.

## - PLATE 90.

*Paspalidium flavidum* A. Camus in Lecomte Fl. l'Indo-Chine VII, 419 ; Haines in Bot. Bih. and Or. (1924) 1001 (*erronee attribuens combinationem Stapfio*).

*Pinicum flavidum* Retz. Obs. IV (1786) 15; Griff. Notul. III, 33; Ic. PL As. t. 139, fig. 67; Duthie Grasses N. W. Ind. (1883) 3, Indig. Fodder Grasses (1886) t. VI, Fodder Grasses N. Ind. (1888) 7 ; Benth. Fl. Austr. VII (1878) 474; Hook. f. Fl. Brit. Ind. VII (1896) 28; Cooke Fl. Bomb. II (1908) 929.

*P. brizoides* Jacq. Eclog. Gram. (1813) 2, t. 2 ; Roxb. Fl. Ind. I (1832) 292 ; Date. & Gibs. Bomb. Fl. (1861) 290; Duthie Grasses N. W. Ind. (1883) 2 ; Aitchis. Cat. Panjab PL (1869) 159 ; Baker Fl. Maurit. (1877) 433.

*P. floridum* Royle III. Bot. Himal. 420.

*P. granulare* Lam. III. I, 170.

Etymology : *Flavidum* means yellowish.

Description : Stem 0.3-1.2 m. long, slender, ascending from a short decumbent base; nodes glabrous. Leaves subbifarious, 7-5-12\*5 cm. by 4-6 mm., narrowly linear, acuminate, thinly coriaceous, glabrous or the margins slightly scaberulous ; sheaths compressed, glabrous, the margins not ciliate; ligule a ridge of long hairs.

Spikes few or many, distant, erect 1.3-2.5 cm. long, shorter than the internodes, secund sessile; rhachis flattened, glabrous. Spikelets 2-5 mm. long, gibbously globose, sessile or nearly so, 2-seriate, closely imbricate, glabrous. Glumes 4, pale green or nearly white, the 3 lower with green nerves; lower involucrel glume about half as long as the spikelet, orbicular, concave, 3-nerved; upper involucrel glume broadly ovate, concave, shorter than the upper floral glume, 7-nerved; lower floral glume shorter than the upper, orbicular, 5-nerved, paleate, empty; upper floral glume broadly ovate or almost orbicular, often mucronate, very convex, striolate-punctate, white. Palea with the sides infolded nearly to the middle, striolate.

Locality : *Sind*: Sanghar (Sabnis B762 !).

*Gujarat*: Near Surat (Dalz. & Gibs, *teste* Cooke).

*Kathiawar*: Morvi (Woodrow *teste* Cooke); Poibandar (Woodrow *teste* Cooke).

*Konkan*: Mulgaum (McCann 9579!); Thana (McCann 8726!); N. & 3.

*Konkan* (Laws *teste* Cooke).

*W. Ghats*: Ehandala (Woodrow *teste* Cooke!).

*Deccan*: Poona (Bhide!); Mr. Gammie's compound, Kirkee (Bhide 894 !)

*S. M. Country*: Eonankeri, in a small tank, 1,800 ft., rainfall 40 in. (Sedgwick & Bell 4964 !); Belgaum (Herb. Econ. Bot. Poona !).

*N. Kanara*: Yellapur (Talbot!); Halyal (Talbot 2095 !).

Ecology : A sporadic grass. Very abundant in the Carnatic both as an associate of man and also far into the Kanara forests.

Apparently a shade loving species, flowering during the rains. The inflorescence is usually very long with the spikes placed at distant intervals. Spikes frequently with a few imperfect spikelets at the top. Leaves often reaching 30 cm. by 12 mm., many-nerved. Tips obtuse, acute or acuminate, margins scabrid; base rounded, sometimes almost subcordate.

Distribution : Plains of India, Ceylon, tropical Asia (not in tropical Africa as reported by Hook. f. and Cooke).

Economic uses : The grain is eaten by the poorer classes especially at times of famine. According to Church the flour of the grain is indigestible. The chief constituent  $\bar{a}e\bar{a}$ 'fat or oil. Affords a good fodder for cattle and horses.

Explanation of Plate 90 : *Paspalidium flavidum* A. Camus.

1. Rhachis.
2. Spikelet.
3. Lower invol. glume.
4. Upper invol. glume.
5. Lower floral glume.
6. Palea of lower floral glume.
7. Upper floral glume.
8. Palea of upper floral glume.
9. Stamens, ovary and styles.

## 2. PASPALIDIUM PUNCTATUM A. Camus.

## PLATE 91.

*Paspalidium punctatum* A. Camus in Lecomte Fl. rindo-Chine VII, 419 ; Haines in Bot. Bilu and Or. (1924) 1001 (*erronee attribuens combinationem Stapfio.*)

*Panicum punctatum* Burm. Fl. Ind. (1768) 26; Hook. f. Fl. Brit. Ind. (1896) VII, 29; Cooke Fl. Bomb. II (1908) 929.

Vernacular names : Pet-nar, Dossa.

Etymology : *Punctatum* meaning punctate, refers to the upper floral glume which is granulate.

Description : Perennial, quite glabrous; stem prostrate at the often floating base, ty6-1-2 m. long, rooting at the lower stout spongy nodes. Leaves 10-20 cm. by 6-10 mm., linear, acute, or acuminate, base narrow; lower sheaths inflated; ligule a ridge of hairs. Spikes many, 1\*3-2.5 cm. long, distant, sessile, longer than the internodes, appressed to the glabrous rhachis, very pale.

Spikelets 2-5-3 mm. long, imbricate, sessile, 2-seriate, ovoid-oblong on a flattened undulate rhachis which is produced beyond the spike into an acicular tip which is as long as or longer than the terminal spikelet. Glumes 4; lower involucral glume small, about 1-2 mm. long, orbicular, rounded or slightly retuse at the apex, thinly membranous; upper involucral glume about half as long as the floral glumes, membranous, 3-5-nerved, orbicular, with truncate or rounded tip; lower floral glume ovate, acute, 3-5-nerved, membranous, neuter; upper floral glume about as long as the lower, cuspidately acuminate, thinly coriaceous, granulate, white. Falea coriaceous, with inflexed membranous sides. Anthers 1-2 mm. long.

Locality : *Deccan*: Foona (Woodrow, Lisboa); Ahmednagar (Woodrow).

Ecology : A subgregarious species growing in marshes.

Distribution : Throughout India in marshes, Ceylon, Malaya (not in tropical Africa),

Explanation of Plate 91 : *Paspalidium punctatum* A. Camus.

1. Lower invol. glume.
2. Upper invol. glume.
3. Lower floral glume.
4. Upper floral glume.
5. Falea of upper floral glume.
6. Stamens ovary and styles.
7. Spikelets.
8. Bhachis and spikelet.

## 3. PASPALIDIUM GEMINATUM Stapf.

*Paspalidium geminatum* Stapf in Fl. Trop. Afr. IX (1920) 583 ; Haines Bot. Bih. and Or. (1924) 1002.

*Panicum geminatum* Forsk. Fl. Aegypt.-Arab. (1775) 18; Schweinf. in Bull. Herb. Boiss. II, App. II, 19 ; Hack, in Bull. Herb. Boiss. IV, App. III, 14; Hitchcock & Chase in Contrib' U. S. Herb. XV, 30.

*P. fluitans* Retz. Obs. III (1783) 8 et V (1789) 18; Willd. Sp. Pl. I, 338 ; Kunth Enum. I (1838) 78; Steud. Syn. Fl. Glum. I (1855) 59; Miq. Fl. Ind. Bat. III, 455; Baker Fl. Maurit. (1877) 433; Cooke Fl. Bomb. II (1908) 929.

*P. brizoides* Lam. III. I, 170 (*non* Retz.).

*P. paspaloides* Pers. Sy\*. I (1805) 81; Kunth Enum. I (1838) 77; Steud. 1. c. 60; Boiss. Fl. Or. V (1881) 436; Balfour f. Fl. Socotra (1888) 310; Hook. f. Fl. Brit. Ind. VII (1896) 30, in Trim. Fl. Cejl. V, 135.

*P. beclmanniqefortne* Mitani ex Trin. in Spreng. Neue Entdeck. II, 83; Spieng. Syst. I (1825) 309.

*P. truncatum* Trin. Diss. II, 130, et Sp. Gram. Ic. t. 168.

*P. affine* Nees Agrost. Bras. 113.

*P. brizaeforme* Presl Eel. Haenk. (1830) 302; Steud. 1. c. 60.

*P. numidianum* Sieb. ex Schult. Mant. II, 267 (*non* Lam.).

*P. carnosum* Salzm. ex Steud. 1. c.

*P. appressum* Doell in Mart. Fl. Bras. II, II, 184.

*P. glomeratvm* Buckl. Prel. Rep. Geol. Surv. Tex. App. 3 (*non* Moencl).

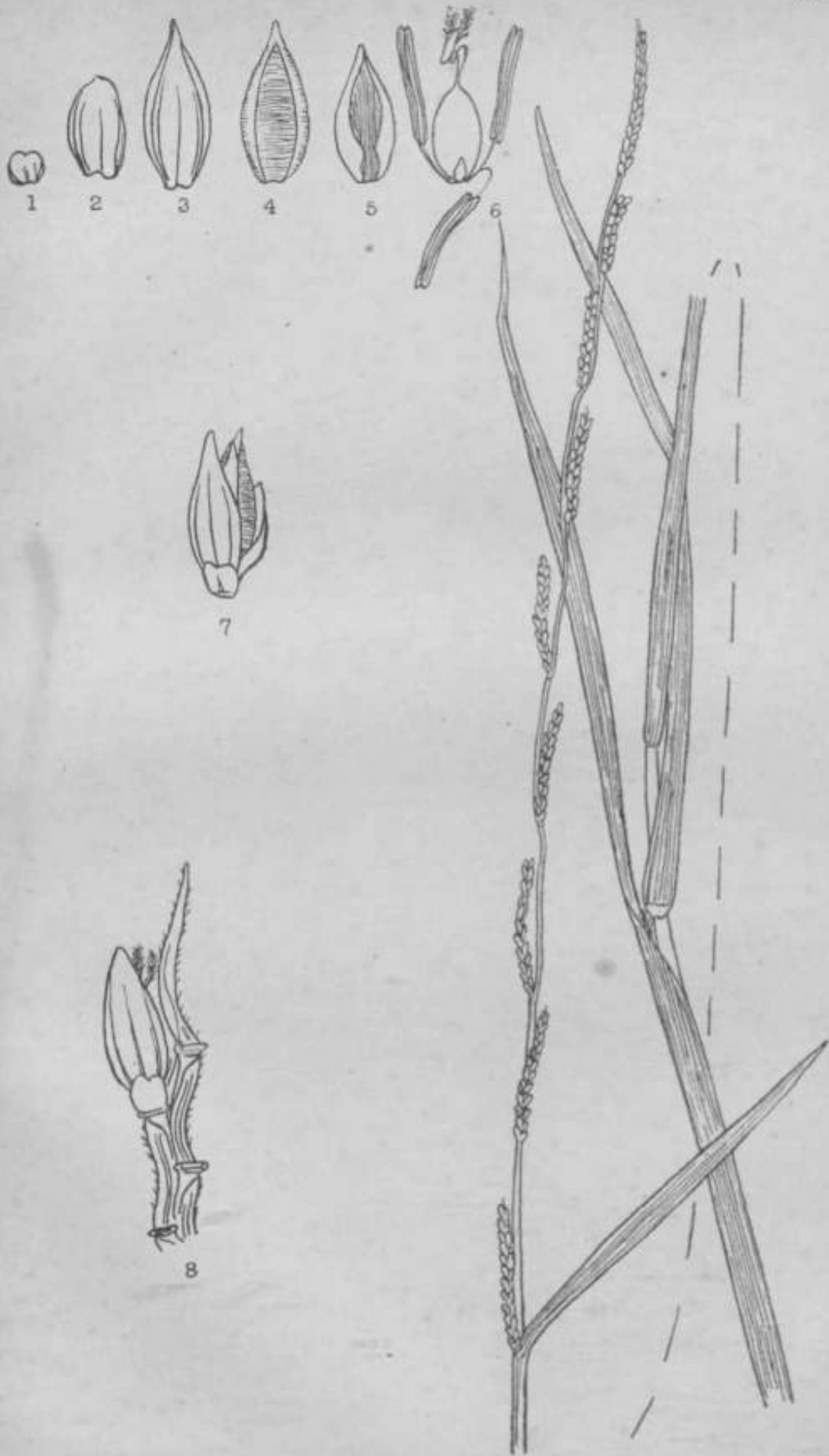
*P. turgiduw* Cheval. Sudania (1911) 26.

*Paspalum appressum* Lam. III. I, 176.

*Digitaria appresto* Pers. 1. c. 85.

*D. affinis* Roem. & Schult. Syst. II (1817) 470.

Etymology : *Gennalvm* means in pairs, alluding to the biseriate spikelets.



PASPALIDIUM PUNCTATUM A. CAMUS.

Desin: H. K. Biele.

**Description** : Perennial; stem 0.3-1.2 m. long, from a stout creeping base, often as thick as a swan's quill, smooth, soft, striate; lower nodes 5-12.5 cm. long, quite glabrous. Leaves 10-20 cm. by 6-10 mm., linear, finely acuminate, glabrous, the margins smooth or nearly so, often incurved, base narrow; sheaths large, loose, glabrous, the margins not ciliate; ligule a ridge of hairs.

Panicle 20-30 cm. long; rhachis erect, angular, glabrous or nearly so. Spikes many, 1.3-3.8 cm. long, sessile, longer than the internodes, often appressed to the rhachis; rhachis of spike flattened. Spikelets 2.5-3 mm. long, ovoid, acute, glabrous, 2-seriate, imbricate. Glumes 4; lower involucral glume 1-2 mm. long, broader than long, thinly membranous, without nerves, white; upper involucral glume ovate, acute, concave, thinly membranous, with 5-7 green nerves, slightly shorter than the upper floral glume; lower floral glume subcoriaceous, 5-7-nerved, paleate, empty or male; upper floral glume broadly ovate, mucronate, thinly coriaceous, smooth or nearly so; palea with inflexed membranous margins.

**Locality** : *Sind*: Munchar Lake (Stocks *teste* Cooke); Tatta (Blatter & McCann D6111 D612!).

*Cutch*: Anjar, tank (Blatter 3745!).

*Kaihiawar*: Porbandar (Bhidel).

*Gujarat*: Lasandra (Chibber!); Ahmedabad, canal banks (Sedgwick!).

*Khandesh*: Dhulia (Chibber!); Borod, growing in water, partly submerged. {McCann A97!}.

*Konkan*: Mahaluxmi (Sabnis 5449!); Bandra, opposite Eantwadi, sandy shore (Vakil A991); Victoria Gardens (McCann A100!); common in Bombay Island (McCann!).

*W. Ghats*: Igatpuri (Blatter & Hallberg 5492!).

*Deccan*: Poona, Bund Gardens (Garade 343!); Ahmednagar, sides of stream Dangar Guy (T. Cooke 6!); Manmad, river-bed (Blatter A941); Sholapuri, Tank, in water (D'Almeida A95!); Pashan (Gammie!).

*8. M. Country*: Dharwar (Sedgwick 3692!); Shiggaon (Sedgwick 20811).

*N. Kanara*: Halyal (Talbot 2149!).

**Ecology** : Growing in or near water, usually in marshy places. It varies in colour from pale green to purple. The plant varies according to the depth of water it is growing in.—A more aquatic species than *P. flavidum* with long floating internodes which branch at the nodes. The floating internodes are hollow. The spikes are more closely arranged and are usually longer than the internodes. The rhachis is setulose, much more so than in *P. flavidum*, in which latter species it is microscopically setulose.

**Distribution** : More or less throughout India, Ceylon, Afghanistan, Arabia, tropical Africa and America.

#### 50. UBOCHLOA Beauv.

Perennial or annual. Leaves linear to lanceolate, flat; ligules a ciliate rim.

Racemes sessile or subsessile on a common axis, simple or nearly so; rhachis more or less triquetrous with a low almost straight or zigzag facial angle or keel, rarely strap-shaped; pedicels solitary or in pairs, alternately to the right and the left of the facial angle, usually reduced to short disc-tipped stumps, or if binate the primary slightly longer. Spikelets close, contiguous or slightly discontinuous, 2- or irregularly pluri-seriate, glabrous or hairy, broad-ovate to elliptic or lanceolate-oblong, awnless, usually more or less flattened or slightly depressed abaxially, convex on the back, falling entire from the pedicels, solitary or binate or in fascicles of 3-4, secund and abaxial on the rhachis. Involucral glumes similar and subequal or more often dissimilar and very unequal in length, the lower being the shorter, upper resembling and more or less equalling the lower floral glume, 5-11- (mostly 7-) nerved. Lower floral glume 5-7-, rarely more-nerved, the inner lateral nerves somewhat distant from the midnerve, palea subequal to the glume, with well-developed inflexed flaps and sharp sometimes marginate keels; upper floral glume elliptic to rotundate-elliptic in outline, very obtuse, with a usually scabrid or barbellate mucro, narrowly involute, 5-7-nerved, palea almost as long as the glume, 2-keeled, the sides tightly embraced by the valve all along. Lodicules 2, small, broadly cuneate. Stamens 3; styles distinct; stigma plumose, laterally exerted upwards. Grain tightly enclosed by the glume and palea, broadly to rotundate-elliptic, dorsally compressed.

"Very similar to *Brachiaria*, but with the orientation of the spikelets inverted and a short fine mucro from the very obtuse apex of the fertile valve. Although very similar in general appearance, none of the species of *Urochloa* can be said to approach closely members of the genus *Brachiaria*. Their affinities are clearly *inter se*, suggesting a distinct line of evolution. The occurrence of parallel states, one with glabrous, the other with pubescent spikelets, but otherwise indistinguishable, runs almost through, the whole genus. To this may be added

the presence of a submarginal fringe in the lower floret, almost normal in some and very rare in other species, and apparently, in no case correlated with other characters." (Stapf. 1. c.)

Species about 18.—Hot parts of the Old World, one in America, but perhaps introduced.

Cooke describes 3 species of *Panicum* which belong here: *Panicum prostratum* Lamk., *P-setigerum* Retz., and *P. javanicum* Poir., to which we add *Urochloa marathensis* Henrard.

- A. Spikelets up to 2 mm. long . . . . . 1. *U. reptans*.  
 B. Spikelets 2\*5-5 mm. long.  
 I. Spikelets lanceolate, acuminate . . . . . 2. *U. setigera*.  
 II. Spikelets ovate to elliptic-oblong.  
 1. Leaves about 3 cm. long. Racemes 2 cm. long .. 3. *U. marathensis*.  
 2. Leaves 3-5-15 cm. long. Racemes 2-5-5 cm. long . 4. *U. Helopus*.

#### 1. UROCHLOA REPTANS Stapf.

##### PLATE 92.

*Urochloa reptans* Stapf in Fl. Trop. Afr. IX (1920) 601; Haines Bot. Bih. and Or. (1924) 1003..  
*Panicum reptans* Linn. Syst. Nat. ed. X, 870; Hitchc. & Chase in Contrib. U. S. Nat. Herb. XV, 36, fig. 17 (excl. *P. grossarium*).

*P. repens* N. L. Burm. Fl. Ind. (1768) 26, t. 11, fig. 1; Rottl. in Neue Schrift. IV, 182; Roxb. Fl. Ind. I (1832) 300; Boj. Hort. Maur. 364 (won Linn.).

*P. prostratum* Lam. 111. I, 171; Miq. Fl. Ind. Bat. III, 446; Griseb. Fl. Brit. W. Ind. (1864) 546; Schweinf. in Bull. Herb. Boiss. II, App. II, 20; Baker Fl. Maur. (1877) 435; Duthie List Grasses N. W. Ind. (1883) 6, 111. Indig. Fodder Grasses (1886) t. 45, Fodder Grasses N. Ind. (1888) 11; Boiss. Fl. Or. V (1884) 438; Dalz. & Gibs. Bomb. Fl. (1861) 290; Hook. f. Fl. Brit. Ind. VII (1896) 33; Cooke Fl. Bomb. II (1908) 932; Merrill in Philipp. Journ. Sc. I, 355,

*P. barbatum* Lam. 1. c.

*P. caespitosum* Sw. Fl. Ind. Occ. I, 146.

*P. Sieberi* Link Hort. Berol. I (1827) 207.

*P. procumbens* var. Nees Agrost. Bras. 109.

*P. crispum* Llanos Fragm. (1851) 42.

*P. insularum* Steud. Syn. PL Glum. I (1855) 61.

*P. calacczense* Steud. 1. c. 65.

*P. aurdianum* Hale in Wood Classb. ed. III, 787.

*P. viaticum* Salzm. ex Doell in Mart. Fl. Bras. II, II, 155.

*P. marginatum* Vahl ex Hook. f. 1. c.

*Brachiaria prostrata* Griseb. in Abh. Ges. Wiss. Goett. VII, 263.

**Vernacular names** : Ghimachara, Surpur chaurela.

**Etymology** : *Urochloa* is derived from *ura*, a tail, and *chloa*, a grass, therefore a tailed grass.—*Reptans* means creeping, alluding to the stem creeping below.

**Description** : A slender annual grass; stem 10-45 cm. long, ascending from a long creeping base, often branched below; nodes pubescent; internodes 2-5-7-5 cm. long. Leaves 2\*5-5 cm. by 6-16 mm., ovate-lanceolate from a cordate amplexicaul base, acuminate, thin, flat, nearly glabrous or quite glabrous above, often clothed with long hairs beneath, sometimes nearly glabrous; sheaths slender, with ciliate margins; ligule a tuft of white hairs or 0.

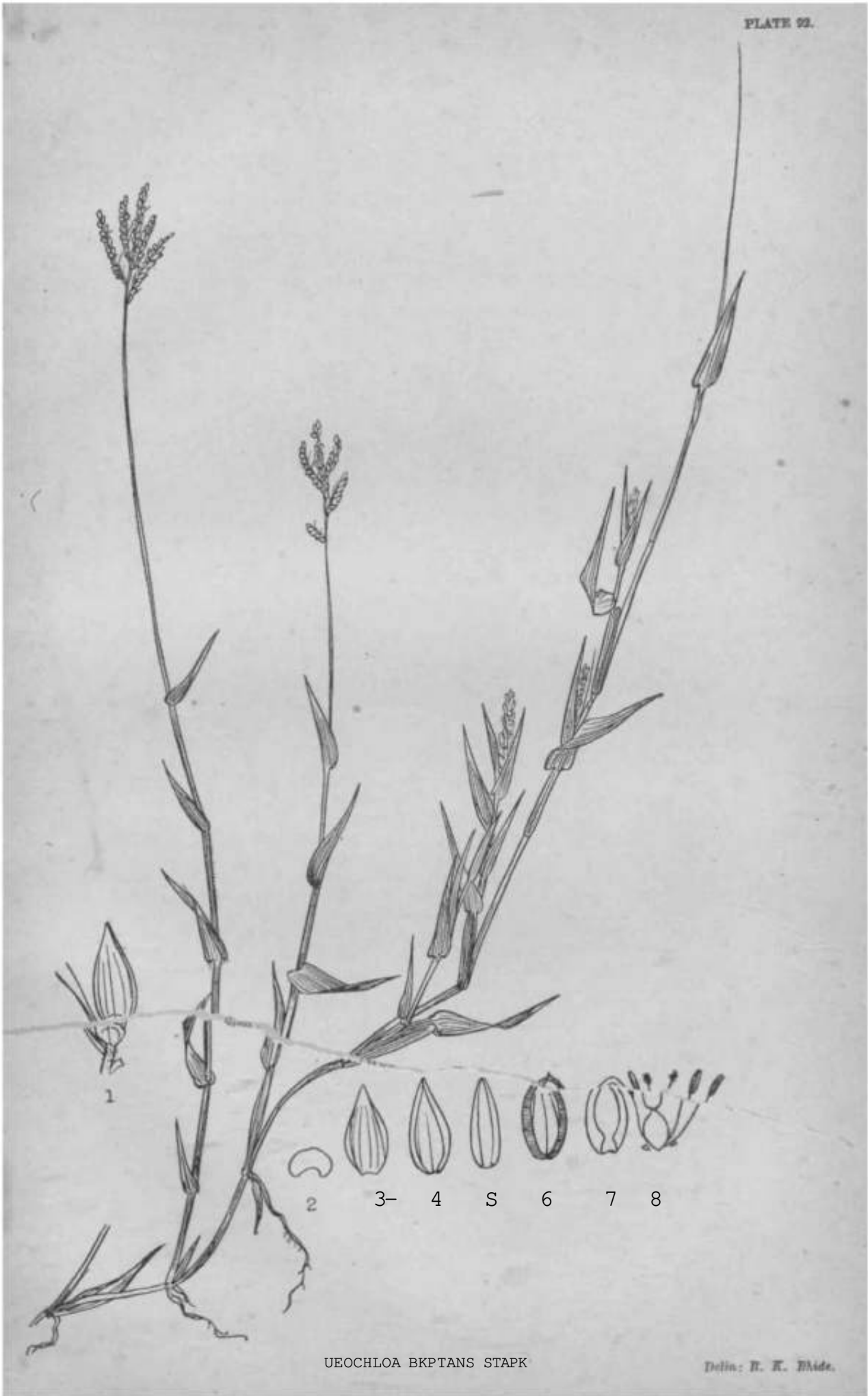
Racemes 5-8, alternate, secund, 1-3-3-2 cm. long, sessile or shortly pedunculate, distichously spreading; rhachis at racemes slender, angular. Spikelets 1-6-2 mm. long, solitary or binate, secund, ellipsoid, somewhat turgid, subacute, glabrous or hairy; pedicels very short\* with long slender hairs at the tip below the spikelet. Glumes 4; lower involucre glume minute,, semilunate, hyaline, nerveless; upper involucre glume about equalling the lower floral glume, membranous, broadly ovate, acute, pubescent, 7-nerved; lower floral glume 5-nerved, empty, with hyaline palea; upper floral glume elliptic, dorsally rounded, thinly coriaceous, finely striolate, nearly white, with subcoriaceous palea. Anthers 0-8 mm. long.

**Locality** : *Gujarat*: Ahmedabad, famine grass plot, Bedar (Herb. Gujarat College!)\*, Ghad, on black soil (Sedgwick 1124!).

*Khandesh*: Nandurbar, (Mamlatdar of Nandurbar!); Umalla, Tapti bank (Blatter & Hallberg 5229!); Bor, Tapti (Blatter & Hallberg 4417!).

*Konkpn*: Vasco da Gama (Bhide!); Matunga, salt pans (Sabnis 95721); Byculla (McCann 9577!).

*Deccan*: Kirkee (Bhide!); Poona (Herb. Econ. Bot. Poona!); Deolali (Blatter A107!); Sholapur (D'Almeida A108! A109!).



UEOCHLOA BKPTANS STAPF

Delin: R. K. Bhide.



UROCHLOA HELOPUS STAFF

Delin: H. K. Bilde.



*S. M. Country:* S. W. of Dharwar, 1,800 ft., rainfall 90 in. (Sedgwick & Bell 4437 !); Dharwar, under trees on black soil, 2,400 ft., rainfall 34 in. (Sedgwick 2882 !).

**Ecology :** Tins grass has generally a creeping stem which roots at the nodes. The habit is more erect when the plant grows in rich cultivated ground.

**Distribution :** Plains of India, Ceylon, tropics generally, subtropical America, also tropical Arabia and the Mascarenes.

**Economic uses** / Considered to be one of the most nutritious fodder grasses. Cattle are fond of it. It yields a considerable quantity of grain which is eaten in times of scarcity.

**Explanation of Plate 92 :** *Vrochha reptans* Stapf.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Palea of lower floral glume.
6. Upper floral glume.
7. Palea of upper floral glume.
8. Stamens, ovary, styles and lodicules.

## 2. UROCHLOA SETTGGERA Stapf.

*Urochloa scitivera* Stapf in Fl. Trop. Afr. IX (1920) 598; Haines in Bot. Bih. and Or. (1924) 1003.

*Panicum setigerum* Ketz. Obs. IV (1786) 15; Roxb. FL Ind. I (1832) 299; Kunth Enum. I (1838) 90 (*excl. syn. nonnullis*); Hook. f. Fl. Brit. Ind. VII (1896) 37; Cooke Fl. Bomb. II (1908) 933.

*P. affine* Poir. Encycl. Suppl. IV, 273 (*ex Kunth*).

**Etymology :** *Setigera* means having bristles or awns.

**Description :** Stems 60-90 cm. long, prostrate and widely straggling below, branched, slender, firm; nodes bearded, the lower rooting; internodes 2-5-5 cm. long. Leaves 7-5-12\*5 by 1-2-2 cm., ovate-lanceolate from a cordate, amplexicaul, more or less ciliate base, finely acuminate, flat, thin, with slender midrib, 5-6 pairs of nerves and scabrid margins; sheath\* glabrous except at the back beneath the leaf-blade, with ciliate margins; ligule a tuft of long woolly hairs.

Inflorescence of 3-10 racemes 2\*5-5 cm. long, the lower very distant, alternate; rachis of racemes angular, glabrous or pubescent, villous at the base. Spikelets 2-5-3 mm. long, loosely imbricate, 2-seriate (one often pedicellate, the other sessile), secund, ovoid, acute or acuminate, glabrous or pubescent; pedicels pubescent and with long spreading slender hairs on or below the pedicel. Glumes 4; lower involucral glume about  $\frac{1}{2}$  as long as the upper, orbicular, thinly membranous, upper involucral glume broadly ovate, acute or acuminate, 7-nerved, membranous; lower floral glume about equal to the upper involucral glume, 5-nerved, paleate, neuter, the palea membranous, as long as the glume, subacute; upper floral glume elliptic, obtuse, shortly apiculate, coriaceous, granulate, with narrowly incurved margins, the palea coriaceous, elliptic-oblong, obtuse.

NOTE.—We do not think there is any good reason for retaining Hook, f.'s *var. tomentosa* which was also mentioned by Cooke i.e. We refer to the note given above after the general characteristics of the genus and add what Stapf says with regard to this species in particular: "The African specimens have glabrous spikelets. In India, however, the pubescent form appears to be prevalent."

**Locality :** *Sind:* Mirpur Sakro (Blatter & McCann D609!); Gharo (Blatter & McCann D610!).

*Kathiawar:* Ejakot (Woodrow 45 *teste* Cooke).

*Khandesh:* Dhulia (Herb. Econ. Bot. Poona!).

*Konkan:* Bassein (Paranjpye !)

*Deccan:* Ganeshkhind Bot. Gardens (Herb. Econ. Bot. Poona !); Mangiri Farm, 11 miles S. E. of Poona (Herb. Econ. Bot. Poona!).

**Ecology :** Subgregarious, growing amongst bushes and in the shade of trees, "When exposed to the weather the leaves are of a smooth shining deep green, when under trees, of a pale colour, soft and somewhat downy, which made me long think they were different species" (Roxburgh).

**Distribution :** India, Ceylon, Mauritius, tropical and S. Africa.

**Economic uses :** Cattle are fond of the grass.

## 3. UBOCHLOA MABATHENSIS Henr.

*Urochloa marathensis* Henr. in Mededeel. Rijks Herb. 43 (1922) 1-3, pi. 1.

*Panicum marathense* Henr. in Herb. Lugd. Bat.

**Description** : Annual, dwarf and robust, glaucous, branching from the lower geniculations. Stems low, striate, quite glabrous, few-noded, nodes pubescent. Leaf-sheaths terete or slightly compressed, striate, lower ones gaping, upper ones tight, shorter than the internodes, hirsute with bulbous-based hairs. Ligule very short, covered with long hairs. Blade cordate at the base, linear-lanceolate, gradually acuminate, more or less 3 cm. long, 5-7 mm. broad, flat, on both sides but especially on the upper sparingly covered with spreading bulbous-based hairs, margin thickened, distinctly undulate, fimbriate with long tubercular hairs.

Bacemes 2-3, distant from each other more or less 1 cm., 2 cm. long, stout, erect-patulous or finally reflexed; rachis subtrigonal, pilose at the base, more than twice as narrow as the spikelets, slightly undulate, the angles scaberulous, otherwise glabrous, giving off solitary pedicels. Spikelets biseriate, broadly elliptic, very acute, 4 mm. long, anteriorly almost flat, posteriorly very convex, green, glabrous. Involucral glumes very unequal. Lower almost -J of the spikelet, subobtusely, 5-nerved, upper as long as the spikelet, very acute, distinctly 7-9-nerved. Lower floral glume equal in shape to the upper involucral glume, flat, 5-nerved. Glabrous on the back, tubercular-echinulate near the margin, except near the tip and base, paleate.

Upper floral glume shorter than the preceding glumes, elliptic with a rounded tip, rigid, opaque, brown-straw-coloured, rugulose, long caudate, 5-nerved, bullate below.

**NOTE.**—Henrard has a variety from the same localities: *tar. velvina*, which differs from the type by the densely pubescent spikelets. What we said in a note under the previous species can be applied here.

**Locality** : S. M. Country and N. Eanara (A. P. Young ex Henrard). We have not seen the specimen.

**Distribution** : So far endemic.

## 4. UROCHLOA HELOPUS Stapf.

## PLATE 93.

*Urochloa Helopus* Stapf in FL Trop. Afr. IX (1920) 595; Haines Bot. Bih. and Or. (1924) 1002.

*Zl. pubescens* Eunth Rev. Gram. I (1829) 31, Enum. Pl. I (1838) 74.

*Zl. panicoides* Schult. Mant. II, 595 (non Beauv.).

*Panicum Helopus* Trin. in Spreng. Neue Entdeck. II, 84; Panic. Gen. 150, et Gram. Ic. et Descr. II, 1, 183; Nees Agrost. Bras. 117; Steud. Syn. PL Glum. I (1855) 57; Duthie List Grasses N. W. Ind. (1883) 4, Fodder Grasses N. Ind. (1888) 8.

*P. Helopus* var. *glabrescens* E. Schum. in Engl. Ffl. Ost.-Afr. C. 101; Stapf in Dyer FL Cap. VII, 392.

*P. hirsutum* Eoen. ex Eoxb. FL Ind. I (1832) 300.

*P. Koenigii* Spreng. Syst. I (1825) 311.

*P. hochsteUerianum* A. Rich. Tent. FL Abyss. II (1851) 369.

*P. geminatum* Hochst. ex A. Rich. 1. c. (non Forsk.).

*P. controversum* Steud. Syn. PL Glum. I (1855) 60; Schweinf. in Bull. Herb. Boiss. II, II, 19.

*Setaria* ? *Ursula* Eunth Rev. Gram. I (1829) 47, Enum. PL I (1838) 157.

*S. pilifera* Spreng. Syst. IV, Cur. Post. 33.

*Panicum javanicum* Hook. f. FL Brit. Ind. VII (1896) 35, (non Poir, partim); Cooke FL Bomb. II (1908) 933 (partim).

This is the species which was described by Hook. f. and many others, amongst them by Cooke, under the name of *Panicum javanicum* Poir. According to Stapf *P. javanicum*, frequently confused with *U. Helopus*, is *U. panicoides* Beauv., a distinct species. A number of synonyms and references have, according to the same authority, to be excluded from the F. B. I. under *Panicum javanicum*: Bentham's Flora of Australia (VII, 476) mentions *Panicum Helopus*, but it is partly *Brachiaria notochtona* Stapf (*Panicum notochtonum* Domin) and partly *Brachiaria ramosa* Stapf. T. 7 in Duthie's Fodder Grass, does not represent *Panicum Helopus*, but *Brachiaria ramosa* Stapf. *Urochloa panicoides* Beauv. is a synonym of *Panicum javanicum* Poir. *P. trichojnis* Hochst. is *Urochloa trichopus* Stapf.

*P. Helopus* represents the state with pubescent spikelets. . . . The pubescent state is predominant in India. Specimens with pubescent spikelets and at the same time an appressed silvery fringe to the lower floret were collected by Jacquemont near Poona. The presence or absence of a hairy vestiture in the spikelets does not appear to be correlated with any other characters; but it has to be observed that the spikelets of the specimens from the African mainland . . . are on the whole slightly larger and more acute than those from . . . India (Stapf).

As a number of foreign elements have crept into the usual descriptions of our species we give Stapf's description of *U. Hehpus*.

**Vernacular names** : Kuri, Kuriya.

**Description** : Annual. Stems tufted, 30-60 cm. high, erect or geniculately ascending from a short sometimes rooting/ base, frequently sparingly branched from the lower nodes, 4-10-noded, intermediate internodes like the uppermost (peduncle) very sparingly pubescent or almost glabrous. Leaf-blades lanceolate to linear-lanceolate from a wider and semi-amplexicaul base, 3-5-15 cm. by 8-12 mm., rarely up to 25 cm. and then linear and narrowed towards the base, soft, flat, pale or yellowish-green, loosely and often finely hirsute with tubercle-based hairs, rarely almost glabrous, margins usually crisped or wavy and more or less ciliate. Sheaths somewhat loose, pale, striate, densely ciliate upwards, more or less shortly\* hirsute with the hairs tubercle-based, nodes pubescent to subvillous. Ligules a densely ciliate rim.

Inflorescence of mostly 4-7 erect or at length more or less spreading stiff or slightly flexuous sessile or subsessile spiciform secund racemes; common axis 1-2-5 (rarely 7-5 cm.) long, subsemiterete below, much flattened upwards, pubescent. Racemes moderately dense, 2-seriate, simple, 2-5-5 cm. long, solitary or here and there approximate and then unevenly distributed; rhachis straight or slightly wavy, flat on the back, about 1 mm. wide, villous at the base, glabrous upwards, rarely sparingly hairy, angles scabrid; internodes up to 1 mm. long; pedicels solitary, reduced to short stout stumps with discoid tips, frequently bearing some long spreading hairs. Spikelets laterally contiguous or subcontiguous, ovate to elliptic-oblong, very acute, 4-5 mm. long, greenish, glabrous or pubescent. Involucral glumes dissimilar, lower broad-ovate, subobtusate to acute, clasping at the base, 1-5-2 mm. long, glabrous or sparingly and minutely pubescent, 5-nerved, upper one corresponding in size and outline to the spikelet, prominently 7-11- (mostly 9-) nerved, glabrous or pubescent. Lower floral glume very similar to the upper involucral glume, but flat or slightly depressed, 5-7-nerved with the inner side-nerves distant, glabrous or pubescent, palea oblong, acute, slightly shorter than its glume. Anthers 2 mm. long. Upper floral glume rotundate-elliptic, greenish to pale brown, 2\*5-3 mm. long, palea finely transversely rugose or granular, mucro up to 1 mm. long, sparingly barbellate. Grain rotundate-elliptic in outline, much compressed, about 2 mm. long, yellowish or greenish.

**Locality** : *Gujarat*: Baroda (Cooke *teste* Cooke).

*Deccan*: Katraj Ghat, 11 miles S. E. of Foona (Shevade!); Poona (Woodrow !); Deolali (Blatter A110!); Ganeshkhind Bot. Gardens (Patwardhan !); Chattershinji (Bhide!); Mangiri, near Poona (Gammie 15344!) ; Dapuri, near Poona (Jacquemont 482!); Akola (Mamlatdar of Akola !).

*S. M. Country*: Dharwar, 2,500 ft., rainfall 35 in. (Sedgwick 21571); Kilgeny (Talbot 2419 !); Haven (Talbot 2284 !); Bijapur (Meebold 11201!); Badami (Woodrow *teste* Cooke).

*N. Kanara*: Kulgi, 2,000 ft. (Talbot 2283!); Nundgod (Mamlatdar of Nundgod).

**Ecology** : Grows on the borders of, and in cultivated land, and on pasture ground.

**Distribution** : Plains of India, Ceylon, tropical and S. Africa, Mauritius.

**Economic uses** : Considered to be a good fodder both for cattle and horses.

**Explanation of Plate 93** : *Urochha Hehpus* Stapf.

1. Part of rhachis and spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Palea of lower floral glume.
6. Stamens.
7. Upper floral glume.
8. Palea of upper floral glume.
9. Stamens, ovary, styles and lodicules.

#### 51. ECHINOCHLOA Beauv.

Annual or perennial. Leaf-blades from a slightly constricted or equally wide rarely much attenuated base. Ligules 0 or represented by a transverse fringe of hairs.

Panicles of crowded or loosely arranged secund spiciform branches mostly bearing spikelets from the base or near it. Spikelets ovate to elliptic- or lanceolate-oblong, usually cuspidate or awned, very convex on the back, flat or slightly depressed in front, falling entire from the pedicels, 2-nate or clustered, secund and abaxial on the triquetrous rhachis of racemously arranged false spikes. Involucral glumes unequal, membranous, the lower much shorter, more or less ovate from a clasping base, 3-5-nerved, often mucronate, the upper corresponding in length and outline to the spikelet (as seen from the back), very concave, 5-7-nerved. si. ute,

cuspidate or cuspidate, rarely produced into a short awn. Lower floret equalling the upper glume (excluding cusps or awns); lower floral glume very similar to the upper involucre glume, but flat or depressed on the back and often with a more pronounced cusp or an awn; palea equal to the body of the valve, or in barren florets more or less reduced, hyaline, finely 2-keeled. Upper floral glume ovate to elliptic-oblong, apiculate or obtuse, very convex on the back, subcoriaceous or crustaceous, polished, faintly 5-nerved, margins firm, involute up to near the tip, then flat, not embracing the tip of the palea, palea subequal to the glume and similar in substance, with rounded keels and flaps which thin out towards the flat slightly recurved tips. Lodicles 2, cuneate, fleshy. Stamens 3. Styles distinct; stigmas plumose, exerted from near the tips. Grain broad-elliptic, dorsally flat, ventrally convex; hilum punctiform, subbasal.

Species about 20-25.—The warm regions of both hemispheres.

NOTE.—It will be useful to remember what Stapf says regarding this genus 1. o. 605: "The segregation of the numerous forms which make up the genus *EcJinocMoa* and their reduction to more or less well definable species is still unsatisfactory, mainly owing to their apparently endless variability and the difficulty, if not impossibility, of discriminating between stable and unstable modifications and the effects of hybridisation. Here, as in other cases, observation in the field and experiment will have to decide."

Cooke describes under *Panicum* 2 species which have to be referred to *Echinochloa*: *P. colonum* and *P. stagninum*. We add *E. Crus-Galli* which Cooke thought did not occur anywhere in the Bombay Presidency.

floral  
floral

- |  |                           |
|--|---------------------------|
| I. Lower <sup>floral</sup> <sup>floral</sup> glume and upper <sup>floral</sup> glume equally acute or cuspidate.       | 1. <i>E. colona</i> .     |
| II. Lower (involucral glume and upper floral glume cuspidate or produced into an awn, the latter more than the former. |                           |
| 1. Ligule 0.   | 2. <i>E. Crus-Galli</i> . |
| 2. Ligule a fringe of stiff hairs or absent in the uppermost leaves.   | 3. <i>E. stagnina</i> .   |

involucral

#### 1. ECHINOCHLOA COLONA Link.

##### PLATE 94.

*Echinochloa colona* Link Hort. Berol. II (1827) 209; Parl. PL Nov. 40; Hitchc. in Gray Man. Bot. ed. 7, 118, et in Contrib. U. S. Nat. Herb. XII, 213, XVII, 256, XVIII, 345; Stapf in Fl. Trop. Afr. IX (1920) 607; Haines Bot. Bih. and Or. (1924) 997.

*E. zonalis* Parl. PL Panorm. 1, 119.

*Panicum colonum* Linn. Syst. Veg. ed. 10 (1759) 870, Sp. PL ed. II, 84; Jacq. Eclog. Gram. t. 32; Roxb. FL Ind. I (1832) 296; Nees Agrost. Bras. 119; Steud. Syn. PL Glum. I (1855) 46; Benth. Fl. Hongk. (1861) 411, et FL Austral. VII (1878) 478; Griseb. FL Brit. W. Ind. (1864) 545; Baker FL Maurit. (1877) 438; Duthie List Grasses N. W. Ind. (1883) 3, Indig. Fodder Grasses (1886) t. 4, Fodder Grasses N. Ind. (1888) 4; Boiss. FL Or. V (1881) 435; Balf. f. Bot. Socotra (1888) 310; Hack, in Bol. Soc. Brot. VI, 140; Schweinf. in Bull. Herb. Boiss. II, App. II, 20, 95; Hook. f. Fl. Brit. Ind. VII (1896) 32; Cooke FL Bomb. II (1908) 931.

*P. arabum* Nees ex Steud. Nomencl. ed. II (1840) 252, et Syn. PL Glum. I (1855) 63 (partim).

*P. brizoides* Linn. Mant. II (1767) 184.

*P. tetrastichon* Forsk. FL Aegypt.-Arab. (1775) 19.

*P. cuspidatum* Roxb. Fl. Ind. I (1832) 298; Duthie Grasses N. W. Ind. (1883) 3; Steud. L. c. 47.

*P. pseudocolonum* Roth Nov? Sp. (1821) 47; Steud. 1. c. 46.

*P. zonale* Guss. Ind. Sem. H. R. Bocc. 1825, et FL Sic. Prodr. I, 82.

*P. numidianum* Presl Cyp. and Gram. Sic. 19 (non Lam.).

*P. Daltoni* Parl. ex Webb in Hooker Niger Fl. (1841) 185.

*P. equitans* Hochst. ex A. Rich. Tent. FL Abyss. II (1851) 365.

*P. Crus-Galli* var. *colonus* Coss. Glum. Expl. Alger. 28.

*P. Petiveri* Kotsch. ex Griseb. I.e. (non Trin.).

**Vernacular names** : Borur, Pakud, Pacushama, Sawank, Tor, Todia, Jiria.

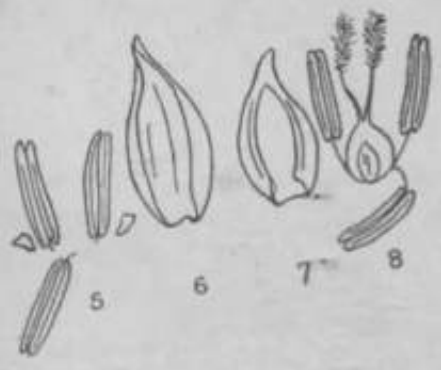
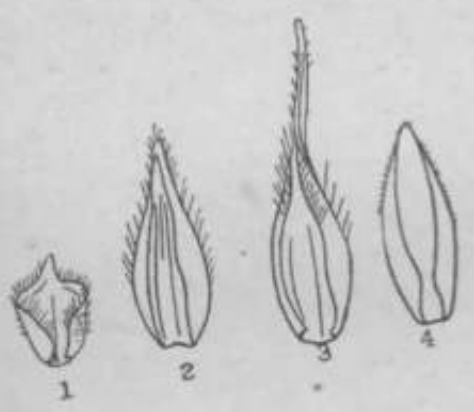
**Etymology** : *Echinochloa* is derived from *echinus*, hedgehog and *chfoa*, grass.—*Colonus* means a cultivator of the ground, colonist.

**Description** : Annual; stem 30-60 cm. long, slender, decumbent or shortly creeping below; nodes glabrous or puberulous. Leaves 10-20 cm. by 4-8 mm., narrowly lanceolate or linear. aenroinate, flat, glabrous, with scaberulous margins; sheaths up to 15 cm. long; ligule C.



ECHINOCHLOA COLONA LINK.

Delin. B. K. BILL.



ECHINOCHLOA CRUS-GALLI P. GRAUV.

Delin: R.

Spikes 8-20, suberect, usually distant, 1-3-2-5 cm. long; rhachis stout, angular, scaberulous on the angles. Spikelets 2-2-5 nun. long, globose ovoid, acute or subcuspidate, more or less hispidly pubescent, secund, sessile, 3-5-seriate. Glumes 4; lower involucral glume about half as long as the lower floral glume, broadly ovate or suborbicular, membranous, 3-nerved, ciliolate; upper involucral glume about equal to the lower floral glume, broadly ovate, cuspidate, concave, 5-7-nerved, hairy; lower floral glume similar, empty, with a hyaline palea; upper floral glume coriaceous, broadly ovate, turgid, acute, finely striolate, polished, yellowish white, with a coriaceous palea.

**Locality** : *Sind*: (Blatter!); Karachi (Nankad!); Mirpurkhas (Bhide!, Sabnis B1176!); Larkana, barren plains (Sabnis B93 ! B95 ! B457 !); Sanghar (Sabnis B894 ! B899 !); Nasarpur, clayey soil (Sabnis B1048!); Mirva Canal, Khairpur Mirs (Sabnis B263!); Khairpur Mirs (Sabnis B337!); Sehwan to Laid (Sabnis B63!); Hyderabad (Sabnis B49!); Pad-Idan (Sabnis B516!); Chuar Ch. (Blatter & McCann D616! D621!); Baghar (Blatter & McCann D617!); Mirpur Sakro (Blatter & McCann D618! D620!); Ghulamalla (Blatter & McCann D619 !); Shikarpur (Woodrow).

*Cutch*: Anjor, brackish water (Blatter 3743 !).

*Gujarat*: Lasandra (Chibber !); Ahmedabad (Cowper !).

*Kathiawar*: Morvi (Woodrow).

*Khandesh*: Muravat, Tapti bank (Blatter & Hallberg 4435!); Bor, Tapti Island (Blatter & Hallberg 4439!) ; Dadgaum (McCann A104!); N. slope of Chanseli (McCann A105!).

*Korikan* : Bombay, salt swamps (Woodrow !); Vetora (Sabnis 33589 !); Bombay, Charni Koad (Sabnis 4292!); Bombay, very common (McCann!); Alibag, rice-fields (Ezekiel!).

*W. Ghats*: Igatpuri (Blatter & Hallberg 5478!, McCann 4331!); Khandala, very common (McCann A101!) ; Castle Rock (McCann A106!); Londa (Woodrow).

*Deccan*: Purandhar Fort (Bhide!, McCann 5520!); Nira Canal, Poona Dist. (Chibber !); Sholapur (D'Almeida A102 !); Deolali (Blatter A103 !); Poona, canal (Ezekiel!).

*S. M. Country*: Dharwar (Sedgwick 2655 !).

*N. Kanara* : Dongi Nallah (Talbot!); Karwar (Talbot 614 !).

**Ecology** : This grass is commonly found in rich cultivated fields and on the banks of fields after the crops have been cut away. Afterwards it sometimes occupies the whole field.

**Distribution** : Throughout the plains of India, Ceylon, all over the tropics and the warm temperate regions of the world. Probably of African and Indian origin according to Stapf.

**Economic uses** : The grain is used for food by the poorer people. The grass is considered one of the best grasses in India. Before and after flowering it is greedily eaten by all kinds of cattle.

**Explanation of Plate 94** : *Echinochloa colona* Link.

1. Spikelet and part of rhachis.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume and palea.
5. Upper floral glume.
6. Palea of upper floral glume.
7. Stamens, grain, styles and lodicules.

\*VAR. FRUMENTACEA BLATTER & MCCANN.

*Echinochloa cohtia* var. *frumentacea* Blatter & McCann in Joura. Bomb. Nat. Hist. Soc. 32 (1928) 647.

*Echinochloa frumentacea* Link Hort. Berol. I, 204; Aitchis. Cat. Panjab PL (1869) 161.

*Panicum frumentaceum* Roxb. Fl. Ind. I (1832) 304; Schult. Mant. II, 230; Trin. Sp. Gram. Ic. t. 164; Duthie Grasses N. W. Ind. (1883) 4, Field & Gard. Crops 3, t. 24, Fodder Grasses N. Ind. (1888) 8.

*P. Crus-GaUi* var. *frumentaceum* Trim. Cat. Ceyl. PL (1885) 104.

*Echinochloa Crus-Galli* var. *frumentacea* Haines in Bot. Bih. and Or. (1924) 998.

*Panicum stagninum* Retz. var. *frumentacea* Cooke in Cooke Fl. Bomb. II (1908) 931.

*Oplismenus frumentaceus* Kunth Rev. Gram. I (1829) 45, Enum. P!. I (1838) 146; Dalz. & Gibs. Bomb. FL Suppl. (1861) 98.

Stapf is of opinion that *Panicum frumentaceum* Roxb. is evidently descended from *Echinochloa colona*.

**Vernacular names** : shamula, Sawan, Shama, Samuka, 3uma, Sanwak, Sann saron, Bavto, Same, Saw<.

Etymology : *Frumenlaceum* is derived from *frumen!*Jin. **produce**, especially of tht various kinds of cereals, **hence com**, pram.

**Description** : **Tafl**, *robust*. **Stems** erect, from 'W-120 cm. high.

Panicle often nodding. Spikes secund, **incurred**, crowded. Spikelets mostly 3-jiate, uieijiuiv pedicelled. one at leawt sessile, varying from lupidulous to almost glabrous, nud from acute to rupidubtp. or rarely distinctly cuspidate.

Locality : Cultivated in aud near the Ghat distrk t-.

Ecology : It ^rows rapidly, coming to maturn y 6 weeks after sown<}; In K, India it is cultivated as a riiuv season crop, mostly nest and at low elevations on the hills.

Distribution : Cull i ated over I lie greater part of India, on the Himalaya up to 6G00 ft.

Economic **uses** : The grain js eaten chiefly by the poorer classes. It is eaten eithe boiled iu milk, or parched. In the Himalayas the ears are first cut, and the stalk? aftmrside given to cattle (Duthie).

2. ScffKOCBLOA **CBCS-GALLI** P. Beauv,

PLATE 8S.

*EchinocMo* *Cnts-Galli* P. Beauv. Agrost. (1812) 161 ; T. Sees Gen. FJ. Germ. Monocot, I, t. 21 ; Eichetib. **Io. Bl Serm. I, t. ∞. fig. 1411, 1412**; Hitchc. ia Contr. U. S. Nat. Herb. SH, 213 ; St. ∞ in FL Trop. Afr. IS (1920) 610; Hnine Bot. Bih. and Or. (1924) 998.

*E. eommutata*, Sdiuli. **Kant**, II, 267,

*E. hixpidida* Nees iu **Boyto** III. **Bot.** Himal. 416 ; Dalz. & Giba, Fl. Bomb. Suppl. (1861) 98,

*Panicum Cfw-GaM* Linn. Sp. PL ed. I, 56; FL Dan. t. 1564; Host Gram. Austr. II, 15, 11); Knapp Gram. Brit. XI; Trin. Sp. Gram. **ic.** t. 161, 182; **Nees EL Afr. Austr.** (ISfl) 58; Steud. *fiya*. PL Glum. I (1855) 47 ; Bcnth. FL Austr. VII (1878) 479 (*partim*); Dutbit List **Grata S. W.** Ind. (1883) 3 (jxwtfw) t. A. fig. 1; Boies. **FL Or. V** (18H) i36 ; Hook, f. FL Brit. Ind. VII (1896) 30 (*partifn*); Stapf ic Dyer FL Cap. VII, 397.

*P. lta*; *i(hun F<nst.* Prodr. 7 ; Nees Agrost. Bras, 257.

*P. h >pidukm Sets*, i fe. V (1791) 18; Lam, III. I, 171; Eosb. FL Ind. I (1832) 303; Nees Fl. Afr. Austr. (1841) 57 ; Jtoyle L c. 420; Stend. Syn. PL Gluu. I (1855) 47.

*P. ortfuumt* Gmel. Syst. I, **187**.

*P. tUagninum* Host. Gram. Austr. III, t. 51 (*rum Retz.*).

*P. Hotta Uaneh.* Bieberat. Fl. T»ure>-Cauc. **III, 57**.

*P. hm saum Pral ex Nees* Agroat. Brns. 267.

*Milium Crus-Galli Mo* **ttch** Mvtli. (1795)202.

*Oplismenus Crus-GaUi* Damort. Agrost. Belg.; Kunth Rev, Gram. I (182!) 44, *el* Euuiu. I (1838) 143 (*exl. si/ii. P. tonale*).

*i. li, no#M* Presl Bel. Haenk. I (1830) 331 ; Kinitii Emmi, I, 1M.

*Orthopogon • fus-GaRi* Spreng. Syst, I (1828) 307.

*O. JifJ-ii* Spreng. I. c.

Vernacular names : Bovar, Pacad, Sarvucik.

Etymology : **Cnt** means a leg, *Galli* nvrail of a cock.

Description : Annual, up to 1 m. high. : stems get **jenlately ascendiog**, Immched below, compress•d towards the base, glnbroia and smooth, interctodes enclosed or wserted. Leaf-blades linear, base scarcely narrowed, narrowed to an wute point. **I JO** om, by 6 to o\*-er 12 muu, **flat, subBacid**, glabrous, more or less dull greyish-green, smooth or seaberulous belnw. **particul.**;•ly toward is the tip, maTginB finely **cartilaginous, so&brid, to almost onooth**. **Sb** atha

at loose, the lower often :

smooth, glabrous and at mt above n. Ligules

0, junction

Leles erect, stric.

scabrid

or 2-nate, sub:

or less approximate

many-ranked :

except

2-5-6-2

sessile false spikes; rachis

stly, particularly near the

BOmcwl

ompresBed, whitish nud tliin. the ujper subherbaceous, all

riatc]except the basw l which **am pubua** **theirmsartio**

**nf blade anil alheatil glabrona inside** marked by a **brown sons**.

**Pw** : • nr **Baxtonis, ai lesgtli exserted, 7\*6-20 em**, Inng; axis triquetrous

i ; branches few to **afibut. ID, wolitar-** „ect or spreading, distjinr

the uppermost cr all more ujnuuiij; 11 'lobed' panicle, the iower

cm. lonj!, forming rather stout **dense mceitlj** **ample nr saboomposite** sitbsecatid

**I dqaetcouc, scabrid, coarsely bri**

**pedicels faecu I** y shurt, up to 1 mm. lonp, scabri-l. ta

discoïd. Spikelets **crowd** outline, a **or ;lvtit-il**

Led **wiiti purple. Lovrei involncra]** glutus membranouB.

rvwi, scabi

**obkmg, concave, acuv-**

v) M

the spit'

**I, rigidly pnfaoent h**

**iBeabridand**

**Hikr to the upper ravoluoral "lumc, but flat or dcpreaswl ojiT**

.. cuujjitate or m)

tip). F<sup>10</sup>jl \*Uil.ttc sii

•w••• 7L>••



hermaphrodite, elliptic-ovate in outline, cuspidate, over 2 mm. long, whitish or yellowish, polished, glume and palea subcoriaceous. Anthers oblong. Grain broad-elliptic in outline, 1-5 mm. long.

**Locality** : *Sind*: Mirpurkhas (Bhide !); GhulamaUa (Blatter & McCann D613!); Keti (Blatter & McCann D614 !).

*Gujarat*: Stream near Prantij (Sedgwick!); the Bokh, Prantij Taluka (Sedgwick 1144!).

*Deccan*: Poona (Woodrow !).

8. *M. Country*: Aluarar, 2,000 ft., rainfall 35 in. (Sedgwick 3096!) ; Bidi, 2,500 ft., rainfall 50 in. (Sedgwick 3076 !).

*N. Kanara*: Halyal (Talbot 2167 !).

**Ecology** : A sporadic species. Very common in marshes in the Mallad tract of the Car- i atic. Grows on the borders of rice-lands and rich moist places.

**Distribution** : Common through the greater part of India and Malaya; as a weed through- out the warm temperate countries of the northern hemisphere, rather rare in the tropics of Africa and the New World and south of the tropic of Capricorn: (Stapf).

**Economic uses** : The grain is used as food by the lower classes. The grass when young is liked by cattle, especially by buffaloes.

See Duthie Fodder Grasses N. Ind. 6; Vasey Agric. Grasses Unit. States, ed. II, 27 ; Maiden Man. Grasses N. S. Wales, 38-41; Yearbook U. S. Dept. Agric. (1902) 580-582.

**Explanation of Plate 95** : *Echinochloa Crus-Galli* P. Beauv.

1. Lower invol. glume.
2. Upper invol. glume.
3. Lower floral glume.
4. Palea of lower floral glume.
5. Stamens and lodicules.
6. Upper floral glume.
7. Palea of upper floral glume.
8. Stamens, ovary and styles.
9. Spikelets.

### 3. ECHINÓCHLOA STAGNINA Beauv.

*Echinochloa stagnina* P. Beauv. Agrost. (1812) 161; Stapf in FL Trop. Air. (1920) 617.

*E. scabra* Roem. & Schult. Syst. II, 479.

*Panicum stagninum* Eetz. Obs. V (1789) 17; Roxb. 71. Ind. I (1832) 295; Grah. Cat. Bomb. PI. (1839) 237 ; Nees Agrost. Bras. 261; Trin. Pan. Gen. 128, *et* in H6m. Acad. P6tersb. 6me s6r. III, 216 ; Steud. Syn. PL Glum. I (1855) 47 ; Stapf in Dyer FL Cap. VII, 394; Cooke Fl. Bomb. II (1908) 930.

*P. scabrum* Lam. III. I, 171, *et* Encycl. IV, 744; Nees 1. c.; Steud. 1. c.

*P. Galli* Thunb. Prodr. (1784) 18, *et* FL Cap. ed. I, 389, ed. Schult. 103.

*P. Crus-GaUi* Woodrow in Journ. Bomb. Nat. BEst. Soc. XIII (1901) 433 (*non* Linn).

*P. Crus-Galli* var. *stagninum* Fenzl. in Ind. Sem. Hort. Berol. 1850; Hook. f. in Trim. FJ. Ceyl. V, 136 ; Prain Beng. PL 1174.

*P. Crus-GaUi* vars. *maximum*, *submuticum* *et* *leiostachyum* Franch. Contr. FL Congo Franc. in Bull. Soc. Hist. Nat. Autun VIII, 347.

*P. pictum* Nees FL Air. Austr. 59 (1841) (*non* Agrost. Bras.).

*P. Burgu* A. Cheval. in Rev. Cult. Colon. VII, 513-520.

*P. Lelievrei* A. Cheval. 1. c. 516.

*P. oryzetorum* A. Cheval. 1. c.

*Orthopogon stagninus* Spreng. Syst. I (1825) 307.

*Oplismenus stagninus* Kunth Rev. Gram. I (1829) 44, *et* Enum. I (1838) 144 (*partim*); Dalz. & Gibs. Fl. Bomb. (1861) 292.

*O. scaber* Kunth Rev. Gram. 1. c. 44, Enum. 1. c. 145.

**Vernacular name** : Banti.

**Etymology** : *Stagnina* is the adjective formed from *stagnus*, pond.

**Description** : Annual or perennial; root-fibres many, long, wiry, with numerous fili- form rootlets; stem erect from a geniculate or prostrate base, reaching 1-5 m. (or more) long, sometimes rooting from the lower nodes. Leaves 15-45 cm. by 3-13 mm., linear, tapering to a fine point; sheaths striate, smooth, glabrous ; ligule a fringe of stiff hairs.

Panicle 10-20 cm, long; rhachis slender, more or less flexuous, angular, grooved, scabrid on the ridges and with scattered bristles; branches few or many, distant or close, alternate, usually suberect, 2-5-5 cm. long, sessile or nearly so with a tuft of hairs at the base; rhachis of the branches angular, grooved, clothed sparingly with bulbous-based hairs. Spikelets crown-

ed, ovoid-lanceolate, 4-5 mm. long (excluding the **aim**), hairy with bulbous-based hairs, pale; lower glumes very short with enlarged tips. Glumes 4; lower involucral 20 mm. long (half as long as the spikelet), broadly ovate or suborbicular, cuspidate, 5-nerved, lustrous and glabrous, thin, with green nerves, acuminate or produced into a short compressed scabrid awn; lower glume like the upper involucral glume with an awn varying from 1 to 2 cm. long, pale, the palea hyaline, as long as the glume; upper floral glume 1 mm. long, ovate-lanceolate, mucronate, straw-coloured, shining, faintly striate, with involute margins, coriaceous; **pslea** up to 1 cm. long as the **lignum**. **Stem** oblong, acute, striate, with reflexed margins.

The *knives* are marked with purple bands which occasionally disappear in dried specimens.

**Locality** : *Smd*: Gtalamaffi (Blatter & McCann D615!).

*Knithitt*: Vimr. on bank of a tank (SkCanu 9531 1958!).

**W. Ghat**: Igatpuri (Blatter & Hafberg 6478!); Kliandala. in water in the smaller village tank (McOami 2744!) ; Panohgani (Blatter & Hafberg B1^1!).

*S. M. Cou-*; Hullop, 2,000 ft., rainfall 50 in. (Sedgwick 3175!) • Cliikkerur, Talaska Kod, water hole by road (Sedgwick 1909!) ; Unnijutti, tank; Sedgwick 3830! ; common in the Carnatic (Sedgwick).

**V. Kanara** : Furdham (Talbot 3130!).

**Ecology** : This grass is commonly found in small stagnant (non-artificial) on the banks of lakes and tanks. Very common in marshes in the Carnatic.

**Distribution** : More or less throughout India, Ceylon, tropical and S. Africa.

**Economic uses** : Considering tropical African conditions Stapf observes (L c 619): "This grass attracts every attention on account of its locally abundant supply and high sugar-content. Chevalier . . . . . It is the most useful of all the plants growing in a wild state in the neighbourhood of Timbuctu. Every part of it is utilised. It yields excellent fodder, material for thatching and caulking, is turned to produce a stilt used in the manufacture of soap and, in the end, the grains are eaten. . . . and the leaves are gathered for extracting oil or pre-paring a beverage resembling beer. Sir John Kirk also describes it as one of the best of fodder grasses. Although usually a perennial with long rhizomes creeping in the mud of swamps, lakes and rivers, it seems to temporarily flooded land to flower frequently the first year found then to behave as an annual."

## 52. OFUSMBNI s Beauv.

Slender leafy grasses; stems creeping below; branches ascending. Leaves ovate-lanceolate, acuminate, thin, flat; margins scabrous, base narrow, auricled on the side; ligule a ridge of long hairs.

Spikes solitary or 2-nate, disarticulating at the base, in small dense panicles or in spike-like more or less second whorls along a common axis; Millie; etc., awned. Glumes 4; involucral glumes similar, more or less subequal, herbaceous to woody, 3-nerved, both usually with straight awns; lower floral glume resembles the upper involucral glume, 5-9-nerved, empty, mucous or very shortly awned, with or without a hyaline 2-nerved or more or less reduced palea; upper floral glume 2-sexual, as long as or shorter than the lower, chartaceous to coriaceous, 5-7-nerved, mucous; palea of similar texture, about equal to the glume, 2-nerved. Lodicules 2, imbricate, enate. Stamens 3. Styles distinct, long; stigmas exserted at the top of the glume, [the **oblong** elliptical, free within the hardened glume].

• Lies about 16.—If the world, but mostly tropical.

1. A tall branching grass; awns stout, smooth, obtuse . . . . . 1. *O. mmpofitus*.
2. A small diffuse grass; awns capitate, scabrous . . . . . 2. *O. Burnanrii*.

I. IJPLHJEXUS coi[PosiTi];s P. Beauv.

## PLATE W.

*Oplismenus compositus* P. Beauv. *Agrost.* (1812) 54; *Duthie Grasses N. w. III.* (1863) 81; *Hort.* J. N. Brit. End. 13; (1896) 66; *Lisboa Bot.* (1896) 27; *Choke*; *Bomb.* (1909) 91; *H.* H. Bot. II. ii. and Or. (1921) 101; *H.* Stapf in *Fl. Trop. Afr.* IX (1920) 6M.

*O. riatar* F. *Bot.* & *T.* 54, 16c.

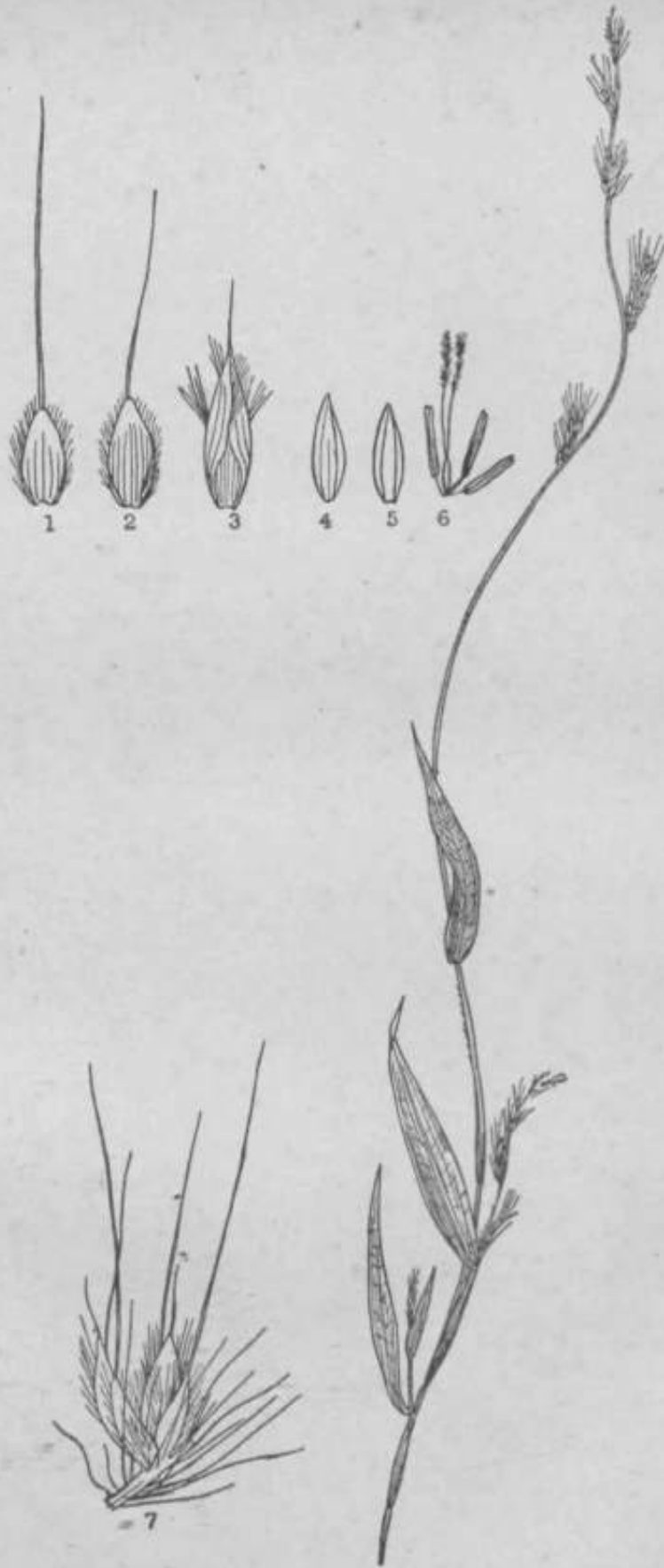
*O. indicus* Willd. in *Act. Acad. Nat. Cur.* IV. 22\*.

*O. sylvaticus* Roem. & Schntt *Syst.* II. 1817: 481.



0PLI8MEH1 B OOMPOSJTUS P. in: Ai V

Prlin: V. K. JIhiHr.



OPLISMENUS in IMMANIUM m: rV

Delis: B. K. Bide.

- O. pratensis* Schult. Mant. II, 597.  
*O. Jacquini* Kunth Rév. Gram. I (1829) 14 ; Enum. PL I (1838) 140.  
*O. lanceolatus* Kunth II. cc. 45, 146 ; Dalz. & Gibs. Bomb. Fl. (1861) 292.  
*O. decompositus* Nees in Endl. Prodr. Fl. Norfolk (1833) 19.  
*O. africanus* Wood Natal Pl. t. 165.  
*Panicum compositum* Linn. Sp. PL (1753) 57.  
*P. datius* Linn. f. Suppl. (1781) 107.  
*P. aristatum* Retz. Obs. IV (1786) 17.  
*P. fanceohtum* Retz. Obs. V (1789) 17 ; Roxb. Fl. Ind. I (1832) 294.  
*P. sylvaticum* Lam. Encycl. IV, 733 ; Trin. Gram. Ic. et Descr. t. 190, fig. A.  
*P. compositum proximum* Rottl. in Gesellsch. Naturf. Fr. Neue Schr. IV (1804) 224.  
*P. peninsulanum, certificandum, longeracemosum, undatum, bidentatum* Steud, Syn Fl. Glum. I (1855) 44, 45.  
*Andropogon undatus* Jacq. Coll. III, 237, and Ic. PL Rar. III, t. 631.  
*Orthopogon compo&itus* R. Br. Prodr. (1810) 194.  
*O. remotus* Trin. Fund. Agrost. (1820) 181.  
*O. pratensis* Spreng. Syst. Veg. I (1825) 306.  
*O. Junghuhnii, longeracemosus, sylvaticus* Miq. PL Ind. Bat. III, 343.  
*Echinochloa lanceolate* Roem. & Schult. Syst. II, 476.  
*Digitaria composita* Willd. Enum. Berol. I, 91.

**Vernacular names** : Turdia, Shora.

**Etymology** : *Oplismenus* is derived from *hoplismeno89*, being armed, alluding to the awns.

**Description** : A tall blanching grass; stems 30-90 cm. long, slender, branched, and creeping below; branches ascending, leafy, rooting from the lower nodes. Leaves variable, 5-15 cm. by 13-20 mm. ovate to ovate-lanceolate, acuminate, thin, flat, glabrous or hairy, base narrow, auricled on one side; sheaths glabrous or pubescent, with ciliate margins.

Panicle 7\*5-25 cm. long; peduncle long or short; branches of panicle usually distant, 2\*5-7-5 cm. long; rhachis glabrous or pubescent, angular, grooved. Spikelets distant, 4 mm. long (excluding the awn), lanceolate-ellipsoid, green; pedicels very short, often with a tuft of hairs at the base. Glumes 4 ; lower involucral glume ovate-lanceolate, acuminate 2-5 mm. long (without the awn, which is about 5 mm. (or more) long and truncate at the apex, glabrous, often purple), 5-nerved, membranous; upper involucral glume 3 mm. long (including a short mucro or awn), rather broader than the lower involucral glume, 5-7-nerved, membranous; lower floral glume, 4 mm. long, membranous, broadly ovate, subacute, the midrib prolonged behind into a very short apiculation, 7-9-nerved with a very narrow palea ; upper floral glume shorter than the lower, ovate-oblong, acute, coriaceous, smooth, shining with incurved margins ; palea oblong, acute, with strongly involute margins.

**Locality** : *Khandesh*: Toranmal (McCann 9593!).

*Konkan*: At the foot of the Ghats under the shade of trees (Dalzell & Gibson); Bassein (Ghibber 164 !); Eanari Caves (McCann 9445 !); Sion, woods (Blatter 95911); Than\* (Lisboa).

*W. Ghats* : Igatpuri (McCann 4342 !); Matheran, to Louisa Point (D'Almeida A244!; Woodrow) ; Khandala, common in forests (McCann 5335!) ; Lonavla (Lisboa); Panchgani, Tiger path (Blatter & Hallberg B1253!); Castle Rock (Bhide!, McCann I) ; Londa (Woodrow!).

*S. M. Country*: Forests west of Dharwar (Sedgwick & Bell 1£53 i); Bidi, shade of trees (Sedgwick & Bell 2962 !).

*N. Kanara*: Yellapur (Talbot 736 !); Karwar (Talbot 1322 !); Goond (Talbot 2204!); Amshi Ghat (Talbot 2192 !); Kadgai (Woodrow).

**Ecology** \* Grows generally under the shade of tree\*. Very common in and near forest of the Carnatic and N. Kanara.

**Distribution** : Throughout India, Ceylon, tropical and subtropical Asia, Africa, Australia and Polynesia.

**Economic uses** : Roxburgh says that cattle are not fond of the **gras**\*.

**Explanation of Plate 96** : *Oplismenus compositus* P. Beauv.

1. Lower invol. glume.
2. Upper invol. glume.
3. Lower floral glume.
4. Palea of lower floral glume.
5. Upper floral glume.
6. Palea of upper floral glume.
7. Grain.
8. Spikelets.

## 2. OPLISMENUS BURMANNII P. Beauv. .

## PLATE 97.

*Oplismenus Burmannii* Beauv. Agrost. (1812) 54 ; Dalz. & Gibs. Bomb. Fl. (1861) 291 ; Duthie Grasses N. W. Ind. (1883) 8, 111. Indig. Fodder Grasses (1886) t. 47, Fodder Grasses N. Ind. (1888) 13 ; Hook. f. Fl. Brit. Ind. VII (1896) 68 ; Lisboa Bomb. Grasses (1896) 27 ; Cooke FL Bomb. II (1908) 927 ; Haines Bot. Bib. and Or. (1924) 999 ; Stapf in Fl. Trop. Afr. IX, 636.

*O. Burmannii* var. *albidulum* N. E. Br. in Gard. Chron. XXVI (1886) 776.

*O. albus* Boem. & Schult. Syst. II, 890.

*O. bromoides* P. Beauv. l. o.

*O. humboldtianus* Nees. Agrost. Bras. 264.

*O. cristatus* Presl Eel. Haenk. I (1830) 223 ; Hitohc. in Contr. U. S. Nat. Herb. XVII, 255.

*O. affinis* Presl l. c.

*O. Preslei* Kunth Enum. I (1838) 140.

*O. indicus* Duthie Grasses N. W. Ind. (1883) 8 (*non* Roem. & Schult.).

*O. africanus* Rendle in Cat. Afr. PI. Welw. II, 184.

*Fanicum Burmanni* Retz. Obs. III (1783) 16 ; Roxb. Fl. Ind. I (1832) 295.

*T. bromoides* Lam. HI. I, 170.

*P. hirtellum* N. L. Burm. Fl. Ind. t. 12, fig. 1 (*non* Linn.).

*Uisectum* Hochst. ex A. Rich. Tent. Fl. Abyss. II (1851) 377.

*JP. japonicum* Steud. in Flora (1846) 18.

*Orthopogon albus* Nees ex Steud. Syn. PI. Glum. I (1855) 14.

*O. Burmanni* Miq. Fl. Ind. Bat. III, 442.

**Vernacular names** : Kudak, Yerwa.

**Etymology** : R. L. Burmann (1707-1780) was a Dutch professor of Botany; he wrote a Flora Indica in 1768.

**Description** : A very slender diffusely branched leafy grass ; stem 15-45 cm. long; nodes glabrous or hairy. Leaves 2-5 cm. by 6-13 mm., ovate, or ovate-lanceolate, acuminate, sparsely pilose with long slender white hairs; sheaths glabrous or hairy.

Panicle 2\*5-6\*3 cm. long; peduncle slender (almost filiform), usually very long; branches of panicle, spike-like, few, distant, subsessile, 4-20 mm. long; rachis slender, angular, clothed with long slender white hairs nearly as long as the spikelets. Spikelets 2\*5 mm. long (excluding the awns), secund, solitary or 2-nate; pedicels short, hairy. Glumes 4; lower involucral glume 1\*6 mm. long (excluding the acute scaberulous capillary awn which reaches 8 mm. long), ovate, obtuse, 3-5-nerved, hyaline, silky-hairy and ciliate; upper involucral glume similar and subequal to the lower, 5-nerved, with an awn reaching 5 mm. long; lower floral glume reaching 2\*5 mm. long (excluding an awn of about 1\*2 mm. long), broadly ovate, subobtuse, concave, hyaline, silky-hairy, and ciliate, 7-9-nerved, empty, epaleate; upper floral glume as long as the lower, ovate, acute, membranous, with incurved margins; palea as long as the glume, membranous, ovate-oblong, acute, with strongly involute margins.

**Locality** : *Gujarat*: Surat, shady places (Sedgwick 314!).

*Konhan*: Versova (McCann 4313 !); Alibag, sandy shore, on the roots of coconut trees (Ezekiel!); Bombay Isl. (McCann!); Parel (Herb. Dehra Dun !, Woodrow).

*W. Ghats* : Igatpuri (McCann 1); Khandala, very common, forming carpets under trees (McCann 9592!); Lonavla (McCann 3898!); Panchgani (Woodrow); Castle Rock (Gammie 15696 !); Londa (Gammie 15826 !).

*Deccan*: Chakan (Gammie !j).

*S. M. Country*: S. W. of Dharwar (Sedgwick & Bell 4438 !); Dharwar, shade of trees (Sedgwick 1837 !).

*N. Kanara*: Halyal (Talbot 2085 !); Karwar (Talbot 1295 !).

**Ecology** : Grows chiefly under the shade of trees and in cultivated ground in the plains or at low elevations on the hills.

**Distribution** : Widely distributed throughout the tropics of both hemispheres.

**Economic uses** : According to Duthie cattle eat this grass with relish, while it is young. It makes good hay.

**Explanation of Plate 97** : *Oplismenus Burmannii* P. Beauv.

1. Lower in vol. glume.
2. Upper invol. glume.
3. Lower floral glume.
4. Upper floral glume.
5. Palea of upper floral glume.
6. Stamens, ovary and styles.
7. Spikelets.

## 53. HYMENACHNE Beauv.

Bather stout grasses. Leaves broadly linear.

Panicles thyrsoid, branches erect, appressed with spiciform branchlets and very numerous crowded narrowly lanceolate acuminate secund spikelets, articulate on their minute pedicels. Lower involucral glume cuspidate, keeled, membranous, shortest, upper with sheathing amplexicaul base on the long internode of the rachilla between it and the lower floral glume, prominently 3-nerved, cuspidate or awned. Lower floral glume longest, lanceolate-acuminate, passing gradually into the awn, with 3 strong nerves meeting in the base of the awn and 2 lateral weaker ones, empty; upper longer than upper involucral glume, oblong, membranous in flower, scarcely hardened in fruit, smooth, faintly 2-nerved, embracing the palea except at the tip, palea similar and as long. Lodicules minute. Stamens 3. Styles free.

Species 7 or 8.—Tropics and subtropics, mostly American.

This genus is not represented in Cooke. The following species is described in the Fl. Brit. Ind. under *Panicum myurus* H. B. & K.

## 1. HYMENACHNE MYUROS Beauv.

*Hymenachne myuros* Beauv. Agrost. (1812) 49, t. 10, fig. 8 (*exd. syn.* Lam.); Nees Agrost. Bras. 275; Griseb. Fl. Brit. West Ind. (1864) 553 (*exd. syn.*); Steud. Syn. PL Glum. (1855) 78; Haines Bot. Bih. and Or. (1924) 991.

*Panicum myurus* H. B. & K. Nov. Gen et Sp. I, 98 (*exd. syn.* Lam.); Kunth Rev. Gram. I (1829) 33, Enum. Fl. I (1838) 86, Suppl. 65; Duthie Fodder Grasses N. Ind. (1888) 10 (*exd. syn.*); Benth. Fl. Austral. VII (1878) 480 (*exd. syn. interruptum*). (*Exd. in omnibus syn.* Lam., Rudge, Richard, Trin.); Hook, f. Fl. Brit. Ind. (1896) VII, 39.

*P. acutiglumum* Steud. Syn. PL Glum. (1855) 66.

*P. auritum* Hassk. PI. Rar. Jav. (1848) 22 (*non Presl*).

*P. Hassharlii* Steud. in Zoll. Syst. Verz. 54, Syn. Gram. 70; Miq. Fl. Ind. Bat. III, 456.

*P. myurum* Meyer Fl. Esseg. 50 (*exd. syn.* Lam. & Rudge).

*P. mangahricum* Steud. l. c. 78.

*P. serrulatum* Roxb. Fl. Ind. I (1832) 307; Kunth Enum. PL I (1838) 126.

*Agrostis monostachys* Poir. Encycl. Suppl. I, 256, *ex* Kunth l. c.

**Vernacular name** : Pokalia.

**Etymology** : *Hymenachne* is derived from the Greek *hymen*, a membrane, and *achna*, chaff, husk.

**Description** : Culm stout, tail, 0.6-1.8 m. high, spongy below, rooting at the nodes of the prostrate base, erect, leafy. Leaves 20-50 cm. by 18-25 mm., flat, tapering from a broad cordate base to a fine point, margin serrulate; sheath smooth, glabrous or ciliate; ligule very short, rounded, hyaline.

Panicle very dense, narrow, very compound with closely appressed branches, 15-30 cm. long, rarely 25 mm. diam, often interrupted, sometimes quite cylindrical. Spikelets variously grouped, shortly and unequally pedicelled, secund on the erect branches of the panicle, 4-6 mm. long, narrowly lanceolate, pale green. Lower involucral glume J of the lower floral glume, narrow from an amplexicaul base, aristulate, hispidulous on keel and cusp; upper narrowly lanceolate, subaristate, hispidulous, 3-nerved. Lower floral glume much longer than upper involucral glume, narrowly lanceolate, gradually tapering into the awn as long as spikelet, strongly 3-nerved, hispidulous on nerves, palea imperfect or 0; upper small, thin, narrow, finely acuminate, almost embraced by the lower, shorter than the upper involucral glume, enclosing its palea on the edges. Styles distinct.

**Locality** : *S. M. Country*: Tadas, tanks, 2,000 ft., rainfall 35 in. (Sedgwick & Bell 4917 !).

**Ecology** : This is a gregarious species. Grows in marshy places and damp ravines. Found in forest tanks in the Mallad tract of the Garnatic.

**Distribution** : Tropical Asia, Australia and America.

**Economic uses** : Not a good fodder grass. In Australia considered to be nutritious to cattle.

54. PANICUM Tinn.

Annual or perennial grasses, rarely suffrutescent, of various habit and size. Leaves mostly linear to linear-lanceolate, but also ovate or filiform to subulate. Ligules usually reduced to a ciliate rim or a fringe of hairs, rarely a distinct membrane or 0.

Panicles usually much divided and at least temporarily open. Spikelets usually loosely scattered, glabrous or hairy, lanceolate to oblong, elliptic or orbicular in outline, symmetrical in profile, rarely somewhat oblique, falling entire or almost so from the often elongated pedicels of a compound or decompound panicle, without a definite orientation towards the axis.

Involucral glumes more or less herbaceous-membranous, lower usually shorter than the upper, often very much so, rarely equalling it, usually with 1 or more nerves, or if very small, nerveless; upper as long as the spikelet, rounded on the back, 5-9-nerved. Lower floral glume very similar to the upper involucral glume and equally rounded and curved on the back, 5-9-, rarely 3- or 11-nerved, male or neuter, palea thinly membranous to subhyaline, subequal to the lower floral glume or more or less reduced, rarely suppressed. Upper floral glume subcoriaceous to coriaceous with firm margins, obtuse to subacute, emucronate, faintly nerved, hermaphrodite, palea subequal to the glume and of similar substance, tightly embraced by the more or less involute margins of the glume. Lodicules 2, broadly cuneate. Stamens 3. Styles distinct; stigmas laterally exerted near the tip of the floret. Grain tightly enclosed by the hardened valve and valvule, dorsally compressed, biconvex to almost plano-convex; scutellum elliptic to ovate-elliptic, about half as long as the grain; hilum subbasal, punctiform.

Species about 400.—In the tropical and subtropical regions of both hemispheres, few in the warm-temperate regions.

Cooke mentions 20 indigenous and 4 cultivated species.

Of the 24 species we have put *Panicum flavidum* Retz., *P. punctatum* Burm., and *P. fluitans* under *Paspalidium*.

*Panicum stagninum* Retz. and *P. colonum* Linn, have been transferred to *Echinochloa*.

*Panicum Isachne* Roth, *P. ramosum* Linn, and *P. muticum* Forsk. belong to *Brachiaria*.

*Panicum prostratum* Link., *P. setigerum* Retz., and *P. javanicum* Poir. have been described under *Urochloa*.

*Panicum interruptum* Willd. and *P. myosuroides* will be dealt with under *Sacciolepis*.

*Panicum patens* ~~Trin.~~ will be transferred to *Cyrtococcum*.

New to the Presidency are *P. psilopodium* Trin. and *P. auritum* Presl.

- A. Lower involucral glume as long as the lower floral glume or nearly so. . . . . 1. *P. turgidum*.
- B. Lower involucral glume shorter than the lower floral glume.
- I. Annuals.
1. Leaves less than 12 mm. broad.
- a. Panicle about 35 cm. long . . . . . 2. *P. obscurans*.
- b. Panicle not more than 25 cm. long.
- aa. Spikelets gaping . . . . . 3. *P. trypheron*.
- bb. Spikelets not gaping . . . . . 4. *P. psilopodium*.
2. Leaves more than 12 mm. broad.
- a. Spikelets 4-5-5 mm. long . . . . . 5. *P. miliaceum*.
- b. Spikelets 2-3\*2 mm. long . . . . . 6. *P. miliare*.
- II. Perennials.
1. Lower involucral glumes very minute, one or rarely both often obsolete. . . . . 7. *P. subeglume*.
2. Lower involucral glumes distinctly evident.
- a. Culms up to 3 m. high . . . . . 8. *P. maximum*.
- b. Culms less than 1\*7 m. high.
- aa. Culms not more than 90 cm. high . . . . . 9. *P. jndudosum*.
- bb. Culms more than 90 cm. high.
- + Spikelets laxly clustered on the branches . . . . . 10. *P. antidotale*.
- ++ Spikelets solitary . . . . . 11. *P. montanum*,
- ++ - f Spikelete fascicled, subsecund, sessile or shortly pedicelled 12. *P. auritum*:

#### 1. PANICUM TURGIDUM Forsk.

#### PLATE 98.

*Panicum turgidum* Forsk. Fl. Aegypt.-Arab. (1775) 18; Del. Fl. Egypte (1812) 19, t. 9, fig. 2; Trin. Diss. Gram. Pan. 189, Gram. Icon, and Descr. II, 227, Pan. Gen. 221, and in Mem. Acad. Pflersb. sér. VI, III, 307; Kunth Enum. I (1838) 97; Steud. Syn. PL Glum. I (1855) 88; Boiss. Fl. Or. V (1884) 441; Duthie Fodder Grasses N. Ind. (1888) 13; Balf. f. Bot. Socotra (1888) 310; Hook. f. Fl. Brit. Ind. VII (1896) 44; Stapf in Kew Bull. (1907) 214 \ Muschler Man. Fl. Egypt I (1912) 57; Cooke Fl. Bomb. II (1908) 935; Stapf in Fl. Trop. Afr. IX (1920) 706.

*P. nubicum* Fig. k De Not. in Mem. Ac. Torin. ser. 2, XIV, t. 21, figs. 1-12.

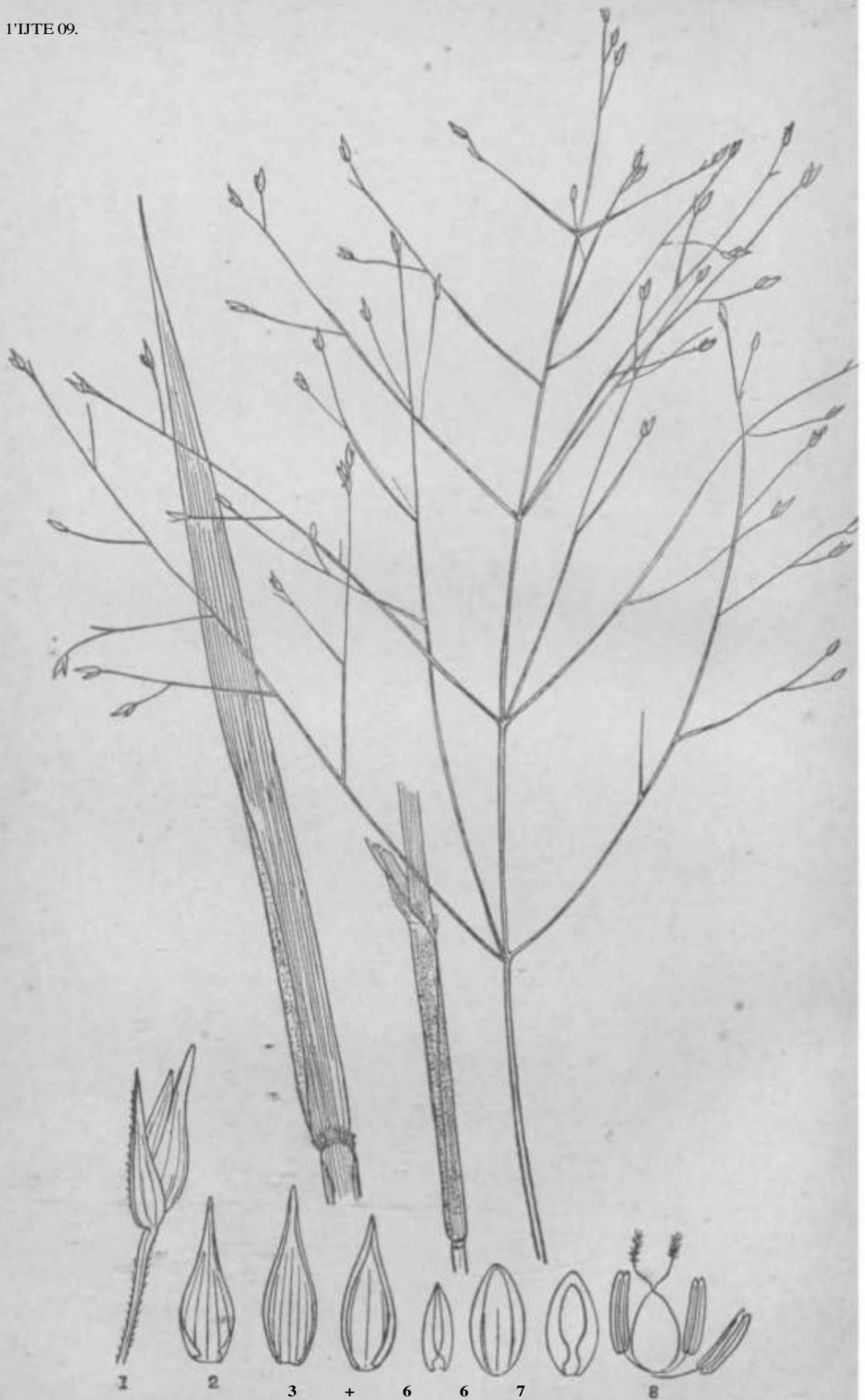
**Etymology** : *Panicum* may have been derived from *panis*, bread, or *panicula*, panicle.—*Turgidum* means turgid, swollen.





PANICUM TURGIDUM KOJISK

Delin: R. K. Bhide.



FAIKTM OISICHANS WOODROW.

**Description** : Perennial, glabrous, glaucous; rootstock sometimes as thick as the little finger; root-fibres thick, velvety; stem hard (bamboo-like), solid, smooth and polished, 2-5-3 mm. diam. about the middle emitting from the nodes fascicles of branches in tufts from a swollen base. Leaves few, those at the base of the stem and branches 2-5-7\*5 mm. long, flat, coriaceous, linear-lanceolate, acuminate, smooth, those of the upper nodes often reduced to open chartaceous sheaths with a setiform blade.

Panicle terminal, subpyramidal, 3-8-10 cm. long; branches at first erect, then more or less spreading, 1\*3-3-8 cm. long; rhachis angular, grooved, glabrous. Spikelets 3-4 mm. long, solitary, or rarely 2-nate, subsecund, ovoid, turgid, glabrous, white; pedicels short or long, -with a cupular tip, scaberulous. Glumes 4, subcoriaceous; lower involucral glume scarcely shorter than the upper, and about equalling the lower floral glume, broadly ovate, acute, concave, 5-7-nerved; upper involucral glume broadly ovate, acute, 7-nerved; lower floral glume ovate, acuminate, 9-nerved, paleate, male; upper floral glume much smaller than the lower, ovate-oblong, acute, smooth, polished. Anthers purple. Styles short; stigmas short, pale purple.

Locality : *Sind*: (Duthie *teste* Cooke); Sehwan, sand-hills (Bhidc!).

*Kathiawar*: Bajkot (Woodrow *teste* Cooke).

**Ecology** : Common on sand-hills of deserts. In pure sand it develops long spongy rootlets 3 mm. thick by means of which it can obtain sufficient moisture.

**Distribution** : Tropical Africa, Egypt, Cyprus, S. Palestine, Arabia, Socotra, S. Persia, Baluchistan, Sind, Gujarat.

Economic uses : In Egypt a kind of bread is made from the grain. An excellent fodder for camels.

**Explanation of Plate 98** : *Panicum turgidum* Forsk.

1. Spikelets.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Palea of lower floral glume.
6. Stamens.
7. Upper floral glume.
8. Palea of upper floral glume.
9. Stamens, ovary, styles and lodicules.

## 2. PANICUM OBSCURANS Woodrow.

### PLATE 99.

*Panicum obscurans* Woodr. in Journ. Bomb. Nat. Hist. Soc. XIII (1901) 434; Cooke Fl. Bomb. II (1908) 935.

*Isachne obscurans* Woodr. in Gard. Chron. 23, ser. 3 (1898) 161.

**Vernacular name**: Tan-sawa.

**Etymology** : *Obscurans* means something that darkens. What it alludes to we are not able to say.

**Description** : Annual; stems tufted, erect or ascending, 30-60 cm. (or more) high; nodes glabrous. Leaves 9-12-5 by 1 cm. at the widest part, lanceolate, acute, with a few scattered hairs above, hispid with bulbous-based hairs below; sheaths closely striate, hispid with short bulbous-based hairs, the margins naked; ligule a tuft of hairs.

Panicle large, 38 by 30 cm., pyramidal, lax; branches of the panicle widely spreading, laxly racemously or subpaniculately branched, each branchlet 1-3-flowered at the apex, naked below; rhachis angular, grooved, scaberulous on the angles. Spikelets distant, solitary, 4-5 mm. long, pedicellate, narrowly ovoid, acuminate. Glumes 4, the 3 lower strongly nerved with green nerves; lower involucral glume 3 mm. long, ovate, acuminate, shorter than the upper, membranous, 5-nerved, the nerves scaberulous; upper involucral glume 4 mm. long, ovate, acuminate, 7-nerved; lower floral glume rather less than 4 mm. long, ovate, acuminate, empty, paleate, the palea half as long as the glume, elliptic-oblong, hyaline, shortly 2-dentate; upper floral glume 2\*5 mm. long, crustaceous, hard, smooth, concave, elliptic, obtuse with incurved margins, yellowish white,<sup>1</sup> very faintly 5-7-nerved; the palea crustaceous, elliptic, obtuse, with incurved margins, as long as the glume.

Stapf says that the tropical African *Panicum hippothrix* K. Schum. is very similar and perhaps identical with *P. obscurans*, but he adds that the blades of the latter are much wider, measuring up to 14 mm. and that the panicle "is perhaps on the whole more open with slightly larger spikelets." (In Fl. Trop. Afr. IX. 699J These are scarcely differences to justify specific distinction, but as we have not seen the African plant, we do not venture to decide the point.

If the identity between the two species should be established, Woodrow's specific name, being<sup>^</sup> of a later date by 4 years, will have to cede to *P. hippothrix*.

**Locality** : *Deccan*: Mangri Farm (Herb. Econ. Bot. Foona!); Jeur, near Sholapur (Woodrow).

**Ecology** : According to Woodrow the whole inflorescence breaks off and is driven about by the wind.

**Distribution** : Endemic.

**Economic uses** : The grain is used as a fast-day food and cooked like rice (Woodrow).

**Explanation of Plate 99** : *Panicum obscurans* Woodr.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Palea of lower floral glume.
6. Upper floral glume.
7. Palea of upper floral glume.
8. Stamens, grain and styles.

### 3. PANICUM TRYPHERON Schult.

*Panicum trypheron* Schult. Mantiss. II (1824) 244; Hook. f. Fl. Brit. Ind. VII (1896) 47; Praia Beng. Pl. 1176; Cooke Fl. Bomb. II (1908) 936; Haines Bot. Bih. and Or. (1924) 995.

*P. miliare* Wall. Cat. no. 8712 (*partim*) E.

*P. mucronatum* Heyne in Wall. Cat. no. 8717 (*partim*).

*P. Neesicwum* Wight & Am. ex Steud. Syn. Pl. Glum. (1855) 74.

*P. Roxburghii* Spreng. Syst. I (1825) 320; Kunth Enum. Pl. I (1838) 126; Steud. 1. c. 98.

*P. tenettuin* Roxb. Fl. Ind. I (1832) 306; Duthie Grasses N. W. Ind. (1883) 7.

Stapf in Fl. Trop. Afr. IX, 712, has separated *P. porphyrrhizos* Steud. from *P. trypheron* Schult. as understood by Hook, f. Fl. Brit. Ind. I. c, and with it all the material covered by the following synonyms : *P. confine* Hochst. ex Steud. Syn. Pl. Glum. I, 72.—*P. jumeniorum* A. Rich. Tent. Fl. Abyss. II, 373 (*non* Jacq.).—*P. trypheron*, therefore, does not occur in tropical Africa.

**Vernacular name** *i* Bhatnr.

**Etymology** : *Trypheron* means delicate.

**Description** : Annual; stems 30-90 cm. high, tufted, erect, or geniculate below, stout or slender, leafy at the base; nodes glabrous; internodes 5-12.5 cm. long. Leaves 7.5-25 cm. by 3-6 mm., usually flat, thin, linear, acuminate, more or less hairy on both surfaces, margins often ciliate, base narrow; sheaths long, glabrous or hairy, the margins often ciliate towards the top; ligule short, fimbriate.

Panicle 10-25 cm. long, often as broad as long, effuse; rachis filiform, slightly bicarinate; branches up to 10 cm. long, capillary. Spikelets 2.5-3 mm. long, very distant, ovoid, acuminate, sometimes with a purple tinge, glabrous; pedicels long or short, filiform. Glumes 4; lower involucre glume about  $\frac{1}{2}$  as long as the lower floral glume, broadly ovate, acuminate, membranous, 5-nerved; upper involucre glume slightly longer than the lower floral glume, ovate, acuminate, 7-9-nerved; lower floral glume similar but shorter, 7-nerved, empty, paleate the palea oblong, obtuse, 2-toothed at the apex, smaller than the glume, hyaline; upper floral glume elliptic, obtuse, dorsally convex, smooth, shining, yellowish white, coriaceous, faintly 5-nerved, the margin very slightly incurved, the palea elliptic, as long as the glume, coriaceous.

**Locality** : *Gujarat*: OIL the Idar Frontier, Prantij Taluka, sandy waste (Sedgwick I).

*Konkan* : Malabar Bill (Lisboa teste Cooke).

*Deccan*: Poona (Woodrow teste Cooke); Jeur (Woodrow teste Cooke); Malhargad (Woodrow teste Cooke).

*S. M. Country*: Dharwar (Garade !); Dharwar, on pasture and dry hills (Sedgwick 6144!).

**Ecology** : Grows on pasture land, borders of cultivated fields and on cultivated land.

**Distribution** : Punjab, Bengal, W. Peninsula, Ceylon, China, Borneo.

### 4. PANICUM PSILOPODIUM Trin.

*Panicum psilopodium* Trin. Gram. Panic. 217; Kunth Enum. Pl. I (1838) 100; Steud. Syn. Pl. Glum. (1855) 83; Aitchis. Cat. Panjab Pl. (1869) 161; Duthie Grasses N. W. Ind. (1883) 6, Field and Gard. Crops I, t. 23, Fodder Grasses N. Ind. (1888) 10 (*in nota*) • Hook' f. Fl. Brit. Ind. VII (1896) 46; Saxton & Sedgwick Plants of N. Gujarat in Rec. Bot. Suiv. Ind. VI (1\*18) SI 2; Haines Bot. «ih. and Or. (1924) 993.

**Vernacular name** : Mordanura.



PANICUM MILIACEUM LINN.

Dolin: H. K. Bhide.

**Etymology** : *Psilopodium* is derived from *psilos*, slight, slender, and *podium*, a foot-stalk or similar support, alluding to the very capillary branches of the panicle.

**Description** : An annual, tufted grass. Culms erect or quickly ascending, 30-60 cm. high, rather slender, simple or branched, usually leafy up to the panicle. Leaves rather broadly linear, acute or somewhat acuminate, 7-30 cm. by 4-8 mm. glabrous or with few short spreading hairs towards the base, rarely thinly hairy all over. Sheaths often with spreading hairs which leave minute raised dots after falling, more usually glabrous, loose, striate. Ligule a narrow row of hairs.

Panicle spreading, 5-20 cm. long, with very capillary branches and slender pedicels which are often 10 mm. long. Spikelets 2-3  $\mu\mu$  long, geminate, narrowly elliptic, with abruptly acute tip. Lower involucral glume very broadly ovate-acute, about  $\frac{1}{2}$  the spikelet, base amplexicaul but not overlapping itself in front, 5-nerved. Upper involucral glume oblong-ovate, as long as spikelet, minutely cuspidate, 9- (11-) nerved. Lower floral glume similar, with delicate, oblong, margined palea; upper narrow-ellipsoid, acute, very smooth and polished as is its palea.

**Locality** : *Gujarat*: Ahmedabad and elsewhere in shady wet places in the monsoon (Saxton & Sedgwick).

**Distribution** : India, Burma, Malacca, Ceylon.

\*5. PANICUM MILIACEUM Linn.

PLATE 100.

*Panicum miliaceum* Linn. Sp. PL (1753) 58; Forsk. Fl. Aegypt.-Arab. (1775) CIV; Host. Gram. Austr. II, 16, t. 20; Kunth Enum. I (1838) 104, Suppl. 81; Trin. Pan. Gen. 194, Sp. Gram. Ic. t. 221; Reichb. Ic. Fl. Germ. VII, t. 82; Steud. Syn. PL Glum. I (1855) 77; Duthie Grasses N. W. Ind. (1883) 5, Field and Gard. Crops, t. 23, Fodder Grasses N. Ind. (1888) 9; Hook. f. FL Brit. Ind. VII (1896) 45; Watt Diet. Econ. Prod. Ind. VI, 12; Cooke Fl. Bomb. II (1908) 939; Stapf in Fl. Trop. Afr. IX, 696.

*P. asperrimum* Fisch. Cat. Hort. Govenk. ex Jacq. Eclog. Gram. 46, t. 31; Nees Agrost. Bras. 199.

*P. Miliun* Pers. Syn. I (1805) 83.

*Milium esadentum* Moench Meth. 203.

*M. Panicum* Mill. Gard. Diet, ed, VIII, no. 1.

**Vernacular names** : Common Millet, Proso Millet, Broom-Corn, Hog-Millet, Cheno, Van, Gajro, Sava, Chinee, Varagu, Chirwa, Bansi, Phikar, Rali.

**Etymology** : *Miliaceum* is derived from the old Latin *milium*, millet.

**Description** : A tufted annual, 0.6-1.2 m. high. Stems erect or geniculately ascending, terete, stout or slender, 4-5-noded, simple or sparingly branched, more or less softly hirsute below the nodes, the uppermost internode usually quite glabrous. Leaf-blades linear from an equally wide or slightly contracted and rounded base, long-tapering to a slender point, 15 to over 30 cm. by 6-20 mm., flat, flexuous, usually glabrous except for the often ciliate lower margins and hispidulous dorsal midrib, rarely sparsely hairy all over, hairs long and fine, midrib somewhat stout and prominent below in large leaves, primary lateral nerves 3-6 on each side, very slender. Sheaths terete, somewhat loose or the upper tight, closely striate, spreadingly hirsute with tubercle-based hairs, pubescent or loosely bearded at the nodes, longer or slightly shorter than the internodes. Ligule a narrow ciliate rim.

Panicles contracted and rather dense or open, narrowly oblong, nodding, often with their base permanently enclosed in the uppermost sheath or only shortly exerted, up to 30 cm. long, in spontaneous specimens usually scantier, looser and at length more open, divided up to the fourth or in cultivated specimens the fifth degree, all the divisions filiform, angular and scabrid; primary axis slender or somewhat stout below, subterete, striate or grooved and smooth towards the base; primary branches more or less approximate below, more distant upwards, often much divided from low down; branchlets relatively long, the lower divided again in the same manner or like the remainder from much higher up with spikelets in small loose racemes of 2 (rarely 3) towards the summit; pedicels hardly thickened upwards, with truncate tips, the lateral from less than 2-6 mm. long. Spikelets ovate-oblong to ovate-lanceolate, apiculate-acuminate, turgid, 4-5-5 mm. long, glabrous, green or brownish green. Involucral glumes persistent, unequal, strongly and prominently nerved; lower broad-ovate, acute, from J- $\frac{1}{2}$  the length of the lower floret, 5-nerved, tipper corresponding in size and outline to the spikelet, broadly rounded on the back, 11-nerved, tip contracted, apiculate to shortly rostrate. Lower floral glume barren, very like the lower involucral glume, palea ovate to ovate-oblong, truncate or emarginate, up to about  $\frac{1}{2}$  the length of the glume. Upper floret hermaphrodite, elliptic-oblong in outline, subacute, very convex on the back, up to over 3 by 2 mm.,

variously coloured (white, yellow, red, brown or black), very smooth and polished, glume and palea crustaceous. Grain white.

**Locality** : Cultivated in many parts of the Presidency, chiefly in Gujarat and on the Ghats.

**Ecology** : This Kharif crop depends on the natural rainfall, and is never irrigated.

**Distribution** : India, Africa and other hot countries.

**Economic uses** : This millet produces food grain for the poor, but it is also used by the middle and richer classes on fast days. In the green state this millet affords excellent fodder for cattle and horses. The straw is not used for fodder.

**Explanation of Plate 100**: *Panicum miliaceum* Linn.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume and palea.
5. Upper floral glume.
6. Palea and grain.

\*6. PANICUM MILIARE Lam.

#### PLATE 101.

*Panicum miliare* Lamk. 111. Gen. I (1791) 173; Roxb. Fl. Ind. I (1832) 309; Kunth Enum. PI. I (1838) 104; Aitchis. Cat. Panjab PI. (1869) 159; Duthie Grasses N. W. Ind. (1883) 5, Field and Gard. Crops 7, t. 26, Indig. Fodder Grasses (1886) t. 46, Fodder Grasses N. Ind. (1888) 10; Hook. f. Fl. Brit. Ind. VII (1896) 46; Cooke Fl. Bomb. II (1908) 939 (*partim*); Haines Bot. Bih. and Or. (1924) 993.

*P. attenuatum* Willd. Enum. Hort. Berol. 1033.

*P. Menieri* Koen. ex Nees in Neue Schrift. Ges. Naturf. Fr. IV (1803) 83;

*P. simplex* Kottl. ex Trin. Gram. Panic. 216.

*P. sumatrmse* Roth Nov. Sp. (1821) 50.

**Vernacular names** : Little Millet, Poi, Bagad, Badi, Kulti, Burburi, Varighudi, Halvari, Sava, Vari, Gadro, Kuri, Save, Baragu.

**Etymology** : *Miliare*, see previous species.

**Description** : An annual grass. Culms 30-90 cm. high, rather slender, erect or base geniculate, simple or branched, usually leafy up to the panicle. Leaves linear 15-60 cm. by 12-25 mm., gradually tapering from a broad base, glabrous or finely hairy, sheaths glabrous, rarely hirsute with tubercle-based hairs.

Panicles very compound, contracted or thyriform, and often nodding, 10-25 cm. long, (without the subsidiary axillary panicles which are often developed). Spikelets glabrous, rather flattened, suddenly acute or slightly cuspidate 2-3\*2 mm. long, mostly paired on unequal pedicels, but often solitary at the ends of the branchlets, lanceolate in flower, elliptic or broadly elliptic in fruit. Lower involucral glume very broadly ovate, subtruncat4, then\* suddenly acute, or scarcely acute, about \ the spikelet, white, membranous, 3-5-nerved, nerves-arching and anastomosing. Upper involucral glume herbaceous, ovate-lanceolate, 11-13-nerved. Lower floral glume 9-nerved, neuter, palea as long as its glume. Upper floral glume narrow-elliptic or elliptic-oblong to broadly ovate, acute, shining, white or pale brown, or dark brown, often 5-5-streaked dorsally.

NOTE.—*P. miliare* is in aU probability a cultivated form of *P. psilopodium*. It is not always easy to distinguish between the two. Hooker already felt this difficulty. "If I remember aright," he says, "*P. miliare* waft-ctmjeo-tured by Mnro to be a cultivated form of *P. psilopodium*; and except in the greater she, more contracted panioley rather larger spikelets and usually shorter pedicels of *P. miliare* I fail to find characters whereby to separate them, and these are not very reliable. In its common state the grain of *miliare* is broader than in any for\*! *oppsftopodium* and mraeh darker coloured." (F. B. I. VII, 40). Duthie was unable to distinguish *P. miliari* from *P. peihpodium* (Todd. Grass. N. Ind. 10). Stapf, however, is inclined to think that they are separable. In his opinion the true *P. psilopodium* has nearly always glabrous leaves, smaller spikelets and a shorter lower involucral glume. Pram in bra Bengal Plants gives as the characters of *P. miliare* : "Leaves hairy; cultivated," and of *P. psilopodium* : "Leaves glabrous; wild." But he has nevertheless, as Haines pointB out, "named most of the glabrous-leaved forms in the Calcutta Herb, as *miliare*, and I have myself noticed whole crops with glabrous leaves, whereas I have collected *psilopodium* with hairy leaves."

The same author, after discussing the various statements, sums up his own observations: "Although absolutely the leaves of *miliare* are often broader than in *psilopodium*, yet they are relatively narrower and much more alternate. Moreover the cultivated *miliare* and its feral forms always appear to have more or less contracted panicle\* in contrast to the shorter, always quickly effuse, panicle of *psilopodium*. The grain of *miliare* is, as would be expected, rather larger being -08-- V long as compared with W long in *psilopodium*."

**Locality** : Cultivated occasionally in some parts of the Presidency.

**Ecology** : This grass is satisfied with very poor soil; usually sown at the commencement of the rainy season and ripens in 3 months.

**Distribution** : Cultivated or naturalized throughout India and Ceylon. Cultivated in the tropics.



IWNKTM MILIAITH LAMK.





PANICUM SUBEGLUME TRIN.

Delin: B. K. Thide.

Economic uses : The grain is of an inferior kind and mostly eaten by the poorer classes of people. Cattle are very fond of the straw, but reckoned inferior to that of rice.

Explanation of Plate 101 : *Panicum miliare* Lamk.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Palea of lower floral glume.
6. Upper floral glume.
7. Palea of upper floral glume.
8. Stamens and grain.

#### 7. PANICUM SUBEGLUME Trin

##### PLATE 102.

*Panicum subeghime* Trin. in Mem. Acad. Pflanzb. ser. 6, III, pt. 2 (1835) 292; Steud. Syn. PL Glum. (1855) 82; He A. f. Fl. Brit. Ind. VII (1896) 51; Cooke Fl. Bomb. II (1908) 936.  
*P. arcuatum* Br. ex Nees in Wight Cat. no. 1639 (non Br. Prodr.).  
*P. Bromianum* Wight & Am. ex Steud. 1. c. 98.  
*P. Torreyanum* Wight & Am. ex Steud. Nom. ed. 2, II, 264.  
*Milium capillare* Both Nov. Sp. (1821) 39; Eunth Enum. PL I (1838) 67.  
*M. tomentosum* Kunth. ex Bottl. in Ges. Naturf. Fr. Neue Schr. IV (1803) 220; Steud. Syn. PL Glum. (1855) 34; Kunth 1. c. 66.

Etymology . *Subeglume* means almost glumeless, alluding to the absence of the involucrel ~~glumes~~.

Description : Perennial; stem slender, 30-60 cm. long, glabrous or nearly so; nodes glabrous or tomentose. Leaves 7-15 cm. by 5-10 mm., linear, finely acuminate, glabrous or softly hairy; sheaths glabrous or softly hairy; ligule short, membranous.

Panicle large, effuse, 7-18 cm. long, spreading; rhachis capillary; branches capillary, reaching 10 cm. long, the lower suberect, alternate, often branched from the base; branchlets filiform. Spikelets pedicellate, 2-5 mm. long, oblong-ellipsoid, tapering to both ends, dorsally compressed, glabrous or silky. Involucral glumes very minute, hyaline, sometimes one (rarely both) obsolete; lower floral glume 5-7-nerved, elliptic-oblong, subacute, glabrous or silky; upper floral glume as long as the lower, elliptic-oblong, acute, with membranous inflexed margins; palea oblong, subacute, slightly shorter than its glume, with membranous inflexed margins.

Locality : S. M. Country: Badami (Woodrow teste Cooke; Bhicje!).

Distribution : W. Peninsula.

Explanation of Plate 102 . *Panicum subeglume* Trin.

1. Spikelet.
2. Lower floral glume.
3. Upper floral glume.
4. Palea of upper floral glume.
5. Stamens, ovary and styles.

#### \*8. PANIUM MAXIMUM Jacq.

##### PLATE 103.

*Panicum maximum* Jacq. Ic. I, 2. t. 13; Collect. I, 76; Trin. Pan. Gen. 180, and in Mém. Acad. Pflanzb. 6, s&. III, 268; Nees Fl. Afr. Austr. (1841) 36; Steud. Syn. PL Glum. I (1855) 72; Griseb. Fl. Brit. West Ind. (1864) 549; Doell in Mart. Fl. Bras. II, II, 202; Hitchc. Cat. Panjab PL (1869) 159; Baker Fl. Maurit. (1877) 436; Boiss. Fl. Or. V (1884) 439; Hook. f. Fl. Brit. Ind. VII (1896) 49; Trin. Fl. Ceyl. V, 153; Stapf in Dyer Fl. Cap. VII, 404; Cooke Fl. Bomb. II (1908) 939; Haines Bot. Bih. and Or. (1924) 995; Stapf in Fl. Trop. Afr. IX (1920) 655.

*P. maximum* var. *hirsutissimum* Oliv. in Trans. Linn/Soc. XXIX, Bot. 171.

*P. maximum* var. *obtusissimum* Stapf in Cheval. Sudania 161,163.

*P. polygamum* Sw. Prodr. Ind. Occ. 24.

*P. laeve* Lam. III 1,172.

*P. jumentorum* Pers. Syn. I (1805) 83; H. B. & K. Nov. Gen. & Sp. I, 104; Duthie Grasses N. W. Ind. (1883) 5, Fodder Grasses N. Ind. (1888) 9.

*P. altissimum* Brouss. Elench. Hort. Monsp. (1805), 42 (non Meyer); Dabs. & Gibs. Bomb. FL Suppl. (1861) 98.

*P. trichocondylum* Steud. Syn. PL Glum. I (1855) 74.

*P. pamplémoussense* Steud. 1. c. 71.

*P. hirsutissimum* Steud. 1. c. 72.

*P. giganteum* Mez in Engl. Jahrb. XXIV, 143.

**Vernacular name** : Guinea Grass.

**Etymology** : *Maximum* means the tallest.

**Description** : A perennial, densely tufted grass, up to 3 m. high. Culms erect or geniculate-suberect, usually stout, 3-4-noded, simple or sparingly branched with the branches erect, terete or compressed below, usually quite glabrous and smooth, more rarely more or less hirsute and rough from the tubercular hair-bases. Leaves glabrous or more or less softly hairy or coarsely hirsute with tubercle-based hairs. Sheaths rather firm, the lower compressed, the others terete and tight, often bearded at the mouth and usually so at the nodes, rarely the nodes quite glabrous. Ligule membranous, very short, ciliolate, usually with dense hairs from behind it. Blades linear from an equally wide or very gradually narrowed and shortly contracted base, long-tapering to a fine point, 10-60 cm. by 4-18 or even 25 mm., flat, margins scaberulous to spinulosly scabrid, midrib prominent below, whitish and shallowly channelled above, primary nerves up to 9 on each side.

Panicle erect or nodding, contracted or open, from 10 to over 45 cm. long, glabrous or more often villosulous at the lower nodes and motile branch bases, divided to the 4th or 5th degree, all the divisions filiform to capillary, often more or less wavy, angular and scabrid or the larger smooth downwards; primary axis comparatively slender, smooth, terete and often fluted below, scaberulous upwards; lower primary branches whorled, suberect or spreading, up to 30 cm. long, mostly remotely divided from 2-5-7-5 cm. above the base, their lower branchlets often up to 7-5 cm. long, flexuous and remotely divided or like the rest rather short and contracted; penultimate divisions usually closely 2-3-spiculate with the lateral pedicels shorter than the clustered spikelets, more rarely loose to very loose with the pedicels several times longer, all the pedicels very fine with small subcupular tips. Spikelets oblong, subobtuse to acute, somewhat turgid, broadly rounded on the back, 3-4-5 or sometimes 4 mm. long, light green or tinged with purple, glabrous or rarely more or less densely pubescent. Involucral glumes dissimilar, faintly nerved. Lower rounded or shortly acute or minutely apiculate, about  $\frac{1}{2}$  to  $\frac{1}{3}$  the length of the spikelet, hyaline, 3-1-nerved or almost nerveless. Upper corresponding in shape and size to the spikelet, membranous, 5-nerved. Lower floral glume male, like the upper involucral glume, 7-nerved, palea slightly shorter, oblong, obtuse. Upper floret hermaphrodite, oblong, shortly acute, up to almost 3 mm. long, whitish, glume and palea thinly crustaceous, finely transversely rugose except on the flexures. Anthers 1-1.5 mm. long. Grain over 1 mm. long.

**Locality** : Widely cultivated, chiefly in Gujarat and Sind.

**Distribution** : Indigenous in tropical and S. Africa, Madagascar, the Mascarenes and in Yemefi. Introduced into India and America.

**Economic uses** : An excellent fodder grass.

**Explanation Of Plate 103** : *Panicum maximum* Jacq.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Palea of lower floral glume.
6. Stamens.
7. Upper floral glume.
8. Palea of upper floral glume.
9. Stamens, ovary and styles.

#### 9. PANICUM PALUDOSUM Boxb.

*Panicum paludosum* Koxb. EL Ind. I (1832) 307 (*non* Nees); Wall. Cat. no. 8711; Griff. Notul. 37, Ic. PL Asiat. t. 139. f. 127; Duthie Fodder Grasses N. Ind. (1888) 11.

*P. proliferum* Hook. f. EL Brit. Ind. VII (1896) 50 (*non* Lam.).

*P. proliferum* var. *paludosum* Cooke El. Bomb. II (1908) 937 (*non* Stapf).

*P. proliferum* Haines in Bot. Bih. and Or. (1924) 995 (*non* Lam.).

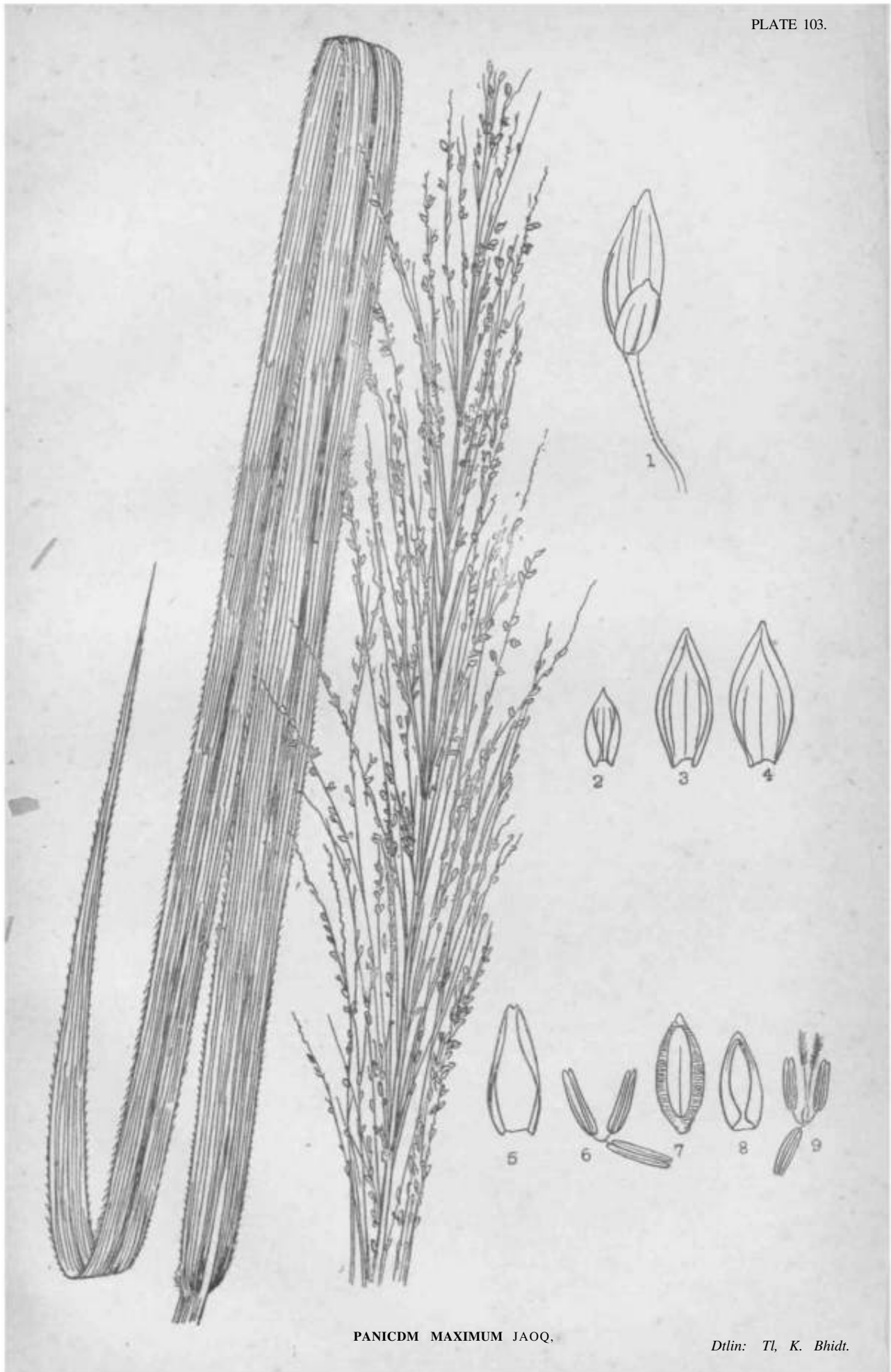
*P. proliferum* Prain in Beng. Plants 1176 (*non* Lam.).

*P. decompositum* var. *paludosum* Trim. Cat. Ceyl. PL 105.

**Vernacular Names** : Borati, Eulus-nan.

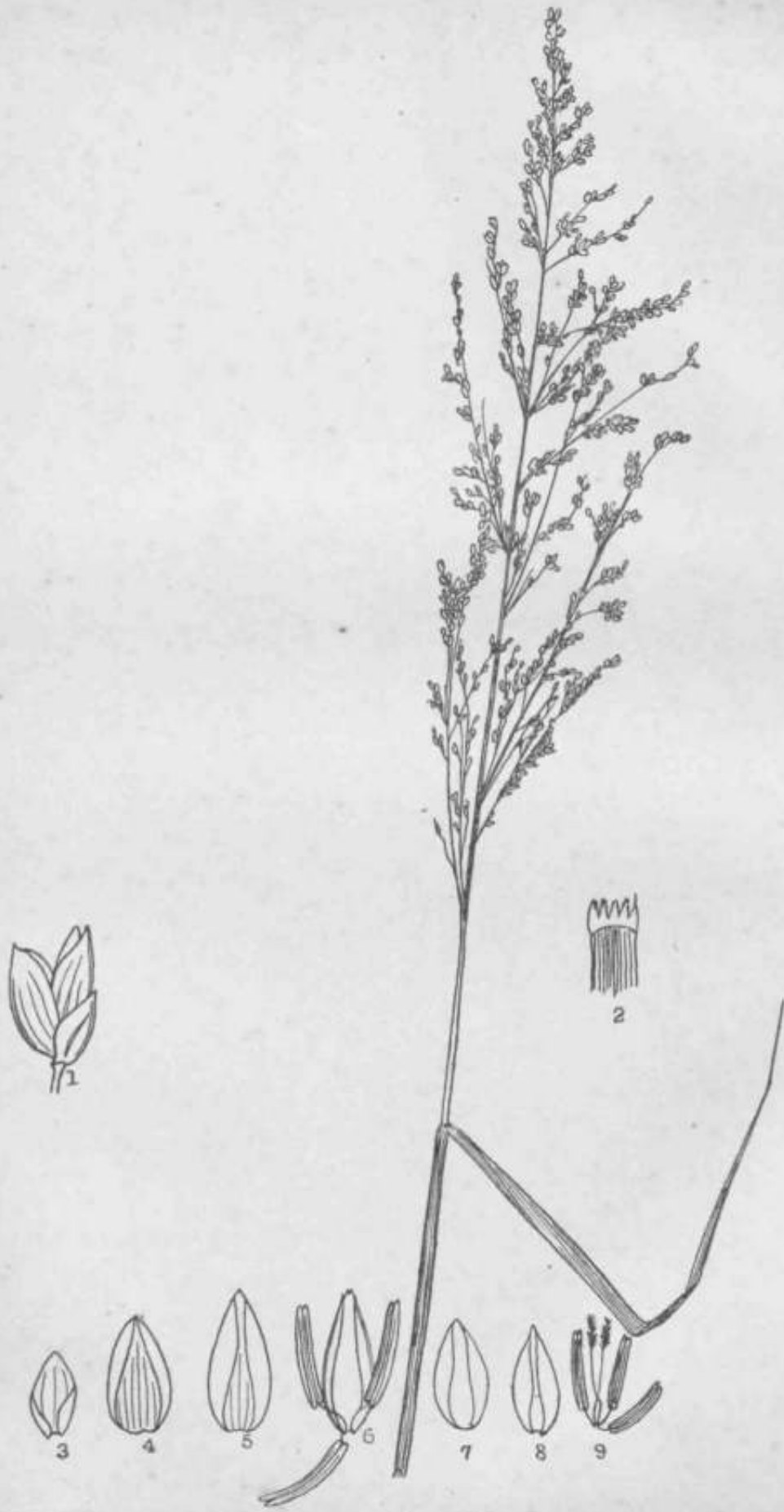
**Etymology** : *Paludosum* is derived from *paktdo*, pond, *i.e.*, inhabiting ponds.

**Description** : Perennial; stem simple or branched, 60-90 cm. high, leafy, ascending from a creeping or floating spongy rootstock which is sometimes as thick as the Kittle finger.



PANICDM MAXIMUM JAOQ.

Dtlin: Tl, K. Bhidt.



FANICUM ANTIDOTALK IffitZ.

Leaves 15-30 cm. by 6-17 mm., linear or ensiform, acute or acuminate, flat, subcoriaceous, glabrous, base broad, subcordate; sheaths loose, glabrous, the margins naked; ligule a ridge of fine hairs.

Panicle 10-25 cm. long, often as broad as long when spreading, sessile at the mouth of the leaf-sheath or very shortly pedunculate; lower branches whorled and fascicled; rhachis stout, angular, scaberulous; branches of the panicle strict, naked below, bearing short erect flowering branchlets about the middle. Spikelets 3-4 mm. long, narrowly ovoid-lanceolate, acuminate, greenish, solitary or 2-nate; pedicels angular, scaberulous. Glumes 4; lower involucral glume not J the length of the upper, orbicular or reniform, not nerved, hyaline; upper involucral glume ovate, acuminate, 7-nerved, as long as the lower floral glume; lower floral glume similar, 9-nerved, paleate or not, empty (rarely male); upper floral glume shorter than the lower, oblong, acute, yellowish white, smooth, shining, with incurved margins; palea as long as the glume, oblong, acute.

**Locality** : *KonJcan*: Byculla (McCann AUO !); Sewri (McCann 36411); Salsette (Lisboa *teste* Cooke).

*W. Ghats*: Ehandala (McCann 5310!); Lonavla (Lisboa *teste* Cooke).

*Deccan*: Poona (Lisboa *teste* Cooke).

*S. M. Country*: Devarayi (Sedgwick 4118 !).

*N. Kanara*: Gersoppa Falls, on rocks in river-bed, common (Hallberg & McCann A139!); Karwar (Hallberg & McCann A124!).

**Ecology** : A subgregarious species. Grows in marshy places, still waters, banks of rivers and tanks. Sometimes it is partially submerged in water.

**Distribution** : India, Ceylon. (It certainly does not occur in tropical and S. Africa, but whether it extends eastwards beyond India we are not able to say.)

#### 10. PANICUM ANTIDOTALE Eetz.

##### PLATE 104.

*Panicum antidotale* Retz. Obs. IV (1786) 17; Duthie Grasses N.W. Ind. (1883) 2, Indig. Fodder Grasses (1886) t. 3, Fodder Grasses N. Ind. (1888) 4; Boiss. Fl. Or. V (1884) 440; Lisboa Bomb. Grasses (1896) 23; Hook. f. Fl. Brit. Ind. VII (1896) 52; Cooke Fl. Bomb. II (1908) 937.

*P. maximum* Wall. Cat. no. 8715 B (*partim*) C (*partim*).

*P. pruinatum* Bernh. ex Trin. Pan. Gen. 191.

*P. subamum* Kunth Rev. Gram. II (1829) 397, t. 112; Enum. PL I (1838) 101.

**Vernacular names** : Git, Sera, Male, Shansukha, Gharam, Ghamar, Girni, Mangrur, Barn, Barwari, Barigagli.

**Etymology** : *Antidotale*, something that works as an antidote.

**Description** : A tall glabrous perennial grass reaching 1-5 m. high; rootstock creeping, stoloniferous; stem solid, woody, terete, smooth; nodes thickened, the lower sometimes rooting. Leaves 15-60 cm. by 6-20 mm., linear, very finely acuminate with capillary tips; sheaths long, glabrous, striate, with naked margins; ligule short, membranous, jagged or fimbriate.

Panicle 15-23 cm. long, effuse, pyramidal; rhachis very slender, angular, glabrous or slightly scaberulous; branches usually fascicled (the upper sometimes solitary), 7\*5-10 cm. long, filiform, spreading and drooping; branchlets capillary. Spikelets laxly crowded on the branchlets, reaching 3 mm. long or slightly longer, ovoid, acute, glabrous. Glumes 4; lower involucral glume half as long as the upper, broadly ovate, subobtusate, 3-nerved, hyaline; upper involucral glume broadly ovate, acuminate, 7-9-nerved, membranous; lower floral glume equal and similar to the upper involucral glume, paleate, empty or male, the palea oblong, subacute, hyaline, as long as the glume; upper floral glume coriaceous, elliptic, obtuse, with incurved margins, dorsally smooth, yellowish white; palea thinly coriaceous, ovate, acute, as long as the glume. Anthers linear-oblong. Styles 2, distinct, conspicuous, very plumose.

**Locality** : *Sind*: (Stocks 659 *teste* Gooke); Karachi to Landi (Burns!); Laki (Bhide!); Sukkur (Woodrow *teste* Cooke); Clifton, near Karachi (Sabnis B797); Umarmot, sand dunes (Sabnis B1080 !); Mirpurkhas (Bhide !), in fallow fields (Sabnis B1208 !); Jamesabad, in fields (Sabnis B1154 !); Sanghar (Sabnis B769!); Gharo (Blatter & McCann D606 ! D608 !).

*Gutch*: Sumrasar (Blatter 3760!); Bhuj, Ehodi Maka (Blatter 37511).

*Kathiawar* (Woodrow *teste* Cooke).

*W. Ghats*: Londa (Woodrow *teste* Cooke).

*S. M. Country*: Dharwar (Garade!).

**Ecology** : This grass usually grows in clumps or in the shelter of bushes and hedges.

**Distribution** : Arabia, Afghanistan, Punjab, Upper Gangetic Plain, W. Peninsula, Ceylon, Australia.

**Economic uses** : On the utility of this grass opinions widely differ.

**Medicinal uses** : According to Stewart the smoke of the burning grass is used for fuming wounds and also as a disinfectant in small-pox. It is also employed in throat affections. Here is the explanation of the specific name *antidotale*.

**Explanation of Plate 104** : *Panicum antidotale* Betz.

1. Spikelets.
2. Ligule.
3. Lower invol. glume.
4. Upper invol. glume.
5. Lower floral glume.
6. Palea of lower floral glume and stamens.
7. Upper floral glume.
8. Palea of upper floral glume.
9. Stamens, ovary and styles.

## 11. PANICUM MONTANUM Boxb.

### PLATE 105.

*Panicum montanum* Boxb. Fl. Ind. I (1832) 313 (*excl. desor. gluma sup. florali*); Eunth Enum.

PL (1838) 126; Benth. EL Hongk. (1861) 412; Hook, f. FL Brit. Ind. VII (1896) 53; Cooke El. Bomb. II (1908) 938; Haines Bot. Bih. and Or. (1924) 996.

*P. courtallense* Nees ft Am. ex Wight Cat. no. 2342; Steud. Syn. PL Glum. (1855) 83.

*P. euchroum* Steud. l. c. 98.

**Vernacular names** : I Salket, Tokarband.

**Etymology** : *Montanum* is derived from *mons*, mountain.

**Description** : Perennial; stem 0.9-1.2 m. high (or more), erect from a woody rootstock, hard, solid, smooth, sparingly branched; nodes glabrous, the lower emitting long filiform roots. Leaves 12-5-18 by 1-3-2.5 cm., spreading or deflexed from the sheath, linear-oblong, acuminate, flat, smooth, many-veined, glabrous or ciliate near the base only, with slender midrib and scaberulous margins, base broad, deeply cordate; sheaths shorter than the internodes, glabrous or pubescent, the margins naked or ciliate near the top; ligule of ooft long hairs.

Panicle 20-38 cm. long, effuse, copiously branched; branches suberect or spreading, the lower branches very long; rhachis of panicle and the branches more or less scaberulous. Spikelets 2.5-3 mm. long, ellipsoid, obtuse, solitary, distant; pedicels long, capillary, erect. Glumes 4; lower involucral glume about half as long as the spikelet (or more), ovate, subacute, 3-5-nerved, with ciliate margins; upper involucral glume broadly ovate, obtuse, 5-nerved, sometimes with ciliolate margins, subcoriaceous; lower floral glume slightly longer than the upper involucral glume, broadly ovate, obtuse, 5-nerved, epaleate, subcoriaceous; upper floral glume elliptic, subacute, faintly striolate, coriaceous or almost crustaceous; palea nearly as long as the glume, elliptic, subacute, coriaceous, with inflexed membranous margins.

**Locality** : *Konhrn*: Pen, Mils (Bhide!); Kanari Caves (McCann A134! A136!).

*W. Ghats*: Ehandala (McCann A136!); Lonavla (Garade!); Castle Bock, on hill behind station (Bhide!).

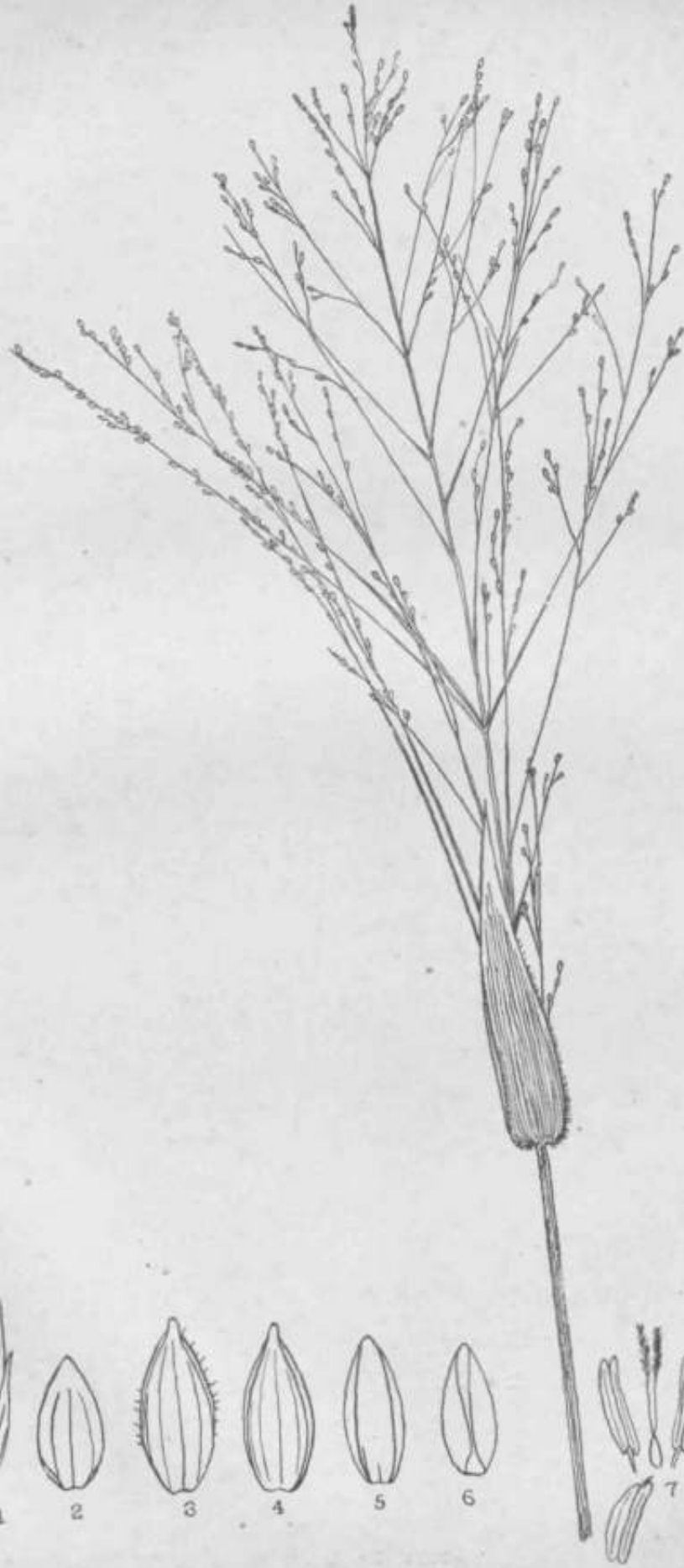
*Deccan*: Lohagad, half way up (McCann A137!).

*N. Kanara*: Dandeli (Talbot 2243!); Kala Nuddi (Herb. Econ. Bot. Poona!); Karwar, hillside in shade of trees (Hallberg & McCann A135!, Talbot!); Sampkhand (Hallberg & McCann 99351).

**Distribution** : Hotter hilly parts of India, Ceylon, Penang, Malaya, China, Philippines.

**Explanation of Plate 105** : *Panicum montanum* Boxb.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Upper floral glume.
6. Palea of upper floral glume.
7. Stamens, ovary and styles.



*PANICUM MOSTANUM* ROXB.





PANICUM AURITUM PRESL.

Delin: It. K. Bhiit.

## 12. PANICUM AURITUM Fresl.

## PLATE 106.

*Panicum auritum* Presl ex Nees Agrost. Bras. 176 ; Bel. Haenk. I (1830) 305; Trin. Pan. Gen. 176; Kunth Enum. Pl. I (1838) 113 ; Steud. Syn. PL Glum. (1855) 70; Baker EL Maurit. (1877) 437; Miq. EL Ind. Bat. III, 456; Hook. f. EL Brit. Ind. VII (1896) 40; Haines Bot. Bit. and Or. (1924) 996.

*P. insulicola* Steud. 1. c. 78.

*P. javanum* Nees & Biihse in Miq. PL Jungh. 376 ; Miq. EL Ind. Bat. 1. c. 453.

*P. patens* Bojer Hort. Maurit. ex Baker 1. c.

**Etymology** : *Auritum* means having long or large ears, alluding in all probability to the broadly cordate leaves.

**Description** : A perennial, tall, erect grass. Culm 0.9-1.6 m. high, soft. Leaves linear-lanceolate, broadly cordate at base, 20-35 cm. by 24-30 mm., glabrous or sparsely hairy beneath. Sheath glabrous or sparsely hairy with villous mouth. Ligule very short.

Panicle long contracted or more or less effuse, 20-45 cm. long, fastigiate branched, branches erect, 5-12 cm. long, branchlets and fascicles of spikelets subsecund. Spikelets green, glabrous, 1.7-2.5 mm., sessile or shortly pedicelled, strongly nerved, subacute. Lower involucre glume broadly ovate,  $\frac{1}{2}$ - $\frac{1}{2}$  the length of the lower floral, obtuse or acute, nerves 3-5 arching, upper involucre and lower floral subequal, ovate-oblong, acute or acuminate, 5-nerved, palea of lower floral glume small, neuter. Upper floral glume as long as the lower lanceolate-acuminate, smooth, white, thinly coriaceous.

**Locality** : W. Ghats: Castle Eock (Gammie 15717 !).

**Distribution** : India, Ceylon, Malay Peninsula, Malaya, China.

**Explanation of Plate 106** : *Panicum auritum* Presl.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume and palea.
5. Upper floral glume.
6. Palea of upper floral glume.
7. Stamens, ovary, styles and lodicules.

## 55. SACGIOLEPIS Nash.

Annual or oftener perennial grasses. Leaf-blades linear and flat or filiform-convolute, ~~filiform-subulate~~

False spikes often very dense, dark or variegated. Spikelets mostly very small, oblong to ovate-oblong or elliptic or lanceolate, subterete or laterally compressed, usually somewhat turgid, falling entire from the short finely filiform pedicels of a spiciform, very rarely open panicle. Involucral glumes similar in structure but unequal. Lower much shorter, softly or rigidly membranous, with a narrow hyaline margin or hyaline tip, stiffened by the hardening of the prominent and often rib-like nerves, or more or less dissimilar owing to the reduction of the lower glume to a small hyaline scale, or its differentiation into a narrow, hardened obscurely nerved back and broad hyaline margins. Upper with a curved or basally gibbous or saccate back, always much concave, mostly 7- or 9-, rarely 5- or up to 13-nerved. Lower floral glume male or barren, very dissimilar to the upper involucre glume and of the same or almost the same length, but with a straighter back; palea narrow, hyaline, finely 2-keeled, shorter than the glume, sometimes reduced or quite rudimentary. Upper floral glume hermaphrodite, oblong in outline seen from the back, very convex, chartaceous, ultimately subcrustaceous, with firm narrowly involute margins, obscurely 5-nerved; palea almost the length of the glume, tightly embraced by it all along and of the same texture, 2-nerved, hardly keeled. Lodicules 2, small, broadly cuneate. Stamens 3. Styles distinct; stigmas long, loosely plumose, exerted terminally or subterminally. Grain tightly enclosed by the glume and palea, elliptic in outline, dorsally compressed, with an almost flat back and convex face; hilum punctiform.

Species over 30.—Tropics of the whole world.

## I. Lower involucre glume 3-nerved.

1. Spikes 1-5 cm. long. Spikelets lanceolate-ovoid, hispid, 2-2.5 mm. long. 1. *S. indica*.
2. Spikes 5-23 cm. long. Spikelets ovoid, 1.3-2.1 mm. long. 2. *S. myosuroides*.

## II. Lower involucre glume 5-nerved.

3. *S. interrupta*.

## 1. SACCIOLEFIS INDICA Chase.

- Saccdolepis indica* Chase in Proc. Biol. Soc. Wash. XXI (1908) 8; Haines Bot. Bih. and Or. (1924) 990; Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 33 (1928) 18.  
*Panicum indicum* Linn. Mant. II, J84; Roxb. FL Ind. I (1832) 281; Hook. f. FL Brit. Ind. VII (1896) 41; Retz. Obs. III (1783) 9.  
*P. arcuatum* R. Br. Prodr. (1810) 189.; Griff. Notul. III, 39, 40; Ic. PL Asiat. t. 147, fig. 1; Duthie Grasses N. W. Ind. (1883) 5, Fodder Grasses N. Ind. (1888) 9.  
*P. Johanna* et *incurvum* Herb. Linn. ex Munro in Journ. ~~Tinn~~, Soc. VI, 39.  
*P. micrbstachyum* Lam. III. 1,170.  
*P. myosurus* Rich. in Act. Soc. Hist. Nat. Par. I (1792) 106.  
*P. myurus* Lam. III. 1,172.  
*P. phalaroides* Roem. & Schult. Syst. II, 452.  
*Eymenachne indica* Blhse ex Miq. FL Ind. Bat. III, 468.

**Description** : A slender grass, 15-60 cm. high. Leaves linear-acuminate, 5-13 cm. long, up to 4 mm. wide, glabrous or hirsute, base narrow; sheath not auxicled.

Panicle spiciform, oblong or cylindric, dense-flowered, green or slightly purplish, 1-5 cm. long by about 4 mm. diam., branches very short. Spikelets longer than their pedicels, 2-2.5 mm. long, crowded, ovoid, acute or acuminate, straight or curved, shortly or hispidly hairy, or glabrous. Lower involucre glume ovate, J-J of the lower floral glume, lanceolate from a broad base, acute, 3-nerved; upper usually subcymbiform, curved, obtuse, 7-U-nerved, 2-5 mm. long. Lower floral glume as long as the upper involucre glume, broadly ovate, obtuse, 9-nerved, palea minute; upper narrowly ellipsoid, very acute, white, smooth, polished, sides overlapping the margins of the similar palea, base obtuse, mucronulate with remains of the rhachilla.

NOTE.—Stapf has separated *Panicum angustum* Trin. Sp. Gram. Ic. t. 334 from *Panicum indicum* Linn. as conceived by Hook. f., and named it *Sacciolepis angusta*. In his opinion the various varieties given in the F. B. I. are mostly referable to *S. angusta* Stapf.

*S. indica* is not a well-defined species. It appears to pass insensibly into *S. myosuroides* and *S. interrupta*. According to Hook. f., the former differs in its caudiform spike and more minute rounded spikelets, the latter in its stouter habit.

Haines thinks it is better to confine *S. indica* to those specimens with hairy spikelets. We have not followed him in this.

**Locality** : W. Ghats: Castle Bock (Bhide!).

S. M. Country: Khanapur, 2,500 ft., rainfall 70 in. (Sedgwick 3080!).

N. Kanara: Tank near Yellapur (Talbot I); Kulgi (Talbot 2291!); Siddhapur to Sirsi (Hallberg & McCann A118 !); Karwar (Talbot 1297 !, Hallberg & McCann A116 !).

**Ecology** : This is a sporadic grass. Very common in the grass-lands of the forest borders of N. Kanara.

**Distribution** : Tropical Asia and Australia.

## 2. SACCIOLEFIS MYOSUBOIDES Haines.

## PLATE 107.

*Sacciolepis myosuroides* Haines Bot. Bih. and Or. 990.

*Panicum myosuroides* R. Br. Prodr. (1810) 189; Kunth Enum. PL (1838) I, 77; Steud. Syn. PL Glum. (1855) 56; Benth. FL Austr. VII (1878) 480 (*excl. syn. angustum*); Duthie Fodder Grasses N. Ind. (1888) 11; Hook. f. FL Brit. Ind. VII (1896) 42; Trim. FL Ceyl. V, 148; Ptain. Beng. Pi. 1175; Cooke FL Bomb. II (1908) 934.

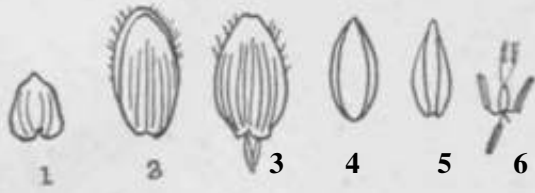
*P. aurvatum* Eoxb. FL Ind. I (1832) 286 (*non* Linn.).

**Vernacular names** : Kora-lom, Pokalia, Didhina, Musa-panchi, Suphetkar.

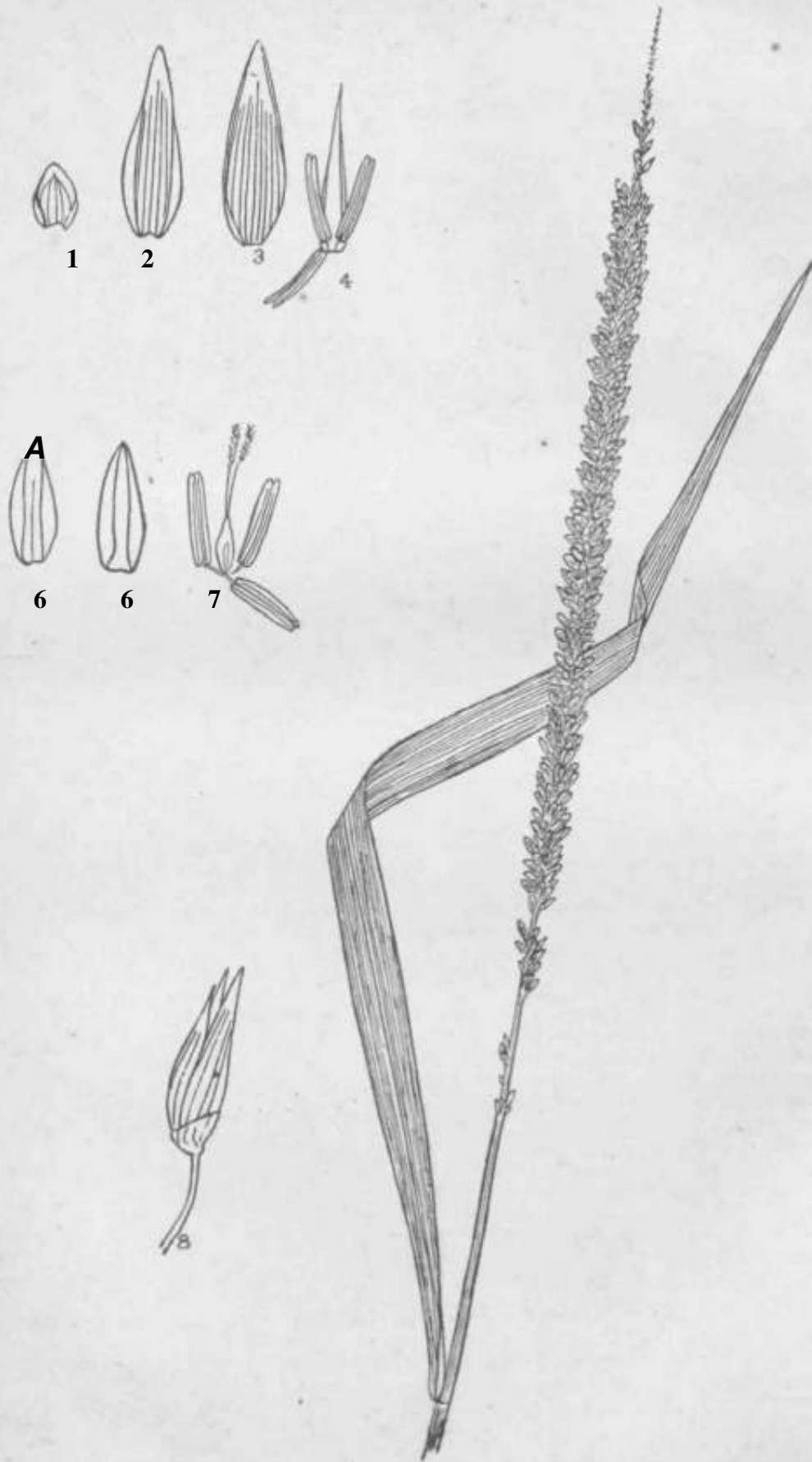
**Etymology** : *Myosuroides* means resembling *Panicum myosurus* (= *Sacciolepis indica* Chase.).

**Description** : Stem 60-90 cm. long, erect, or shortly creeping below, rather stout, leafy; internodes 7-5-12-5 cm. long. Leaves 15-20 cm. by 2-5-4 mm., narrowly linear, finely acuminate, margins smooth, base narrow; sheaths 5-10 cm. long, with naked margins; ligule O.

Inflorescence a spike-like panicle 3\*8-20 cm. by 4 mm., cylindric, erect, or curved; rhachis grooved, glabrous. Spikelets innumerable, 2 mm. long or less, densely crowded in small fascicles, very shortly pedicellate, globosely ovoid, obtuse, glabrous or pubescent, green or purplish. Glumes 4; lower involucre glume about half as long as the upper, ovate, subacute, 3-nerved; upper involucre glume ovate, obtuse, conspicuously 5-9-nerved, glabrous or pubescent; lower floral glume about equalling the upper involucre glume, but broader, ovate, obtuse, very concave, 5-9-nerved, glabrous or pubescent, paleate, empty; upper



SAOOIOLEFIB UYOSIROIDES dLMNES.



BAL I FOLEPIS ISTKHIITTA STAFF.

-floral glume much smaller than the lower, ovate-oblong, acute, quite smooth, white, dorsally convex with involute margins, thinly coriaceous; palea as long as the glume.

**Locality** : *Konkan*: Savantvadi (Woodrow); Alibag (Lisboa). We have not seen any specimen.

**Ecology** : Grows on the borders of lakes.

**Distribution** : India, Ceylon, Malay Peninsula, China, Australia. Not in tropical Africa.

**Economic uses** : Eaten with relish by cattle (Lisboa).

**Explanation of Plate 107** : *Sacciolepis myosuroides* Haines.

1. Lower invol. glume.
2. Upper invol. glume.
3. Lower floral glume and palea.
4. Upper floral glume.
5. Palea of upper floral glume.
6. Stamens, ovary and styles.
7. Spikelet.

### 3. SACCIOLEPIS INTERBUPTA Stapf.

#### PLATE 108.

*Sacciolepis interrupta* Stapf in Fl. Trop. Afr. IX (1920) 757; Haines Bot. Bih. and Or. (1924) 991.

*Panicum interruptum* Willd. Sp. Pl. I, 341; Kunth Enum. I (1838) 87; Nees Fl. Afr. Austr. (1841) 51; Roxb. Fl. Ind. I (1832) 286; Griff. Notul. III, 26, and Ic. PL Asiat. t. 139, fig. 221, t. 146, fig. 2; Dalz. & Gibs. Bomb. Fl. (1861) 316; Steud. Syn. PL Glum. I (1855) 66; Hook, f. Fl. Brit. Ind. VII (1896) 40; Cooke FL Bomb. II (1908) 934; Stapf in Dyer FL Cap. VII, 413.

*P. uliginosum* Roth Nov. PL Sp. (1821) 50.

*P. inundatum* Kunth Rev. Gram. I (1829) 34, and Enum. I (1838) 88; Steud. I.e. 66.

*Hymenachne interrupta* Biihse in Miq. PL Jungh. I, 377; Miq. FL Ind. Bat. III, 458; Steud. 1. c. ^

*P. in£\*cum* Hack, in Bolet. Soo. Brot. V, 210 (*non* Linn.).

**Vernacular name** : Pokalia.

**Etymology** : *Interrupta* means interrupted, alluding to the panicle which is interrupted below.

**Description** : A large perennial grass, quite glabrous; stem reaching 1.5-1.8 m. long, ascending from a stout creeping and rooting or floating rootstock; lower nodes emitting fascicles of long stout roots clothed with root-hairs; upper internodes very long, slender. **Leaves** 15-30 cm. by 6-13 mm., linear, finely acuminate, soft, flat, glabrous, with smooth or scaberulous margins, base rounded or subcordate; sheaths 5-10 cm. long, with smooth margins, ligule short, broad, membranous.

Inflorescence a spike-like panicle 15-30 cm. by 6-8 mm., cylindrical, interrupted below; xhachis stout, strict, channelled. Spikelets 4-5 mm. long, densely crowded in small fascicles, subsessile or shortly pedicellate, spreading, ovoid-lanceolate, acute, green. Glumes 4; lower involucral glume scarcely 1.6 mm. long, broadly ovate, obtuse, hyaline, 3-5-nerved; upper involucral glume ovate, acute, herbaceous, membranous, prominently 9-nerved; lower floral glume about equalling the upper involucral glume, ovate, acute, 7-nerved, paleate, male or barren, the palea hyaline; upper floral glume shorter than the lower, ovate-oblong, subacute, thinly coriaceous, white, polished, dorsally convex, the palea thinly coriaceous, as large as the glume. Anthers purple, much exserted. Grain obovoid, apiculate.

Very variable in size and shape, especially the panicle which varies a good deal as to colour.

**Locality** : *Sind* (Woodrow *teste* Cooke).

*Konkan*: Bassein, tank (Bums I); Wada, tank (Ryan 453 !); Nagotna (Gammie 16074!); Borivli, Kanari, in water (McCann A120!); Bhivandi (Chibber I); Vehar (Sabnis !); Gokura Creek, Bassein (Garade 1708!); Virar, on bank of a tank (McCann 9583 !); Panvel (Woodrow); Vengurla (Woodrow); margins of tanks throughout the *Konkan* (DalzeII & Gibson).

*W. Ghats*: Tingerwadi, Igatpuri (Blatter & Hallberg 3825!); Londa, in water (Gammie 15854!).

*8. M. Country*: Tadas, tanks (Sedgwick & Bell 4916!); Hulkop (Sedgwick & Bell 3174!); Belgaum (Herb. Econ. Bot. Poona !).

*N. Kanara*: Sirsi—Siddhapur (Hallberg & McCann A117 !); Tinai Ghat (Gammie 157911).

It is doubtful as to whether Woodrow's plant from Sind was correctly named as this **grass** is **one** of moist regions.

**Ecology** : Usually inhabiting marshy and swampy places such as ricefields and the banks of tanks; also found in deep standing water.

**Distribution** : Tropical and S. Africa, India, Ceylon, Malaya.

**Explanation of Plate 108** : *Sacciolepis interrupta* Stapf.

1. Lower invol. glume.
2. Upper invol. glume.
3. Lower floral glume.
4. Palea of lower floral glume and stamens.
5. Upper floral glume.
6. Palea of upper floral glume.
7. Stamens, ovary and styles.
8. Spikelet.

#### 56. PSEUDORAPHIS Griffith.<sup>1</sup>

(formerly under *Chamaeraphis* B. Br.).

*Pseudoraphis* differs from *Chamaeraphis* in having the spikelets in paniced racemes, whilst in the latter they are on the axis of a solitary spike-like raceme.

Species about 5.—From India to Australia.

#### 1. PSEUDORAPHIS ASPERA (Eoen.) Pilger.

##### PLATE 109.

*Pseudoraphis aspera* (Eoen.) Pilger in Notizbl. des Bot. Gart. u. Museum Berlin-Dalhem X., no. 93 (1928) 210.

*Chamaeraphis aspera* Nees in Wall. Cat. no. 8679; Merrill Fl. Manila (1912) 96.

*C. spinescens* Poir. Encycl. Mfith. Suppl. II (1811) 189; Hook. f. Fl. Brit. Ind. VII (1896) 62; Lisboa Bomb. Grasses (1896) 25; Cooke FL Bomb. II (1908) 922.

**Etymology** : *Pseudoraphis* is derived from *pseudo*, and *raphis*, needle, in allusion to the awns.

**Description** : Forming floating much-branched masses with leafy ascending stems 30-90 cm. long. Leaves 2-5-7-5 cm. by 1-6-3 mm., flat, acuminate, narrowly linear-lanceolate, smooth or scabrid, base narrowed; sheaths long, loose, with naked margins; ligule a ridge of minute hairs.

Panicle 5-10 cm. long, shortly pedunculate, more or less contracted; rhachis angular, Bulcate; branches filiform, angular, grooved, flexuous, few- or many-flowered, the lower 2-5-5\* cm. long, the awn-like tips 4-13 mm. long. Spikelets (including their awn) 6-8 mm. long, subsessile. Glumes 4; lower involucral scarcely 0-8 mm. long, orbicular or subquadrate, usually rounded at the apex, hyaline; upper involucral glume 6-8 mm. long (including the awn), lanceolate, setosely scabrid on the sides, membranous, 9-11-nerved, with a long scabrid awn which is sometimes as long as the body of the glume; lower floral glume shorter than the upper involucral glume, finely acuminate or awned, 7-nerved, male paleate, membranous, the palea hyaline, smaller than the glume, linear-oblong, subacute; upper floral glume about 2 mm. long, ovate-lanceolate, acute, female, nerveless, the palea hyaline.

**Locality** : *Konhan*: Bassein, Nirmal tank (Collr. unknown!); Thana (McCann 9828 I); Antop Hill (McCann !); Salsette, in tanks (McCann!); Wangni (Woodrow).

*W. Ghats*: Ehandala, on banks of village tank (McCann!); Londa, in a pond (Bhide 1); Mahableshwar Lake (McCann!).

*S. M. Country*: Honapur Tank, Eunnur (Sedgwick & Bell 4928!).

*N. Kanara*: In tanks (McCann I); Karwar, in marshy places (Talbot 15051); Halyal (Talbot 2109 ! 2148!).

**Ecology** : Usually growing submerged in water with the panicle and a few leaves above the surface. It is not a tank-floater, but roots in the mud and sends up fine stems which project from the water for 20-30 cm. and are leafy above the water only.

**Distribution** : India, Ceylon, S. China, Philippines, E. Australia.

<sup>1</sup> Pilger has left one species under *Chamaeraphis* viz. *C. hordeacea* R. Br. of N. Australia. All the other new forms have been put under *Pseudoraphis* Griff. Not. ad Pl. As. III (1861) 29. We have not seen the *Chamaeraphis* genus as yet except the few meagre lines given by Griffith himself. See R. Pilger, Ueber *Chamaeraphis* R. Br. in Notizbl. des Bot. Gart. u. Museum Berlin-Dalhem X., no. 23 (1928) 207-210. \* *Chamaeraphis* R. Br. in



PSECDOTUPHIS ASPERA PTLUEH,

*Desin* : B. E. Hilde.





OSETO0000TM PILIPES A. CAMUS.

**Explanation of Plate 109** : *Pseudoraphis aspera* Pilger.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume with palea.
5. Upper floral glume with palea.
- G. Grain.

## 57. CYRTOCOCCUM Stapf.

Perennial. Culms weak, rising from a decumbent or creeping and rooting base. Leaf-blades flat, linear-lanceolate or almost linear. Ligules membranous, short.

Spikelets- on long to very long and capillary or short pedicels, widely scattered or approximate, obliquely obovate to semiobovate, laterally much compressed, falling entire from the pedicels of very loose and open or contracted and dense panicles. Involucral glumes thinly membranous, unequal to subequal, 3-5-nerved. Lower floret barren with or without a palea, glume similar to the upper involucral glume, palea, if present, narrow, 2-nerved. Upper floret about as long as—or almost as long as the lower, hermaphrodite, glume narrowly boat-shaped, papery to subcrustaceous with firm very narrowly involute margins, obsolete 5-nerved; palea subequal to the glume, with a narrow convex back, of the same substance as the valve, with fine keels and thin flaps. Lodicules 2, minute, broadly cuneate. Stamens 3. Styles distinct; stigmas sublaterally exerted high up. Grain not known.

Species 6 or 7.—Tropical Africa, Indo-Madagascar.

None of the species here described were mentioned by Cooke. Hook. f. in F. B. I. has them under *Panicum*, sect. *Gibbosae*.

## I. Spikelets shortly pedicelled.

- |                         |                         |
|-------------------------|-------------------------|
| 1. Leaves 2-5 cm. long  | 1. <i>C. trigonum</i> . |
| 2. Leaves 5-15 cm. long | 2. <i>C. pilipes</i> .  |

## II. Spikelets on capillary pedicels which are much longer than the spikelets.

- |                       |
|-----------------------|
| 3. <i>C. patens</i> . |
|-----------------------|

## 1. CYRTOCOCCUM TRIGONUM A. Camus.

*Cyrtococcum trigonum* A. Camus in Bull. Mus. Hist. Nat. 27 (1921) 118.

*Panicum trigonum* Betz. Obs. III (1783) 9 (*end. syn. Burm.*); Boxb. Fl. Ind. III (1832) 305; Kunth Enum. Pl. I (1838) 116; Nees Agrost. Bras. 206; Boxb. Fl. Ind. I (1832) 305;

Hook. f. Fl. Brit. Ind. VII (1896) 56.

*P. difforme* Both Nov. Sp. (1821) 52.

*P. radicans* Benth in Miq. Pl. Jungh. 375; Miq. Fl. Ind. Bat. III, 453 (*non* Betz.).

*P. gibbum* Steud. Syn. Pl. Glum. (1855) 87.

**Etymology** : *Cyrtococcum* is derived from *kyrtos*, curved, gibbous, and *coccus*, alluding very likely to the obliquely obovate or semiobovate spikelets.

**Description** : Perennial. Culms decumbent, branching, interlaced below; branches erect. Leaves 2.5-5 cm. long, linear-lanceolate, glabrous or laxly hairy. Sheath glabrous or margin ciliate. Ligule rounded.

Panicle 25-35 mm. long, contracted, rhachis and short suberect branches glabrous. Spikelets 1-5 mm. long, very shortly pedicelled, hispidulous. Lower involucral glume about the length of the lower floral glume, obtuse or acute, 3-nerved, pale brown; upper pale brown. Lower floral glume 5-nerved, pale brown; upper naked or bearded at the tip.

**Locality** : W. Ghats: Matheran, Harrison's Springs and Monkey Point (D'Almeida A251! A252 I).

N. Kanara: Kirvatti and elsewhere (Sedgwick!).

**Ecology** : This gregarious grass grows in high deciduous forests of N. Kanara, associated with bamboo. According to Roxburgh, it grows on pasture ground and under the shade of trees.

**Distribution** : India, Ceylon, Java.

## 2. CYRTOCOCCUM PILIPES A. Camus.

## PLATE 110.

*Cyrtococcum pilipes* A. Camus in Bull. Mus. Hist. Nat. 27 (1921) 118.

*Panicum pilipes* Nees & Am. ex Benth in Miq. Pl. Jungh. III, 376; Miq. Pl. Ind. Bat. III, 453; Hook. f. Fl. Brit. Ind. VII (1896) 57.

*P. hertnaphroditum* Steud. Syn. PL Glum. (1855) 67; Benth. EL Austral. VII (1878) 485.

*P. oocyphyttum* Hochst. ex Steud. l. c. 65.

**Etymology** : *Pilipes* is derived from *pilus*, a hair, and *pes*, foot or foot-stalk, alluding to the pedicels which often bear slender hairs.

**Description** : Perennial. Culms 30-60 cm. high, geniculate ascending from a slender, creeping, branching base, lower nodes rooting, upper subpubescent. Leaves 5-15 cm. long, 8-35 mm. broad, glabrous or sparsely hairy above, puberulous beneath, finely acuminate, base narrow. Sheath glabrous or ciliate, mouth hairy. Ligule rounded.

Panicle 7-13 cm. long, contracted, branches short, rather remote, erect or spreading with short fastigiate branchlets, often slender hairs on the pedicels. Spikelets 1-5 mm. long, brown, very shortly pedicelled, glabrous. Lower involucre glume about  $\frac{1}{2}$  the length of the lower floral glume, obtuse, 3-nerved. Lower floral glume 5-nerved; upper white, its palea narrow, patent, hard.

**Locality** : *Konhm*: Above Eanari Caves (McCann A133!).

*W. Ghats*: Matheran (D'Almeida A132!, Woodrow!); Mahableshwar, in forests, 4,500 ft., rainfall 270 in. (Sedgwick & Bell 4801!); Pratapgad Fort (Bhide 1207!); Castle Bock, in shade of trees (McCann A131!, Bhide!).

*S. M. Country*: Belgaum (Herb. Bot. Gard. Calc.).

*N. Kanara*: Coastal forests, Earwar (Sedgwick & Bell 5113!); Eirwatti, deciduous forests (Sedgwick 3130!); Halyal (Talbot!); Supa, 2,000 ft. (Talbot 2091!); Yellapur (Talbot 907!); Devimane Ghat (Hallberg & McCann A128!); Gersoppa Falls (Hallberg & McCann A125!); Anmod forests (Sedgwick 3252!); Eulgi, 2,000 ft. (Talbot).

**Ecology** : This grass grows in dense shady forests. It is gregarious.

**Distribution** : Mascarene Islands, Madagascar, India, Malaya, Australia, Pacific Islands.

**Explanation of Plate 110** : *Cyrtococcum pilipes* A. Camus.

1. Spikelets.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Palea of lower floral glume.
6. Upper floral glume.
7. Palea of upper floral glume.
8. Stamens, ovary and styles.

### 3. CYRTOCOCCUM PATENS A. Camus.

*Cyrtococcum patens* A. Camus in Bull. Mus. Hist. Nat. 27 (1921) 118.

*Panicum patens* Linn. Sp. Pl. (1753) 86; Burm. EL Ind. t. 10, f. 2; Spreng. Syst. I (1825) 322 (excl. syn. *muUinode*); Eunth Enum. PL I (1838) 126 (excl. syn. Roxb.); Hook. f. FL Brit. Ind. VII (1896) 57.

*P. accrescens* Trin. Sp. Gram. Ic. t. 88, *et corrig.* vol. III; Eunth l. c. 116.

*P. obliquum* Roth Nov. Sp. (1821) 51; Eunth l. c. 103; Miq. FL Ind. Bat. III, 452.

*P. radicans* Retz. Obs. IV (1786) 18; Nees Agrost. Bras. 206; Eunth l. c. 216.

**Etymology** : *Patens* means open, alluding to the panicle which is contracted or open.

**Description** : Culms 30-90 cm. high, creeping and rooting and branched below, leafy, nodes glabrous. Leaves 5-15 cm. by 6-8 mm., ovate to linear-lanceolate, finely acuminate, thin, glabrous or ciliate below with tubercle-based hairs. Sheath with the margins and mouth ciliate. Ligule rounded.

Panicle 5-13 cm. long, contracted or effuse, usually inclined with spreading glabrous or puberulous branches naked below, and very long distant spreading branchlets, rachis, branches and pedicels capillary. Spikelets 1-5 mm. long. Lower involucre glume  $\frac{1}{2}$ - $\frac{3}{4}$  the length of the lower floral glume, ovate, obtuse, 3-nerved. Upper involucre and lower floral glume glabrous or with ciliate tips. A very variable plant.

**Locality** : *Konhin*: Vasco da Gama (Bhide!); Vetora (Sabnis 33440!).

*W. Ghats* : Castle Rock (Gammie 15579, very large specimen McCann A144 f).

*S. M. Country*: Tadas, in shade of trees, 2,000 ft., rainfall 35 in. (Sedgwick 2102!).

*N. Kanara* : Nagargalli, forests, very abundant (Sedgwick 2892!); GersoDDa Falls (Hallberg & McCann A126!, Chibber!); Malamani, 1,600 ft. (Talbot 2676!)- Etkri (Talbot 2280!); Guddehalli, Earwar (Hallberg & McCann A127!).

**Distribution** : Tropical Asia, Malaya, Pacific Islands.

## 58. SETARIA Beauvi

Annual (rarely perennial) grasses of various habit; nodes of stem glabrous or hairy; ligules a ridge of hairs.

Spikelets subsessile in contracted, cylindrical or pyramidal terminal panicles, articulate on a very short pedicel, subtended by 1 to many persistent scabrid or barbed bristles (modified branchlets) which often form a one-sided involucre, but are sometimes present and absent in the same inflorescence. Glumes 4; lower involucre glume usually much the smallest, 3-5-nerved, membranous; upper involucre glume 5-7-nerved; lower floral glume more or less exceeding and resembling the upper involucre glume, usually paleate; upper floral glume coriaceous or crustaceous, 5-nerved, paleate, the palea about equalling the glume. Lodicules 2, broadly cuneate. Stamens 3. Styles distinct; stigmas laterally exerted. Grain tightly enclosed by the hardened glume and palea, oblong or ellipsoid.

In 1897, P. Lamson Scribner (in U. S. Dept. Agr. Div. Agrost. Bull. IV, 38) proposed the name *Chaetochloa* for the grasses generally known as *Setaria*. Stapf has given convincing reasons why the old name should be retained. See Kew Bull. (1920) 124-127.

Species about 100.—Warm regions of the World, a few species common as weeds in the more temperate parts.

Cooke has 5 indigenous and 1 cultivated species. We retain them all but we change *S. rhachitricha* T. Cooke into *S. homonyma* Chiov.

## A. Leaves more or less plicate.

- |                                   |           |                         |
|-----------------------------------|-----------|-------------------------|
| I. Perennial. Culm reaching 24 m. | . . . . . | 1. <i>S. plicata</i> .  |
| II. Annual. Culm reaching 0-6 m.  | • • . . . | 2. <i>S. homonyma</i> . |

## B. Leaves flat, not plicate.

- |   |           |                           |
|---|-----------|---------------------------|
| AA. Bristles not retrorsally barbellate.  |           |                           |
| I. Upper floral glume smooth  | . . . • . | 6. <i>S. italica</i> .    |
| II. Upper floral glume rugose.  |           |                           |
| 1. Panicle spiciform, continuous; bristles 6 or more  | . . . . . | 3. <i>S. glauca</i> *     |
| 2. Panicle interrupted or subpyramidal; bristle 1 on pedicel and usually 3-4 below pedicel. | . . . . . | 4. <i>S. intermedia</i> . |
| BB. Bristles retrorsally barbellate.  | . . . . . | 5. <i>S. verticMata</i> . |

## 1. SETARIA PLICATA T. Cooke.

*Setaria plicata* T. Cooke FL Bomb. II (1908) 919.

*Panicum plicatum* Lam. III. I (1791) 171; Jacq. Eclog. Gram. I. t. 1; Trin. Gram. Panic. 183, Gen. Pan. 161, Sp. Gram. Ic. t. 223; Kunth Enum. PL I (1838) 94; Griff. Notul. III, 24, Ic. PL Asiat. t. 139, fig. 229; Duthie Grasses N. W. Ind. (1883) 6, Fodder Grasses N. Ind. (1888) 11; Benth. Fl. Hongk. (1861) 411; Hook. f. Fl. Brit. Ind. VII (1896) 55; Trim. Fl. Ceyl. V, 157.

*P. amplissimum* Steud. Syn. PL Glum. (1855) 54.

*P. asperatum* Kunth Rev. Gram. I (1829) 39, Enum. PL I. c. 39; Miq. Fl. Ind. Bat. III, 456.

*P. excurrens* Trin. Pan. Gen. 131, 249, Sp. Gram. Ic. t. 49; Benth. Fl. Hongk. (1861) 412 (excl. syn.).

*P. nepdhmse* Spreng. Syst. (1805) 321; Hialz. & Gibs. Bomb. FL (1861) 291; Aitchis. Cat. Panjab PL (1869) 160.

*P. nervosum* Roxb. FL Ind. I (1832) 311.

*P. neurodes* Schult. Mant. II, 228; Duthie Grasses N. W. Ind. (1883) 5.

*P. Wallichianum* Nees FL Afr. Austr. (1841) 49.

Etymology : *Setaria* is derived from *seta*, a bristle, referring to the involucre of bristles.

Description : Perennial; stem 0.3-2\*4 m. long, erect or ascending from a woody branching rootstock, stout, leafy; nodes strigillose; internodes 5-15 cm. long. Leaves 15-60 by 1-3-7-5 cm., linear-lanceolate, finely acuminate, chartaceous, glabrous or sparsely hairy, plicate between the numerous veins, base narrow; sheaths smooth or hispid, the margins naked, or ciliate near the top only; ligule of long hairs.

Panicle 30-60 cm. long, contracted, nodding; rhachis stout, angular, scabrid; branches usually alternate, distant (the lower 7-5-10 cm. long), filiform, suberect, bearing short capillary few-flowered branchlets and bristle-like flowerless ones. Spikdets 3 mm. long, sessile or shortly pedicellate, ovoid, acute or apiculate, glabrous. Glumes 4; lower involucre glume broadly ovate, obtuse, 5-nerved, membranous, half as long as the spikelet; upper involucre glume

lather more than half as long as the upper floral glume, ovate, obtuse, 7-nerved, membranous; lower floral glume slightly longer than the upper, ovate, shortly apiculate, membranous, empty, paleate or jiot, 5-nerved, the palea when present small, hyaline, narrowly ovate, acute; upper floral glume crustaceous, ovate-oblong, acute or shortly apiculate, slightly transversely striate, pale yellow, with strongly involute margins; palea ovate, acute, nearly as long as the glume, faintly transversely striate and with incurved membranous margins.

Easily recognized by its lanceolate plicate leaves and open panicle. The spikelets soon fall off leaving the bare rhachis. Herbarium material seldom has the spikelets *in situ*.

**Locality** : *Konkan*: Bombay, Victoria Gardens (McCann 5376!); Parel (Lisboa); western side of the Ghats (Dalzell & Gibson).

*W. Ghats*: Lingmala, Mahableshwar, in forests (Sedgwick & Bell 4642!); Fanchgani (Blatter & Hallberg B1234! B1235!, McCann!).

*S. M. Country*: Belgaum Fort, common all over Belgaum in compounds (Sedgwick 3066!).

*N. Kanara* : Kulgi (Talbot 2278 !); Halyal (Talbot 2408 !).

**Ecology** : A tall grass growing usually in shady situations and cool places.

**Distribution** : India, Ceylon, Malay Peninsula and Islands, China.

**Economic uses** : Sometimes cultivated as an ornamental grass.

## 2. SETARIA HOMONYMA Chiov.

### PLATE 111.

*Setaria homonyma* Chiov. in Nuovo Giorn. Bot. Ital. n. s. XXVI, 78; Stapf et Hubbard in Fl. Trop. Afr. IX (1930) 857.

*Panicum homonymum* Steud. Syn. PL Glum. (1855) 48; Duthie Grasses N. W. Ind. (1883) 4. *r. ehamaeraphis* Nees ex A. Br. in Ind. Sem. H. Berol. 1855, App. 20 (*non* Trin.).

*P. rhachitrichum* Hook., f. Fl. Brit. Ind. VII (1886) 56 (*non* Hochst.).

*Setaria rkachitricha* T. Cooke Fl. Bomb. II (1908) 919.

**Description** : Annual; stems tufted, erect, 20-60 cm. long, glabrous; nodes softly pubescent. Leaves 7-5-20 by 1-3-2-5 cm., oblong-lanceolate, tapering to both ends, finely acuminate, flaccid, glabrous or sparsely hairy, many-veined, plicate between the veins; sheaths with ciliate margins; ligule a tuft of hairs.

Panicle 5-15 cm. long, pyramidal; rhachis of panicle angular, hairy; branches 2-5-3\*8 cm. long, alternate, spreading, with bristle-like flowerless scabrid branchlets at the base of the spikelets, much longer than the spikelets, 1 (rarely 2) to each pedicel; rhachis of branches angular, sparsely hairy. Spikelets numerous, glabrous, 2-5 mm. long, densely or loosely imbricate, ovate, subacute, dorsally compressed, pale with green nerves, articulated on short scaberulous pedicels. Glumes 4; lower involucral glume orbicular-oblong, 1 mm. long, hyaline, obscurely nerved or nerveless; upper involucral glume 2\*5 mm. long, broadly ovate, subobtuse, 5-nerved, thinly membranous; lower floral glume about equal to the upper involucral glume, similar, 5-nerved, epaleate; upper floral glume elliptic-oblong, subacute, coriaceous, white, transversely striate, 2-5 mm. long, with strongly involute margins; palea as long as the glume, elliptic, with involute membranous margins.

**Locality** : \**W. Ghats*: Londa (Gammie ex Woodrow).

We doubt the occurrence of this species in the Presidency. Neither Cooke nor we have seen any specimens. There are none in Herb. Kew, neither do the herbaria of the Presidency contain any. Besides, the distribution of the species is not in favour of its presence in Bombay.

**Distribution** : India (subtropical Himalaya, Chota Nagpur, Calcutta), tropical Africa.

**Explanation of Plate 111** : *Setaria homonyma* Chiov.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Palea of lower floral glume.
6. Upper floral glume.
7. Palea of upper floral glume.
8. Stamens, ovary, styles and lodicules.

## 3. SETABIA GLAUCA Beauv.

*Setaria glauca* Beauv. Agrost. (1812) 51; Kunth Enum. PL I (1838) 149, Suppl. 106; Griff. Notul. 44, PI. Asiat. t. 149, \*g. 1; Dalz. & Gibs. Bomb. Fl. (1861) 293; Aitchis. Cat. Panjab PI. (1869) 162; Miq. Fl. Ind. Bat. III, 466; DutHe Grasses N. W. Ind. (1883)



SETARIA HOMONYMA (Hmv)

Delin: R. K. Bhide.

- 8, Indig. Fodder Grasses (iBSf) fe X, Fodder Grasses K. ind. (1888) 14 ; Boies. FL Or. V (IW-1) 142 ; Book, f. VI. Brit. Ind. VIJ (ISM) 78 (prlim) ; Trim. Fl. fVyl. V. 162 ; Prain Beng Pl. 1170 ; Cooke Fl. Bomb. II fl908) 820.
- Panicum glaberrimum* Linn. Sp. Pl. (1753) M ; Tiin. Sp. Gram. Ic. t. 195 ; Roxb. Fl. Ind. I (1832) 284 ; Benth. Fl. Hongfc. (18fil)411.
- P. towem Waig. Obs. (1772) 30.
- Setaria* /s/... Hubliard in Shodan .Will (A9K8 232,
- S. otmeama* Link. orLond. Hint. Briti 25.
- Ji. chri/xitiitliu* Heyiib. Nom. II. (iill.
- S. flav* Kmitli !!«v. «ram. I (1829) 46.
- S. to* licenni Kunth Ennm. PL I (1838) 100.
- / (iwiTm aloper nW/f KOPII. «rTrin. Gram. Panic. [62.
- / . /...w... Mfniwli. Meth. iiTli) 206.
- P. heir,,!,,,,* Linn, f, Snppl. (1781)107.
- J' . Iwlcoides* Jacq. Eclog. Gram. t. 22.
- P. liittuffl* Ghildenst, Eteia. II. 38.
- J' . fmiabattm* Willd. ex. Sees Aflost. Bras. 242.
- P. jmmt/i™* Poir. Entgol. IV, 27-1.
- P. wylciiaalnm* Rottl. « HprenR. Syai. Veg. I (1825) 301.
- Jfmiitetum fflaiiauii H li'l',lu,n* K, Br, I'RJ.II. (1810) L66.

Mr. C Iv Iluljpuril CJ tho Ki-w Eleibariuni informs us thnt he changed *Srlaria glauca* Auct. into *S. EnMWM* oo armiini of the synonym *ftmimm hteseene* Veigpl OJS. (1772) 20. J)r. Sttipf tiiuks tlini this in!mi' ohangB is uimTOessary and we quite agree with him ftfer read-TIII; iim BSB. «i this questini], which he kimly aEowed Mi. Ihililmrd to [Hit al. our (liKpisal, As Dr. Stapf is now about to ptlilisi his MS., we refrain bom goring his arRuucnts in this place.

Vernacular names : Uinli. Rub, BHIHITH. Kangni, Pingi-natehi, Kaka-kora, Kolara, Bandri, Bhadli.

Etymology : *Gbaum\** means spH-green ; tho puniolns ate sometimes grwn instead of yellow or purplish.

Description r Stem 30-60 tan. high, erect, *ur* HSii'inling, simple or bnnohed ; nodes glabrous, the lower rooting. Leaves 10-30 by I <m., 1 incur, Hrtoly acumiimto, flat, KIHbrots or spanwly hiiiry. with ecabrid raergitis, baas usually rounded; shentha smooth; ligule a cidge of hairs.

Inflorescence a cylindric densely flowered spike-like raceme 2-5-12<sup>1</sup>/<sub>5</sub> em. long ; bristlcK of i II v. >h !• ••! li-12, pale or reddieh Imvvn. IP turn, lung, with very short erpct. or spreading teeth. Spikclots numerous, eloselj- set nlonL' the i'h:n-his of tho spike, 3 mm, long, ellipsoid, glabrous. Glumes -I; lower involuclm glume less than half as long as the Bjiikelet, liroadly ovate, often shortly tjjiii-uliitr, :-:iii>rved, hviiiui-; \j]ijier involu«rul glume slightly longer than the lower, broadly ovate or suborbicular, hyaline. i>-n<rv«t ; lower fioral ^hime thinly membranouK, as long us thr upper one, 5-nrved, paleate, t-tmpty or male, the pslea hyaline : upper floral glume coriaceous, broadly elliptic, obtuse, dorsuUy convex, transversely rugose, pale.

HUB species is rv;nli\ rceognizad by its cybud™ infloreHocnue. It is very varinbie in sue and colour of the inifonacrncr, ranging from jinle straw to sometimes deep purple. Tho moat common tint is ii slight purplish.

Locality : *9ujarttt*: Nadiad (Chibber!); Ahmcdnbad (Saxton 1063!); Bftroda (Cooko). *Khawltsh*: Toranmal (McCarra AU9! A150!); N. slope of Qhanaeli (McCann A1511).

*Konhm*: Bhnndup (McCsn 36061); Mulguum (McCann A147 !); Basaitj (McCann. 9607 !); Sion (MoCanu 3573 !); Thftna (Lisboa).

*W. Ghats'* Khandala, vury common (McCann 6406!); Patichgani, behind Marathi well (Blatter 3824 1); Mahableshwar, eommon (Woodrow 1, Daljsell & Gibson, Cooke).

*Deccan* : Shivner Fort, Junnar (Paranjpye !); ChattaTshiEji HilJ, Poonn (li\* kiel '); Shivapur, nearPoona (Bhide 981!); Puraadhar, foot (McCann 6603!); Tjohagnii, top (KaCaun 9501!); Nasik (Lishoa).

5, *M. Country*: Dharwar Dist. (Sedgwiok 21731); Dumbni, under trees /falbot 2300!}.

*N. Kanara* : Dandeli (Bell 4224!); Halyat (Talbot 21ii 1) ; Honsvar (Talbot

»logy : The commonest grass of the genus almost throughout the Presidtmcy. On nd cultivated soil it is a common pasture grass. Cultivated as a kharif crop only in the |Paths of the Poona District. Sown in June, ripens in September. It Hourifhos thtueh-the, )"ear, but is best developed during the monsoon.

Distribution : All warm, temperate and tropical regions.

Economic uses : Considered to be a fairly good green fodder. The seeds have been used as a food during famine time.

#### 4. SETARTA INTERMEDIA Eoem. & Schult.

*Setaria intermedia* Roem. & Schult. Syst. II (1817) 489; Kunth Enum. PL I (1838) 150; Aitchis. Cat. Panjab PL (1869) 162; Duthie Grasses N. W. Ind. (1883) 9, Fodder Grasses N. Ind. (1888) 14; Hook. f. Fl. Brit. Ind. VII (1896) 79; Trim. Fl. Ceyl. V, 163; Cooke Fl. Bomb. II (1908) 920; Haines Bot. Bih. and Or. (1924) 989.

*S. glauca* Hochst. PL Hohenack. no. 937.

*Panicum intermedium* Roth Nov. Sp. (1821) 47.

Vernacular names : Landgar, Chiriyaka dana, Sawa, Lundi.

Description : Stem 60-90 cm. long, slender, erect or ascending; nodes glabrous, the lower often rooting. Leaves 5-23 cm. by 3-20 mm., linear-lanceolate, finely acuminate, thin, flat, sparsely hairy on both surfaces, with scaberulous margins, base narrow; sheaths long, smooth, the mouth villous, the margins ciliate especially in the upper part.

Panicle 10-15 cm. long, narrowly pyramidal; rachis glabrous, grooved; branches short, distant below, rather crowded above, dense-flowered; bristles of involucrel 3-6, about 6 mm, long, very slender, flexuous, studded with minute erect teeth, pale. Spikelets 2-2.5 mm. long, ovoid, subacute. Glumes 4; lower involucral glume orbicular-oblong or ovate, about \ as long as the spikelet, hyaline, faintly 3-nerved; upper involucral glume about half as long as the spikelet, broadly ovate, subacute, hyaline, 5-nerved; lower floral glume about equalling the upper, broadly ovate, thinly membranous, 5-nerved, paleate, empty, the palea hyaline; upper floral glume broadly ovate or suborbicular, acute, coriaceous, very concave, transversely rugulose all over, yellowish brown; palea elliptic, subacute.

Locality : *Gujarat*: Doongri (Chibber!); Ahmedabad (Gammie 16351!); Nadiad (Chibber!).

*Khandesh*: Toranmal (McCann A152!); Umalla village (Blatter & Hallberg 5184!).

*Konkan*: Dadar, very common in Bombay Isl. (McCann A153!); common in Salsette (McCann!).

*W. Ghats*: Igatpuri, common (McCann 4320!); Khandala, common (Blatter 4410!, McCann!); Lonavla (McCann 4466!); Panchgani (Blatter & Hallberg B1227! B1272!).

*Deccan*: Purandhar Fort (Bhide!, McCann 5022! 5595!); Chattarshinji\* Poona (Bhide!); in cultivated fields about Poona (Jacquemont 355).

*S. M. Country*: Dharwar (Sedgwick 1839!); Belgaum (Ritchie 839).

*N. Kanara*: Yellapur (Talbot 1520!); Halyal (Talbot 2296!).

Ecology : A common plant of cultivation and waste land.—A monsoon species.

Distribution ; Temperate and tropical regions.

#### 5. SETARIA VERTICILLATA Beauv.

*Setaria verticillata* Beauv. Agrost. (1812) 51; Kunth Enum. PL I (1838) 152; Dalz. & Gibs. Bomb. FL (1861) 294; Aitchis. Cat. Panjab PL (1869) 162; Duthie Grasses N. W. Ind. (1883) 9, Fodder Grasses N. Ind. (1888) 15; Reichb. Ic. FL Germ. t. 47; Hook. f. FL Brit. Ind. VII (1896) 80; Trim. Fl. Ceyl. V, 163; Prain Beng. PL 1170; Cooke FL Bomb. II (1908) 921; Haines Bot. Bih. and Or. (1924) 989.

*S. respiciens* Hochst. ex Miq. Fl. Ind. Bat. III, 467.

*S. verticilliformis* Dum. Fl. Belg. (1827) 150.

*S. Rottleri* Spreng. Syst. Veg. I (1825) 304.

*Panicum adhaerens* Forsk. FL Aeg.-Arab. (1775) 20.

*P. asperum* Lam. FL Fr. III, 577.

*P. floricundum* Willd. ex Spreng. 1. c. 306.

*P. humih* Trin. Gram. Panic. 167.

*P. italicum* Ucria Hort. Reg. Panhorm. (1789) 54.

*P. respiciens* Hochst. ex Steud. Syn. PL Glum. 52.

*P. verticillatum* Linn. Sp. PL ed. II, 82; Roxb. FL Ind. I (1832) 301.

*P. viride* Desf. Fl. Atl. I, 58.

*Pennisetum verticillatum* R. Br. Prodr. (1810) 195.

*P. respiciens* A. Rich. Tent. Fl. Abyss. II (1851) 379.

Vernacular names : Lapti, Chirchira, Bardani, Chilaya, Chiklenta.

Description : Annual; stems erect or ascending, 30-90 cm. long, stout or slender, leafy\* more or less branched, glabrous. Leaves 7-5-25 cm. by 4-20 mm., thin, flat, glabrous or sparsely



hairy and scaberulous, linear or linear-lanceolate, tapering to a fine point, base usually narrow ; sheaths smooth, striate ; ligule a fringe of hairs.

Panicle 2.5-12.5 cm. long, erect or curved, spike-like, cylindrical or oblong, coarsely bristly ; bristles of the involucrel 1 or few, 4-8 mm. long, closely studded with conspicuous downward-pointing teeth. Spikelets 2 mm. long, ellipsoid, obtuse, glabrous. Glumes 4; lower involucrel glume 0.8 mm. long, ovate, acute, hyaline, faintly 3-nerved; upper involucrel glume about as long as the spikelet, ovate, subacute, thinly membranous, 5-nerved; lower floral glume similar to the upper involucrel glume, 5-nerved, empty, paleate or not, the palea when present hyaline, very small; upper floral glume elliptic-oblong, plano-convex, subobtusely, coriaceous, straw-coloured, faintly striatulate and with incurved margins ; palea as long as the glume, coriaceous, elliptic, faintly striatulate. •

Easily distinguished from the other species by its readily sticking to one's clothing (*Panicum adhaerens* Forsk.!).

**Locality** : *Sind*: Umarnot (Sabnis B748 !); Sanghar (Sabnis B758 !); Mirpurkhas, cultivated fields (Sabnis B701!); Bughar, Indus River (Blatter & McCann D640!); Ghulam-alla, garden (Blatter & McCann D641!); Mirpur Sakro (Blatter & McCann D642 1).

*Cutch* (Blatter 3744!).

*Kathiawar*: Morvi (Woodrow).

*Gujarat*: Ahmedabad (Sedgwick!); Baroda (Woodrow).

*Konkan*: Sion (Herb. St. X. C. 5236!); Juvem (Herb. St. X. C. 4237!) ; Malabar Hill (McCann 3626!); Byculla (McCann!).

*S. M. Country*: In a village, Dharwar Dist. (Sedgwick 3109 !).

**Ecology** : Grows in shady places. " Delights in a rich soil in out of the way corners, where there is rubbish " (Roxburgh). This is essentially a village grass. It is semiscandent in hedges in all village sites of the Carnatic and never seen far from habitations.

**Distribution** : India, Ceylon

**Economic uses** : Eaten by cattle when young. The grain is eaten by poorer classes.

#### \*6. SETARIA ITALICA Beauv.

*Setaria italica* Beauv. Agrost. (1812) 51 ; Reichb. Ic. Fl. Germ. t. 47 ; Aitchis. Cat. Panjab PL (1869) 162; Duthie Grasses N. W. Ind. (1883) 8> Field and Gard. Crops 5, t. 25, Fodder Grasses N. Ind. (1888) 15 ; Miq. Fl. Ind. Bat. III, 467 ; Hook. f. Fl. Brit. Ind. VII (1896) 78 ; Prain Beng. PL 1170; Haines Bot. Bih. and Or. (1924) 988.

*Panicum italicum* Linn. Sp. PL (1753) 56; Roxb. FL Ind. I (1832) 302 ; Dalz. & Gibs, Suppl. (1861)98.

*Pennisetum macrochaetum* Jacq. Eclog. Gram. III, 36, t. 25; Rheede Hort. Malab. XII, t. 79.

**Vernacular names** : Italian Millet, Foxtail Millet, Rala, Bhadli, Kang.

**Description** : Annual. Culms erect, tufted, 0.6-1.5 m. high. Leaves linear or lanceolate-linear, acuminate, 7-10 mm. broad or broader. Sheath densely ciliate on margin and mouth.

Panicle 7-13 cm. long, 10 mm. wide or more, dense, inclined or nodding, simple, cylindrical or lobed or compound ; rachis very hairy. Spikelets oval, 2-2.5 mm. long, in small clusters on the abbreviated branchlets of the panicle, with 2-3 bristles below each pedicel, bristles nearly smooth or microscopically barbellate, 5-8 mm. long, barbs suberect or spreading. Lower involucrel glume oblong or subglobose, hyaline, smooth; upper ovate, obtuse or rounded, about | the length of the upper floral glume, 5-nerved. Lower floral glume hyaline, delicately 4-5-nerved, as long as and same shape as the upper floral glume, but not concave. Upper floral glume oval or elliptic or subglobose, concave, hardening, variable in length, not rugose but smooth and microscopically cancellate.

**Locality** : *Konkan*: Bombay, cultivated in compound of the Training College (McCann 4286 !); Bassein, Botanic Garden (Joshi!); Chowpatti, Bombay (Herb. St. X. C. 4299!).

*Deccan*: Ganeshkhind Botanic (. ardens (Patwardhan!).

*S. M. Country*: Dharwar, cultivi 'ed (Talbot 2014 !).

In the Presidency it is cultivated chiefly in t J Carnatic, Satara and Ahmednagar, and to some extent in Gujarat. In 1914-15 the area under cultivation was 247,677 acres.

**Ecology** : This grass does best on medium light soil and thrives better than other millets with deficient rainfall. It is sown usually in July-August without any subordinate mixture, in an unmanured field. It ripens in about 3 months.

**Distribution** : Most warm, temperate and tropical countries.

**Origin** : See DeCandolle, Origin of cultivated plants, p. 378.

He sums up his investigations in these words: " The sum of the historical, philological, and botanical data make me think that the species existed before all cultivation, thousands of year\* ago in China, Japan, and in the Indian Archipelago. Its cultivation must\* have early spread towards the West, since we know of Sanskrit names, but it does not seem to have been

known in Syria, Arabia and Greece, and it is probably through Russia and Austria that it early arrived among the lake-dwellers of the stone age in Switzerland.

*Economæ Use* : The grain is much esteemed as an article of human food. The straw is considered to be nourishing, but in many parts it is only used for feeding goats. In other localities it is utilised for bedding and thatching houses.

*Medicinal use* : The grain is sometimes apt to produce diarrhoea. It is said to act as a diuretic and astringent. It is also used externally in rheumatism. Said to be a popular remedy in parturition.

#### 59. TRICHOLAENA Schrad.

Erect tufted perennial (rarely annual) grasses. Leaves narrow ; ligule a fringe of hairs.

Spikelets 1-2-flowered, articulate on their pedicels, paniculate, laterally compressed, clothed with long silky hairs. Glumes 3 or 4 ; lower involucral glume somewhat remote from the upper,, often reduced to a minute scale or obsolete ; upper involucral glume membranous, emarginate or mucous, or finely mucronate or aristate from the sinus, 5-nerved, usually hairy; lower floral glume like the upper involucral glume, male or barren, with a hyaline 2-nerved subequil palea ; upper floral glume much smaller than the lower, thinly chartaceous, glabrous, shining, obtuse or emarginate, obscurely 5-nerved, 2-sexual. Lodicules 2, small. Stamens 3. Styles-free

Species 10-12.—Chiefly African. The following 2 in the Bombay Presidency.

1. Spikelets up to 4 mm. long; lower involucral glume minute or obsolete; lower floral glume apiculate (not awned). . . . . 1. *T. Teneriffae*.
2. Spikelets reaching 10 mm. long ; lower involucral glume 2-5 mm. long; lower floral glume awned . . . . . 2. *T. Wightii*.

#### 1. TRICHOLAENA TENEBIFFAE Parlat.

*Tricholaena Teneriffae* Parl. in Webb. & Berth. Phyt. Canar. III, pt. 2 (1848) 425; Fl. Ital. I, 131; Lisboa Bomb. Grasses (1896) 2T; Hook. f. Fl. Brit. Ind. VII (1896) 65; Cooke Fl. Bomb. II (1908) 924.

*Panicum plumosum* Presl Fl. Sic. (1826) 43.

*P. saccharoides* Trin. Gram. Panic. 245.

*P. Teneriffae* R. Br. Prodr. (1810) 189 ; Boiss. Fl. Or. V (1884) 434.

*P. villosum* Presl Gram. & Cyp. Sic. 18.

*Saccharum Teneriffae* Linn. f. Suppl. (1781) 106 ; Sibth. Fl. Graec. I, t. 53 (*excl. anal*).

*Agrostis plumosa* Ten. Fl. Nap. Prodr. Supl. I, 59.

*Eymology* : *Tricholaena* is derived from *tkrix*, hair, and *laena*, mantle, referring to the silky hairs on the spikelets.—*Teneriffae* is a volcano in the Canary Islands.

*Description* : Perennial; stems many from a woody rootstock, geniculate below, slender,, rigid. Leaves 3-2-7.5 cm. by 1-6-3 mm., narrowly linear-lanceolate, finely acuminate, convolute, rigid, glabrous; sheaths glabrous ; ligule a narrow softly hairy ridge.

*Inflorescence* of slender erect panicles 6-3-11.5 cm. long ; branchlets and pedicels capillary. Spikelets up to 4 mm. long, clothed with silky hairs. Glumes 3 (rarely 4); lower involucral glume minute or obsolete ; upper involucral 3 mm. long, ovate, acute, densely silky; lower floral glume 4 mm. long, ovate, acute, apiculate, paleate, the palea narrowly oblong, subobtusely, hyaline; upper floral glume 2-5 mm. long, ovate-oblong, obtuse, coriaceous, shining; palea as long as the glume, oblong-lanceolate, subacute. Anthers 2-5 mm. long, narrowly linear. Stigmas 2-5 mm. long, exserted, sessile or nearly so, plumose.

*Locality* : *Sini*: Laki (Bhide !); Thano-Bullo-Ehan (Woodrow).

*Distribution* : Punjab, W. Peninsula; westward to Sicily and N. Africa, Abyssinia,, tropical Africa.

#### 2. TRICHOLAENA WIGRTII Nees.

#### PLATE 112.

*Tricholaena Wightii* Nees ex Steud. Syn. Pl. Glum. (1855) 93; Lisboa Bomb. Grasses (1896) 27; Hook. f. Fl. Brit. Ind. VII (1896) 65; Cooke Fl. Bomb. II (1908) 925.

*Rhynchelytrum Wightii* Duthie Fodder Grasses N. Ind. (1888) 21.

*R. villosum* Chiov. in Ann. Istit. Bot. Roma VIII, 310; Stapf & Hubbard in Fl. Trop. Afr. IX (1930) 875.

*Monachyron vfflosum* Paxl. in Hook. Niger Fl. (1841) 191.

*Panicum megahnthum* Steud. Syn. Pl. Glum. (1855) 93.

*Tricholaena longiseta* in Bull. Herb. Boiss. II, App. 2, 23, 95 (*nan Hochst.*)



TRICHOALAENA WIGHTII NEES.

Delin: R. K. Blyde.

*T. Dregeana* Hack, in Bull. Herb. Boiss. IV, App. 3, 15( *partim, non* Durand & Sctdnz).

*T. villosa* Durand & Schinz Consp. FL Afif. V, 771.

*Mdinis Wightii* Hack, in Oesterr. Bot. Zeitschr. (1901) 464.

*M. Bertlingii* Mez in Engl. Bot. Jahrb. LVII. 196.

*M. Rangei, pulchra, Barbeyana etaffinis* Mez 1. c. 195, 196.

**Description** : Stems 15-45 cm. high, tufted, stout or slender. Leaves 2-5-15 cm. by 3-6 mm., linear, finely acuminate, flat, glabrous or hairy ; sheaths glabrous or hairy with bulbous-based hairs ; ligule a hairy line.

Inflorescence a narrow panicle 5-12-5 cm. long ; branchlets and pedicels capillary, flexuosa. Spikelets variable in size, sometimes exceeding 1 cm. long (including the awns), silky-hairy. Glumes 4 ; lower involucral glume 2-5 mm. long, linear, obtuse, distant from the others, strongly bearded at the base; upper involucral glume ovate-lanceolate, tumid at the base, obtuse or subacute, silky-hairy, the midnerve produced from the back into a capillary awn nearly 5 mm. long; lower floral glume similar to the upper involucral glume, with a similar awn, silky-hairy, paleate, male, the palea narrow, hyaline; upper floral glume 2-5 mm. long, elliptic-oblong, obtuse, concave, smooth, thin, 2-sexual; palea as long as the glume. Anthers 2-5 mm. long. Stigmas 1-6 mm. long, with distinct styles free to the base or nearly so.

**Locality** : *Korikan*: Commonly cultivated in gardens in Bombay (McCann!); Sewri, probably an escape (Hallberg 3592 !).

*W. Ghats*: Khandala Ghat, Satara Dist. (McCann!); Mahableshwar (Lisboa); Panchgani (Lisboa).

*Deccan*: Satara Diet. (McCann!); Diva Ghat (McCann 5590!); Malhargad (Woodrow); Poona (Woodrow); Khandala Ghat (McCann !).

*S. M. Country* : Badami (Bhide !, Woodrow 23).

**Distribution** : W. Peninsula, Eajputana, Arabia, Cape Verde Islands.—A very doubtful native as it is so often cultivated in gardens.

**Explanation of Plate 112** : *Trwholaena Wiffktii* Nees.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume (side view).
4. Lower floral glume.
5. Palea of lower floral glume and stamens.
6. Upper floral glume (side view).
7. Palea of the upper floral glume.
- \* 8. Ovary.

#### 60. PENNISETUM Pers.

Annual or perennial grasses. Leaves narrow.

Inflorescence of spike-like racemes of involuclate clusters of shortly pedicellate spikelets articulate on a simple rhachis; involucl consisting of unequal scabrid or plumose simple or branched bristles. Spikelets 1-6 in each involucl, persistent on their pedicels, 1-2-flowered, obovoid or lanceolate. Glumes 3 or 4; lower involucral glume small or 0 : upper involucral glume subequal to the lower floral glume, 5-7-nerved, awned or not, rarely absent; lower floral glume paleate or not, male or empty; upper floral glume sessile, coriaceous, 2-sexual or female. Lodicles 2. Stamens 3 ; anthers linear. Styles long, free or connate below. Grain oblong, **free** within the hardened glume and palea.

Species about 40.—In most warm countries.

Cooke has 6 indigenous and 1 cultivated species. We add another cultivated species: *P. purpureum* Schum. & Thoun. The name *P. cenchroides* Rich, has to cede to *P. ciliare* Link., and *P. typhoideum* Eich. to *P. spicatum* Roem. & Schult.

A. Anther-cells not bearded at the tips.

I. Bristles of involucl free to the base.

1. Inner bristles of involucl scaberulous, not ciliate.
  - a. Leaves 30-45 cm. long . . . . . 1. *P. Alopecuros.*
  - b. Leaves 7-15 cm. long . . . . . 2. *P. dichotomwn.*
2. Inner bristles of involucl ciliate below the middle, but naked at the base. Involucl stipitate . . . . . 3. *P. orientals*

3. Inner bristles of involucre densely villous or ciliate below the middle, not naked at the base. Involucre sessile.
- a. Inner bristles of involucre densely villous . . . . . 4. *P. pedicclatum*.
- b. Inner bristles of involucre laxly ciliate with long silky hairs, not villous . . . . . 5. *P. setosum*.
- II. Inner bristles of involucre dilated below, their bases confluent in a coriaceous disk . . . . . 6. *P. ciliare*.
- B. Anther-cells more or less bearded at the tips. Styles connate.
- I. Culms less than 2 m. high. Palea of upper floral glume truncate. . . . . 7. *P. spicatum*.
- II. Culms more than 2 m. high. Palea of upper floral glume minutely 2-toothed . . . . . 8. *P. purpureum*.
1. PENNISETUM ALOPECUBOS Nees.

## PLATE 113.

*Pennisetum Ahpecuros* Nees ex Steud. Syn. Pl. Glum. (1855) 102; Duthie Grasses N. W. Ind. (1883) 10; Lisboa Bomb. Grasses (1896) 35; Hook. f. Fl. Brit. Ind. VII (1896) 84; Cooke Fl. Bomb. II (1908) 914.

*P. Hohenackeri* Hochst. ex Steud. 1. c. 103.

*P. aureum* Dalz. & Gibs. Bomb. Fl. (1861) 294.

*Gymnothrix Alopecurfis* Nees in Wight Cat. no. 1663; Steud. 1. c.

*G. cenchroides* Eoem. & Schult. Syst. II, 499.

**Etymology** : *Pennisetum* is derived from *penna*, a feather, and *seta*, a bristle.—*Alopecuros* is the name of a nearly related genus of grasses.

**Description** : Perennial; stems 60-90 cm. high, stout, erect, densely tufted below, sub-distichously branched above; branches strict, erect. Leaves 30-45 cm, by 2-5-4 mm., coriaceous, convolute, glabrous, with usually a tuft of soft hairs at the base; sheaths glabrous or nearly so; ligule a small hairy ring.

Racemes spike-like, 12-5-18 cm. long; rachis flexuous, scaberulous, angular; involucre very shortly pedicellate; bristles very unequal, the longest 2-3 times as long as the spikelet, scaberulous. Spikelets reaching nearly 10 mm. long, lanceolate, acute, solitary. Glumes 4; lower involucral 1½ mm. long, suborbicular, hyaline; upper involucral glume 4 <sup>TMTM</sup> long, lanceolate, acuminate, 3-nerved, hyaline; lower floral glume 8 mm. long, lanceolate, acuminate, 7-11-nerved with involute margins; upper floral glume slightly longer than the lower one, lanceolate, acuminate, 5-nerved, with involute margins, 2-sexual; palea lanceolate, as long as the glume.

**Locality** : *Sind* (Dalzell).

*Gujarat*: N. Sonasan, on dry sandy bank (Sedgwick!).

*Khandesh*: Toranmal, very common around lake (McCann 9862!).

*W. Ghats*: Lonavla (Lisboa); Panchgani (Blatter 3802!, Blatter & Hallberg 1292!, McCann!); Londa (Gammie 15827!).

*Deccan*: Poona (Woodrow!, Lisboa, Jacquemont 407!); near Poona (Gammie 15314!); Nasik (Bourke!, Blatter & Hallberg 9863!, Lisboa); Purandhar, N. foot (McCann 5045!); Lohagad, plain (McCann 9502!).

*S. M. Country*: Dharwar (Sedgwick 3718!); Belgaum (Woodrow).

*N. Kanara*: Halyal (Talbot 2090!).

**Ecology** : Commonly found in clumps on sandy soil near streams and lakes. It is extremely tough and occupies sometimes large patches of land excluding almost everything else. *Dichanthium caricosum* is commonly found growing together with this grass.

**Distribution** : Rajputana, Central India, W. Peninsula.

**Economic uses** : "ID Poona brooms are said to be made of it, and at Mt. Abu it is employed in the manufacture of cordage." (Lisboa.)

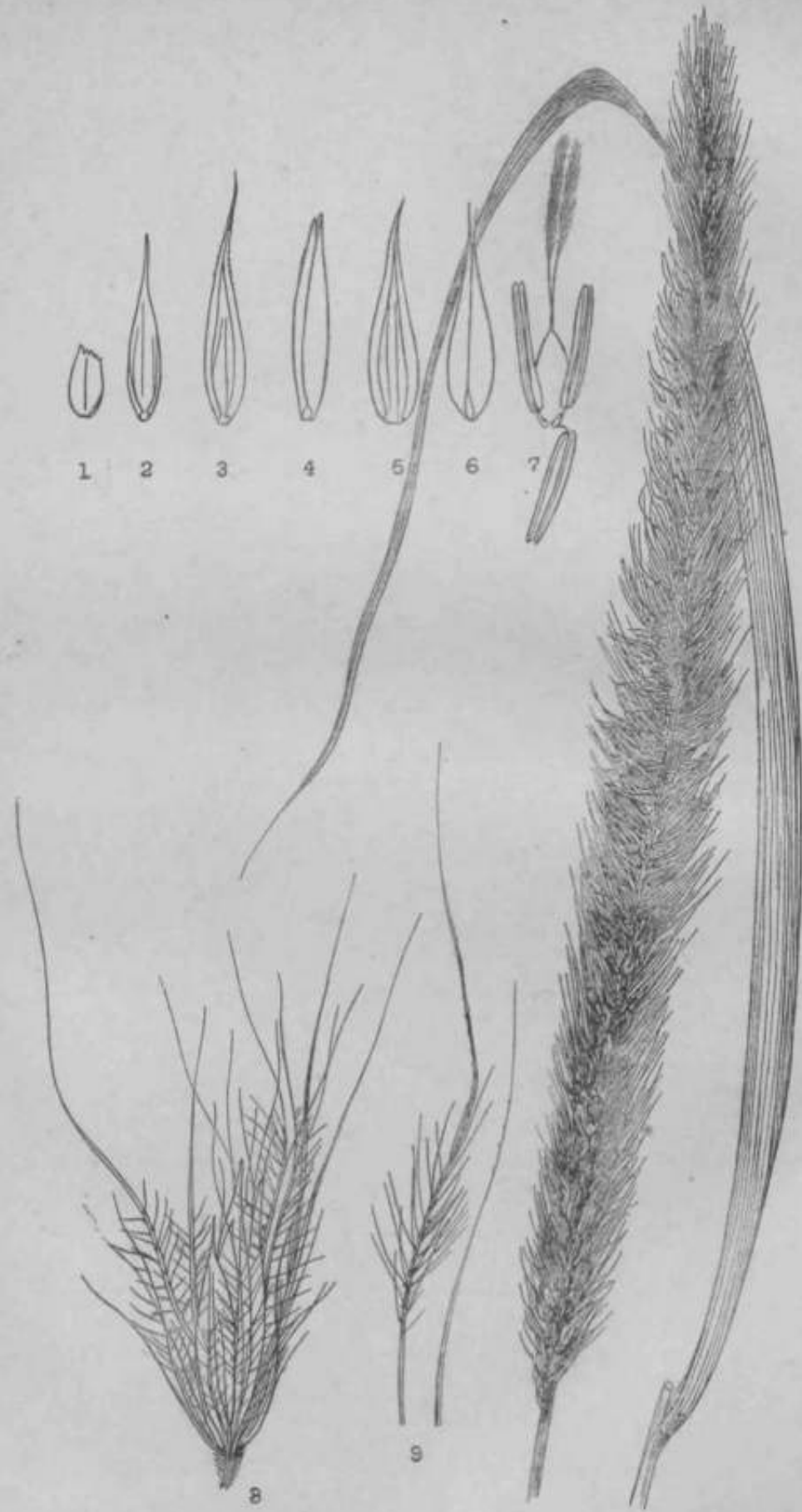
**Explanation of Plate 113** : *Pennisetum Ahpecuros* Nees.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Upper floral glume.
6. Palea of upper floral glume.
7. Stamens, ovary and styles.



PENNISETUM ALOPECUROIDES NEES.

Delia: E. K. Balf.



PERISETUM OBIECTUM RICH

Delin; R. K. Bhide.

## 2. PENNISETUM DICHOTOMUM Del.

*Pennisetum dichotomum* Del. Fl. d'Egypt. (1813) 159, t. VIII, fig. 1., Trin. Diss. II, 66, Pan. Gen\* 94; Kunth Enum. PL I (1838) 161, Suppl. 110; Steud. Syn. Pl. Glum. (1855) 105; Boiss-Fl. Or. V (1884) 444; Aitchis. Cat. Panjab Pl. (1869) 162; Duthie Grasses N. W. Ind. (1883) 10; Hook. f. Fl. Brit. Ind. VII (1896) 85; Asohers. Schweinf. 111. Fl. d'Ég. 161, no. 1131 Cooke Fl. Bomb. II (1908) 915.

*P. phalaroides* Schult. Mant. II, 147.

*Gymnothrix longiglumis* Munro in Cat. Griff. etc. Pl. 56 (*rumen*).

*Cenchrus ramosissimus* Poir. Encycl. VI, 51; Dalz. & Gibs. Bomb. Fl. (1861) 294.

*Phalaris setacea* Forsk. Fl. Aegypt.-Arab. (1775) 20.

*Panicum dichotomum* Forsk. 1. c.

**Description** : Perennial, quite glabrous, bushy; stem distantly dichotomously branched, the branches often fascicled; internodes long, rigid, smooth and polished. Leaves 7-5-15 cm. by 2\*5-4 mm., narrowly linear, tapering to a subulate point, rigid.

Racemes 6-3-12-5 cm. long, cylindrical, pale (nearly white); rhachis more or less scaberulous, angular; involucre sessile or nearly so; bristles very numerous, slender, pale, unequal, the longer twice as long as the spikelet, free to the base. Spikelets usually solitary, 8 mm. long, lanceolate, acuminate, nearly white. Glumes 4; lower involucral glume nearly 6 mm. long by 1-6 mm. broad at the base, lanceolate, acuminate, 1-nerved, hyaline; upper involucral glume 8 mm. long, lanceolate, acuminate, 5-7-nerved, hyaline; lower floral glume as long as the upper involucral glume, ovate-lanceolate, cuspidately acuminate, paleate, 5-nerved, the palea nearly as long as the glume, lanceolate, acute; upper floral glume as long as the lower one, ovate-lanceolate, acuminate, cuspidate, 5-nerved; palea 6 mm. long, lanceolate, acuminate. Styles much exerted beyond the spikelets, free nearly to the base, densely plumose in the upper part.

**Locality** : *Sind*: On sand hills (Stocks, Woodcow); Bholari (Bhide !); Nasarpur, sandy plains (Sabnis B1050 !); Sehwan, sand dunes (Sabnis B673 !).

*Gujarat*: In hedges (Dalzell & Gibson).

**Ecology** : A desert plant growing on sand hills, stony ground and amongst rocks.

**Distribution** : Punjab, N. W. Provinces, W. Peninsula, Afghanistan, Persia, Arabia, Syria, Sinai, Egypt.

**Economic uses** : Collected for fodder, horses and donkeys relish it; one of the most valuable of desert plants.

## 3. PENNISETUM ORIENTALE Bich.

## PLATE 114.

*Pennisetum orientate* Rich. in Pers. Syn. I (1805) 72; Boiss. Fl. Or. V (1881) 445; Duthie Grasses N. W. Ind. (1883) 10; Hook. f. Fl. Brit. Ind. VII (1896) 86; Cooke Fl. Bomb. II (1908) 915; Muschler Fl. Egypt (1912) 66; Haines Bot. Bih. and Or. (1924) 986.

*P. araneosum* Edgew. in Journ. As. Soc. Beng. XXI (1852) 180; Aitchis Cat. Panjab PL 162; Duthie Grasses N. W. Ind. (1883) 10.

*P. asperifolium* Kunth Rev. Gram. I (1829) 49.

*P. datum* Hochst. ex Steud. Norn. ed. 2, II (1840) 297.

*P. fasciculatum* Trin. in Mem. Acad. Petersb. ser. 6, III, II (1835) 181.

*P. macrostachyum* Fresen. in Mus. Senkenb. II, 135 (*non* Trin.).

*P. persicum* Boiss. & Biihse in Nov. Mem. Soc. Nat. Mosc. XII (1860) 232.

*P. Ruppellii* Steud. Norn. 1. c.

*P. sinaicum* Dene! in Ann. Sc. Nat. ser. 2, II (1834) 11; Duthie 1. c.

*P. tenue et variabile* Fig. & Notar. in Mem. Acad. Torin. ser. 2, XII (1852) 246, 248-

*P. tiberiadis* Boiss. Diagn. ser. I, XIII, 43.

*Cenchrus asperifolius* Desf. Fl. Atlant. II, 388.

*G. orientalis* Willd. ex Trin. Diss. II, 69.

*Panicum orientate* Willd. Enum. Hort. BeroL II, 1031.

**Description** : Perennial, 60-120 cm. high; stem suberect from a stout rootstock, leafy, clothed below with withered sheaths. Leaves 15-30 cm. by 3-10 mm., narrowly linear, finely acuminate, flat, smooth, the margins scaberulous ciliate close to the obtuse or truncate base; sheaths glabrous with ciliate margins; ligule a shortly ciliate line.

Racemes reaching as much as 25 cm. long; rhachis subterete, pubescent; involucre shortly stipitate, the stipe pubescent; bristles very unequal, the longest about 20 mm. long (rarely one may be found 2-5 cm. long), often purplish, scaberulous, the inner ciliate with long hairs below the middle, but naked at the base. Spikelets usually 2-6 (rarely solitary) within the involucre, reaching 6 mm. long, on pubescent pedicels. Glumes 4; lower involucral glume 1-6-2 mm. long, ovate-oblong, obtuse, nerveless, hyaline; upper involucral glume 4 nun. long, ovate-lanceolats\*



acuminate ; lower floral glume 6 mm. long, ovate-lanceolate, 5-nerved, awned, triandrous, the palea 5 mm. long, oblong, obtuse, often 2-fid, hyaline ; upper floral glume 5 mm. long, membranous, ovate-lanceolate, 5-nerved, awned ; palea 4 mm. long, lanceolate, acuminate, with involute margins, sometimes biaristulate at the tip.

**Locality** : *Sind*: Hyderabad (Woodrow !); Mirpurkhas (Mankad!).

*Konkan* : Victoria Gardens, Bombay (McCann 4385 !).

**Distribution**: W. Himalaya, Punjab, W. Peninsula, Persia, Syria, Cilicia, Sinai, Egypt, Algeria.

**Explanation of Plate 114** : *Pennisetum orientate* Rich.

1. Lower invol. glume.
2. Upper invol. glume.
3. Lower floral glume.
4. Palea of lower floral glume.
5. Upper floral glume.
6. Palea of upper floral glume.
7. Stamens, grain and styles.
8. Spikelets.
9. Bristles.

4. PENNISETUM PEDICELLATUM: Trin.

PLATE 115.

*Pennisetum pediceatum* Trin. in Mem. Acad. Petersb. ser; 6, III, pt. II (1835) 184; Hook, f. Fl. Brit. Ind. VII (1896) 86; Cooke Fl. Bomb. II (1908) 916 ; Haines Bot. Bih. and Or\* (1924) 986.

*P. lanugirvsum* Hochst. in Flora XXV (1842), Beibl. I, 133.

*P. amoenum* A. Rich. Tent. Fl. Abyss. II (1851) 386.

*P. intertextum* Schlecht. in Bot. Zeit. IX (1851) 878.

*Eriochaeta densiflora, nervosa et secundiflora* Fig. & De Not. in Mem. Ace. Torin. ser. II, XIV (1854) 375-378.

**Description** : Annual; stems 30-90 cm. long, branched from the base and above, leafy. Leaves 15-25 cm. by 4-10 mm., flat, flaccid, glabrous or sparsely hairy; sheaths glabrous; ligule a shortly ciliate membrane.

Racemes cylindric, 5-12\*5 cm. long, dense-flowered; rhachis glabrous or nearly so, notched ; involucre sessile; outer bristles few, slender, short, about 3 mm. long, inner bristles numerous, the longest reaching 10 mm. long (or more), densely villous below the middle, unequal, usually pale, free to the base. Spikelets 4 mm. long, usually solitary within the involucre, shortly pedicellate. Glumes 4 ; lower involucral glume very small, woolly; upper involucral oblong-lanceolate, apiculate, 4 mm. long, 7-nerved, hyaline; lower floral glume 3 mm. long, oblong, truncate, 3-toothed, 5-nerved, hyaline; upper floral glume ovate-oblong, obtuse, with a fimbriately ciliate tip, rather shorter than the lower floral glume, coriaceous, smooth, shining; palea as long as the glume, lanceolate, toothed.

**Locality** : *Gujarat* (Lisboa).

*Kathiawar*: Rajkot (Woodrow).

*Khandesh*: Toranmal, in watercourse (McCann 9868 !).

*Deccan* : College Farm, Poona (Garade!).

**Distribution** : Bihar, Bajputana, W. Peninsula, tropical Africa.

**Explanation of Plate 115** : *Pennisetum pedicellatum* Trin.

1. Spikelets.
2. Bristles.
3. Lower invol. glume.
4. Upper invol. glume.
5. Lower floral glume.
6. Palea of lower floral glume with stamens.
7. Upper floral glume.
8. Palea of upper floral glume.
9. Stamens, grain and styles.

5. PENNISETUM SETOSUM Rich.

*Pennisetum setosum* Rich, in Pers. Syn. I (1805) 72 ; Lisboa Bomb. Grasses (1896) 36 ; Hook, f. Fl. Brit. Ind. VII (1896) 87 ; Cooke Fl. Bomb. II (1908) 916; Haines Bot. Bih. and Or\* (1924) 986.

*P. barbatvm* Schult. Mant. II, 147.

*P. breve* Kees Agrost. Bras. (1829) 283.



PENNISETUM PEDICELLATUM TRIN.

Delin: B. K. Bida.



PENNJSETUM CILIARE LINK.

Della: B. K. Bhide.

- P. ciliatum* Parl. in Hook. Niger Fl. (1841) 184.  
*P. flaver 4ms* Presl Reliq. Haenk. I (1830) 316.  
*P. hirsutum* Nees l. c. 284.  
*P. holcooides* Schult. l. c. 148; Duthie Grasses N. W. Ind. (1883) 10; Indig. Fodder Grasses (1886) t. 49, Fodder Grasses N. Ind. (1888) 17.  
*P. gracile* Benth. in Hook. Niger Fl. l. c. 564.  
*P. myurus* Parl. in Atti. Eion. Ott. Sc. Ital. 586.  
*P. polystachyum* Schult. l. c. 146.  
*P. purpurascens* H. B. & K. Nov. Gen. & Sp. I (1816) 13.  
*P. Richardi* Kuntb Rev. Gram. I (1829) 49, 255, t. 39.  
*P. Sieberi* Kunth Rev. Gram. l. c. 50.  
*P. triticooides* Roem. & Schult. Syst. II (1817) 877.  
*P. uniflorum* H. B. A K. l. c. t. 34.  
*Panicum Alopecurjls* Lam. 111. I, 169, Encycl. IV, 739.  
*P. barbatum* Roxb. Fl. Ind. I (1832) 282.  
*P. cenchroides* Rich. in Act. Soc. Hist. Nat. Par. I (1792) 106.  
*P. densispica* Poir. Encycl. Suppl. TV (1816) 273.  
*P. Tiolcooides* Roxb. l. c. 285.  
*P. polystachyum* Schult. Mant. II, 146.  
*P. triticooides* Poir. l. c. 274.  
*Setaria cenchroides* Roem. & Schult. Syst. II (1817) 495.  
*Cenchrus setosus* Sw. Prodr. Veg. Ind. Occ. (1788) 26 (*excl. syn.*).

About the treatment of *Pennisetum setosum* by Leeke (Zeitschr. Naturw. 79 (1907) 17-19) see A. Chase, The North Amer. Species of *Pennisetum* in Contrib. U. S. Nat. Herb. 22 (1921) 222.

**Vernacular name : Sivati.**

**Etymology :** *Setosum* means provided with bristles.

**Description :** Annual; stem erect, often fastigiately branched at the nodes, green or purplish. Leaves 15-25 cm. by 6-10 mm., linear, finely acuminate, glabrous or hairy; sheaths glabrous; ligule a line fringed with rather long soft hairs.

Racemes 5-10 cm. long, usually purplish brown; rachis glabrous, notched; involucre sessile; bristles unequal, the outer not ciliate, short, about 3 mm. long, the inner longer, ciliate below the middle with long silky hairs (1 of the inner bristles is often much longer than the others, reaching 13 mm., the others 6-8 mm. long). Spikelets 4 mm. long, solitary within the involucre. Glumes 3 or 4; lower involucral glume minute or wanting; upper involucral glume 4 mm. long, ovate-oblong, gradually or suddenly cuspidate, 5-nerved, hyaline; lower floral glume 3 mm. long, oblong, obtuse, with 2 subobtuse lateral and an acute median tooth at the apex, 5-nerved, paleate, male, the palea 2-5 mm. long, narrowly oblong, hyaline; upper floral glume 2-5 mm. long, ovate-oblong, truncate, fimbriately ciliate at the tip, coriaceous, smooth and shining; palea as long as the glume, oblong, truncate, toothed or ciliate at the tip. Anthers nearly 2 mm. long. Styles long, reaching 3 mm., much exerted beyond the spikelet.

Our specimens from Khandesh have the bristles quite free from hairs.

**Locality :** *Sind:* Hyderabad (Woodrow).

*Gujarat:* Ahmedabad, No. 6 grass plot Bhadar (Sedgwick !).

*Khandesh:* To Toranmal (McCann 9869 1); Chanseli Hill, S. slope (McCann 9867 !).

**Distribution :** India (W. Bengal, Bihar, Upper Gangetic Plain, W. Peninsula), tropical Africa and America.

6. PENNISETUM CILIARE Link.

PLATE 116.

*Pennisetum ciliare* Link. Hort. Berol. I (1827) 213; Boiss. PL Or. V (1881) 445; Aschers.-Schweinf. 111. Fl. d'Eg. 161, no. 1132; Sickenberg Contrib. Fl. d'Eg. 301; Muschler Fl. Eg. I (1912) 65.

*Cenchrus ciliaris* Linn. Mantiss. II (1771) 302; Desf. Fl. Atlant. II, 387.

*Pennisetum cenchroides* Rich. in Pcrs. Syn. I (1805) 72; Beauv. Agrost. (1812) 59, t. 13, fig. 5; Aitohis. Cat. Panjab Pl. (1869) 162; Lisboa Bomb. Grasses (1896) 36; Duthie Grasses N. W. Ind. (1883) 10, Indig. Fodder Grasses (1886) t. 12, 13, Fodder Grasses N. Ind. (1888) 17; Cooke Fl. Bomb. II (1908) 916.

*P. ciliare* Link. Hort. Berol. I, 213.

*P. distylum* Guss. Ind. Sem. Hort. Bocc. 8; Fl. Sic. Prodr. 1, 12.

*P. rufescens* Spreng. Syst. Veg. I (1825) 302.

*Cenchrus longifolitis* Hochst. ex Stoud. Syn. Pl. Glum. 106.

*C. rufescens* Desf. Fl. Atlant. II, 387.

*Panicum vulpinum* Willd. Enum. Hort. Berol. 1031.

**Vernacular name** / Anjan dhaman.

**Description** : Perennial; steins tufted, 15-45 cm. long, erect or decumbent and much-branched from the base, stout or slender, leafy, or ascending from a branched often nodose rootstock. Leaves 10-25 cm. by 3-6 mm., linear, tapering to a fine point, glabrous or hairy.

Racemes cylindrical, dense, 2-5-10 cm. by 8-13 mm., pale or purplish; rhachis finely scaberulous; involucler subsessile; outer bristles slender, short, not ciliate; inner bristles about 10 mm. long (1 bristle conspicuously longer and stouter than the others, reaching 13 mm. long or more), dilated and connate into a ring at the base. Spikelets 4-5 mm. long, oblong-lanceolate, 3-1 in each involucler. Glumes 4; lower involucler glume 2\*5 mm. long, ovate-lanceolate, acute, faintly 1-nerved, hyaline; upper involucler glume 3 mm. long, ovate, acuminate, 1-nerved, hyaline; lower floral glume 4-5 mm. long, ovate-lanceolate, cuspidately acuminate, 3-5-nerved, paleate, usually male, the palea narrowly lanceolate, as long as the glume; upper floral glume as long as the lower one, lanceolate, 3-5-nerved; palea lanceolate, as long as the glume.

**Locality** : *Sind* : (Burns !); Mirpurkhas (Mankad !, Sabnis B1043 !); Jacobabad (Deputy Commissioner I); Sanghar (Sabnis B892 !); Clifton near Karachi (Sabnis B805 !); Jemadar ka Landa, near Karachi (Stocks); Sehwan to Laki (Sabnis B620 !); Nasarpur (Sabnis B1056 !); Umarmot, sand dunes (Sabnis B1079!); Tatta, Kullian Koto Lake (Blatter & McCann D630! D631! D633 !); Tatta (Blatter & McCann D632 ! D634 ! D635 !); Indus Delta (Blatter & McCann D636!).

*Cutch*: Bhuj Hill (Blatter 3767 !).

*Kathiawar*: Rajkot (Woodrow).

*Gujarat*: Nadiad (Chibber !); Dohad (Chibber!); Daman (Bhide !); Surat (Gammie !); Ahmedabad (Sedgwick !); near Madalpur, Ahmedabad (Saxton 1065 1).

*Ehandesh*: Tapti bank, Muravat (Blatter & Hallberg 516511); Umalla, Tapti bank (Blatter & Hallberg 5208 !).

*Deccan* (Lisboa!).

*S. M. Country*: Gokak (Shevade !).

**Ecology** : Common in dry soil. Usually found in the drier parts of the Presidency.

**Distribution** : India (Kashmir, Upper Gangetic Plain, W. Peninsula, Deccan) throughout Africa, Sicily, Canaries.

**Economic uses** : An excellent fodder for horses and cattle. Believed to increase the milk of cows. " In some parts of India it is credited in having the property of imparting a slightly intoxicating effect to the milk of buffaloes grazing on it." (Lisboa.)

**Explanation of Plate 116** : *Pennisetum ciliare* Link.

1. Lower invol. glume.
2. Upper invol. glume.
3. Lower floral glume and palea.
4. Upper floral glume.
5. Palea of upper floral glume.
6. Stamens, ovary and styles.
7. Spikelets.

\*7. PENNISETUM SPICATUM Boem. & Schult.

#### PLATE 117.

*Pennisetum spicatum* Boem. & Schult. Syst. Veg. II (1817) 499.

*Panicum spicatum* Boxb. Fl. Ind. I (1832) 283.

*Penicillaria spicata* Willd. Enum. Hort. Berol. 1037; Aitchis. Cat. Panjab Pl. (1869) 163.

*Hokus spicatus* Linn. Syst. ed. X (1859) 1305; Grah. Cat. Bomb. Pl. (1839) 238; Dalz. & Gibs. Suppl. (1861) 99.

*Pennisetum typhoideum* Bich. in Pers. Syn. I (1805) 72; Boiss. Fl. Or. V (1884) 447; Duthie Grasses N. W. Ind. (1883) 11, Field and Gard. Crops 30, t. 71, Fodder Grasses N. Ind. (1888) 18; Lisboa Bomb. Grasses (1896) 34; Hook, f. Fl. Brit. Ind. VII (1896) 82; Prain Beng. Pl. 1169; Cooke Fl. Bomb. II (1908) 917; Haines Bot. Bih. and Or. (1924) 985.

*Panicum americanum* Linn. Sp. Pl. I, 56.

*Pennisetum americanum* K. Schum. in Engl. Pflanzenw. Ost. Afr. B. (1895) 51; Hitchc. in Bailey Cyclop. Hort. 2537.

*Hoku\* racemosus* Forsk. Fl. iegypt-Arab. (1775) 175.

*Alopecurus\* indica* Bunn. Fl. Ind. 27.

*Pennisetum glaucum* B. Br. Prodr. I (1810) 195.

In order to explain the above synonymy and the final adoption of the specific name *P. 8jricatum* we reproduce a MS. note kindly sent to us by Mr. Hubbard.

" *Pennisetum typhoideum* L. Rich. in Fers. Syn. i. 72 (1805) has been changed to *Pennisetum americanum* by K. Schum. in Engl. Pflanzenw. Ost.-Afr. B. 51 (1895), based on *Panicum americanum* L. Sp. PL ed. i. 56 (1753). *Panicum americanum* L. in turn, is based on *Panicum americanum* Clusius Hist. ccxv (1601). Hitchcock in Contr. U. S. Nat. Herb. xxii, 218 (1921) suggests that the figure (in Clusius) is that of the 'common millet' (*Setaria italica*) and that the description is based on more than one species. I do not think the figure is that of the 'common millet/ it is however very similar to a form of 'pearl millet' cultivated in Spain; in addition Clusius says that his *Panicum americanum* grows as tall as a man and has stouter, thicker stems than the common millet which he calls *Panicum vulgare* and figures on the same page. In the second edition of the Species Plantarum, 1484 (1763), Linnaeus quotes *Panicum americanum* in synonymy under *Holcus spicatus* L. (first published in Syst. Nat. ed. x. ii. 1305 (1759); this is the basis of *Pennisetum spicatum* Roem. et Schult. Syst. Veg. ii. 499 (1817)). It appears advisable to use this name in preference to *Pennisetum americanum* E. Schum., owing to the uncertainty as to what *Panicum americanum* Clusius really is and also the name 'americanum' is misleading."

**Vernacular names** : Bulrush Millet, Cat-tail Millet, Pearl Millet, Bajri, Sajgure, Sejji, Bajhri, Bajra.

**Etymology** : *Spicatum* is derived from *spica*, spike, meaning spiked.

**Description** : Annual. Culms tall, erect, stout, terete, 0.9-1.8 m. high, rooting at the lower nodes, sometimes woolly, pubescent below the inflorescence. Leaves 30-90 cm. by 6-50 mm., linear to linear-lanceolate from a rounded base, acute, flat, more or less rough, glabrous, rarely hirsute; sheath terete, rather inflated, glabrous except the bearded nodes and the often villous junction with the blade, rarely hirsute, usually slightly rough, rather shorter than the internodes, ligule narrow, long and densely ciliate rim.

Panicle spike-like, cylindrical, very dense, 10-20 cm. long, often purplish; rachis stout, villous; branchlets reduced to a peduncled involucre cluster of 1-8 spikelets; peduncles villous, straight, 2-5 cm. long, often horizontally spreading or partly deflexed; involucre of very numerous ciliate often purplish bristles about as long as the spikelets. Spikelets sessile or shortly pedicelled within the involucre, readily deciduous when ripe, oblong, 5-6 mm. long, pale or purplish upwards. Lower involucral glume minute or 0, half-orbicular or subquadrate, 1-3-nerved; upper variable in length, sometimes absent, usually  $\frac{1}{2}$ - $\frac{1}{2}$  the length of the upper floral glume, subquadrate, truncate, obtuse or retuse, 3-nerved, very rarely as long as the upper floral glume and coriaceous. Lower floral glume ovate-oblong, obtuse or truncate and apiculate, 5-nerved, epaleate or paleate, male or neuter, rarely bisexual; upper coriaceous or herbaceous, ovate, acute, 5-7-nerved, palea very broad, truncate, ciliate at the tip and dorsally, nerves 2, approximate, excurrent. Lodicules 0. Anthers linear, 2-5 mm. long, tips bearded. Styles connate. Grain oblong, obovoid, or pyriform, smooth, free, top exposed.

**Locality** : This kharif crop occupied in 1922-23 4,018,089 acres or about 20 per cent, of the grass cropped area in the Presidency. Ahmednagar claims about 20 per cent., Nasik 16-6 and Poona 14-25 per cent. These districts are followed by Sholapur, Satara, W. Ehandesh, E. Ehandesh and Bijapur, each of which grows 7-8 per cent, of the total area. Ahmedabad shows 3-9 and Kaira 3 per cent. The total area in Sind was 771,367 acres in 1922-23.

**Ecology** : Mollison says that it is entirely a rain crop, occupying the lighter description of soils in all districts of moderate rainfall. The crop does best when the climate is moderately dry and when the monsoon comes in downpours, with plenty of sunshine between the showers. It is nearly always a mixed crop, and as such may be grown continuously on the same land. But rotation is also frequent. A crop sown in early July will be ripe at the beginning of October.

**Distribution** : Cultivated in numerous forms in India, northern and tropical Africa.

**Origin** : Unknown. See Leeke, Untersuchungen iiber Abstammung und Heimat der Negerhirse.

**Economic uses** : The grain is used chiefly by the lower classes and in many parts it is their staple food.—The stalks and leaves are used as fodder for cattle, horses and sheep.—The ashes are used as an alkali in dyeing.

**Diseases** : See Butler in Mem. Dept. Agric. India II (1907) no. 1 and Maxwell Lefroy in Mem. Dept. Agric. India II (1908) no. 9.

**Explanation of Plate 117** • *Pennisetum spicatum* Boem. & Schult.

1. Spikelets.
2. Part of anther.
3. Stamens.

4. Lower invol. glume.
5. Upper invol. glume.
6. Lower floral glume.
7. Palea of lower floral glume.
8. Upper floral glume.
9. Palea of upper floral glume.
10. Stamens, ovary and styles.

\*8. PENNISETUM PURPUREUM Schum. & Thonn.

*Pennisetum purpureum* Schum. & Thonn. Beskr. Guin. PL 44 ; Stapf in Kew Bull. (1912) 309..

*P. macrostachyum* Hook. Niger Flora 563.

*P. Benthamii* Steud. Syn. PL Glum. I, 105.

*P. nitens* Hack, in Bol. Soc. Brot. VI (1888) 142.

*Oymnothrix nitens* Anderss. in Peters Reise nach Mossamb. VI (1864) 552.

*Pennisetum flevispica* K. Schum. in Engl. Pflanzenw. Ost.-Afr. C (1895) 105.

**Vernacular names** : Elephant Grass, Napier's Fodder.

**Description** : Perennial. Rhizome creeping. Culms erect, in tufts of up to 20, 2-3 m. or occasionally up to 7 m. high by 1-2-2.5 cm. diam. at the base ; branches obliquely erect, terete, glabrous, smooth, excepting the upper part of the uppermost internode which is more or less hairy to tomentose, exerted parts sometimes covered with a glaucous bloom; nodes mostly exerted from the sheaths, all glabrous or most of them or only the uppermost with a ring of stiff, long, appressed hairs. Leaf-blade linear, inserted on the sheath with a very marked hinge-fold, tapering upwards to a fine point, 30-60, rarely to 90 cm. long by 2-5 cm. diam., with a strong midrib, rounded or the back with a shallow channel above towards the base, and in the larger leaves with 6 or 7 slightly prominent primary nerves on each side, dull green, ~~soTnp.tmiPfl~~ slightly glaucous or tinged with purple, more or less rough on both sides, glaucous beneath, usually more or less hairy above, especially towards the base which sometimes becomes fringed, hairs fine, mostly rather stiff and long and often springing from small tubercles ; margins spinulose scabrid. Sheaths terete, clasping the stem, striate, glabrous and smooth or pubescent to hirsute with tubercle-based hairs near the top. Ligule a narrow rim bearing a dense fringe of white hairs 2 or 3 mm. long.

Inflorescence a dense, cylindrical, erect spike, 8-20 and even 30 cm. long and 1-5-3 cm. diam., yellow or tinged with brown, purple or quite blackish purple, made up of deciduous spikelets or fascicles of spikelets, each spikelet or fascicle surrounded by an involucre of numerous bristles of unequal length, most of them 5-8 mm. long, one usually very much longer (1-2-2 or exceptionally to 4 cm. long), scabrid, one or several of the innermost and longest sparingly plumose towards the base, rarely all naked, often dark yellow, brownish or purplish towards the tips or blackish-purple from the base. Spikelets sessile or if in fascicles of 2-4 the lateral pedicelled, all lanceolate, more or less acuminate, 5-7 mm. long, glabrous, straw coloured or tinged with brown or purple towards the tips of the florets, rarely blackish purple all over, hermaphrodite or, if fascicled, the lateral male, rarely neuter or all hermaphrodite. Lower involucral glume suppressed or quite rudimentary, upper ovate to ovate-lanceolate, acute, 0.5-1, rarely to 2 mm. long, subhyaline, 1-nerved or nerveless. Lower floral glume male or more often barren, lanceolate, acute or acuminate, half as long to almost as long as the upper glume, 3-nerved, rarely 1- or 5-, or even 7-nerved, palea linear-lanceolate, 2-nerved, shorter than the glume or in the barren florets reduced or suppressed ; upper hermaphrodite or in the lateral spikelets male, lanceolate, acuminate or rostrate-acuminate, scaberulous upwards, usually 5-nerved, palea narrow, linear-lanceolate, slightly shorter than the glume, tips minutely 2-toothed. Lodicules 0. Anthers 2-5-3 mm. long, tips very minutely penicillate. Styles united throughout; stigmas very slender, up to 4 mm. long, exerted from the top of the floret. Mature grain unknown.

A most variable plant as can be seen from Stapf's description given above. He refrains from subdividing the species.

**Locality** : Imported into Bombay in 1915. Has been grown at several centres in W. India: Agricultural College Farm, Poona, the Governor's Dairy Farm, Ganeshkhind, the Sewage Effluent Farm A at Hadapsar in the Deccan, the Ghharodi Cattle Farm in N. Gujarat and the Willingdon Cattle Farm near Karachi.

**Distribution** : Indigenous in tropical Africa between 10° N. Lat. and 20° S. Lat.

**Economic uses** : One of the best fodder-grasses. See Stapf Kew Bull. (1912) 313-316 \* H. H. Mann in Bull. 100 and 127 of the Dept. Agriculture, Bombay ; Rhodesian Agric. Journ. VII (1910) 1398.







OENOCLOA BEFLORUS HOXB.

Delin: B. K. Bhide.

## 61. CENCHRUS Linn.

Annual or perennial herbs. The inflorescences are spike-like racemes, consisting of involuclate clusters of shortly pedicellate spikelets jointed on a simple rhachis. Involucl consisting of hardened spike-like bristles, connate at the base into a short, coriaceous cup, which is surrounded by erect or squarrose bristles. Spikelets 1-3 in each involucl, mostly glabrous or nearly so, persistent, 1-2-flowered, with 3-4 glumes. Lower involucral glume 1-nerved, usually narrow, sometimes wanting; upper involucral glume and lower floral glume subequal, 5-7-nerved. Lower floral glume longer than the upper involucral, with or without male flower, paleate. Upper floral glume coriaceous, with a hermaphrodite or female flower. Lodicules 2. Stamens 3. Styles 2, stigmas plumose. Grain broad, oblong, dorsally compressed, with a punctiform hilum, free within the glume and palea.

Species about 25.—Tropical and subtropical.

- |                               |                            |
|-------------------------------|----------------------------|
| 1. Base of involucl rounded   | 1. <i>O. biflorus</i> .    |
| 2. Base of involucl turbinate | 2. <i>O. catharticus</i> . |

## 1. CENCHRUS BIFLORUS Boxb.

## • PLATE 118.

- Cenchrus biflorus* Eoxb. Fl. Ind. I (1832) 233 ; Lisboa Bomb. Grasses (1896) 36 ; Dalz. & Gibs. Bomb. Fl. (1861) 294 ; Duthie Grasses N. W. Ind. (1883) 9 ; Cooke Fl. Bomb. II (1908) 917 ; Achariyar S. Ind. Grasses (1921) 121.
- O. buUnfer* Hochst. ex Boiss. Fl. Or. V (1884) 448.
- O. echinatus* Wall. Cat. no. 8854 B. C.
- O. montanus* Nees in. Royle 111. Himal. PL (1839) 406 (*nomen*); Boiss. 1. c; Duthie Grasses N. W. Ind. (1883) 9, Indig. Fodder Grasses (1886) t. 48, Fodder Grasses N. Ind. (1888) 16, Muschler Man. Fl. Egypt I (1912) 62.
- O. Schimper* Hochst. ex Steud. Nom. ed. 2, 1 (1840) 317.
- O. tripsaeoides* Br. in Salt. Voy. Abyss. App. 62 (*notnen*).

**Vernacular names** *i* Anjan, Dhaman.

Etymology : *Cenchrus* is the Greek *kenchros*, a kind of millet. — *Biflorus* means 2-flowered<sup>^</sup>

**Description** : Annual ? ; stem 15-60 cm. long, simple. Leaves 7\*5-25 cm. by 3-10 mm., linear-lanceolate, finely acuminate, glabrous or hairy; sheaths glabrous or nearly so, ciliate near the mouth ; ligule a pubescent ring.

Racemes 5-10 cm. long, solitary, cylindrical; rhachis angular, smooth; involucl usually 2-flowered, rounded at the base; bristles thick, lanceolate-subulate, erect, dorsally flattened, the outer very short, about 1\*6-2\*5 mm. long, glabrous, the inner 3 mm. long, glabrous or puberulous. Spikelets 4 mm. long, subglobose. Glumes 4; lower involucral glume 2\*5 mm. long, ovate, acuminate, very thin, hyaline, 1- (rarely 3-) nerved ; upper involucral glume 4 mm. long, ovate, apiculate, 5-nerved, hyaline ; lower floral glume scarcely shorter than the upper involucral glume, ovate, acute, 5-7-nerved, paleate, the palea 3 mm. long, oblong, obtuse; upper floral glume as long as the lower, ovate, obtuse. Anthers 2-5-3 mm. long. Styles free almost to the base. Grain 2 by 1\*6 mm., orbicular-oblong, compressed, smooth, shining, pale brown.

**Locality** : *Sind*: Karachi (Woodrow); Jemadar ka Landa, near Karachi (Stocks); Jamesabad, in fields (Sabnis B1110 !); Umarmot, sandy plains (Sabnis B1081!); Nasarpur, clayey soil (Sabnis B1051 !); Mirpur Sakro (Blatter & McCann D627 !); Tatta (Blatter & McCann D628!).

*Gujarat*: Kharaghoda, under trees (Saxton 1064 !); Ahmedabad (Sedgwick !, Cooke); Morvi (Woodrow).

*Khandesh* : Bhusawal, Tapti (McCann 5154 !); Umalla, Tapti Bank (Blatter & Hallberg 5158 !); Kaperkhedo, Bori River (Blatter & Hallberg 4393 !).

**Ecology** : Generally growing in sandy soil.

**Distribution** : Punjab, Bajputana, Gangetic Plain, W. Peninsula, Baluchistan, Arabia, Nubia, Abyssinia.

**Economic uses**: One of the nutritious of Indian grass?\*, and considered by some to be the very best (Duthie). The hay is good.

**Explanation of Plate 118** : *Cenchrus biflorus* Boxb.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Palep. of lower floral glume.

6. Upper floral glume.
7. Palea of upper floral glume.
8. Stamens, ovary and styles.

## 2. CENCHRUS CATHARTICUS Del.

## PLATE 119.

*Cenchrus catharticus* Del. Cat. Hort. Monsp. (1838), Schlecht. Linnaea XIII (1839); Litter (1839) 103 ; Duthie Indig. Fodder Grasses (1886) t. XI, Fodder Grasses N. Ind. (1888) 15 ; Boiss. Fl. Or. V (1884) 448; Lisboa Bomb. Grasses (1896) 37 ; Hook, f. Fl. Brit. Ind. VII (1896) 90 ; Cooke Fl. Bomb. II (1908) 918 ; Hitchcock & Chase in Contrib. U. S. Nat. Herb. XX (1920) 53, fig. 8 ; Achariyar S. Ind. Grasses (1921) 122.

*C. annularis* Anders, in Peters. Beise Mossanb. Bot. (1864) 553.

*C. echinatus* A. Eich. Tent. Fl. Abyss. II (1851) 389.

*C. niloticus* Fig. & De Not. in Mem. Acad. Torin. (1854) 380.

*Elymus Caput Medusae* Forsk. Fl. Aeg.-Arab. (1775) 25 (wv linn.).

**Vernacular names** : Bharont, Kukar.

**Etymology** : *Catharticus* is the Greek *Jcatharticos* which signifies something that is efficacious in purging or purifying.

**Description** : Quite glabrous; stems tufted, geniculately ascending, branched from the base, leafy. Leaves 2\*5-12-5 by 3-6 mm., linear-lanceolate, finely acuminate; sheaths glabrous; ligule a hairy ring.

Racemes 2-5-15 cm. long, usually more or less enclosed in the uppermost leaf-sheaths; rachis angular, glabrous, flexuous; involucler with a turbinate base; bristles hard, subulate, sharply pungent, the outermost short, glabrous or nearly so, spreading or reflexed, the inner ciliate at the base, subulate, suberect or squarrosely spreading, dorsally grooved, reaching 10 mm. long. Spikelets shorter than the inner bristles. Glumes 4 ; lower involucral glume ovate-lanceolate, acute, hyaline, 2 mm. long; upper involucral glume rather more than 4 mm. long, 5-nerved, hyaline ; lower floral glume ovate, acuminate, as long as the upper involucral glume, 5-nerved, paleate, hyaline, the palea 3 mm. long, narrowly lanceolate, acute, hyaline; upper floral glume as long as the lower one, cuspidately acuminate, 5-nerved, membranous; palea ovate, acuminate, membranous, as long as the glume. Grain 2\*5 mm. long, ovoid-oblong,, compressed, pale, rugulose.

**Locality** : *Sind*: Karachi (Burns!); Gharo (Blatter & McCann D629 !).

*Cutch*: Sumrasar (Blatter 3762 !).

*Gujarat*: Ahmedabad, sandy ground (Sedgwick !); Ferim Island, at the mouth of the Narbada River (Raoji).

*Khandesh*: Bor, Bori River (Blatter & Hallberg 5115 !).

**Ecology** : Growing mostly in sandy or arid soil. The burs when mature are readily attached by their spines to passing animals, the seed thus being widely distributed. The same may happen in the case of waterbirds.

**Distribution** : Punjab, Gangetic Plain, W. Peninsula, Bellary, Nellore, Arabia, tropical Africa.

**Explanation of Plate 119** : *Cenchrus catharticus* Del.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Upper floral glume.
6. Palea of upper floral glume.
7. Filaments, ovary and styles.

## 62. ISACHNE R. Br.

Perennial grasses. Leaves ovate or linear-lanceolate.

Spikelets small or minute, loosely paniculate, not or obscurely articulate with the pedicel subglobose or obovoid, 1-2-flowered. Glumes 4, the 2 lower often separately deciduous, thinly coriaceous or membranous, strongly nerved; involucral glumes subequal, convex, empty\* the 2 floral glumes both paleate, equal and convex, or the lower larger and flatter; lower floral glume male or neuter; upper floral glume jointed and often stipitate on the very short rachilla, hemispheric, female or hermaphrodite. Lodicles most minute. Stamens usually 3 (rarely 4 or 6). Styles 2, free; stigmas short, plumose, exerted at the top of the spikelet. Grain free within the hardened glume and palea.



CEXCMH s c.miAHTIOUS DEL.

Dili\*: B. K. Blide.



For discussion of the genus see : Chase, Genera Paniceae, IV. Proc. Biol. Soc. Washington 24 (1911) 149 and Hitchcock, North Americ. Species of *Isachne* in Contrib. U. S. Nat. Herb. 22 (1920) 115.

Species about 30.—Tropical and subtropical regions.

- A. Involucral glumes longer than the floral glumes . . . . . 1. *I. Lisboae*.
- B. Involucral glumes about equalling the floral-glumes. . . . .
- I. Floral glumes equal and similar, both hemispheric and coriaceous. . . . . 2. *Z. elegans*.
- II. Floral glumes usually unequal, the lower floral glume thin, flat, often longer than the upper.
- a. Stem reaching 45 cm. long; panicle rather large, ovoid or pyramidal; spikelets 2 mm. long; leaves 2-5-6-3 cm. long . . . . . 3. *Z. australis*.
- b. Stem rarely reaching 25 cm. long; panicle small, lax-flowered; spikelets 1-2-1-6 mm. long; leaves 2-5-3-8 cm. long . . . . . 4. *Z. miliacea*.

#### 1. ISACHNE LISBOAE Hook. f.

##### PLATE 120.

*Isachne Lisboae* Hook. f. Fl. Brit. Ind. VII (1896) 22; Lisboa Bomb. Grasses (1896) 6; Cooke Fl. Bomb. II (1908) 922.

**Etymology** : *Isachne* is derived from the Greek *isos*, equal and *achne*, a glume, alluding to the equal glumes.

**Description** : A low plant 15 cm. high ; stems creeping with long wiry roots^ then ascending, rather stout leafy. Leaves 2-5-5 cm. by 17 mm., recurved, thin, oblong-lanceolate, acute, ciliate on the margins with long slender hairs, closely and conspicuously nerved; sheaths glabrous or sparsely hairy ; ligule 0.

Panicles 2-5-5 cm. long; branches of the panicle (spikes) 13-20 mm. long, horizontally spreading. Spikelets 2-5-3 mm. diam., secund on the lower side of the branches, hairy with bulbous-based hairs; pedicels short, triquetrous, hairy. Glumes 4 ; lower and upper involucral glumes equal, broadly ovate or suborbicular, acuminate, conspicuously 5-nerved, longer than the floral glumes, hairy; floral glumes orbicular, equal, smaller than the involucral glumes, concave, glabrous. Palea with incurved flaps.

**Locality** : *W. Ghats*: Mahableshwar, 4,000 ft., rainfall 270 in. (Sedgwick & Bell 4581!), Fitzgerald Ghat (Woodrow!), common near lake (McCann!); Panchgani, First Tableland (Blatter & Hallberg !), very common on Tableland (McCann !).

**Ecology** : This species is very local, inhabiting apparently only the Panchgani and Mahableshwar plateaux. Very common at Mahableshwar in damp places with stems spreading, hardly ascending. It is subgregarious. When growing in water the plant is erect and leafless to the waterline, while the habit is prostrate in marshes and drier soil. There appears no difference of colour between the inflorescence and the rest of the plant.

**Distribution** : Endemic.

**Explanation of Plate 120** : *Isachne Lisboae* Hook, f.

1. Lower invol. glume.
2. Upper invol. glume.
3. Lower floral glume.
4. Palea of lower floral glume.
5. Upper floral glume.
6. Palea of upper floral glume.
7. Grain and styles.
8. Spikelet.

#### 2. ISACHNE BLEGAKS Dalz.

##### PLATE 121.

*Isachne elegans* Dalz. in Dalz. & Gibs. Bomb. Fl. (1861)'291; Lisboa Bomb. Grasses (1896) 7 ; Hook. f. FL Brit. Ind. VII (1896) 23 ; Cooke Fl. Bomb. II (1908) 923.

**Vernacular name** : Doonda.

**Description** : A small elegant grass 20-30 cm. high ; stems densely tufted, soft, geniculate below, and with slender fibrous roots. Leaves 5-15 cm. by 4-6 mm., linear-lanceolate, acute,

striate, with thickened and glabrous or minutely serrulate margins; sheaths bristly at the mouth.

Panicle 7.5-12.5 cm. long, glabrous, branches slender, alternate, undulating, 1.3-2.5 cm. long, smooth; pedicels short, glabrous. Spikelets 2.5-3 mm. diam., hispid, with 2 perfect flowers. Glumes 4; involucrel glumes equal, similar, inconspicuously many-nerved, broadly ovate or suborbicular, with red margins, hairy; floral glumes as long as the involucrel glumes, hemispheric, puberulous. Anthers 1-6 mm. long, brownish yellow.

We have found specimens reaching the following dimensions: Stem 90 cm.; leaves 25 by 1 cm., or broader, sparingly hairy or almost villous; panicle 25 by 15 or more cm.

**Locality** : *Konkan* : Pen, in inundated land (Dalzell).

*W. Ghats* : Lonavla (Woodrow 175); Khandala, behind hotel (McCann 9555 !); Mahabaleshwar, 4,000 ft., rainfall 270 in. (Sedgwick & Bell 4583 1); Panchgani, Tableland, forming large patches (Blatter 5080 !).

*Deccan* : Margins of rivulets in the Deccan (Dalzell & Gibson); Sinhadag forests (Bhide!); Nasrapur to Purandhar (Bhide 1001!); Purandhar, north foot (McCann 5048!); Lohagad Fort, top (McCann 9560 !); Ganeshkhind Gardens (Herb. Econ. Bot. Poona!); between Poona and Karli (Jacquemont 556).

*S. M. Country*: Dharwar, rice fields, 2,500 ft. (Sedgwick 1829!).

*N. Kanara*: Halyal, ricefields (Talbot 2305 !).

**Ecology** : Usually forming large mats in moist soft soil, and then not growing very tall; also on margins of streams.

**Distribution** : Endemic.

**Explanation of Plate 121** : *Isachne elegans* Dalz.

1. Lower in vol. glume.
2. Upper invol. glume.
3. Lower floral glume with palea, filaments, ovary and styles.
4. Upper floral glume with palea, filaments, ovary and styles.
5. Spikelet.

### 3. ISACHNE AUSTRALIS K. Br.

#### PLATE 122.

*Isachne australis* R. Br. Prodr. (1810) 196; Lisboa Bomb. Grasses (1896) 7; Hook. f. Fl. Brit.

Ind. VII (1896) 24; Cooke Fl. Bomb. II (1908) 923.

*I. atro-virens* Trin. Gram. Panic. 251.

*I. lepidota* Steud. in Flora XXIX (1846) 19.

*Panicum antipodum* Spreng. Syst. I (1825) 314.

*P. atro-virens* Trin. ex Spreng. Neue Entdeck. II, 88.

*P. australis* Rasp, in Ann. Sc. Nat. V (1825) 299.

*P. lepidotum* Steud. in Flora XXIX (1846) 19.

*P. nodibarbatum* Hochst. Pl. Hohenack. no. 127.

*P. violaceum* Eleine ex Thiele in Linnaea IX (1834) 307.

*Aira ischaemoides* Koen. ex Kunth Enum. PL 1 (1838) 307.

*MiUum globosum* Thunb. Fl. Jap. (1784) 49.

**Vernacular names** : Doaria, Dauria.

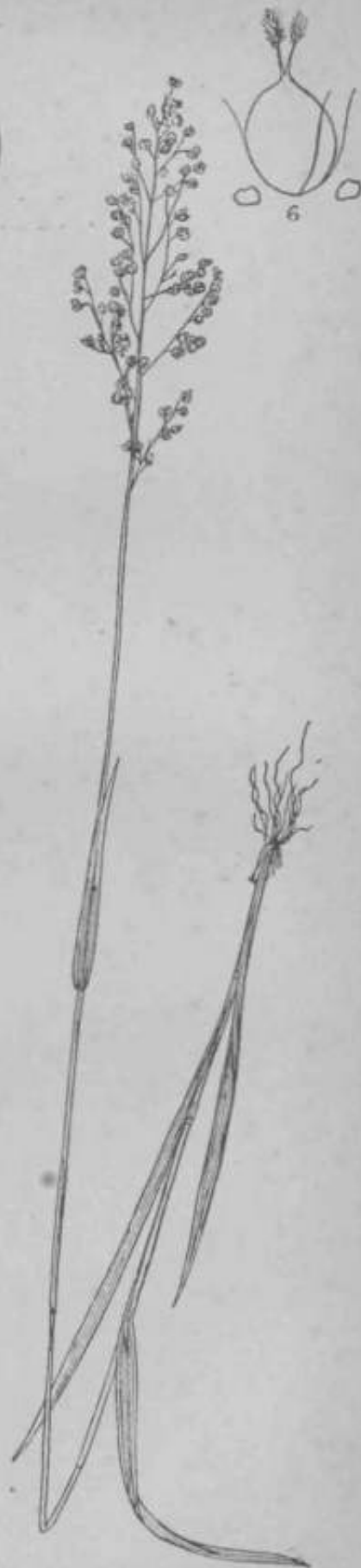
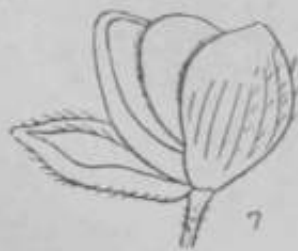
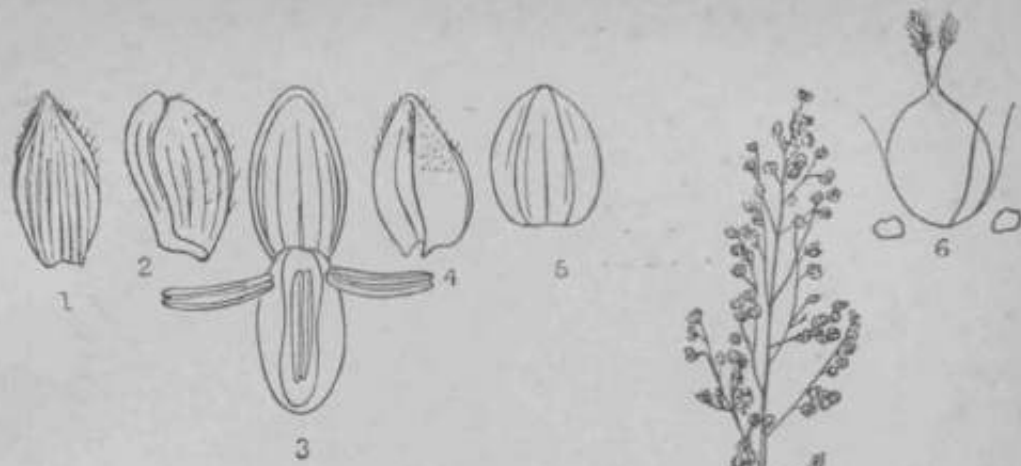
**Etymology** : *Australis* means southern.

**Description** : Stem slender, erect or ascending from a creeping rootstock, 20-45 cm. high, leafy, smooth, branched below; nodes glabrous. Leaves 2.5-6.3 cm. by 4-8 mm., linear-lanceolate, acuminate, flat, multistriate, scaberulous on both surfaces, base rounded; sheaths 2-3-8 cm. long, striate, the margins above the middle densely ciliate; ligule a tuft of long slender erect white hairs.

Panicle 2.5-10 cm. long; branches alternate, flexuous, erect or spreading, up to 3-8 cm. long, sometimes divided; rhachis angular, smooth. Spikelets 1-6-2 mm. diam., globose, sessile or pedicellate, green or violet; pedicels sometimes 6 mm. long, capillary. Glumes 4; involucrel glumes similar, broadly ovate or suborbicular, obtuse, concave, membranous, 7-nerved, glabrous or with a few bristles; floral glumes usually unequal, the lower longer and thinner than the upper, ovate, obtuse, nerveless; upper floral glume hemispheric, coriaceous, ciliate. Palea glabrous. Anthers 1-6 mm. long, red.

**Locality** : *Gujarat* (Lisboa).

*Konkan*: Nagotna, in dry plains (Gammie 16064!); Kharda (Ryan 565!); Bhandup (McCann 9841!); Matunga to Mahim (McCann 9842 !); Andheri (McCann 5129!);







ISACHNE ELEGANS DALZ.

Dolls: H. K. White.

Sion (McCann 5244 !); Fen (McCann 5390 !); Alibag, ricefields (Ezekiel!); Mulgaum, tank (McCann 5103!).

*W. Ghats*: Matheran, Charlotte Lake (D'Almeida A247 !); Khandala, common (McCann 9840 !); Sakarpathar, Louavla (Gammie 15961!); Igatpuri (Blatter & Hallberg 4308 !); Mahableshwar (Woodrow); Londa (Bhide !).

*Deccan*: Poona (Lisboa); Nasik (Lisboa).

*S. M. Country*: Dharwar Dist., ricefields, 1,800 ft., rainfall 35 in. (Sedgwick 3737 !); Kunniir, marshes, 2,000 ft., rainfall 35 in. (Sedgwick & Bell 4935!).

*N. Kanara*: Karwar (Bell!); Gohann (Herb. Econ. Bot. Poona!); Halyal (Talbot 2160!); Sirsi to Siddhapiir (Hallberg & McCann A19!); Yellapur (Talbot 1521!); Kadgal (Herb. Econ. Bot. Poona !).

**Ecology** : A subgregarious species. Very common in marshy land in the Carnatic. Grows in fields and is detrimental to crops.

**Distribution** : All over India, Australia, New Zealand.

**Economic uses** : Said to be eaten by cattle and horses.

**Explanation of Plate 122** : *Isachne australis* R. Br.

1. Lower invol. glume.
2. Upper invol. glume.
3. Lower floral glume with palea and stamens.
4. Upper floral glume.
5. Palea of upper floral glume.
6. Grain, filaments, styles and lodicules.
7. Spikelet.

#### 4. ISACHNE MILIACEA Both.

##### PLATE 123.

*Isachne miliacea* Both Nov. Pl. Sp. (1821) 58 ; Lisboa Bomb. Grasses (1896) 8; Hook. f. Fl.

Brit. Ind. VII (1896) 25 ; Cooke Fl. Bomb. II (1908) 923.

*I. Meneritana* Poir. Encycl. Suppl. III, 185 (*exd. syn.*).

*I. minutida* Kunth Eev. Gram. II (1829) 1.117.

*I. adstans* Miq. 71. Ind. **Bat. III**, 461.

*I. polygonoides* Doell in Mart. Fl. Bras. II, II, 273.

*I. geniculata et stigmata* Griff. Not. III, 41, 42 ; Ic. PL Asiat. 1.139, f. 206, 1.148, **fig. 2.**

*Panicum aequatum* Nees *ex* Steud. Syn. PL Glum. 98.

*P. adstans* Steud. l. c. 94.

*P. Benjamini* Steud. l. c. 96.

*P. Meneritana* Spreng. Syst. I (1825) 321.

*P. minutulum* Gaud, in Freyc. Voy. Bot. 410.

*P. polygonoides* Lam. Encycl. IV, 748.

*P. patens* Roxb. FL Ind. I (1832) 305.

*P. gonatodes* Steud. l. c. 95.

*Neurachne Meneritana* Roem. & Schult. Syst. II (1817) 475 (*exd. syn.*).

**Vernacular name** : Swamp Millet.

**Etymology** : *Miliacea* is derived from *milium*, millet.

**Description** : A slender plant, variable in size, 15-25 cm. high; stems very slender, prostrate, widely creeping and branched below, then ascending. Leaves small, rather distant, 3-8 cm. by 3-8 mm., ovate, acute, glabrous or sparsely hairy, base rounded.

Panicle small, lax-flowered. Spikelets 1-2-6 mm. diam., globose, few and distant; pedicels short or long, capillary. Involucral glumes orbicular-oblong, almost hemispheric, often hispid with long hairs, obscurely 7-nerved; lower floral glume rather longer than the upper, ovate-oblong membranous, male; upper floral glume smaller, hemispheric, coriaceous, female. Palea glabrous.

**Locality** : *Konkan* (Woodrow).

*W. Ghats*: Lonavla (Woodrow); Mahableshwar, in forests, fairly common in one spot (McCann!); Panchgani (McCann!).

*N. Kanara*: Sulgeri, 500 ft., rainfall 200 in. (Sedgwick & Bell 4248!); Yellapur (Talbot 1521!); Gorsoppa Falls, Mysore side (McCann & Hallberg A23 !).

**Ecology** : Likes shady pasture ground. A monsoon species.

**Distribution** : More or less throughout India, Ceylon, China, Malay and Pacific islands, S. America.

## SUBFAMILY II: POIDEAE.

Mature spikelets breaking up, leaving the persistent or subpersistent involucrel glumes on the pedicel, or if falling entire, then not consisting of 2 heteromorphous florets as *hh Pani&rideae*.

## TRIBE IV : Arundinelleae.

Florets 2, heteromorphous, the lower awnless or barren. Khachilla not continued beyond the upper floret. Lower floral glume awnless, rather resembling the involucrel glumes ; upper generally awned, at length firm or hard ; awn from the sinus between 2, sometimes minute or bristle-like lobes, rarely from the entire, obtuse tip, usually kneed and twisted below the knee.

See key page xvii.

## 63. ARUNDINELLA Raddi.

Perennial or annual erect grasses. Leaves narrow.

Spikelets paniculate, continuous with or imperfectly jointed on the pedicels; rhachilla not produced beyond the upper floret. Glumes 4, membranous, chartaceous or thinly coriaceous ; involucrel glumes acute or acuminate, 3-5-nerved, the upper usually the longer; lower floral glume equalling the lower involucrel glume or slightly longer, 3-7-nerved, paleate\* male or 'neuter (rarely 2-sexual); upper floral glume much shorter than the lower one, thin, 2-sexual (or sometimes ? female), entire or minutely 2-fid, 3-7-nerved, awnless or 1-3-awned (if 3-awned, the 2 lateral awns bristle-like, straight, the median awn geniculate). Paleae of floral glumes linear or oblong, 2-keeled; flaps more or less auricled. Lodicules 2, minute. Stamens 3; anthers linear-oblong. Styles 2, distinct; stigmas short, laterally exerted. Grain oblong to ellipsoid, free within the upper floral glume and palea.

Species about 55. In the tropics.

Cooke describes 12 species from the Bombay Presidency. We retain them all except that we change *A. agrostoides* Trin. into *A. ciliata* Nees, *A. brasiliensis* into *A. hispida* O. Etze- and *A. capillaris* into *A. mutica* Nees.

To the 12 species we add another : *A. villosa* Wight & Am

## A. Upper floral glume with 3 awns.

## I. Leaves less than 10 cm. long. Annuals.

1. A straggling grass. Leaves glabrous or sparsely hairy . . . . . 1. *A. avenacea*.
2. An erect grass. Leaves hispid with bulbous-based hairs . . . . . 2. *A. tuberculata*.

II. Leaves 15-30 cm. long. Perennials . . . . . 3. *A. setosa*.

## B. Upper floral glume with 1 awn.

I. Spikelets 1\*5-2 mm. long . . . . . 4. *A. tenella*.

## II. Spikelets 2-5-3 mm.

1. Stem scarcely 15 cm. high. Leaves 2-5-4 cm. long . . . . . 5. *A. pygmaean*

## 2, Stem exceeding 15 cm.

- a. Stem reaching 45 cm. Leaves 2\*5-10 cm. long; they and the sheaths clothed with long soft hairs . . . . . 6. *A. ciliata*.

- b. Stem reaching 90 cm. Leaves 10-15 cm. long; they and the sheaths glabrous or nearly so. . . . . 7. *A. Metzii*.

- c. Stem reaching 1\*2 m. Leaves 20-30 cm. long; sparsely hairy; sheaths glabrous or nearly so. . . . . 8. *AM Lawii*\*



ISACHNE MILJACEA ROTH.

Delin: B. K. Dhida.



ARUNDINELLA AVENACEA ML'NBO.

Delin: R. K. Bask.

## III. Spikelets 4-6 mm. long.

## 1. Panicle branched.

a. Rootstock hard, creeping, not tuberous.

Rhachis of panicle angular, glabrous . 9. *A. hispida*.

b. Rootstock tuberous. Rhachis of panicle

filiform, scaberulous . . . 10. *A. mutica*.

## 2. Panicle spicate

a. Leaves 2\*5-4 cm. long . . . 11. *A. spicata*.

b. Leaves 10-20-30 cm. long . . . 12. *A. villosa*.

C. Upper floral glume without awn . . . 13. *A. gigantea*.

## 1. ABUNDINELLA AVENAOBA Munro.

## PLATE 124.

*Arundinella avenacea* Munro ex Thw. Enum. Pl. Ceyl. (1864) 362; Hook, f. Fl. Brit. Ind. VII (1896) 69; Gooke Fl. Bomb. II (1908) 1000 (*arenacea per err.*).

*A. Campbelliana* Lisboa in Journ. Bomb. Nat. Hist. Soc. V (1891) 346.

*A. malabarica* Heyne ex Hook, f. El. Brit. Ind. VII (1896) 69.

*Aira* No. 3, Griff. Notul. III, 55, Ic. PL Asiat. t. 146, fig. III.

**Etymology** : *Arundinella* is a diminutive of *arundo*, a reed.—*Avenacea* is derived from *avena*, oats.

**Description** : An annual weak straggling slender grass; stems ascending, leafy, 15-30 cm. long; rooting at the lower nodes; nodes glabrous. Leaves 2-5 cm. by 6-10 mm., ovate-lanceolate, acute, flat, glabrous or sparsely hairy, strongly nerved, from an amplexicaul pectinately ciliate 2-auricled base; sheaths glabrous, the margins naked or ciliate in the upper part; ligule linear, small, membranous.

Panicle 1.3-2.5 cm. long, ovoid-oblong, compact; branches very short. Spikelets 4 mm. long (excluding the awns). Glumes 4; involucrel glumes distant at the base, 3-5-nerved, membranous; lower involucrel glume 4 mm. long (including awn), lanceolate, acute narrowed into a scaberulous awn; upper involucrel glume rather longer, notched at the tip, with a long scaberulous awn in the sinus; lower floral glume shorter than the upper involucrel glume, oblong, obtuse, dorsally mucronate, paleate, neuter or male, the palea oblong-obovate, 2-fid at the apex; upper floral glume 2-sexual or female, shorter than the upper involucrel glume, oblong, membranous, with 2 lateral tufts of white hairs, divided at the apex into 2 triangular lobes from each of which slender capillary awns issue; median awn about 10 mm. long, the lower half brown, twisted, the upper half geniculate, pale, scabrid, subulate; palea linear-oblong, 2-fid at the apex.

This grass in its young state resembles *A. spicata* so much that it can easily be mistaken for that species.

**Locality** : *Konkan*: Ratnagiri (Woodrow).

*W. Ghats*: Khandala, very common (McCann 9604 !); Tiger's Leap, near Lonavla (Woodrow); Mahableshwar, very common, 4,500 ft., rainfall 270 in. (Sedgwick & Bell 4510 !, Lisboa); Panchgani (Blatter 5383 !), Tiger's Path (Blatter & HaUberg B 1255!); Castle Eock (McCann 9854 !, Woodrow, Bhide!).

8. *M. Country*: Bam Ghat (Ritchie 890).

*N. Kanara*: Anmod, 1,800 ft., rainfall 200 in. (Sedgwick 3253 !); Tinai Ghat, 1,800 ft., rainfall 250 in. (Sedgwick 3269!); Yellapur (Talbot 1035!); Supa (Talbot 2487 !); Kumberw-ada (Talbot 2255 !); Karwar (Talbot 1302 !); Katgal (HaUberg & McCann A165 !); Devimane (McCann 9936!).

**Ecology** : A subgregarious grass. Very common in Kanara forests. A species of open grass-land but also in rocky situations.

**Distribution** : Khasia, Burma, W. Peninsula, Ceylon.

**Explanation of Plate 124** : *Arundinella avenacea* Munro.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Palea of lower floral glume.
6. Stamens.
7. Upper floral glume.
- 8. Palea of upper floral glume, with stamens, ovary and styles.

## 2. ARUNDINELLA TUBERCULATA Munro.

## PLATE 125.

*Arundinella tuberculata* Munro ex Lisboa in Journ. Bomb. Nat. Hist. Soc. V (1891) 344 ; Hook. f. FL Brit. Ind. VII (1896) 69; Cooke Fl. Bomb. II (1908) 1000 ; Janowski in Bot. Archiv I (1922) 24.

**Etymology** : *Tuberculata* means that the plant is beset with tubercle-based hairs.

**Description** : Annual; stem erect or slightly decumbent at the base, 30-45 cm. high, glabrous. Leaves 2-5-9 cm. by 4-13 mm., linear-lanceolate, acute, hispid with white bulbous-based hairs, base rounded ; sheaths reaching 5 cm. long, hispid with long white bulbous-based hairs; ligule a ridge of hairs.

Panicle 7-5-15 cm. long, narrowly oblong; rhachis angular; branches 1-3-2-5 cm. long, scaberulous. Spikelets ovoid, acute, pedicellate, single or geminate, 4 mm. long (excluding awns), clothed with long bulbous-based hairs. Glumes 4; lower involucral glume 4 mm. long (including an awn of about 1 mm. long), 3-nerved, with bulbous-based hairs along the nerves, subcoriaceous ; upper involucral glume 4 mm. long (excluding the beak), ovate, acute, 5-nerved, with bulbous-based hairs along the nerves, narrowed into a beak as long as the body of the glume, subcoriaceous; lower floral glume rather more than 4 mm. long, elliptic-oblong, obtuse, 2-fid, glabrous, subcoriaceous, with incurved margins, paleate, male, the palea as long as the glume, oblong-lanceolate, acute; upper floral glume rather more than 2-5 mm. long, lanceolate, acute, when ripe subcrustaceous, brown and scabrid; median awn reaching 13 mm. long, the lower half brown, twisted or not, the upper half straight, whitish, scaberulous; lateral awns acicular, transparent, 2-2\*5 mm. long.

**Locality** : *Konkan* : Vasco da Gama (Bhide !).

*W. Ghats*: Panchgani, slopes below Third Tableland (Blatter & Hallberg 1232 !); Pasarni Ghat (Blatter & Hallberg 1306 !).

*Deccan* : Poona (Woodrow).

*S. M. Country* : Dry hills between Yelvigi and Savanur, 1,900 ft., rainfall 25-30 in. (Sedgwick 1959!).

*N. Kanara*: Manoli (Talbot 3979!); Jog to Siddhapur, open grass-land, rocky soil (McCann 9856!); Katgal, open grass-land (Hallberg & McCann A164!); Karwar, open grass-land (Hallberg & McCann A163 !).

**Ecology** : A subgregarious plant. Grows in dry watercourses on barren uplands in the centre of the Dharwar District. This is the only species of *Arundinella* which inhabits the drier tracts.

**Distribution** : Central India, W. Peninsula.

**Explanation of Plate 125** : *Arundinella tuberculata* Munro.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Palea of lower floral glume and stamens.
6. Upper floral glume.
7. Palea of upper floral glume.
8. Stamens, ovary and styles.

## 3. ARUNDINELLA SETOSA Trin.

## PLATE 126.

*Arundinella setosa* Trin. Gram. Panic. (1826) 63 ; Hook. f. Fl. Brit. Ind. VII (1896) 70; Cooke Fl. Bomb. II (1908) 1001; Duthie Grasses N. W. Ind. (1883) 13 ; Janowski in Bot. Archiv I (1922) 24.

*A. hirsuta* Nees ex Steud. Syn. Pl. Glum. 115 ; Hohen. Pl. Ind. Or. no. 920.

*A. stricta* Nees in Hook. Kew Journ. II (1850) 102 ; Dalz. & Gibs. Bomb. Fl. (1861) 292.

**Vernacular names** : Turdia, Kotir.

**Description** : Perennial; stem 30-90 cm. high, erect from a hard rootstock, slender, rigid,, subtuberosus at the base ; nodes glabrous. Leaves 15-30 cm. by 3-6 mm., linear, finely acuminate, glabrous, pubescent or sometimes hispidly hairy; sheaths glabrous; ligule very small.

Panicle 7-5-25 cm. long, lax; branches 5-12-5 cm. long, distant, suberect., filiform, Spikelets (including the mucro of the upper involucral glume) reaching 6 mm. long (or more). Glumes 4 ; lower involucral glume 6 mm. long, ovate-lanceolate, aristately acuminate, 3-nerved, hairy or almost glabrous; upper involucral glume rather more than 6 mm. long, oblong-lanceolate, narrowed into a long awn with truncate tip, 5-nerved; lower floral glume 5 mm. long,,



AITUNUINKLLA TUHKKICITUTA MUNRO.

Dtlin; H. K, lithic.





ARUNDINELLA SETOSA TRIN.

Delin: R. K. Bhatt.

obtuse, paleate, male, the palea 3 mm. long, oblong-lanceolate, subacute; upper floral glume 3 mm. long, ovate-lanceolate, acuminate, 2-sexual; palea as long as the glume, narrowly oblong-lanceolate, subacute; median awn more than 6 mm. long, brown below, pale above; lateral awns capillary, 1-2 mm. long.

**Locality** : *Konkan*: Near Bombay (Bitchie).

*N. Kanara*: Dandeli (Talbot 2266!); Gersoppa Falls, on rocks in riverbed. (McCannA166!).

**Distribution** : W. Himalaya, Ehasia Hills, Bihar, Central India, Nilgiris, Ceylon, Tonkin China, Philippines.

**Economic uses** : Not eaten by cattle.

**Explanation of Plate 126** : *Arundinella setosa* Trin.

1. Spikelet.
2. Lower invol. glume..
3. Upper invol. glume.
4. Lower floral glume.
5. Palea of lower floral glume.
6. Upper floral glume.
7. Palea of upper floral glume.
8. Stamens, ovary and styles.

#### 4. ARUNDINELLA TENELLA Nees & Wight.

##### PLATE 127.

*Arundinella tenella* Nees & Wight *ex* Steud. *Nom. ed.* 2, pt. 1 (1840) 143; Dak & Gibs. *Bomb.*

*Fl.* (1861) 292; Duthie *Grasses N. W. Ind.* (1883) 13; Lisboa in *Journ. Bomb. Nat. Hist. Soc.* V (1891) 345; Hook. *f. Fl. Brit. Ind.* VII (1896) 71; Cooke *Fl. Bomb.* II (1908) 1001.

*Anmagrostis tenella* Wight *ex* Steud. *Syn. PL. Glum.* I (1854) 115. •

*Arundindhupumik'* S̄IouLU. < W<sub>r</sub> • UvX • M<sub>r</sub>\*/wv • ((J^  
*Acrathmin^mluinEocMTIx* A. Kich. *Tent. Fl. Abyss.* II (1851) 414,1.100.

**Etymology** : *Tenella* means tender, delicate.

**Description** : Annual, nearly glabrous; stems solitary or tufted, erect, glabrous or with a few scattered hairs. Leaves 2-5-7-5 cm. by 6-20 mm., ovate to linear-lanceolate, acuminate, membranous, many-nerved, sprinkled with a few slender soft hairs, base narrowed; sheath usually glabrous with ciliate margins.

• Panicle 5-25 cm. long, effuse, copiously branched; rhachis slender, strict, erect; branches alternate or the lower subverticillately fascicled, each with widely spreading capillary branches and branchlets. Spikelets the smallest of the genus, 1-6-2 mm. long; pedicels long, slender. Glumes 4; lower involucral glume 1\*2-1\*6 mm. long, ovate-lanceolate, acute, thinly membranous, 3-nerved; upper involucral glume longer, 1\*6-2 mm. long, ovate-lanceolate, cuspidately acuminate, 5-nerved; lower floral glume 1-6 mm. long, ovate, obtuse, paleate; upper floral glume 1 mm. long, lanceolate, scabrid above; awn solitary, about 2\*5 mm. long, the lower part brown, slightly twisted, the upper part pale.

**Locality** : *Khandesh*: Toranmal (McCann 9594!).

*Konkan*: Pen (McCann 5502!); Bombay (Lambert).

*W. Ghatsj* Igatpuri (McCann 5354!); Mahableshtar, 4,500 ft., rainfall 270 in. (Sedgwick & Bell 4522!), common under the shade of trees (Dalzell, Cooke, Woodrow, Lisboa); Panchgani (Blatter 3798!), Maratha Well (Blatter & Hallberg B1222!); Karli and Ehandala (Jacquemont 631); Ehandala, very common (McCann 5354!); Lonavla (Gammie!, Woodrow).

*Deccan*: Purandhar (McCann 5013!).

*N. Kanara*: Yellapur, 2,000 ft., rainfall 100 in. (Sedgwick 3125!); Halyal (Talbot 2553!); Dandeli (Talbot 2268!); Thai (Talbot 2576!).

**Ecology** : A very ornamental grass; found commonly throughout the hilly parts of the Presidency on rocks and walls in the open during the rains. Soon after the monsoon the plants die down.

**Distribution** : W. Himalaya, Khasia Hills, Bihar, Central India, W. Peninsula, Abyssinia.

**Economic uses** : Cattle do not care for the grass when dry.

**Explanation of Plate 127** : *Arundinella tenella* Nees & Wight.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Palea of lower floral glume.

6. Upper floral glume.
7. Palea of upper floral glume.
8. Stamens, ovary and styles.
9. Ligule.

## 5. ARUNDINELLA PYGMAEA Hook. f.

*Arundinella pygmaea* Hook. f. FL Brit. Ind. VII (1896) 72; Cooke FL Bomb. II (1908) 1002; Janowski in Bot. Archiv I (1922) 25.

**Etymology** : *Pygmaea* means small like a pygmy.

**Description** : A small slender plant scarcely 15 cm. high.; stem very slender. Leaves chiefly radical, 2\*5-3\*8 cm. by 2-5 mm., linear-lanceolate, nerveless except the strong midrib, with a few scattered long hairs and finely serrulate margins; sheaths glabrous.

Panicle erect, effuse; rhachis filiform; branches few, capillary. Spikelets 3 mm. long (including the cuspidation of the upper involucral glume), ovoid-lanceolate, hispidly hairy; pedicels very long, capillary. Glumes 4; lower involucral glume 2 mm. long, ovate, 3-nerved, hispid with long hairs; upper involucral glume 3 mm. long, ovate-lanceolate, cuspidately acuminate, 5-nerved, hispid with long hairs; lower floral glume 2 mm. long, ovate, obtuse, coriaceous, with incurved margins, obscurely 5-nerved; upper floral glume about 1 mm. long, elliptic-oblong; awn solitary, 4-5 mm. long, the lower half brown, the upper half pale.

**Locality** : W. Ghats: Crest of the W. Ghats (Woodrow); Mahableshwar, in public garden, 4,500 ft., rainfall 270 in. (Sedgwick & Bell 4619!); Khandala (McCann 5318!); Igatpuri, (Blatter & Hallberg 5143 !).

N. Kanara (Lisboa).

**Distribution** : Endemic.

## 6. ARUNDINELLA CILIATA Nees.

## PLATE 128.

*Arundinella ciliata* Nees ex Miq. in Verh. Nederl. Ind. III, IV (1851) 30; Janowski in Bot. Archiv I (1922) 25.

*Hokus ciliatus* Boxb. Fl. Ind. I (1832) 318.

*Arundinella agrostoides* Trin. Ic. XXIII (1828-36) t. 265; Cooke FL Bomb. II (1908) 1002.

*A. agrostoides* var. *ciliata* Hook. f. Fl. Brit. Ind. VII (1896) 71.

*Brandtia holcoides* Kunth Rev. Gram. II (1835) 127, t. 170.

*Perotis polystachya* Heyne ex Hook. f. 1. c. 71.

**Description** : Annual; stem 20-45 cm. long, stout or slender. Leaves 2\*5-10 cm. by 6-13 mm., flat, narrowed to the base, clothed with long soft hairs; sheaths softly hairy; ligule a ridge of hairs.

Panicle 2-5-20 cm. long, contracted; branches fascicled, suberect. Spikelets 2-5-3-2 cm. long, ovoid-lanceolate, the lower half usually bristly; pedicels reaching 3 mm. long, slender, glabrous or nearly so. Glumes 4; lower involucral glume ovate, acuminate, 3-nerved, usually with a few bristles on the lower half; upper involucral glume 3-2 mm. long, ovate, cuspidately acuminate, 5-nerved; lower floral glume rather more than 2-5 mm. long, ovate-lanceolate, coriaceous, paleate, 3-nerved, the palea ovate-lanceolate, acuminate; upper floral glume about 1-2 mm. long, elliptic, obtuse, usually female; palea oblong, obtuse; median awn reaching 5 mm. long, the lower half twisted, brown, the upper half pale, geniculate above the twisted-column; lateral awns 0.

**Locality** : Korikan (Wight). We have not seen any specimens.

**Distribution** : India, Philippines.

**Explanation of Plate 128** : *Arundindla ciliata* Nees.

1. Ligule.
2. Spikelet.
3. Lower invol. glume.
4. Upper invol. glume.
6. Lower floral glume.
- ti. Palea of lower floral glume.
7. Stamens.
8. Upper floral glume.
9. Palea of upper floral glume.
10. Stamens, ovary and styles.



ABUNDINELLA TENELLA NEES \* WIQHT.

IWi>.- B. X. BKidt.



ARUNDINELLA CILIATA NEES.

Delin: R. K. Thiele.

## 7. ARUNDINELLA METZII Hochst.

*Arundinella Metzii* Hochst. in Miq. Anal. Bot. Ind. pt. 2 (1851) 19; Steud. Syn. PL Glum. 116 (excl. syn. Roxb.); Cooke EL Bomb. II (1908) 1003.

*Agrostis fusca* Heyne ex Hook. f. EL Brit. Ind. VII (1896) 72.

*Arundinella agrostoides* Trin. var. *tendla* Herb. Ind. Or. Hook, f. & Th. ex Hook, f. 1. c.

**Description** : Annual, 30-90 cm. high; stems slender erect. Leaves 10-15 cm. by 6-8 mm., linear, glabrous or sparsely hairy; sheaths glabrous or sparsely hairy.

Panicle 2\*5-20 cm. long, effuse; rhachis slender, smooth or subscaberulous; branches elongate, alternate or fascicled, 2-5-10 cm. long. Spikelets 3 mm. long, ovoid-lanceolate. Glumes 4; lower involucral glume 2-5 mm. long, ovate-lanceolate, with a slender mucro about 0-8 mm. long, strongly 3-nerved; upper involucral glume 3-2 mm. long, similar, with a mucro about 1-2 mm. long, 5-nerved; lower floral glume elliptic, obtuse, 2-5 mm. long, 3-nerved, paleate, empty or male, the palea 1-6 mm. long, oblong-lanceolate, acute, hyaline; upper floral glume 1-2 mm. long, ovate, obtuse; palea as long as the glume, linear-lanceolate, subobtuse; awn solitary, 3-2 mm. long, the lower half brown, the upper pale.

**Locality** : W. Ghats: Lonavla (Woodrow).

S. M. Country: Devarayi, 1,800 ft., rainfall 90 in. (Sedgwick & Bell 4474 !).

N. Kanara : Yellapur, 2,000 ft., rainfall 100 in. (Sedgwick 3469!); Sunksal, rocky bank of a stream in evergreen forest, 500 ft., rainfall 150 in. (Sedgwick & Bell 5040!); Birchy (Talbot 2105 ! 2116 ! 2488 !); Dandeli (Talbot 2268 !).

**Distribution**: W. Peninsula.

## 8. ARUNDINELLA LAWH Hook. f.

*Arundinella Lawii* Hook. f. in Trim. Fl. Ceyl. V (1900) 180; Cooke EL Bomb. II (1908) 1003

*A. agrostoides* Hook. f. FL Brit. Ind. VII (1896) 71 (*partim*).

**Vernacular names** : Eotir, Dundi.

**Description** : Perennial; stems tufted, erect, 60-120 cm. high, leafy, smooth; nodes hairy. Leaves 20-30 cm. by 6 mm., linear, finely acuminate, flat, sparsely hairy, with nearly smooth margins; sheaths elongate, glabrous or nearly so, auricled and ciliate at the mouth; ligule a tomentose lunate ridge.

Panicle 30-50 cm. long, pyramidal, decompound, effuse, drooping; rhachis slender, smooth; lower branches reaching 15 cm. long, in distant fascicles, filiform, spreading, flexuous; branchlets capillary. Spikelets numerous, usually hairy, rather more than 2-5 mm. long (excluding the awns); pedicels very long. Glumes 4; lower involucral glume about 2 mm. long (including a short slender awn about 0-6 mm. long), lanceolate, acute, 3-nerved, hairy on the nerves, thinly membranous; upper involucral glume similar to the lower but longer (nearly 5 mm. long, including an awn of nearly 2\*5 mm. long), 5-nerved, hairy on the nerves, thinly membranous; lower floral glume rather less than 2-5 mm. long, shorter than the upper involucral glume, oblong, subobtuse, faintly 5-nerved, not awned, hyaline, paleate, the palea narrowly oblong, subobtuse with a faint median nerve; upper floral glume 1-2-1-6 mm. long, elliptic-lanceolate, acute, hyaline, usually 3-nerved, with incurved margins and a long filiform awn reaching 13 mm. long, 2-sexual.

A most variable plant.

**Locality** : Konkan: (Woodrow 35 !); N. and S. Konkan (Law.).

**Ecology** : Grows mostly in streams and river-beds.

**Distribution** : W. Peninsula, Ceylon.

## 9. ARUNDINELLA HISPIDA O. Etze.

*Arundinella hispida* O. Etze. Rev. Gen. (1891) 761; Janowslri in Bot. Archiv I (1922) 26.

*Andropogon hispidus* Willd. Sp. PL IV (1805) 908.

*Ischaemum hispidum* H. B. & E. Nov. Gen. & Sp. I (1815) 194.

*Arundinella brasiliensis* Raddi Agrost. Brasil. (1823) 37, 1. 1, fig. 3; Trin. Diss. II, 62, Sp. Grain

Ic. t. 266; Hook, f. Fl. Brit. Ind. VII (1896) 73; Cooke FL Bomb. II (1908) 1003.

*A. paUida* Nees Agrost. Brasil. (1829) 465.

*Acratherium miliaceum* Link Hort. Berol. II (1841) 234.

*Orthopogon agrostoides* Trev. ex Steud. Norm. ed. 2, II (1841) 234.

*Andropogon virens* Spreng. Syst. I (1825) 287.

*Arundinella Mikani* Nees 1. c. 465.

*Goldbachia Mitani* Trin. in Spreng. Neue Entdeck. II (1821) 81.

*Riedelia Mikani* Trin. ex Kunth Enum. PL I (1833) 515.

*Aira brasiliensis* Spreng. Syst. I (1825) 278.

*Ischaemum pallidum* Kunth Enum. PL I (1833) 515.

*Arundinella Ritchiei* Munro ex Lisboa in Journ. Bomb. Nat. Hist. Soc. V (1891) 343.

*Bolcus nervosus* Roxb. Fl. Ind. I (1832) 318.

*Arundinella nepalensis* Trin. Sp. Gram. (1828) t. 268; Duthie Grasses N. W. Ind. (1883) 13; Lisboa l. c. 343.

**Description** : Perennial; rootstock stout, hard, creeping and sending out stout sheathed branches sometimes as thick as a goosequill, or tufted and intricately branched; stems 30-150 cm. long, stout or slender, simple or branched, hairy or almost glabrous; nodes glabrous or pubescent. Leaves 15-30 cm. by 4-17 mm., usually ciliate at the narrow base, glabrous or hairy; sheaths usually glabrous; ligule a minute ridge fringed with long hairs.

Panicle pyramidal, thyriform or subcorymbose, 10-45 cm. long; rhachis angular, usually glabrous; branches 2-5-25 cm. long, few or many, fasciculate or subverticillate. Spikelets 4-5 mm. long, subsecund, pedicellate, ovoid-lanceolate, usually glabrous. Glumes 4; lower involucral glume 3-2 mm. long, ovate-lanceolate, acuminate, subacute, 3-nerved, glabrous or (rarely) sparingly setose; upper involucral glume 5 mm. long, ovate-lanceolate, acuminate, 5-nerved; lower floral glume 4 mm. long, elliptic-oblong, obtuse or shortly 2-fid, 3-5-nerved, paleate, empty or male, the palea 3-2 mm. long, lanceolate, hyaline; upper floral glume less than 3-2 mm. long, bearded at the base, narrowly ovate-lanceolate, scaberulous, 2-sexual; awn 4 mm. long, straight or slightly twisted, brown below, pale above; palea narrowly lanceolate, acute, as long as the glume.

A most variable plant. See Hook, f. FL Brit. Ind. VII, 74.

**Locality** : *W. Ghats*: Ehandala (Saxton 1205!, Lisboa); Lonavla (Hallberg 9660!, Garade!, Lisboa); Mahableshwar, 4,500 ft., rainfall 270 in. (Dalzell & Gibson, Lisboa), in a A stream (Sedgwick & Bell 4543!); Panchgani (Woodrow); Castle Rock, on banks of Duoki River, 1,900 ft. (McCann 9855!).

*N. Kanara*: Kala Nuddi to Supa, 1,800 ft., rainfall 100 in. (Sedgwick & Bell 4872!); Yellapur, in a gravelly stream-bed, 2,000 ft., rainfall 100 in. (Sedgwick 3126!); flampkhand, in river-bed (Hallberg & McCann A159!); Dandeli (Talbot 2241!).

**Distribution** : Throughout the hilly parts of India, China, Malaya, Australia, tropical America.

#### 10. ABUNDINELLA MUTICA Nees.

*Arundinella mutica* Nees ex Steud. Syn. PL Glum. (1855) 116.

*A. capillaris* Hook. f. FL Brit. Ind. VII (1896) 74; Cooke FL Bomb. II (1908) 1004.

*Andropogon capillaris* Herb. Heyne ex Hook. f. Fl. Brit. Ind. 1. c. 75.

Hook. f. had called this plant *A. capillaris* though Nees had given it the name *mutica* in 1855. As an explanation he gave the following: "Nees describes the leaves as with sparsely setulose margins and gl. IV as mucronate, from which it is evident that the awn has fallen away in his specimen. This latter suggested the name *mutica*, which being misleading I have replaced by Heyne's of *capillaris*."<sup>99</sup> This cannot be considered a sufficient reason to change a name.

**Description** : Perennial, very slender, stem erect from a tuberous rhizome which is clothed with the woolly bases of leaf-sheaths; nodes glabrous. Leaves 15-30 cm. by 4-8 mm., linear, acuminate, glabrous or hairy; sheaths glabrous, striate; ligule a ridge of hairs.

Panicle oblong, 12-5-18 cm. long; rhachis filiform, scaberulous; branches alternate, slender, 10-15 cm. long. Spikelets 4-5 mm. long, glabrous, solitary or geminate; pedicels long, capillary, angular. Glumes 4; lower involucral 3-2 mm. long, ovate, acute, with a long slender inuro, 3-nerved, with a scaberulous keel; upper involucral glume reaching 5 mm. long, ovate-lanceolate, narrowed into a subcuspidate acuminate tip, 5-nerved; lower floral glume tatter more than 3-2 mm. long, ovate-oblong, subacute, 3-nerved, paleate, the palea 3-2 mm. long, oblong-lanceolate, acute, hyaline; upper floral glume 3-2 mm. long, lanceolate, acute, slightly scabrid; palea oblong-lanceolate, acute; awn nearly 6 mm. long, geniculate about the middle, easily breaking off.

**Locality** : *Konkan*: Parel, Bombay Island (Woodrow).

*N. Kanara*: Kala Nuddi (Woodrow).

We doubt the occurrence of this species in the Bombay Presidency. Woodrow gives two localities, but neither Cooke nor we have seen his specimens. Lisboa (Journ. Bomb. Nat. Hist. Soc. V (1891) 8) calls this plant common all over Bombay. If it is really common it is strange that we should never have met it.

**Distribution** : W. Peninsula.



ARDNDINELLA SPICATA DALZ.

Delia: R. K. Bbide.





## 11. ABUNDINELLA SFIGATA Dalz.

## PLATE 129.

*Arundinella spicata* Dalz. in Dalz. & Gibs. Bomb. 71. (1861) 293; Hook. f. Fl. Brit. Ind. VII (1896) 77, *sub speciebus indeterminab.*; Cooke Fl. Bomb. II (1908) 1004.

**Description** : A small grass in appearance resembling a *Setaria*; stem 15-30 cm. high, erect, simple. Leaves 2\*5-3-8 cm. by 6 mm., linear-lanceolate, acute, densely hispid with long hairs; sheaths densely hispid; ligule a minute hairy ring.

Inflorescence of cylindric racemes 2-5 cm. long. Spikelets 6 mm. long to top of upper involucral glume; pedicels very short. Glumes 4; lower involucral glume 1-6-2 mm. long, lanceolate, acuminate, with a few long bulbous-based hairs, 3-nerved; upper involucral glume leaching 6 mm. long, narrowly lanceolate, attenuated into a long acuminate point, folded round and completely concealing the upper floral glume and its awn, 3-nerved and with a few scattered long hairs; lower floral glume 2-5 mm. long, lanceolate, acute, thinly membranous, glabrous, paleate, empty or male, the palea 1-6 mm. long, lanceolate, acute; upper floral glume 1-2 mm. long, oblong, obtuse, female or 2-sexual; palea lanceolate, acute, hyaline; awn 4 mm. long, the lower half brown, the upper pale geniculate about the middle.

**Locality** : *W. Ghats* : Mahableshwar, common in open localities, 4,500 ft., rainfall 270 in. (Sedgwick & Bell 4508!), common on the Mahableshwar Hills (Dalzell & Gibson, Woodrow, Cooke); Panchgani, very common on the Tablelands (Blatter 3797 !, McCann!).

**Ecology** : A monsoon species, appearing in flower by the end of September.

**Distribution** : W. Peninsula; so far endemic.

**Explanation of Plate 129** : *Arundinella spicata* Dalz.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Palea of lower floral glume.
6. Upper floral glume.
7. Palea of upper floral glume.
8. Grain.

## 12. ARUNDINELLA VILLOSA Wight &amp; Arn.

*Arundinella villosa* Wight & Arn. *ex* Steud. Syn. Pl. Glum. I (1854) 115; Hook. f. Fl. Brit. Ind. VII (1896) 72 *cum omnibus varietatibus*.

*A. Hookeri* Munro *ex* Hook. f. 1. c. 73.

• **Description** : Stem 30-40 cm. high, tufted, slender, stiff, leafy at the villous base, villous below the panicles. Leaves 10-20 cm. by 2-2-5 mm., strict, rather rigid; glabrous, tomentose or villous. Ligules of long hairs. Panicle very narrow, 5-10 cm. long, spiciform, rhachis villous; branches 12-18 mm. long, brown.

Spikelets subdistichously crowded, spreading or erect, 5-6 mm. long, setosely hirsute. Lower involucral glume  $\frac{1}{2}$  of upper, long-pointed, 3-5-nerved, upper involucral glume subaristately long-pointed, 5-nerved. Lower floral glume sharp-pointed, 5-nerved, neuter or male; upper oblong-lanceolate very minutely scaberulous, rounded at the tip, sometimes 2-dentate, awn not twice as long as the spikelet, column of awn included, twisted.

The leaves vary a good deal as to their size. In addition to the measurements given above, the following have been observed : 30 cm. by 8 mm. and 5-15 cm. by 6-8 mm.

**Locality** : *W. Ghats*: Khandala (McCann 9602A! 9602B !).

**Distribution** : E. Himalaya, Ehasia Hills, Central India, Deccan Peninsula, Ceylon.

## 13. ARUNDINELLA GIGANTEA Dalz.

## PLATE 130.

*Arundinella gigantea* Dalz. in Dalz. & Gibs. Bomb. Fl. (1861) 293; Hook. f. Fl. Brit. Ind. VII (1896) 76; Cooke Fl. Bomb. II (1908) 1005.

**Description** : A tall grass; stems erect, smooth, terete, 1\*8 m. high, as thick as a goose-quill at 45 cm. below the panicle; nodes glabrous. Leaves 30-60 by 2-2-3\*2 cm., linear-lanceolate, finely acuminate, glabrous or sparsely hairy, many-nerved, base rounded or cordate; sheaths striate, sparsely hairy or almost glabrous; ligule a narrow glabrous membrane.

Panicle subcorymbose thyrsiform, 12-5-18 by 5-7-5 cm.; rhachis stout, scabrid, angular, concealed by the numerous erect angular branches which are 5-10 cm. long. Spikelets 2\*5-3 mm. long. Glumes 4; lower involucral glume 2 mm. long, broadly ovate, acute, strongly, 3-nerved, with a scaberulous keel; upper involucral glume 2\*5-3-2 mm. long, ovate, narrowed

into an acuminate point, 5-nerved ; lower floral glume 2-2.5 mm. long, ovate, subobtusate, 3-5-nerved, paleate, the palea 1-6 mm. long, elliptic, hyaline ; upper floral glume 1-6 mm. long, elliptic, thickly coriaceous, white, without an awn.

**Locality** : *Korikan*: (Stocks); Eineshvar, below the Ghats (Dalzell & Gibson).

*W. Ghats*: Londa (Bhide!); Castle Rock, in shade (McCann 9853 !, Gammie-15668!).

*S. M. Country*: Devarayi (Sedgwick 4474 !).

*N. Kanara*: Dudsagar Falls (McCann A174!); Nagergali, forests, 1,800 ft., rainfall 80 in. (Sedgwick 2921!); Birchy (Talbot 2250!); Dandeli (Talbot 2493 !); Tinai Ghat (Talbot 2627 !); Jugglepet (Talbot 1387 !); Supa (Talbot 2493 !); Karwar (Hallberg & McCann A161!); Gersoppa Falls, on rocks, in river-bed (Hallberg & McCann A160!); Yellapur (Sedgwick 3469 !, Talbot!).

**Distribution** : W. Peninsula ; so far endemic.

**Explanation of Plate 130** : *ArundinellagiganteaBaXz.*

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Palea of lower floral glume.
6. Upper floral glume.
7. Palea of upper floral glume.
8. Stamens, ovary and styles.
9. Ligule.

#### 64. TRISTACHYA Nees.

Perennial, usually coarse grasses. Leaves various.

Spikelets 2-flowered (lower flower male, the upper 2-sexual), large, lanceolate to linear, sessile or shortly pedicellate, in clusters of 3 at the tips of the branchlets of a raceme or panicle ; rhachilla not produced beyond the upper floret. Glumes 4 ; involucral glumes more or less\* unequal, not awned, persistent 3-nerved, membranous or subcoriaceous; lower floral glume membranous, 3-7-nerved, not awned; upper floral glume membranous or ultimately cartilaginous, 2-lobed, with a long twisted awn in the sinus (copiously bearded above the middle, in the Indian species); palea hyaline, 2-keeled. Lodicules 2, cuneate, fleshy. Stamens 3. Styles Blender ; stigmas plumose, laterally exserted. Grain narrow, free.

Species 10. Tropics except Australia.

#### 1. TRISTACHYA BARBATA Nees.

*Tristachya barbata* Nees ex Steud. Syn. PI. Gram. (1855) 238; Boiss. Fl. Or. V (1884) 552; Duthie Grasses N. W. Ind. (1883) 32 ; Hopk. f. Fl. Brit. Ind. VII (1896) 272 ; Cooke. Fl. Bomb. II (1908) 1005.

*T. Stocksii* Boiss. 1. c. ; Munro in Aitchis. Cat. Panjab PI. (1869) 168 ; Duthie Fodder Grasses N. Ind. (1888) 51.

*Loudetia barbata* A. Braun in Flora XXIV (1841) II, 714.

*Sorghum barbatum* Hochst. & Steud. PI. Arab. Exsic. no. 788 ex Hook, f. 1. c.

**Etymology** : *Tristachya* means 3-spiked, alluding to the spikelets which are congested in threes at the ends of the panicle branchlets.

**Description** : Stem 15-45 cm., branched and woody at the base, geniculately ascending, the base clothed with tomentose leaf-sheaths ; nodes woolly. Leaves 2-5-7.5 cm. by 2-5-4 mm., linear-lanceolate from a rounded base, finely acuminate, pungent, rigid, glaucous, many-nerved, with a subserrulate thickened margin.

Panicle 2-5-5 cm. long and nearly as broad, sparingly branched; branches solitary and 2-nate, capillary. Spikelets nearly 13 mm. long (excluding the awn); callus glabrous. Glumes 4 ; lower involucral glume 6 mm. long, ovate-lanceolate, subacute, 3-nerved ; upper involucral glume 8 mm. long, oblong-lanceolate, 3-nerved ; lower floral glume nearly 13 mm. long, male lanceolate, acuminate, interruptedly 7-nerved, with a linear-lanceolate palea 6 mm. long; upper floral glume 8 mm. long, 2-sexual, densely hairy on the back above the middle with very slender hairs nearly 4 mm. long, 2-lobed, the lobes lanceolate, acute, aristate, each lobe 3-nerved, 4 mm. long with an awn 16 mm. long from the sinus; palea lanceolate, acute, 6 mm. long.

**Locality** : *Sind* (Stock, 1217, 648 ex Cooke.).

**Distribution** : Sind, Baluchistan, Arabia, Nubia.

TRIBE V: *Aveneae*.

Florets 2 to many, all alike (except the uppermost which often are reduced). Involucral glumes generally hyaline or scarious and shining. Floral glumes membranous or subherbaceous with hyaline shining margins or firmer, 5- or more-nerved, rarely 3-nerved (with the side-nerves delicate and not submarginal); awn, if present, from the back or from the sinus, or from between bristles, kneed and usually twisted below the knee.

See key page xviii.

## 65. AVENA Linn.

Annual or perennial herbs, low or moderately tall. Panicles narrow or open, usually rather few-flowered of usually large spikelets. Spikelets 2-several-flowered; rhachilla bearded, disarticulating above the involucral glumes and between the flowering glumes. Involucral glumes About equal, membranous or papery, several-nerved, longer than the lower floret, usually exceeding the upper floret. Floral glumes indurate, except toward the summit, 5-9-nerved, bidentate at the apex, bearing a dorsal bent and twisted awn, which is straight and reduced in *Avena sativa*.

The genus as just described does not include *Trisetum* Pers. as is the case in Hook, f.'s *Avena* in It Brit. Ind. VII, 274.

Species about 55.—Chiefly temperate regions. One species cultivated in the Presidency.

## •1. AVENA SATIVA Linn.

*Avena sativa* Linn. Sp. Pl. (1753) 79; Hook. f. Fl. Brit. Ind. VII (1896) 275; Duthie Field and Oard. Crops pt. 1, 13, pi. III, Grasses N. W. Ind. (1883) 31, Fodder Grasses N. Ind. (1888) 51; Mukerji Handb. Ind. Agric. 247-8; Mollis Textb. Agr. III, 49-51.

Vernacular names : Oats, Jai.

Etymology : *Avena* was the name of some wild oats of the ancient Romans.

Description : Vn annual grass. Stems erect, tufted, smooth, 1<sup>2</sup> m. high. Blades flat, up to 30 cm. high and 12 mm. wide, scabrous, especially on the margins; ligule membranaceous, truncate, 1-3 mm. long, toothed or serrate, decurrent along the margin of the sheath; sheaths smooth, striate, the lower rather papery.

Panicle open or more or less contracted, erect or nodding, sometimes 1-sided, the pedicels thickened at the apex. Spikelets large, drooping, variable in size, but usually about 20-25 mm. long; involucral glumes strongly several-nerved, membranaceous, acuminate, scabrous, containing usually 2 florets; floral glumes smooth or slightly hairy at the base, teeth acute but not awned, the dorsal awn absent or, if present, usually straight and not much longer than the involucral glumes, often present only on the lower floret, palea enclosed by the inrolled margin of the glume, densely short-ciliate on the 2 keels. The florets do not easily disarticulate, which condition is probably due to cultivation.

Locality : Very little cultivated in the Presidency. Has been grown at Hyderabad (Sind), Also at military grass farms for military horses at Ahmednagar and elsewhere.

Ecology : This crop is only grown in the rabi season and in this Presidency always under irrigation. It does best on well-drained, friable soils of fair depth.

Distribution : See De Candolle, Origin of Cult. Pl. 373-6 and Hehn. Eulturpfl. and Haust. (1894) 539.

Economic uses : The crop is grown at remount and horse-rearing depots not so much for the grain as the fodder. The crop has a special position as an excellent fodder crop (Mann.).

For a useful introduction to the study of oats-see : Herbert Hunter: Oats, their varieties and characteristics. London, 1924.

## 66. COELACHNE R. Br.

A small, leafy, variable marsh grass. Leaves short, flat or convolute.

Spikelets 2-flowered (both flowers perfect or upper imperfect) in open or contracted or spioiform panicles, not articulate on the pedicels, not awned. Rhachilla jointed at the base, produced between the lower and upper floral glume but not beyond the upper. Lower involucral glume suborbicular, concave, obtuse and delicately nerved; upper smaller, more oblong, both persistent. Lower floral glume much longer, sessile, coriaceous, glabrous, except the shortly bearded callus, palea as long, coriaceous; upper much smaller and palea more or less hairy. Stamens 3; anthers long, narrow. Ovary ovoid; stigmas free. Grain free within the glume and palea.

Specied 3 or 4.—East Indies, S. China, tropical Australia, E. Africa, Madagascar.

## 1. COELACHNE PULCHELLA R. Br.

## PLATE 131.

*Coelachne pulchella* R. Br. Piodr. (1810) 187 ; Lisboa Bomb. Grasses (1896) 98 ; Hook, f. Fl. Brit. Ind. VII (1896) 270 *cum omnibus varietat.*

*C. brachiata* Munro ex Benth. Fl. Austr. VII (1878) 626 (*partim*).

*C. infirma* Buese Pl. Jungh. I, 350 ; Miq. Fl. Ind. Bat. III, 399.

*C. madagascariensis* Bak. in Journ. Linn. Soc. XXV (1890) 348.

*C. perpusilla* Thw. Enum. PL Zeyl. (1864) 373 (*partim*).

*Isachne brachyglumis* Hochst. in Hohen. Pl. Nilgh. no. 1283 (*nomen tantum*).

*I. perpusilla* Wight & Am. ex Wight Cat. no. 2043.

*Panicum simpliciusvulum* Wight & Am. ex Steud. Syn. Pl. Glum. 96.

**Etymology** : *Coelachne* is derived from *koilos*, a hollow, and *achna*, a glume, perhaps alluding to the two concave lower glumes.—*Pulchella* means beautiful.

**Description** : Stems 15-45 cm. high, flaccid, decumbent or ascending, slender or rather stout, leafy up to the panicle. Leaves uniform throughout the stem, 1-2.5 cm. long, lanceolate, subulate, acuminate, distant or subequitantly sheathing, ecostate, minutely scaberulous above, nerves striate; ligule a few hairs.

Panicle very various. Spikelets 1-2.5 mm. long, sessile or pedicelled, globose or ovoid. Lower involucre glumes suborbicular or hemispheric, many-nerved, membranous or herbaceous. Lower floral glume hermaphrodite, coriaceous, dorsally rounded, nerves 0 or very obscure, palea coriaceous ; margins incurved; upper much the smallest, often imperfect, neuter or female.

**Locality** : *W. Ghats*: Mahableshwar, by the lake, 4,500 ft., rainfall 270 in. (Sedgwick & Bell 4851 !); Castle Rock, in a marsh (Bhide !, McCann !).

*S. M. Country*: Roadside near Khanapur, 2,500 ft., rainfall 60 in. (Sedgwick 2960!).

*N. Kanara* : Kumbmoada (Talbot 2273 !); Karwar, in wet fields (McCann !); Sirsi to Siddhapur, in fields (Hallberg & McCann A47 !).

**Ecology** : A subgregarious species, growing in marshes.

**Distribution** : Of the genus.

**Explanation Of Plate 131** : *Coelachne pulchella* R. Br.

1. Lower invol. glume.
2. Upper invol. glume.
3. Lower floral glume.
4. Palea of lower floral glume.
5. Stamens, ovary and styles.
6. Upper floral glume.
7. Palea of upper floral glume.
8. Ovary and styles.
9. Spikelets.

## 67. DANTHONIA Lam.

Annual or perennial grasses, tufted, low or moderately tall.

Panicle few-flowered, open or spike-like of rather large spikelets. Spikelets 3-many\* flowered, with the uppermost florets reduced, erect, not jointed on their pedicels. Bhachilla-hairy, readily disarticulating above the involucre glumes and between the flowering glumes, produced beyond the uppermost glume. Lower involucre glumes empty, subequal, as long as the whole spikelet, persistent, keeled, acute or acuminate, 3-9- (rarely 1-) nerved. Flowering glumes dorsally rounded, ciliate, 7-9-nerved, 2-fid, lobes acute, usually extending into slender awns, a stout awn arising in the sinus; awn flat, tightly twisted below, geniculate, exserted, including 3 nerves of the glume; palea broad. Lodicules 2, fleshy. Stamens 3. Styles free. Grain free within the membranous or hardened glume and palea.

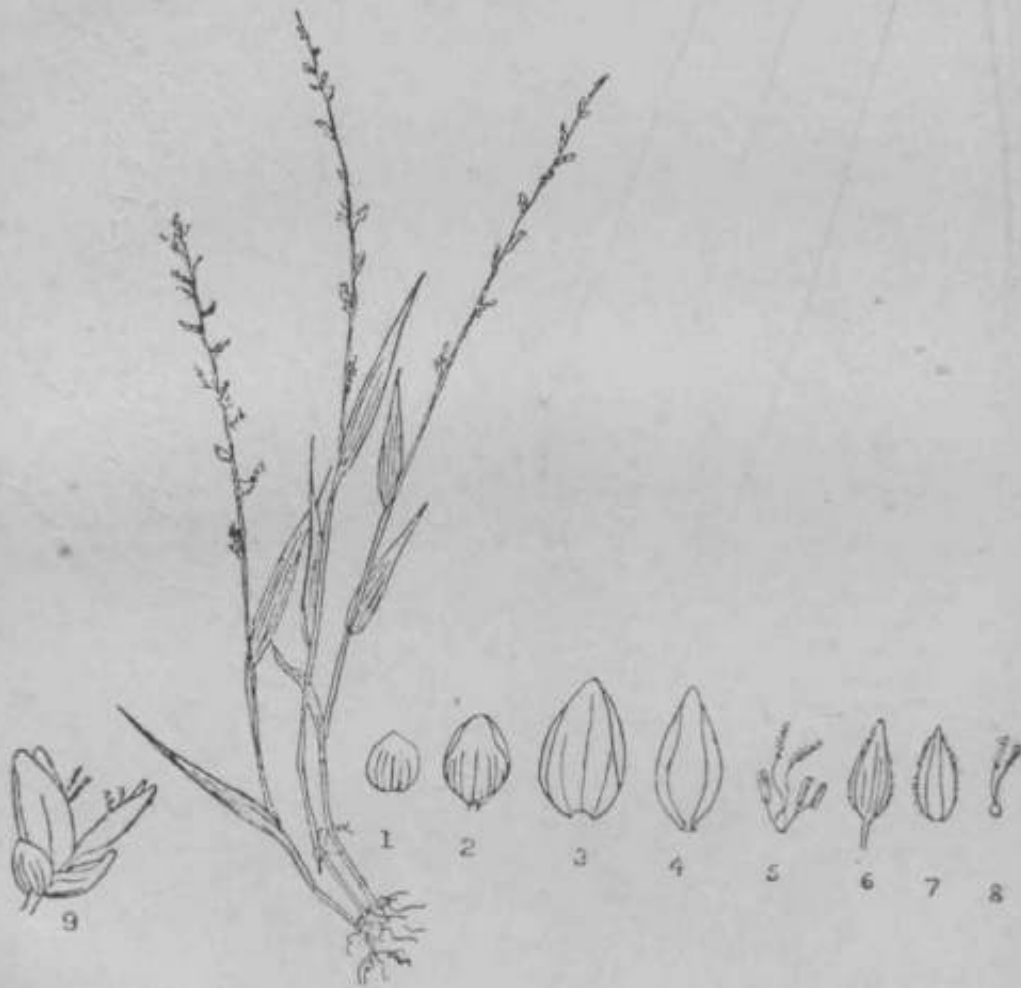
Species about 100. In the temperate regions of both hemispheres, especially abundant in S. Africa.

## 1. DANTHONIA GAMMIEI Bhide.

*Danthonia Gammiei* Bhide in Journ. k Proc. As. Soc. Beng. new series, VII (1911) 513 ; Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 33 (1929) 236.

**Etymology** : The specific name was given in honour of George Gammie, Director of the Botanical Survey of Western India.

**Description** : Stem 10-60 cm. high, nodes glabrous. Leaves linear, glabrous below,, sparsely long-ciliate above, 2<sup>5</sup>-7-5 cm. by 2-5-3 mm., base rounded; ligule a very narrow! truncate, fimbriate membrane; sheaths glabrous; upper leaves very much reduced in size!





THYSANOLAEKA PLOECERA MEZ.

Delin: R. K. Bhide.

Peduncle and rhachis hairy ; panicle lax, racemose, 2-5-5 cm. by 12-16 mm. Spikelets few, short-pedicelled, about 18 mm. long excluding the awns. Involucral glumes empty, lanceolate, acuminate, lower one strongly 5-nerved dorsally, rounded, glabrous, subcoriaceous, margins membranous; upper one by j shorter than the lower, membranous, 3-nerved. Lower floral glume without the awns much smaller than the involucral glumes, terete, convolute, 7-9-nerved, dorsally villous all over, 2-dentate with a stout broad median awn; column of awn golden yellow, twisted and shining, tail minutely scabrid, dorsally narrowly 2-channelled; teeth produced into small slender awns reaching as far as the column of the median awn, with a fringe of long white hairs at the junction of the lateral awns with the glume ; rhachilla produced and terminating in a minute, ciliate, awned or awnless barren glume (upper floral glume); lodicules membranous, half as long as the anthers, oblong, emarginate. Stamens 3. Styles 2, distinct. Anthers and plumose stigmas protruding from the top of flowering glume.

**Locality** : *W. Ghats*: Castle Rock (Gammie !);

*N. Kanara*: Jog to Siddhapur, open grass-land on rocky soil (McCann A50 ! A51!); Mirjan, laterite flats (Hallberg A49!).

**Ecology** : Grows in open grass-land on rocky soil.

**Distribution** : So far endemic.

## TRIBE VI: Arundineae.

Florets 2 to many, enveloped by very long hairs, springing either from a long and slender callus or from the back of the floral glumes. Involucral and floral glumes membranous, often hyaline, awnless or minutely awned from the tips.

See key page xviii.

### 68. THYSANOLAENA Nees.

A large glabrous reed-like grass ; stems solid. Leaves broad, flat. Spikelets innumerable, very minute, 1-flowered, jointed on very short pedicels and subsecund on the very numerous crowded, long, filiform, compound, suberect branches and branchlets which form a very large effuse pyramidal panicle ; rhachilla produced but not beyond the floret. Glumes 4 ; involucral glumes small, concave, awnless, faintly nerved or nerveless ; lower floral glume rather longer than the upper, empty, acuminate, epaleate ; upper floral glume ovate, acute, ciliate, with long erect white hairs; palea short, truncate. Stamens 2-3; anthers short. Styles free. Grain very minute, free within the hardened glumes.

Species 1.—Tropical Asia.

Cooke has one species: *Thysanolaena Agrostis* Nees. We change it into *T. procera* Mez.

#### 1. THYSANOLAENA PROCERA Mez.

#### PLATE 132.

*Thysanolaena procera* Mez. in Janowski Bot. Archiv I (1922) 27.

*Agrostis procera* Retz. Obs. IV (1786) 19.

*Melica latifolia* Roxb. Hort. Beng. (1814) 8.

*Agrostis latifolia* Heyne ex Hook. f. Fl. Brit. Ind. VII (1896) 61.

*A. maxima* Roxb. Fl. Ind. I (1832) 317.

*Thysanolaena maxima* O. Ktze. Rev. Gen. II (1891) 794.

*Panicum acariferum* Trin. Sp. Gram. Ic. I (1828) 87.

*Thysanolaena acarifera* Nees & Arn. in Nov. Act. Leopold. XIX, Suppl. I (1843) 181; Lisboa in Journ. Bomb. Nat. Hist. Soc. V (1890) 347; Duthie Grasses N. W. Ind. (1883) 13, Fodder Grasses N. Ind. (1888) 21.

*T. Agrostis* Nees in Edinb. N. Phil. Journ. XVIII (1835) 180; Hook, f. FL Brit. Ind. VII (1896) 61; Cooke Fl. Bomb. II (1908) 1006.

*Myriachaeta arundinacea* Zoll. & Mor. Syst. Verz. Zoll. (1845-46) 101.

*M. glauca* Mor. ex Steud. Syn. PL Glum. I (1855) 404.

**Vernacular name** : Barucha.

**Etymology** : *Thysanolaena* is derived from *thysanoi*, fringe, tassels, and *laena*, a garment or cloak, alluding to the very compound panicle.

**Description** : A large handsome grass; stem 1-2-3-6 m. high, reaching sometimes 10 mm. diam., glabrous, polished. Leaves very large, 30-60 by 5-10 cm., coriaceous, linear-lanceolate, tapering to a fine point, many-veined, base cordate ; sheaths glabrous, striate, hairy at the mouth ; ligule small, ciliate.



Panicle large, 30-60 cm. long, soft, glabrous; branches very numerous, suberect, filiform, with many short branchlets carrying small spikelets. Spikelets 1-2-1-6 mm. long, ovoid-lanceolate, acuminate, pedicellate; rhachilla produced into a linear-lanceolate point about 0-5 mm. long. Glumes 4; involucre glumes less than 0-8 mm. long, subequal, about half as long as the floral glumes, ovate, subacute, hyaline, obscurely 1-nerved; lower floral glume longer than the upper, lanceolate, acuminate, membranous, glabrous, epaleate, empty, 1-nerved; upper floral glume ovate-lanceolate, acuminate, ciliate with long white erect hairs.

**Locality** : *Gujarat*: In bed of nala (Sedgwick & Bell 5393!); Bansda, Surat Dist. (Woodrow).

*Khandesh*: (Lisboa); Chanseli to Dadgaum, in a dry nala (McCann 9589 !); Dangs (Woodrow).

*Konkan*: Victoria Gardens, Bombay (McCann 9846!); Thana (Lisboa).

*Deccan*: Ganeshkhind Botanic Gardens (McCann 9847 !); Nasik (Lisboa).

**Ecology** : Grows on banks of nalas in the drier parts of the Presidency. " Not uncommon on the plains and on low elevation on the hills, usually in the vicinity of water." (Duthie).

**Distribution** : Throughout India, Penang, eastwards to New Guinea.

**Medicinal uses** : A decoction of the root is used as a rinse for the mouth in cases of fever (Cambell).

**Explanation of Plate 132** : *Thysanolaena procera* Mez.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Upper floral glume.
6. Palea of upper floral glume.
7. Stamens, ovary and styles.

#### 69. PHRAGMITES Adans.

Tall perennials with a creeping rhizome; stem stout, hollow, leafy upwards. Leaves long, flat.

Panicle lax, usually very large and decompound. Spikelets conspicuously silky from the long hairs on the callus, loosely 3-10-flowered, awnless; rhachilla disarticulating above the lower and between the following floral glumes, slender, penicillate with long hairs, not produced beyond the flowering glumes. Glumes glabrous; involucre glumes unequal, oblong-lanceolate, acute, 3-nerved, membranous, persistent; floral glumes heteromorphous, the lowest linear-lanceolate, much exceeding the involucre glumes, the following very thin, more or less caudate-acuminate, hyaline, 3-nerved; callus long, slender, densely clothed with very long silky hairs. Palea linear-oblong, about half as long as their glumes, 2-keeled. Lodicules 2 (sometimes 3 in the lower floret). Stamens 3 (sometimes 2 in the lower floret). Styles 2, distinct, rather short; stigmas laterally exerted, densely plumose. Grain oblong, semiterete.

Some European authors have taken up *Trichoon* Both, Archiv. Bot. Eoemer I, pt. 3 (1798) 37 as antedating *Phragmites* Trin. Fund. Agrost. (1820) 134. The latter name, however, dates from Adanson (1763) and should be retained. Cf. M. L. Fernald, the Generic name Phrag\* mites in Khodora 24 (1922) 55-56. Also: Hitchcock, Genera of Grass. Unit. Stat. in Bull. 772 Unit. St. Dept. Agric. (1920) 64.

Species 2.—One cosmopolitan and one in the Argentine.

#### 1. PHRAGMITES MAXIMA Blatter & McCann, *nov. comb.*

*At. undo maxima* Forsk. Fl. Aegypt.-Aiab. (1775) 24.

*Phragmites communis* Trin. Fund. Agrost. (1820) 134; Boiss. El. Or. V (1884) 563; Duthie Grasses N. W. Ind. (1883) 35, Fodder Grasses N. Ind. (1888) 601; Lisboa Bomb. Grasses (1896) 116; Hook. f. Fl. Brit. Ind. VII (1896) 303; Muschler Man. EL Egypt I (1912) 115.

*Ph. bifaria* Wight Herb. no. 3310 *ex* Hook. f. 1. c. 304.

*Ph. chiknsis* Steud. Nom. ed. 2, II (1841) 234.

*Ph. hispanica* Nees in Nov. Act. Nat. Cur. XIX, Suppl. I (1843) 174.

*Ph. humilis* Not. in Cat. Hort. Genuen (1846) 27.

PA. *Karha* Trin. *ex* Steud. Nom. ed. 2, II (1841) 324; Lisboa Bomb. Grasses (1896) 116\* flonke Fl. Bomb. II (1908) 1007.

*Ph. longivalvis* Steud. 1. c. 196.

*Ph. mauritànica* Kunth Eev. Gram. I (1829) 80, 277, t. 50; Enum. PL I (1838) 251.

*Ph. ntpalensis* Nees *ex* Steud. Syn. PL Glum. 196.

*Ph. pumila* Griseb. in Goett. Nachr. (1868) 76 (*an* Willk. ?).

- Ph. Roxburghii* Steud. 1. c.; Duthie Grasses N. W. Ind. (1883) 35, Fodder Grasses N. Ind. (1888) 60; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 378.  
*Ph. vulgaris* Trin. Fund Agrost. (1820) 134; Merrill Interpr. Rumph. Herb. Amb. (1917) 95.  
*Arundo Corea* Herb. Rottl. ex Hook. f. Fl. Brit. Ind. VII (1896) 304.  
*A. Donax* Herb. Ham. ex Wall. Cat. no. 5017-B. A.  
*A. graecci* Link in Linnaea IX (1834) 136.  
*A. Karka* Retz. Obs. IV (1786) 21; Roxb. Fl. Ind. I (1832) 347.  
*A. Phragmites* Linn. Sp. Pl. (1753) 81; Ledeb. Fl. Ross. IV, 393.  
*A. Ztox&wr* Kunth Rev. Gram. I (1829) 79; Griff. Not. III, 47; Ic. Pl. Asiat. t. 139, fig\* 243.  
*A. Roxburghiana* Kunth ex Steud. Nom. 1. c.  
*A. tibialis* Roxb. Ic. Pict. (ined.) t. 854 et in Wall. Cat. no. 5017 G.  
*A. vulgaris* Lam. Fl. Franc. 3 (1778) 81.  
*Canna palustris* Rumph. Herb. Amb. 4, 20, t. 5.  
*Czernya arundinacea* Presl Cyp. & Gram. Sicil. 22.  
*Oxyanthe japonica* Steud. 1. c. 197.  
*Sericura japonica* Steud. in Flora XXIX (1846) 20.  
*Trichoon Karka* Roth Catal. II, 2.

As can be seen from the above synonymy we have united *Ph. communis* Trin. and *Ph. Karka* Trin. under the name of *Ph. maxima*. Forskal's name *Arundo maxima* is the oldest (1775), 3 years older than Lamark's *Arundo vulgaris* (1778).

Hook, f. kept the two species separate, but he gives sufficient reasons for uniting them in a note under *Ph. Karka*.

"Except by its greater size, larger more spreading panicle with rather smaller spikelets, more spreading glumes, and shorter gl. III, I can point out no character whereby herbarium specimens of *P. Karka* can be distinguished from *P. communis*, and none of those are constant. In both dwarf or very slender states occur with almost filiform leaves and greatly reduced panicles. Dr. Stapf, who has carefully revised my separation of the great pile of Indian specimens into the two species, is equally at a loss to point out any other characters than those given above whereby to distinguish them, except that the rhachilla appears to him to be rather longer and more slender in *P. Karka* and the glumes hence more widely apart; and the glumes also are rather narrower. The perennial duration of the stems and leaves of *P. Karka* requires verification. These organs are undoubtedly annual in the northern form of *P. communis*, and F. Mueller observes (in a letter to Bentham) that they are so in the Tasmanian *P. communis*; whereas in the tropical Australian plant which Bentham includes under it they are evergreen."

If botanists are anxious to keep up the distinction between the two former species, the only thing to do is to make as many or more forms.

**Vernacular name** : Narkul.

**Etymology** : *Phragmites* is taken from Dioscorides and means fit for railings. The Greeks, as even the Venitians at the present day, used reeds for enclosures.—*Maxima* means very tall.

**Description** : Stems erect, 120 cm. to 3 m. high, sometimes much taller or dwarfed, smooth, simple or branched, covered with the leaf-sheath. Leaves close, bifarious, linear, acuminate, reaching up to 4 cm. broad, coriaceous, smooth, base contracted, margins smooth; sheaths loose, glabrous, the mouth auricled; ligule a ciliate line.

Panicle up to 60 cm. long, erect, oblong; branches widely spreading, filiform. Spikelets when fully expanded about 12 mm. broad across the glumes; pedicels capillary, smooth; callus densely clothed with long silky hairs. Glumes glabrous; lower involucral glume 3-5 mm. long, oblong-lanceolate or-linear, acute, 3-nerved; upper involucral glume 4-6 mm. long, oblong-lanceolate, acute, 3-nerved; lower floral glume 4-10 mm. long; upper floral glume equally long or rather longer than the lower. Palea about 2-5 mm. long, linear-oblong. Anthers about 2 mm. long.

**Locality** : *Sind*: Keti (Blatter & McCann D652 ! D653!); Tatta, Kullan Kote Lake (Blatter & McCann D654!).

*Cutch*: Anjar (Blatter 3740!).

*Gujarat*: Mahals-Dangs, by a stream, 800 ft., rainfall 100 in. (Sedgwick & Bell 5390!).

*Khandesh*: Bhusawal, N.-E. Tapti River (Blatter & Hallberg 4436); Chanseli Hill, north slope, watercourse (McCann A44! A45!).

*Deccan*: Dhond (Woodrow).

*S. M. Country*: Banks of Warda River, Bangalore Road, 1,800 ft., rainfall 33 in. (Sedgwick 2092 !); Haveri (Talbot 2178 ! 2198 !).

*N. Kanara* -• Supa, 2,100 ft. (Talbot 2195 !).

**Ecology** : Grows chiefly near the margins of rivers and lakes, and in low wet places.

**Distribution** : Cosmopolitan.

**Economic uses** : A good plant for binding loose soils. The young grass is sometimes eaten by cattle, but generally too coarse for fodder purposes. It is mentioned that this grass has\*proved poisonous to cattle in Kumaon. The stems are used for making baskets, chairs, hurdles and screens.

•70. ARUNDO Linn.

Tall, stout, perennial grasses with broad linear blades and large plume-like terminal panicles. Spikelets 2-7-flowered, laterally compressed, in large decompound panicles; flowers mostly bisexual; rhachilla disarticulating above the involucre glumes and between the flowering glumes, joints short, glabrous. Involucral glumes equal, broadly lanceolate, shortly acuminate, keeled, membranous, 3-5-nerved. Floral glumes more or less equalling the involucre glumes, ovate to lanceolate-ovate, acuminate, finely bifid or entire, long-hairy below, 5-9-nerved, 3 nerves more or less percurrent or excurrent, the rest short, the middle nerve often produced into a short fine bristle; callus short, shortly bearded. Paleae slightly exceeding the length of the floral glume, 2-keeled. Lodicules 2, obovate, nerved, glabrous. Stamens 3. Ovary glabrous; styles distinct, almost as long as the laterally exerted plumose stigmas. Grain obovoid-oblong, broad, loosely enclosed in the floral glume and palea; hilum basal, punctiform; embryo occupying almost wholly one side of the grain.

Species 12.—Tropical and temperate regions.

\*1. ARUNDO DONAX Linn.

*Arundo Donax* Linn. Sp. PL (1753) 81; Duthie Grasses N. W. Ind. (1883) 35, Fodder Grasses N. Ind. (1888) 60; Lisboa Bomb. Grasses (1896) 115; Hook. f. Fl. Brit. Ind. VII (1896) 302.

*A. benghalemis et bifaria* Retz. Obs. IV (1786) 22, V, 20; Roxb. Fl. Ind. I (1832) 347, 348.

*A. longifolia* Salisb. Prodr. 24.

*A. sativa* Lam. Fl. Franc. III, 616.

*Donax arundinacea* Beauv. Agrost. (1812) 78, t. 16, fig. 4.

*D. benghalensis* Beauv. 1. c.

*D. bifarius* Trin. in Spreng. Neue Entdeck. II, 73.

*Amphidonax bengalensis* Nees ex Steud. Syn. PI. Glum. 197.

*A. bifaria* Nees ex Steud. 1. c. 410.

*Jsclochloa arundinacea* Mert. & Koch Fl. Germ. I, 529.

*Aira benghalensis* Gmel. Syst. I, 174.

**Vernacular name** : Giant Reed.

**Etymology** : *Arundo* is the collective name of the Romans for various reeds.—*Donax* means reed, from the Greek *doneo*, I move, alluding to the fact that the plant is moved about by the wind.

**Description** : Stem creeping below, erect, 1-6 m. high, smooth, hollow, very many-noded, simple or scantily branched, internodes slightly exceeded by the sheaths, these very tight, firm, smooth. Blades linear-lanceolate from a broad base, long-tapering to a very fine point, more or less drooping, 30-60 cm. long, 2-5 cm. broad, smooth.

Panicles erect, 30-60 cm. long; branches scaberulous, erect or drooping; spikelets 8-10 mm. long, light brown. Involucral glumes glabrous; floral ones 6-10 mm. long; hairs 5-6 mm. long. Anthers 3 mm. long. Grain 2-5 mm. by almost 1 mm.

A smaller variegated form with white-striped leaves is cultivated (*var. variegata*).

**Locality** : Often grown in gardens.

**Ecology** : A hygrophylous species.

**Distribution** : Lower Himalaya, Punjab, Naga, Nilgiri and Coorg Hills, N. Asia, N. Africa, Europe.

---

## TRIBE VII: Agrostae.

Floret 1. Ehachilla not continued beyond the floret or only as a more or less distinct point or bristle. Floral glume membranous or thinly herbaceous, not or hardly changed when mature, usually truncate, 5- (very rarely 3-) nerved, all the nerves or the outer side-nerves often slightly excurrent, parallel or at least not anastomosing; awn, if present, from the back, rarely from the truncate tip.

See key page xviii.



*Helicostachya setulosa* Bl. + Nees



**HKLEOCHLOA SCHOESOLIDE3 HOST.**

*Desig: B. K. Thida.*

## 71. HELEOCHLOA Host.

Rigid annual or perennial erect or prostrate grasses. Leaves flat or convolute.

Spikelets 1-flowered, densely imbricate, in cylindrical spike-like panicles laterally compressed; rachilla not produced beyond the floral glume. Glumes 3, scarious, the involucral glumes subequal or the lower shorter, keeled, 1-nerved, persistent; floral glume equalling the upper involucral glume or longer, ovate or oblong, loosely 1-nerved, enveloping the grain, membranous; palea oblong, obtuse or 2-fid, 2-nerved. Lodicules 2. Stamens 2 or 3. Styles elongate. Grain ovoid or ellipsoid, loose in the glume and palea.

Species 8.—Mediterranean-oriental.

- |                                    |                            |
|------------------------------------|----------------------------|
| 1. Panicles less than 2-5 cm. long | 1. <i>H. schoenoides</i> . |
| 2. Panicles reaching 8 cm.         | 2. <i>H. setulosa</i> .    |

## 1. HELEOCHLOA SCHOENOIDES Host.

## PLATE 133.

*Heleochloa schoenoides* Host Gram. Austr. I (1801) 23, t. 30; Boiss. Fl. Or. V (1884) 476; Duthie Fodder Grasses N. Ind. (1888) 48; Lisboa Bomb. Grasses (1896) 93; Hook. f. Fl. Brit. Ind. VII (1896) 235; Cooke Fl. Bomb. II (1908) 1011.

*Crypsis aculeaki* Duthie Grasses N. W. Ind. (1883) 25, Fodder Grasses N. Ind. (1888) 45, t. 62.

*C. schoenoides* Lam. III. I, 166, t. 42, fig. 1; Duthie Grasses N. W. Ind. (1888) 25.

*C. compacta* Steud. Syn. PL Glum. 151.

*C. nilaica* Fresen. & De Notar. in Mem. Acad. Tor. ser. II, XIV (1854) 322.

*C. vaginiflora* Opiz. Natural. VIII (1824) 83.

*Phalaris vaginiflora* Forsk. Fl. Aeg.-Arab. (1775) 18.

*PUEum schoenoides* Linn. Sp. PL (1753) 60.

*Spartina phleoides* Both Neue. Beytrag. I, 101.

*Pechea sub-cylindrica* Pourr. Chlor. Narb. no. 103.

**Etymology** : *Heleochloa* is derived from *hdios* the sun, and *chloa*, a grass, very likely a habitat name.—*Schoenoides* means resembling *Schoenus*, a genus of *Cyperaceae*.

**Description** : Annual; stems prostrate, spreading in a circle round the root, 2-5-15 cm, long, glabrous, smooth, more or less striate, rigid; nodes glabrous. Leaves 2-5-5 cm. long narrowly lanceolate, acuminate; sheaths more or less inflated, ribbed, hairy at the mouth and with membranous (sometimes ciliate) margins; ligule a dense ring of long slender hairs.

Inflorescence a spike-like ovoid-oblong, compressed panicle 13-20 mm. long, sessile on the greatly dilated sheath of the uppermost leaf. Spikelets densely imbricate, 3-2 mm. long. Glumes 3; lower involucral glume 2-5 mm. long, linear-lanceolate, folded, glabrous except for the ciliate keel, scarious, 1-nerved; upper involucral glume a little longer than the lower, cvate-lanceolate, acute, scarious, with ciliate keel, 1-nerved; floral glume nearly 3-2 mm. long, broadly ovate, acute, membranous, 1-nerved, the keel nearly glabrous; palea oblong, obtuse. Stamens usually 3; filaments very long, not thickened at the base; anthers small. Grain 1-2 mm. long, oblong-ellipsoid, compressed.

**Locality** : *Sind*: Bhubak (Cooke!).

**Ecology** : A halophytic species.

**Distribution** : Punjab, W. Himalaya, Kashmir, Bundelkhand, westwards to the Atlantic.

**Explanation of Plate 133** : *Heleochloa schoenoides* Host.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Upper floral glume.
6. Grain.

2. HELEOCHLOA SETULOSA Blatter & McCann, *nov. comb.*

## PLATE 134.

*Vilfa setulosa* Trin. in Mem. Acad. Petersb. ser. VI, V, II (1840) 55.

*Heleochloa dura* Boiss. FL Or. V (1881) 477; Lisboa Bomb. Grasses (1896) 93; Hook. f. Fl. Brit. Ind. VII (1896) 236; Cooke Fl. Bomb. II (1908) 1011.

*Crypsis dura* Boiss. Diagn. ser. II, IV (1859) 125.

*C. phalaroides* Duthie Grasses N. W. Ind. (1883) 25 (*non* M. Bieb.).

**Etymology** : *Setulosa* means minutely pubescent.

**Description** : Perennial, pale, clothed all over with minute velvety pubescence; stems stout, ascending, 15-25 cm. long, densely fastigiate from a woody inclined base which is clothed

with leaf-sheaths, about 2-5 mm. diam., hard, few-leaved; nodes glabrous. Leaves 7-5-15 cm. long, involute, terete, rigid, pungent; sheaths short coriaceous, glabrous; ligule a narrow line of hairs.

Inflorescence a spike-like panicle reaching 9 cm. by 4 mm., solitary at the top of the stem. Spikelets densely imbricate, 2-5 mm. long. Glumes 3, all 1-nerved and with ciliate keels; lower involucre glume 1-6 mm. long, linear-oblancoelate, acute, apiculate; upper involucre glume 2 mm. long, linear-oblancoelate, apiculate; floral glume 2-5 mm. long, elliptic-oblong, obtuse, mucronate; palea 2 mm. long, 2-fid, with obtuse ciliate lobes, 2-nerved. Stamens usually 2, less commonly 3; filaments very long, thickened at the base; anthers short.

**Locality** : *Bind*: Salt water creeks (Stocks 455); Gholam, in Indus Delta (Blatter & McCann D688!).

*Kathiawar*: Dwarka (Börgesen).

**Ecology** : Grows generally in salt water creeks.

**Distribution** : Sind, Arabia.

**Explanation of Plate 134** : *Heleochha setuhsa* Blatter & McCann.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea of floral glume.
6. Stamens, ovary and styles.

#### 72. GARNOTIA Brogn.

Erect, perennial (rarely annual), stout or slender grasses. Leaves flat or convolute.

Spikelets paniculate, very small, narrow, terete, 1-flowered, solitary or 2-nate, jointed on their pedicels; rhachilla not produced beyond the floret. Glumes 3; involucre glumes subequal, lanceolate, acute, acuminate or awned, strongly 3-nerved, empty; floral glume as long as the involucre glumes, lanceolate, acuminate or awned, thinly coriaceous or membranous, quite smooth, faintly 1-nerved, paleate, 2-sexual, tip acute or minutely 2-dentate; awn rarely jointed, sometimes geniculate, slender, scaberulous; palea as long as the glume, linear, the lobes, minutely auricled at the base. Lodicules 2. Stamens 3; anthers linear. Styles free; stigmas with simple hairs, laterally exerted. Grain linear or oblong, dorsally compressed, free within the glume and palea.

Species 12.—Indo-Malaya, China, Japan.

- |   |                           |
|---|---------------------------|
| 1. 5-20 cm. high, growing on trees. Leaves 2-5-5 cm. long | • 1. <i>G. arborum</i> .  |
| 2. 30-60 cm. high. Leaves 7-20 cm. long                   | • 2. ff. <i>stricta</i> . |

#### 1. GARNOTIA ARBORUM Stapf.

#### PLATE 135.

*Garnotia arborum* Stapf ex Woodrow in Journ. Bomb. Nat. Hist. Soc. XIII (1901) 439; Cooke Fl. Bomb. II (1908) 1013.

**Etymology** : *Garnotia* is commemorative.

**Description** : A low stiff erect annual grass 5-20 cm. high, growing on trees amongst moss; stems tufted, terete, smooth, shining, glabrous, often tinged with red; nodes pubescent. Leaves 2-5-5 cm. by 1-6-3-2 mm., linear, acuminate, glabrous; sheaths glabrous, striate; ligule a narrow lacerate membrane.

Inflorescence paniculate; branches 2-3, fascicled on the rhachis, the clusters 6-20 mm. apart, angular, stout, truncate. Spikelets 1-flowered, articulate on the ends of the branches, early deciduous. Lower involucre glume 2\*5-3-2 mm. long, membranous, 3-nerved, the nerves hispid, the midrib produced into an awn equalling the glume or less; upper involucre glume similar; floral glume nearly equalling the involucre glumes, but more coriaceous, 2-toothed, with an awn 20 mm. long from between the teeth, obscurely nerved; palea hyaline, slightly smaller than the glume, acute, with large flaps at the base, nerveless. Stamens 3; anthers 0-6 mm. long. Grain 2-5 mm. long, ovoid-lanceolate, acute at the apex, rounded at the base.

**Locality** : *W. Ghats*: Igatpuri (McCann 4598!); Khandala (McCann!); Lonavla (Gammie 15501!); on trees at Nandgaon, on the crest of the Ghats, 10 miles S. of Lonavla, (Woodrow 30); Lingmala, near Mahableshwar, on tree (McCann 3412!).

*Deccan*: Kalsubai Hill, under a steep rock (Patwardhan 1189!).

At Khandala we have observed this species covering roofs completely to the exclusion of everything else.

**Distribution** : Apparently endemic.



GAIINOTU ARBORUM STAPP,

Delin: H. K. Davis.





GARNOTIA STRICTA BROGN.

**Explanation of Plate 135** : *Garnotia arborum* Stapf.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea of floral glume.

## 2. GAENOTIA STRICTA Brqgn.

## PLAT 136.

*Garnotia stricta* Brqgn. in Duperr. Voy. Bot. (1829) 133, t. 21; Hook. f. Fl. Brit. Ind. VII (1896) 243; Cooke Fl. Bomb. II (1908) 1013.

*G. sandvicensis* Hillebr. Fl. Hawaii (1888) 513.

*Aira* Griff. Not. III, 56, Ic. PL Asiat. t. 145.

**Description** : Annual ? ; stems 30-60 cm. long, tufted, geniculate and often branched at the base, smooth, glabrous. Leaves 7-5-20 cm. by 2\*5-10 mm., lanceolate or linear-lanceolate, glabrous or hirsute, or scabrous above, the margins flat or hirsute ; sheaths usually glabrous, ligule a narrow ciliate membrane.

Panicle 5-20 cm. long, very narrow ; branches in distant fascicles, scaberulous. Spikelets pale, 2-5-3-2 mm. long, sparsely hairy at the base. Lower involucral glume ovate-lanceolate, finely acuminate, 3-nerved, the midnerve sometimes excurrent; upper involucral glume similar; floral glume entire or notched, usually awned, the awn 13 mm. long or less.

**Locality** : *Konkan*: Pen (McCann 5501!); Kalyan (Talbot!); between Neral and Earjat (Woodrow).

*W. Ghats*: Khandala, St. Mary's Villa, on roof (McCann A299!); Igatpuri (McCann 4589 !); Panchgani (Blatter & HaUberg B1283 ! B1305 !).

*N. Kanara*: Top of Guddehalli (Hallberg & McCann A303 !); Gersoppa Palls (Hallberg & McCann A300 !).

\* **Distribution** : Himalayas, Khasia Hills, Bihar, W. Peninsula, Sandwich Islands.

**Explanation of Plate 136** : *Garnotia stricta* Brqgn.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea of floral glume.
6. Stamens, ovary and styles.

## 73. POLYPOGON Desf.

Annual or perennial, usually decumbent grasses, with flat blades.

Spikelets 1-flowered, minute, jointed (but persistent) on the pedicels, laterally compressed, keeled, densely crowded on the short branches of a spiciform or lobed panicle; rachilla not produced beyond the lower floral glume. Glumes 3. Involucral glumes equal, concave, keeled, bifid, notched or entire, with a slender awn below the tip or in the sinus. Lower floral glume much smaller, hyaline, sessile, truncate, toothed, awned or not; palea small, 2-nerved. Lodicles 2, falcate. Stamens 1-3 ; anthers small. Ovary glabrous; styles free. Grain obovoid, free within the glume and palea.

Species about 10.—All warm regions.

## 1. POLYPOGON JIONSPELIENSIS Desf.

## PLATE 137.

*Polypogon monspeliensis* Desf. PL Atlant. I (1798) 66 ; Duthie Grasses N. W. Ind. (1883) 30, Fodder Grasses N. Ind. (1888) 50 ; Lisboa Bomb. Grasses (1896) 94 ; Hook. f. Pi. Brit. Ind. VII (1896) 245.

*P. cruentus* Duthie 1. c. (*crinitus per errorem*).

*P. maritimus* Duthie 1. c. (*non* Willd.).

*P. nepahnsis* Nees ex Steud. Norn. ed. 2, II (1840) 378 ; Duthie 1. c. 30.

*P. fugax* Nees ex Steud. 1. c.; Duthie Fodder Grasses N. Ind. (1888) fil.

*P. paniceus* Lag. Gen. and Sp. Nov. 3.

*P. polysetus* Steud. in Flora XII (1829) 467.

*P. zeylanicus* Nees ex Steud. Syn. PL Glum, 182,

*Agrostis ahpecuroides* Lam. III. 812.

*A. crinita* Moench Meth. (1794) 178,

*A. panicea* Willd. Sp. PL I, 128.

*A. triaristata* Knapp Gram. Britt, t. 23.

*Cynosurus paniceus* Linn. Sp. PL (1753) 73.

*Phleum crinitum* Schreb. Gram. I, 151, t. 20, fig. 3; Roxb. FL Ind. I (1832) 313.

*P. monspeliense* Koel. Descr. Gram. 57.

*Alopecurus aristatus* Gouan Hort. Monsp. 37.

*Al. monspeliensis* Linn. Sp. PL (1753) 61.

*AL paniceus* Linn. Sp. PL ed. II, 90.

*Pkalaris cristata* Foisk. FL Aeg.-Arab. (1775) 17.

**Vernacular names** : Chitra, Malhar.

**Etymology** : *Potypogon* is derived from *polys*, much, and *pogon*, beard.—*Monspeliensis* after Montpellier, an old university town of France.

**Description** : Stems tufted, 10-60 cm. high, stout or slender, leafy, base geniculate. Leaves 7-15 by 3-6 mm., green, ligule oblong.

Panicle 1-15 cm. by 6-10 mm. broad, pale yellowish green, silky, sometimes tabulate from the projecting branches. Spikelets 1-2 mm. long, minutely pubescent, very shortly pedicelled. Involucral glumes very variable in breadth, obovate-oblong, sides scaberulous, keels scabrid, margins ciliate, tip entire, notched or very shortly 2-fid; awns from the length of the glume to 8 mm. long, excessively delicate. Lower floral glume very small, oblong, glabrous, 2-fid, awned or not; palea oblong, tip notched. Anthers very minute, short. Ovary ovoid.

**Locality** : *Sind*: Sukkur. (Bhide !); Shikarpur (Bhide !).

**Ecology** : Common in cultivated ground.

**Distribution** : Tropical and temperate regions.

**Economic uses** : This grass is of little value as fodder.

**Explanation of Plate 137** : *Polypogon monspeliensis* Desf.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lower floral glume.
5. Upper floral glume.
6. Grain.

## TRIBE VIII: Stipeae.

Floret 1. Bhachilla not continued beyond the floret. Floral glume hardened when mature, tightly enveloping the fruit; nerves joining or closely approaching at the tip; awn terminal, rarely 0.

See key page xviii.

### 74. ARISTIDA Linn.<sup>1</sup>

Annual or perennial tufted grasses. Leaves flat or convolute.

Spikelets paniced, 1-flowered, not articulate on their pedicels, laterally compressed; bhachilla not produced beyond the flowering glume. Glumes 3; involucral glumes very narrow, long, 1-nerved, keeled, persistent, with or without a terminal awn; floral glume very narrow, cylindrical, coriaceous, 3-nerved, tipped by 3 very long capillary awns (the 2 lateral awns occasionally short or obsolete); callus long articulate at the base; palea minute, convolute round the ovary and grain. Lodicules 2, long, narrow, hyaline. Stamens 3; anthers long, narrow. Styles free, short; stigmas penicillate, laterally exerted. Grain long, narrow, cylindrical, free in the convolute closely enveloping glume.

Species about 320.<sup>1</sup> Tropical and temperate parts of the world.

Cdoke describes 7 species. We retain them and add *Aristida mutabilis* Trin. & Rupr. and *A. pogonoptila* Boiss.

A. Awns without column.

I. Involucral glumes not awned.

I. *A. ~~adensis~~*.

II. Involucral glumes awned.

1. Spikelets 16 mm. long

2. *A. setacea*.

2. Spikelets 10 mm. long

3. *A. Hystrix*.

3. Spikelets 6 mm. long

4. *A. mutabilis*.

<sup>1</sup> We shall have to refer repeatedly to the splendid monographs by J. Th. Henrard : "A critical Revision of the genus *Aristida* in Vc dried, van s'Rijks Herbarium.- Leiden no. 54 (1926), no. 54 A (1927) and "A Monograph of the Genus *Aristida* " vol. I (not dated).



POLYPOGON MONSPELIENSIS DESF.

Dolin: B. K. Ekide



ARISTIDA ADSCENSIO LINN

Delis :

## B. Awns with a column.-

## I. Column of awn articulate on the floral glume.

## 1. Awn plumose.

a. Glumes glabrous. Central awn without a naked tip . . . . . 5. *A. poganoptila*;

b. Glumes not glabrous. Central awn with a naked tip . . . . . 6. *A. hirtigluma*..

## 2. Awn not plumose.

a. Stems less than 15 cm. high. Lower involucre glume 5 mm. long . . . . . 7. *A. hystriacula*..

b. Stems reaching 60 cm. high. Lower involucre glume 22 mm. long . . . . . 8. *A. funiculata*..

## II. Column of awn not truly articulate on the floral glume, though readily separating . . . . .

9. *A. redaeta*.

## 1. ARISTIDA ADSCENSIONIS Linn.

## PLATE 138.

*Aristida Adscensionis* Linn. Sp. PL (1753) 82 ; Kunth Enum. PL I, 190 ; Steud. Syn. PL Glum. (1855) 139; Hook. f. FL Brit, Ind. VII (1896) 224, *excl. synonymis aliquibus*; Cooke PL Bomb. II (1908) 1008.

*A. abyssinica* Trin. & Rupr. Sp. Gram. Stip. in Act. Acad. Petrop. ser. VI, V (1842) 134.

*A. canariensis* Willd. Enum. (1809) 99.

*A. modatica* Steud. Syn. PL Glum. (1855) 139.

*A. curvata* Nees var. *abyssinica* Rich. Tent. FL Abyss. II (1851) 392.

*A. divaricate*, Jacq. Eclog. Gram. (1813) 7, t. 6 (*non* Humboldt et Bonpl. *nee* Lagarca).

*A. Heymanni* Regel in Act. Hort. Petrop. VII, 2 (1881) 649.

*A. hystrix* Duthie Fodder Grasses N. Ind. (1888) 47, t. 31 (*non* Linn. f.).

*A. aethiopica* Trin. & Rupr. 1. c. (1842) 134, *non* 167 *sicut habet* Hook. f.

*A. Adscensionis* Linn. var. *aethiopica* Hook. f. FL Brit. Ind. VII (1896) 225.

*A. Ehrenbergii* Trin. & Rupr. 1. c. (1842) 136.

*A. Adscensionis* Linn. var. *Ehrenbergii* Henrard in Meded. Rijks Herb. I (1926) 158.

*A. festucoides* Poir. Encyclop. I (1810) 453.

*A. Adscensionis* Linn. var. *festucoides* Henrard 1. c. I (1926) 177.

*A. Adscensionis* Linn. var. *angustifolia* Pilger in Henrard 1. c. I (1926) 9.

*A. Adscensionis* Linn. var. *typica* Stapf in Hook. f. Fl. Brit. Ind. VII (1896) 224..

*A. Adscensionis* Linn. var. *bromoides* Henrard 1. c. I (1926) 62.

*A. coarctata* H. B. K. Nov. Gen. et Sp. I (1815) 122.

*A. debilis* Mez. in Fedde Rep. *sp. nov.* XVII (1921) 151.

*A. fasciculate*, Torrey in Ann. Lye. Nat. Hist. New York I, pt. 1 (1824) 154.

*A. Grisebachiana* Founder Nex. PL pt. II. Gram. (1881) 78.

*A. Adscensionis* Linn, *subsp. guineensis* Henrard 1. c. I (1926) 216.

*A. Hermannii* Mez. in Fedde Rep. *sp. nov.* XVII (1921) 153.

*A. Adscensionis* Linn. var. *humilis* Henrard 1. c. (1927) 247.

*A. interrupta* Cav. Ic. V. (1799) 45, t. 471, fig. 2.

*A. luzoniensis* Cav. Ic. V. (1799) 45, t. 470, fig. 2.

*A. Adscensionis* Linn. var. *condensata* Henrard 1. c. II (1927) 318.

*A. macochloa* Hochst. in Flora XXXVIII (1855) 200.

*A. maritima* Steud. Syn. PL Glum. (1855) 137.

*A. mauritiana* Hochst. ex A. Rich. Tent. FL Abyss. II (1851) 392.

*A. mongholica* Trin. et Rupr. 1. c. (1842) 133.

*A. nana* Steud. Syn. PL Glum. (1855) 137.

*A. nigrescens* Presl Reliq. Haenk. I (1830) 223.

*Chaetaria canariensis* P. Beauv. Agrost, (1812) 30.

The above is a list of synonyms which have been included by Henrard under *A. Adscensionis* Linn, either as representing the typical plant or as subspecies and varieties.

The following is a list of synonyms which Hook, f. in the F. B. I. (VII, 224, 225) had cited! under *A. Adscensionis*, but which have to be excluded according to Henrard's recent investigations.

*Aristidi coerulescens* Desf. Fl. Atl. I (1798) 109, t. 21, fig. 2, treated as a distinct species by Henrard I, 99.—*A. chaetophylla* Steud. Syn. PL Glum. (1855) 420, no. 108b.—*A. depressa* Retz.

Obs. IV (1786) 22 (*ex* Henrard 1,136).—*A. datior* Cav. Ic. VI (1799) 65, t. 581, fig. 1 (*non* Doell), put by Henrard (p. 161) under *A. coerulescens* Best.—*A. gigantea* Linn. f. Suppl. (1781) 113. Henrard (1,199) is doubtful about the identity of this species, as he has not seen the type.—*A. Jacquiniiana* Tausch. in Flora II (1836) 508, considered by Henrard (II, 268) as a distinct species.—*A. panicidata* Forskal in Fl. Aegypt.—Arab. (1775) 25. Hooker f. considers it to be identical with *A. Adscensionis* "*ex descript*" Trinius, however, observes that Forskal's diagnosis agrees with nearly all the *Aristidas* with naked awns. Before we can find Forskal's type it will be impossible to place his plant with anything like certainty. (See Henrard II, 418).—*A. mutabilis* var. *aequilonga* Trin. & Bupr. 1. c. (1842) 150. Henrard 1. c. II (1827) 366 retains *A. mutabilis* as a distinct species and considers the specimen mentioned under the variety *aequilonga* as the type-specimen of *A. mutabilis*.—*Chaetaria coerulescens* P. Beauv. Boem. & Schult. Syst. II, 294. identical with *A. coerulescens* Desf.—*C. depressa* F. Beauv. Agrost. 30.—*C. elatior* F. Beauv. Agrost. 30.—*C. gigantea* F. Beauv. Agrost., doubtful.

**Vernacular names** : Motti-burri, Longi-kussal, Lani.

**Etymology** : *Aristida* is derived from *arista*, an awn, alluding to the flowering glume which is usually tipped by 3 capillary awns.—*Adscensionis* refers to Ascension Island in the South Atlantic Ocean.

**Description** : Annual or perennial; stems 23-60 cm. long, densely tufted, very slender, erect or ascending, simple or branched; branches erect, smooth. Leaves 7-5-30 cm. by 1-2 mm., convolute, filiform, smooth or scaberulous; sheaths smooth, with rounded auricles; ligule of fine short hairs.

Panicle 7\*5-30 cm. long, contracted, subsecund; rhachis filiform, smooth; branches short; pedicels short, capillary. Spikelets erect, 6-8 mm. long. Lower involucral glume 4 mm. long, oblong-lanceolate, acute, membranous, often purple with a scaberulous keel; upper involucral glume lanceolate, 6 mm. long, 2-toothed and apiculate at the tip, the keels smooth; floral glume 8 mm. long, 3-nerved, smooth; awns 3, not articulate on the glume, the middle one larger than the lateral, 10-20 mm. long; callus long, pointed, hairy at the base; palea minute, oblong, hyaline, retuse.

**NOTE**.—Cooke includes under *A. Adscensionis* the plant called *A. depressa* Retz. Obs. IV (1786) 22 by Dab & Gibs, in their Flora of Bombay, and stated by them to occur \* on dry hills.' Neither Cooke nor we have seen the specimen and so we cannot know whether it is the real *Aristida depressa* of Retz. or whether it belongs to *A. Adscensionis*. If it is Retz's species we would have to add *A. depressa* Retz. to the Bombay Flora, as it is considered to be a species distinct from *A. Adscensionis*.

For the benefit of botanists who wish to clear up this point we quote from Henrard p. 137, when he points out the difference between the two species. "Well-developed plants (of *A. depressa*) have sterile innovation-shoots but the root-system is rather faint and much resembles that of annual grasses. The blades are thin and setaceously convolute and the panicles are very loose and open. The spikelets differ from those of *A. Adscensionis* in the very unequal length of the glumes, the lower glume is about  $\frac{1}{2}$  as long as the upper and both are moreover very acute, the lower distinctly awned, the upper without a bifid apex and slightly pointed/\*

**Locality** : *Sind* : Laki (Bhide!); Sehwan to Laki, foot of hills (Sabnis B612!); Umarmot, sand dunes (Sabnis B1075!); Tatta (Blatter & McCann D6261); Kullian Eote Lake (Blatter & McCann D625!).

*Cutch*: Bhuj Hill (Blatter 3769!).

*Kathiawar*: Jetalsar (Woodrow 43).

*Gujarat*: Ahmedabad (Saxton 1066!); road to Lasandra (Chibber!); Sevalia (Chibber!); road to Gogka (Chibber!).

*Khandesh*: Bor, Tapti River (Blatter & Hallberg 5412!); Toranmal (McCann A230!).

*W. Ghats*: Fanchgani (Blatter & Hallberg B1315!).

*Deccan*: Pashan (Garonne!); Manznad (Blatter 9973!); Happy Valley, Ahmednagar Dist. (Chibber!); Poona (Cooke, Woodrow); Bowdhan Hill near Poona (Woodrow 38).

*S. M. Country*: Dharwar, 2,400 ft., rainfall 34 in. (Sedgwick & Bell 4346!); Haveri (Talbot 2181!); Ranibennur (Jouvhat!); Gokak Hills (Bhide!).

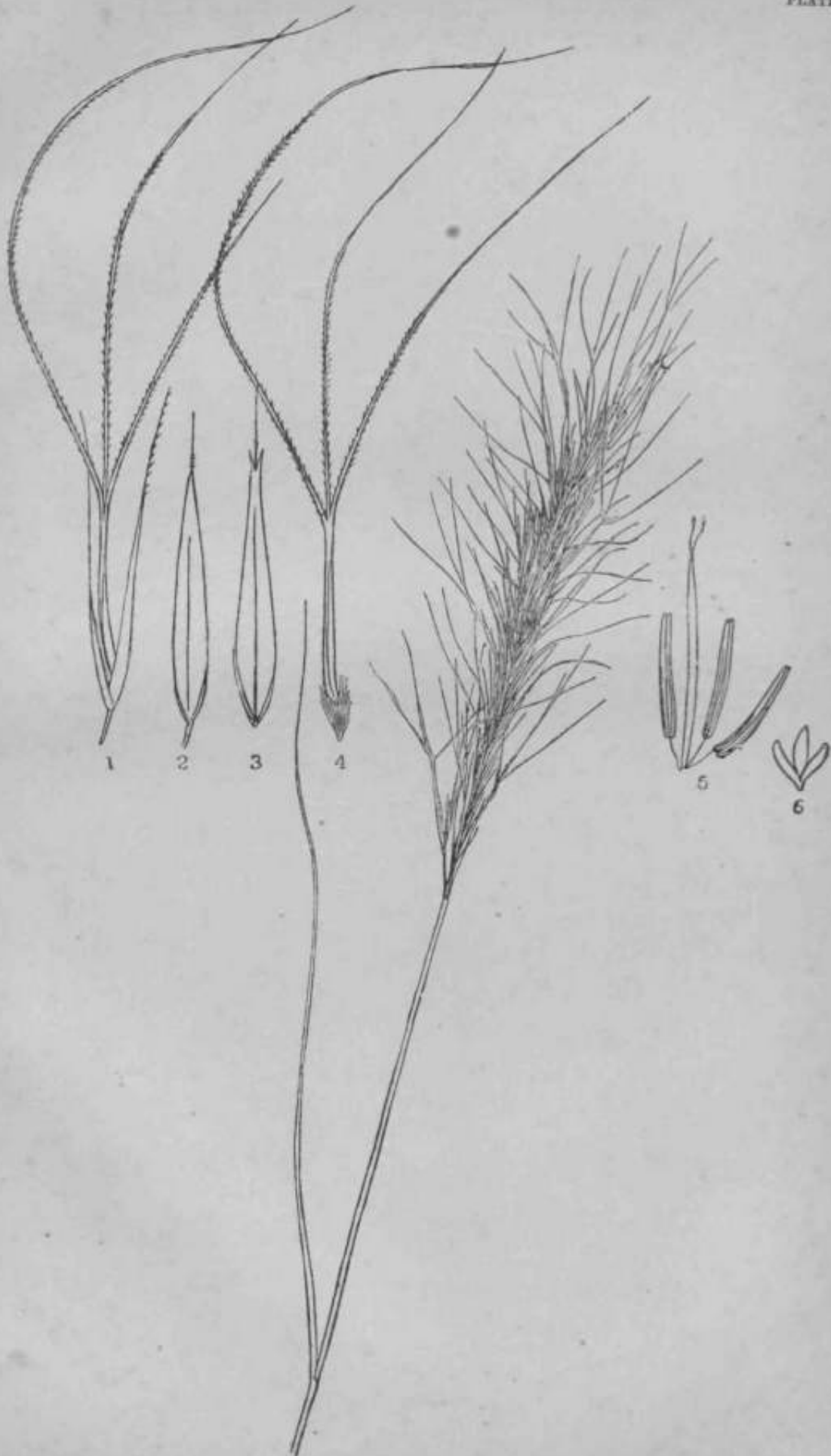
**Ecology** : A subgregarious species. Common on dry land.

**Distribution** : Most warm countries.

**Economic uses** : As to the value of this species as a fodder grass opinions are very much divided. See Lisboa 91.

**Explanation of Plate 138** : *Aristida Adscensionis* Linn

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.



ARISTIDA SETACKA RKTZ.

Delin: B. K. White.





ARISTIDA HYSTRIX I (N. F.)

Delin: B. K. Dhillon

4. Floral glume.
5. Stamens, grain and styles.
6. Lodicules.

## 2. ARISTIDA SETACEA Retz.

## PLATE 139.

*Aristida setacea* Retz. Obs. IV (1786) 22; Roxb. Fl. Ind. I (1832) 349; Grah. Cat. Bomb. PL (1839) 218; Dalz. & Gibs. Bomb. Fl. (1861) 295; Duthie Grasses N. W. Ind. (1883) 27; Lisboa Bomb. Grasses (1896) 91; Hook. f. Fl. Brit. Ind. VII (1896) 225; Cooke Fl. Bomb. II (1908) 1008; Haines Bot. Bih. and Or. (1924) 977.

*A. Hystrix* Bak. Fl. Maurit. (1877) 451 (*exd. syn.*).

*A. quinqueseta*. Steud. Syn. PL Glum. (1855) 420.

**Vernacular names** : Mothi Kussal.

**Description** : Perennial; stem 60-90 cm. high, stout, erect or geniculate ascending from a woody base, with stout wiry root-fibres, hard, smooth and polished, simple or subfastigiate branched. Leaves 15-30 cm. by 2-4 mm., usually convolute, coriaceous, smooth; sheaths long, smooth; ligule of short hairs.

Panicle various, 15-30 cm. long, inclined, sometimes subsecund, open or contracted; rhachis slender, smooth; branches long or short, the lower sometimes reaching 10 cm. long, filiform or capillary, usually fasciated and erect. Spikelets 16 mm. long (excluding awns), erect; pedicels capillary. Lower involucral glume awned, 16 mm. long (including an awn of 4 mm. long), 1-nerved; upper involucral glume a little longer than the lower (with an awn about 4 mm. long), notched at the insertion of the awn, and with hyaline margins, 1-nerved; floral glume 16 mm. long, 3-nerved; awns 3, inarticulate at the base, 2-5-3-2 cm. long, subequal or the middle the longest; callus long, bearded with long hairs. Stamens 3; anthers 4 mm. long.

**Locality** : *Kathiawar*: Rajkot (Woodrow).

*Khandesh*: Dadgaum (McCann 9764!).

*Konkan*: Vetora (Sabnis 33677 !); Vengurla, seacoast (Chibber !); Salsetto (Graham).

*W. Ghats* : Khandala (Graham).

*Deccan*: Manmad (Blatter 229 !); Ganeshkhind Bot. Gardens (Patwardhan!).

*M. Country*: Eappatgudd, Hills, 2,600 ft., rainfall 30 in. (Sedgwick & Bell 5217 !); Dharwar, 2,500 ft., rainfall 34 in. (Sedgwick 1822 !); dry hills and fields north of Dharwar (Sedgwick 3778 !); Byadgi (Talbot 1759 !); Badami (Bhide !).

*N. Kanara*: Karwar, common (Sedgwick & Bell 5065!); Halyal (Talbot 2161!).

**Ecology** : A sporadic species, growing on dry hilly ground.

**Distribution** : Bihar, W. Peninsula, Mascarene Islands.

**Economic uses** : Useless as fodder; cattle do not eat it. The long wiry stems are used for tatties and brooms. A very troublesome grass for those who have to walk through it.

**Explanation Of Plate 188** : *Aristida setacea* Retz.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Stamens and grain.
6. Lodicules.

## 3. ARISTIDA HYSTRIX Linn. f.

## PLATE 140,

*Aristida Hystrix* Linn. f. Suppl. (1781) 113 (*non* Thunbg.); Roxb. Fl. Ind. I (1832) 350; Graham Cat. Bomb. PL (1839) 335; Dalz. & Gibs. Bomb. FL (1861) 295; Hook. f. FL Brit. Ind. VII (1896) 225; Cooke Fl. Bomb. II (1908) 1009.

*Chaetaria Hystrix* Beauv. Agrost. (1812) 30.

**Vernacular names** : Pawn-burri, Matari-Kussal (old woman's hair), Kale kuseal

Etymology : *Hystrix*, porcupine.

**Description** : Perennial; stems 15-60 cm., long, from a creeping rootstock, diffuse, ascending, sometimes proliferously branched. Leaves rather glaucous, 3-8-10 cm. by 1\*6-3-2 mm. convolute; sheaths glabrous striate; ligule of soft hairs.

Panicle 10-16 cm. long and *as* broad as long, rigid; rhachis stout, flexuous and angular; branches and branchlete smooth. Spikelets (excluding awns) 10 mm. long, Btraw-colourftd,

Lower involucre glume 10 mm. long (including awn), lanceolate, acuminate, 1-nerved, with an awn of 1-6 mm. long, chartaceous; upper involucre glume more than 13 mm. long (including an awn of 1-6 mm. long), lanceolate, acuminate, chartaceous, 1-nerved, quite glabrous, minutely toothed at the tip at the base of the awn; floral glume 10 mm. long; callus 1\*6 mm. long, pointed, shortly villous; awns 3, not articulate with the glume, subequal or the middle one sometimes the longest, scabrid.

Hooker f.'s statement (1. c.) that the callus is naked is not correct. Cooke (1. a), however, is right when saying that it is shortly pilous.

**Locality** : Gujarat: Daman, on sand hills (Bhide!).

8. *M. Country*: Tadas, dry hillsides, 2,000 ft., rainfall 35 in. (Sedgwick 3823 !); Dharwar (McCann !, Sedgwick!); Haveri (Talbot 2182 !); Badami (Bhide!, Cooke, Woodrow).

**Ecology** : A sporadic grass. A xerophyte and flowers almost the whole year round. Common in dry stony places.

**Distribution** : Central Provinces, W. Peninsula.

**Economic uses** : Eaten by cattle when young, otherwise not much used as a fodder grass.

**Explanation Of Plate 140** : *Aristida Hystrix* Linn. f.

1. Lower invol. glume.
2. Upper invol. glume.
3. Floral glume.
4. Palea and lodicules.
5. Spikelet.

#### 4. ABISTTDA MUTABILIS Trin. & Rupr.

*Aristida mutabilis* Trin. & Rupr. in Mem. Acad. Petersb. ser. VI (1842) 150; Hook, f. Fl. Brit. Ind. YH (1896) 226, *excl aliquib. syn.*

-*A. cirticidata* Edgew. in Journ. Proc. Linn. Soc. VI (1862) 209; Aitchis. Cat. Panjab Pl. (1869) 164; Duthie Grasses N. W. Ind. (1883) 26, Fodder Grasses- N. Ind. (1888) 47.

*A. mutabilis* Trin. & Rupr. *var. tangensis* Henrard l. c. II (1927) 368.

-*A. hngeradiata* Steud. Syn. Pl. Glum. (1855) 140.

*A. hoggariensis* Batt. & Trib. Bull. Soc. Bot. Fr. Tome. LIII, sSrie IV, Tome VI (1906) Sess. exteior. avril 1906, p. XXXII.

*A. mutabilis* Trin. & Rupr. *var. hoggariensis* Henrard l. c. II (1927) 239.

The following synonyms given by Hook. f. 1. c. must be excluded: *Aristida Kunthiana* Trin. & Rupr. in Mem. Acad. Petersb. ser. VI (1842) 151, a distinct species.—*Aristida meccano* Hochst. *ap.* Trin. & Rupr. 1. c. 152, a distinct species.

**Etymology**: *Mutabilis* means changeable.

**Description** : An annual grass. Stems 15-30 cm. high, many ascending from the root, simple or proliferously branched, slender. Leaves 2-5-7\*5 cm. long, very slender, curved, convolute, rigid, smooth.

Panicle 7-15 cm. long, very narrow, subcylindric; branches very short, crowded or sometimes with a few remote lower down on the stem ascending from a naked base and bearing a dense oblong fascicle of spikelets; rhachis smooth, branches scaberulous. Spikelets (excl. awns) 6 mm. long, very short-pedicelled, pale green or straw-coloured. Lower involucre glume 5 mm. long, shortly awned, keel scaberulous; upper 6 mm. long, tip 2-toothed below the awn. Floral glume scaberulous, callus shortly bearded, awn obscurely articulate with the glume, column nearly as long as the glume, slender, smooth, branches capillary, rather short, central one about 12 mm. long.

**Locality** : *Sind*: Sehwan to Laki, foot of hills (Sabnis B235!).

*Khandesh*: W. Ehandesh (Blatter!).

**Distribution** : Punjab, Sind, Rajputana, Ehandesh, S. India, Arabia, tropical Africa.

#### 5. ARISTIDA POGONOPTILA Boiss.

*Aristida pogonoptila* Boiss. Fl. Or. V (1884) 496; Henrard l. c. II (1927) 456.

*ArthraJtherum pogonoptOum* Jaub. & Spach III. Pl. Or. IV (1850-53) 56, t. 337.

**Etymology** : *Pogonoptila* is derived from the Greek *pogon* beard and *ptilos* bald, perhaps alluding to the glabrous glumes.

**Description** : A perennial grass. Rhizome short, oblique, branching. Stems 15-45 cm. high, strict or geniculate, erect, simple or sparsely branching, slender, terete, glabrous, smooth, obsolete and finely striate, few-noded, leafy at the base and covered with imbricate sheaths. Uppermost internode at flowering time scarcely longer than the sheath; lower internodes longer than the upper. Nodes quite glabrous, mostly rufescent. Leaves glaucous-

oent, thin, more or less flexuose or rarely rigid, keelless, on the back finely papillose, articulate on the sheath. Lower leaves 7-25 cm. long, the uppermost very often short (2-5-5 cm.). Lowest sheaths aphyllous, chartaceous, straw-coloured, persistent, subcomplicate, striate, ovate- or oblong-lanceolate, mostly acuminate. Proliferous sheaths rotund-truncate, keelless, nerved, densely ciliate with long, white hairs at the apex, densely bearded at the mouth with a ring of short bristles, otherwise glabrous, the upper ones herbaceous, tubular-involute. No ligule.

Panicle 7-5-15 cm. long, oblong, somewhat lax, simple and made up of many spikelets. Bhachis filiform, continuous, semiterete, scabrous, strict. Branchlets capillary, flexuose, scabrous, alternate, distichous; the spikelets arranged in racemes, pedicelled, mostly 3-5, unequal, getting shorter upwards; pedicels capillary, scabrous, thickened at the apex, most of them longer than the glume. Glumes 3. Involucral glumes awnless, of unequal length, subnavicular, 3-nerved, glabrous or with scattered hairs on the back and the margins. Lower one shorter, usually fimbriolate at the apex; upper one inserted slightly higher up, narrower than the lower one and about 2 mm. longer, slightly narrowed at the base, emarginate at the apex. Floral glume (including the stalk and awn) about 5 cm. long. Stalk stout, turbinate, densely setulose, bearded-hirsute at the apex. Inner palea tubular-involute, thinly 3-nerved, chartaceous, keelless, oblong, glabrous, cinereous or black-violet, long awned, on the back papillose-scabrous, especially from the middle to the apex, obtusely emarginate after the awn has fallen. Awn deciduous, setaceous-subulate, far below the middle geniculate and trifurcate; the undivided part almost as long as the glume, contorted, erect, canaliculate, filiform, papillose-scabrous, near the apex conspicuously bearded-hirsute, otherwise naked, or laxly hairy; lateral awns capillary, naked, scabrous, more or less diverging, strict, about  $\frac{1}{2}$  the length of the central one and much thinner; central awn strict, long-plumose, at the base setaceous-filiform, upwards capillary. Inner palea minute, membranous, hyaline, nerveless, involute, keelless, glabrous, cuneate-obovate, truncate or rotundate at the apex, obsolete crenulate. Xodicles 2, submembranous, glabrous, finely striate, obliquely ovate, obtuse. Stamens 3. Filaments capillary. Anthers yellowish, glabrous, linear, elongate, emarginate at apex and base. Ovary obovate; quite glabrous. Styles 2, terminal, elongate, filiform, densely plumose, laterally exerted.

Hook. f. in F. B. I. VII, 228 included this species under *A. hirtigluma* Steud., but according to Henrard, it "differs in the glabrous glumes, in the shorter column, more hairy and barbulate at the point of insertion of the 3 awns and in the more loosely and longer plumose central awn, without a naked tip."

**Locality** : *Sind* (ex Boiss.).

**Distribution** : Punjab, Sind, Baluchistan.

#### 6. ARISTIDA HIRTIGLUMA Steud.

##### PLATE 141.

*Aristida hirtigluma* Steud. Nom. ed. 2, pt. 1 (1840) 131, et Syn. PL Glum. (1855) 144; Trin. & Bupr. in Mem. Acad. Petersb. (1842) 171; Aitchis. Cat. Panjab Pl. (1869) 164; Duihies Grasses N. W. Ind. (1883) 26, Fodder Grasses N. Ind. (1888) 47; Boiss. Fl. Or. V (1884) 496; Hook. f. Fl. Brit. Ind. VII (1896) 227, *excl. aliquibus syn.*; Cooke Fl. Bomb. II (1908) 1009.

*A. ciliata* Steud. Hochst. herb. arab. un. it. no. 165 (*mm* Desf.) *ex* Henrard.

*A. ciliata* Steud. & Hochst. *ex* Steud. Nom. ed. 2, pt. 1 (1840) 131 (*mm* Desf.).

*A. Schimperii* Hochst. & Steud. *ex* Steud. 1. c. 143.

*Arthrathrum ciliatum* Nees Fl. Air. Austr. I Gramineae (1841) 182 (*excl. syn.*).

The following synonyms cited by Hook. f. in Fl. Brit. Ind. VII, 228 have to be excluded.

*Aristida decorata* Steud. Syn. Pl. Glum. (1855) 421 which is *A. Raddiana* Savi.—*Aristida paradisaea* Edgew. in Journ. As. Soc. Beng. XVI, II (1847) 1219, which is a distinct species.

• See Blatter Fl. Aden in Eec. Bot. Survey Ind. VII, 3 (1916) 380.—*Aristida pogonoptila* Boiss. Fl. Or. V (1884) 496, a distinct species.

**Etymology** : *Hirtigluma* means having the glumes hairy.

**Description** : Perennial; stems tufted, 30-60 cm. high, smooth, glabrous, terete, shining; nodes glabrous. Leaves 5-15 cm. long, reaching 1-2 mm. broad when opened out, con-vohite, filiform with capillary tips; sheaths quite glabrous except for a few long hairs at the mouth, close; ligule a very narrow densely ciliate membrane.

Panicle slender; branches short, erect, capillary. Spikelets pale green or straw-coloured; linear-lanceolate. Lower involucral glume 8 mm. long, linear-oblong, acute, scarious; upper

involucral glume a little longer but similar; floral glume slightly muricate; callus about 0.5 mm. long, pointed, shortly villous; column of awn 2-5-3 mm. long, plumose with long slender hairs, articulated on the glume; middle branch 3-8 cm. long or more, plumose in the lower half with long delicate hairs; lateral branches very slender, hair-like, about 13 mm. long, not plumose.

**Locality:** *Sind:* Bholari (Bhide!); Sehwan, sand hills (Bhide!); Laid (Bhide!); hills near Bullo Khan (Woodrow!); Sehwan to Laid, foot of hills (Sabnis B614!).

**Distribution:** Tunis, Upper Egypt, Sinai, Syria, Nubia, Abyssinia, Eritrea, Highlands, of Somaliland, Arabia, Sind, Punjab.

**Explanation of Plate 141:** *Aristida hirtigluma* Steud.

1. Lower invol. glume.
2. Upper invol. glume.
3. Floral glume.
4. Palea of floral glume.
5. Stamens, ovary and styles.

#### 7. ARISTIDA HYSTRICULA Edgew.

*Aristida hystricula* Edgew. in Journ. Linn. Soc. VI (1862) 208; Aitchis. Cat. Panjab PI. (1869) 164; Duthie Grasses N. W. Ind. (1883) 26, Fodder Grasses N. Ind. (1888) 47; Hook. f. FL Brit. Ind. VII (1896) 227; Cooke Fl. Bomb. II (1908) 1009.

**Etymology:** *Hystricula* means a small porcupine.

**Description:** Annual, dwarf, slender, about 2-5-7-5 cm. high, pale; stems many from the root, 1-3-2-5 cm. high, densely crowded; nodes glabrous. Leaves subulate, curved, convolute, acuminate, glabrous, less than 2-5 cm. long; sheaths glabrous; ligule a small line of hairs.

Panicle without the awns 1-3-2-5 cm. long, shorter than the awns, narrow, few-flowered; branches few, short, erect. Spikelets 10 mm. long or more. Lower involucral glume 4-5 mm. long, much shorter than the upper, ovate-lanceolate, acute, apiculate, scarious; upper involucral glume 10 mm. long, linear, running out into a slender awn or often cleft at the tip into 2 subulate lobes 1-6 mm. long; lower floral glume 4 mm. long; column of awn 13 mm. long, twisted, the 3 branches subequal, extremely slender, 13-20 mm. long.

Henrard 1. c. II (1927) 251, points out that "the most striking character, a character neglected by all the authors who studied the species, is the densely hairy bifid callus." Hooker 1. c, therefore when saying that the callus is "minute, glabrous" is not correct. Cooke does not describe the callus.—Apparently no Indian species has a naked callus.

**Locality:** *Bind:* Laki (Bhide!); Bholari (Bhide!); Hyderabad (Bhide!); Jamadar ka Landa, near Karachi (Stocks 1187).

**Distribution:** Punjab, Sind, Baluchistan.

#### 8. ARISTIDA FUNICULATA Trin. & Rupr.

##### PLATE 142.

*Aristida funiculata* Trin. & Rupr. in Mem. Acad. Petersb. ser. 6, VII (1849) 159; Aitchis. Cat. Panjab PL (1869) 164; Boiss. FL Or. V (1884) 492 (*partim*); Duthie Fodder Grasses N. Ind. (1883) 47; Hook. f. FL Brit. Ind. VII (1896) 226; Cooke Fl. Bomb. II (1908) 1010.

*A. macrathia* Rich. Tent. Fl. Abyss. II (1851) 393; Boiss. 1. c. 493 (*Macranthera*).

*A. Mallica* Edgew. in Journ. Proc. Linn. Soc. VI (1862) 206.

*A. funiculata* Trin. & Rupr. *tar. mallica* Henrard 1. c. II (1927) 328.

*A. patadoxa* Steud. *ap. Schmidt* Fl. Cap. Verd. (1852) 140.

*A. funiculata* Trin. & Rupr. *tar. paradocxa* Henrard 1. c. II (1927) 425.

**Vernacular names:** Pandhri or Pandri kussal, Bushi kussal.

**Etymology:** *Funiculata* is derived from *funis*, a rope, cord, referring to the twisted columns of the awn.

**Description:** Annual, very slender; stems 25-60 cm. long, many, geniculately ascending. Leaves 5-15 cm. by 1-2-2 mm., convolute or flat, ciliate, at the base; sheaths glabrous; ligule a small ciliate membrane.

Panicle 10-25 cm. long, lax, narrow; rachis angular; branches short, erect, capillary. Spikelets variable in length, 1-3-2-2 cm. long. Lower involucral glume reaching 2-2 cm. Long!



1 2 3 4 5  
AHISTIDA IIIHTIGLDMAXBBD

Delin: R. K. Bbide.



ARISTIDA TRICHOSTACHYA. (L.) TUCKERMAN. f. KVPr

Drawn: R. E. Blake.

linear-lanceolate, acute, 1-nerved, tapering into a slender awn; upper involucral glume somewhat shorter than the lower, similar in shape and similarly awned; floral glume small, smooth, awned; awn articulate on the glume, the column 13-20 mm. long, twisted, with 3 capillary branches of which the middle is the longest, reaching 3-2 cm. long.

**Locality** : *Sind*: Mirpurkhas (Sabnis B1038!); Gharo (Blatter & McCann D622!); Tatta, tombs (Blatter & McCann D623!); Ghulamalla (Blatter & McCann D624!); Jam-village (Woodrow 19).

*Cutch*: Bhuj, Bhodir Maka (Blatter 3728!).

*Gujarat*: Ahmedabad, dry waste land (Sedgwick!).

*Khandesh*: Red earth upland north of Taloda (Sedgwick!); Bor, Tapti River (Blatter & Hallberg 4416!); Amalner, Bori River (Blatter & Hallberg 5108!).

*W. Ghats* : Panchgani (Blatter & Hallberg B1310!).

*Deccan*: Pona (Lisboa); Dapuri near Poona (Jacquamont 489); Pashan near Poona (Gammie!); Kirkee to Poona, railway line (Garade 816!); Katraj Ghat (Bhide 1041!); Satara (Lisboa); Sholapur (Lisboa); Wai (Talbot 4483!); Nasik (Bourke!); Bairarwadi, Purandhar (McCann 5062!); Rahuri (Nana A227).

*S. M. Country*: Dry fields, Yelvigi, 1,800 ft., rainfall 28 in. (Sedgwick & Bell 4898!); Belgaum (Woodrow); near Belgaum (Woodrow!); Badami (Bhide!).

**Ecology** : Generally subgregarious, but sometimes so common that extensive patches of it have a dull grey or glaucous colour.

**Distribution** : Punjab, Rajputana, W. Peninsula, Baluchistan, Arabia, tropical Africa.

**Economic uses** : Useless as fodder.

**Explanation of Plate 142** : *Aristida funieulata* Trin. & Rupr.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Lodicules.
5. Stamens and grain.
6. Floral glume.

#### 9. ARISTIDA REDACTA Stapf.

*Aristida redacta* Stapf in Kew Bull. (1892) 85; Hook. f. Fl. Brit. Ind. VII (1896) 227; Cooke Fl. Bomb. II (1908) 1010.

*Stipa aristoides* Stapf ex Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 358; Prain Beng. PL 1211.

**Etymology** : *Redacta* is derived from *reducere*, meaning reduced, alluding to the branches of the awn which are absent or very short.

**Description** : Annual or sometimes perennial (and then more robust); stems tufted; 15-60 cm. high, simple, or proliferously branched in robust specimens; nodes glabrous. Leaves 10-15 cm. long, very slender, convolute, hairy above, smooth below, margins rough; sheaths glabrous; ligule narrow, shortly and densely ciliate.

Panicle 23-25.5 cm. long by 19 cm. broad; branches usually twin, remote, at length spreading; pedicels unequal, shorter than the glumes. Spikelets on long or short capillary pedicels, green or purplish. Lower involucral glumes subequal, narrowly lanceolate, finely acuminate, shortly aristate, reaching 13 mm. long; floral glume with a hairy callus, usually purplish, armed with an awn 3-2 cm. long; column of awn capillary, twisted, easily separating from the glume but not truly articulate; branches 3 from the top of the column, the lateral much shorter than the middle one, sometimes 0.

**Locality** : *Konkan*: Trombay, common on the hillside (McCann A212! A213!); Kankeahwar Hill, Alibag (Bhide!).

*W. Ghats*: Lonavla (Woodrow); Panchgani (Blatter & Hallberg B1275!).

*Deccan*: Junnar, Poona Dist. (Woodrow); Wai (Talbot 4484!); Lohagad, plain (McCann 9503!); Bairarwadi, below Purandhar (McCann 5063!); Pashan (Gammie!).

*S. M. Country*: Hubli, barren hillside, 2,200 ft., rainfall 28 in. (Sedgwick & Bell 4929!); Yelvigi, dry fields, 2,000 ft., rainfall 28 in. (Sedgwick & Bell 4897!); Dharwar, 2,400 ft., rainfall 34 in. (Sedgwick & Bell 4891!, Talbot 2910) Haveri (Talbot 2216!).

*N. Kanara* (Law).

**Ecology** : This species commonly grows on open hillsides among other plants by which it is supported as it is very weak and bends over. A subgregarious species occasionally forming almost pure associations.

**Distribution** : Central India, Nagpur, W. Bengal, W. Peninsula, S. Persia.



**TRIBE IX: Zoysieae.**

Mature spikelets falling entire and singly, or in clusters. Floret 1. Rhachilla not continued beyond the floret. Involucral glumes equal, or the lower much smaller or suppressed. Floral glume small, delicately membranous, 3-1-nerved. Spikelets in slender spiciform panicles, or racemes.

See key page xviii.

## 75. TRACHYS Pers.

A diffuse softly villous annual grass. Leaves ovate-lanceolate.

Inflorescence of 2-3 spikes radiating from the top of a long peduncle; rhachis broad, herbaceous, jointed, each joint bearing on the under surface at the articulation a solitary globose cluster of 2-3 perfect 1-flowered glabrous spikelets surrounded by many short spinescent glumes of imperfect ones. Glumes 4, very unequal; lower involucral glume minute, tooth-like; upper involucral glume elongate, linear-lanceolate, very acute, membranous, strongly nerved; lower floral glume much the largest, obliquely ovate or obovate-oblong, cuspidately acuminate, rigidly coriaceous, 9-many-nerved, paleate, empty, the palea minute; upper floral glume much shorter and narrower than the lower one, linear-oblong, acuminate, chartaceous, smooth, dorsally convex, with incurved margins, 2-sexual; palea as long as the glume, acuminate, hyaline, the margins inflexed below the middle. Lodicules very minute or 0. Stamens 3; anthers linear. Styles very long; stigmas slender, penicillate, exerted at the top of the glume. Grain oblong, compressed, free within the glume and palea.

Species 1.—Coast of India and Ceylon.

## 1. TRACHYS MURICATA (Linn.) Steud.

## PLATE 143.

*Trachys muricata* (Linn.) Steud. Syn. Pl. Glum. (1855) 112.

*Cenchrus muricatus* Linn. Mant. (1767) 302.

*Trachys mucronata* Pers. Syn. I (1805) 85; Beauv. Agrost. (1812) 107, t. 21, fig. 7; Hook. f.

Fl. Brit. Ind. VII (1896) 96; Cooke Fl. Bomb. II (1908) 1014.

*Cenchrus tripsaceus* Herb. Linn. ex Munro in Journ. Linn. Soc. VI (1862) 55.

*Trachystaehys geminata* A. Dietr. Sp. Pl. II, 16.

*Tripsachum distachyum* Herb. Linn. ex Munro l. c.

*Panicum dimidiatum* Burm. Fl. Ind. (1768) 25, t. 8, fig. 3.

*P. squarrosum* Eetz. Obs. IV, (1786) 15, t. 1; Eoxb. Cor. Pl. III, t. 206; Fl. Ind. I (1832) 288.

**Etymology** : *Trachys* means rough, alluding to the rough spike.—*Muricata* means rough.

**Description** : Stems 15-45 cm. long, ascending or prostrate, leafy, glabrous; nodes villous. Leaves 2\*5-10 cm. by 6-13 mm., ovate-lanceolate, acuminate, flaccid, softly villous on both surfaces, margins often crisped, base rounded; sheaths glabrous or hairy; ligule a thin membrane.

Peduncles reaching 20 cm. long, slender, shining. Spikes 2.5-5 cm. by 2.5-4 mm., stipitate, the stipes 2.5-6 mm. long, glabrous and more or less angular; rhachis rigidly herbaceous, with a broad flat midrib and broad closely nerved wings. Clusters of spikelets reaching 6 mm. diam., often partially sunk in a concavity of the rhachis; perfect spikelets reaching 6 mm. long, the imperfect much shorter. Glumes 4; lower involucral glume 1.6-2 mm. long, lanceolate/acute; upper involucral glume 4 by 1.6 mm., linear-lanceolate, very acute, 3-nerved, hyaline; lower floral glume 5 by 3.2 mm., broadly and obliquely ovate or obovate, cuspidately acuminate, with many green nerves, paleate, the palea 1.2 mm. long, oblong, obtuse, hyaline; upper floral glume 3'2 by 1.6 mm., ovate, acute.

**Locality** : *S. M. Country*: Badami (Bhide!, Cooke, Woodrow); Gokak (Talbot!); Dharwar (Woodrow).

**Ecology** : Grows in sandy ground near the sea.

**Distribution** : W. Peninsula, Ceylon.

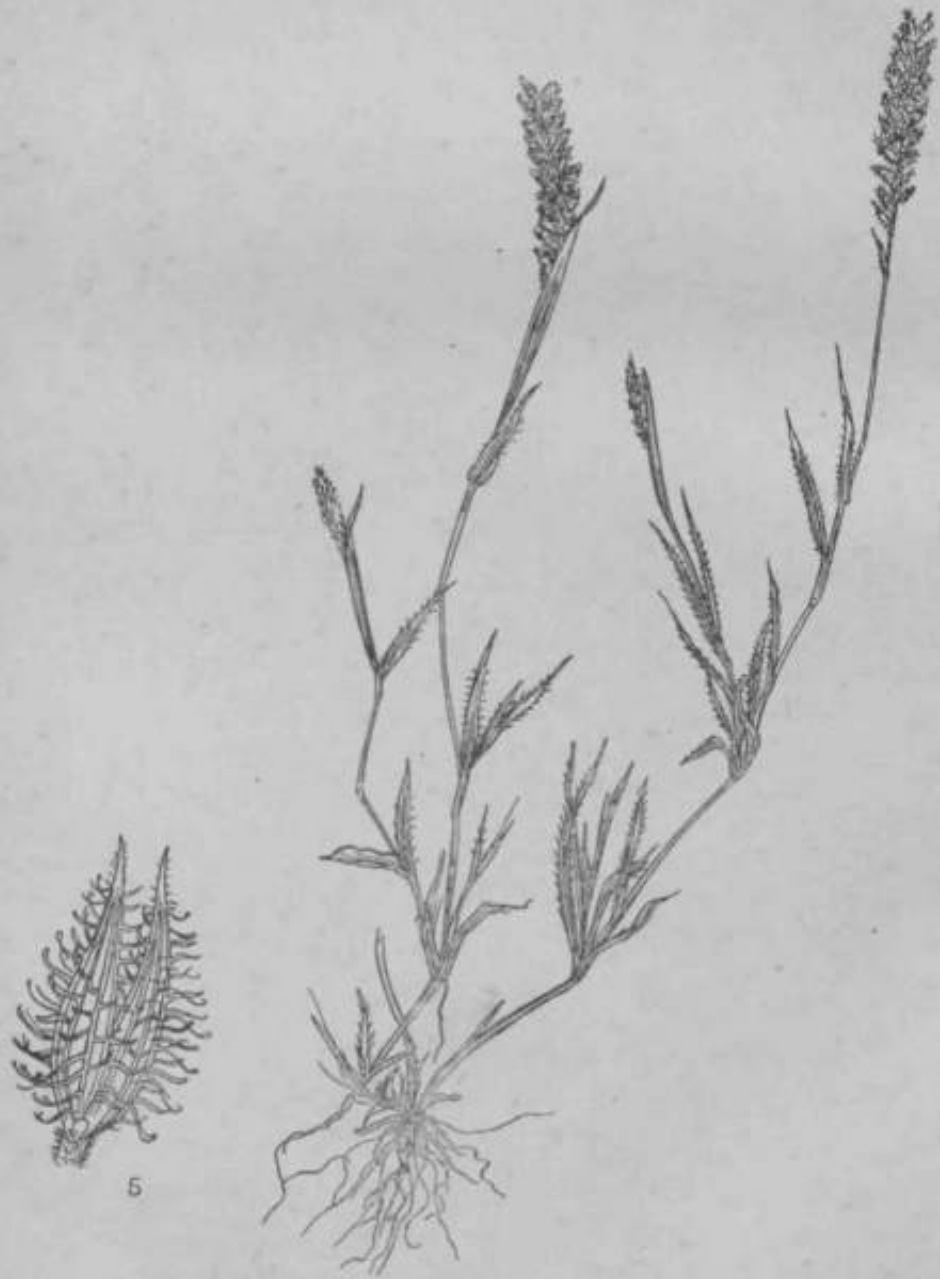
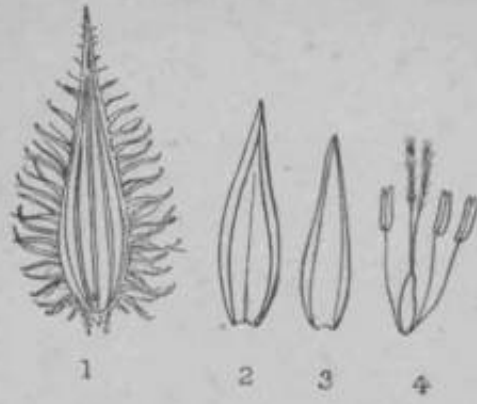
**Explanation of Plate 143** : *Trachys muricata* (Linn.) Steud.

1. Lower invol. glume.
2. Upper invol. glume.
3. Lower floral glume.
4. Palea of lower floral glume.
5. Upper floral glume.



THAIHYS MUKICATA (UNN.) SIKW.

Delin: B. K. Bhide.



NAZIA RACEMOSA K'XTZE

Delin: H. K. Bhide.

6. Palea of upper floral glume.
7. Part of rhachis.
8. Cluster of spikelets.
9. Grain.

## 76. NAZIA Adans.

(Tragus Hall.)

Annual or perennial grasses ; stems erect, ascending or decumbent. Leaves linear, rather rigid, with, cartilaginous spinulously ciliate margins ; ligule a delicate ciliate rim.

Spikelets in deciduous clusters of 2-4, on the filiform continuous axes of cylindrical spike-like racemes or panicles. Lower involucral glume minute, hyaline or suppressed; upper involucral glume 5-ribbed or 5-nerved, membranous between the hispid or spinous-hooked ribs or nerves, exceeding the floral glume; floral glume solitary, lanceolate or oblong-lanceolate, membranous, 3-nerved, 2-sexual; palea as long as the glume, 2-nerved. Lodicules 2, broad, cuneate, fleshy. Stamens 3. Styles distinct, very slender ; stigmas narrow, plumose, exserted from the top of the glume. Grain oblong to ellipsoid, free within the glume and palea.

The type species is *Cenchrus racemosus* Linn, and the genus *Nazia* Adans. is based on this species. As to *Tragus* Haller, this author, according to Hitchcock, cites pre-Linnæan writers who connect *Tragus* with *Cenchrus racemosus* Linn. (Hitchc. Genera of Grasses Unit. St. in Unit. St. Dept. Agric. Bull. 772 (1920) 165).

Species 3.—Tropical regions of both hemispheres.

## 1. NAZIA RACEMOSA Euntze.

## PLATE 144.

*Nazia racemosa* Euntze Rev. Gen. PL III, 357; Hitchcock Genera of Grasses Unit. St. in Unit. St. Dept. Agric. Bull. 772 (1920) 165.

*Tragus racemosus* Scop. Introd. Hist. Nat. (1777) 73 ; Desf. Fl. Atlant. II, 386 ; Duthie Grasses N. W. Ind. (1883) 13, Indig. Fodder Grasses (1886) t. 14, Fodder Grasses N. Ind. (1888) 22 ; Hook. f. FL Brit. Ind. VII (1896) 97 ; Cooke FL Bomb. II (1908) 1014 ; Haines Bot. Bih. and Or. (1924) 979.

*T. brevicaulis* Boiss. Diag. PL Or. ser. I, XIII, 44.

*Lappago racemosa* Honck. Syn. PL Germ. I (1792-3) 440 ; Host Gram. Austr. I, t. 36 ; Sibth\* Fl. Graec. II, t. 101 ; Keichb. Ic. Fl. Germ. I, t. 30 ; Aitchis. Cat. Panjab PL (1869) 163.

*L. biflora* Roxb. FL Ind. I (1832) 281 ; Grah. Cat. (1839) 234.

*L. aliena* Dalz. & Gibs. Bomb. Fl. (1861) 295 (*non* Spreng.).

*L. occidentalis* Nees in Schimp. PL Arab. Fel. ed. II, no. 793.

*Cenchrus racemosus* Linn. Sp. PL (1753) 1049.

*C. linearis* Lam. FL Franc. III, 631.

*Phalaris muricata* Forsk. Fl. Aeg.-Arab. (1775) 302.

**Vernacular name:** Barchente.

**Description :** Stems tufted, leafy below, simple or branched, the branches often fasciculate and densely leafy, geniculate, ascending from a decumbent base or wholly decumbent, up to 30 cm. long; nodes glabrous. Leaves variable in length, 0.6-3.8 cm. by 2.5-4 mm., linear-lanceolate, acuminate, flat or undulate, rigid, very glaucous, subpungent, smooth, with pectinately ciliate margins, closely striate; lowest sheaths short, broad, pale, the intermediate ones more or less herbaceous, the uppermost tumid, usually embracing the base of the panicle; ligule a slender ciliate rim.

Inflorescence a cylindrical spike-like panicle 2-7.5 cm. long; rhachis slender, straight or slightly undulate, pubescent. Spikelets 3-2 mm. long, acute, usually 2 facing each other and appearing like a single spikelet with 2 equal echinate glumes; pedicels stout, about 0.8 mm. long. Glumes 3 or 2 ; lower involucral glume very minute, about 0.5 mm. long, hyaline, often suppressed; upper involucral glume 3-5 mm. long, slightly curved, involute, enveloping the floral glume, strongly 5-ribbed, with rows of stout hooked spines along the ribs, thin between the ribs ; floral glume solitary, 2 mm. long, oblong-lanceolate, shortly apiculate.

**Locality :** *Sind:* Tatta, Tombs (Blatter & McCann D679 !)

*Kaihiawar:* Rajkot (Woodrow).

*Gujarat:* Ahmedabad, waste ground (Sedgwick!); Domas, near Surat (Graham).

*Khandesh:* Bor, Tapti bank (Blatter & Hallberg 5467 !).

*Konhan:* SaJsette (Graham).

*Deccan:* Poona (Woodrow!, Jacquemont 386); Foona, Chattarshinji Hill (Bhide !); Bijapur (Cooke, Woodrow).

8. *M. Country;* Dharwar (Sedgwick & BeU 4145 !); Mallapur HiU, Bagalkot (Faranjpye !); Gokak (Shevade!); Badami (Woodrow!).

**Ecology :** A sporadic xerophytic species. Very common on barren uplands of Dharwar Dist. Likes dry pasture ground.

**Distribution :** Most warm countries.

**Economic uses :** Said to be nutritious and much grazed in the rains.

**Explanation of Plate 144 :** *Nazia racemosa* Kuntze.

1. Upper invol. glume.
2. Floral glume.
3. Palea of floral glume.
4. Stamens, ovary and styles.
5. Spikelets.

#### 77. LATIPES Eunth.

A perennial rather rigid grass. Leaves subulate, convolute.

Spikelets 1-flowered, in simple spike-like racemes, 2-seriate (1 usually imperfect), persistent on the flattened truncate spreading articulate pedicels; rhachis flexuous. Glumes 3; involucre glumes thickly coriaceous; lower involucre glume usually the longest, narrow, recurved, 3-nerved, with pectinate margins, dorsally smooth; upper involucre glume lanceolate, spinulosly tuberculate, embracing the floral glume; floral glume solitary, shorter than the upper involucre glume, oblong, acute, hyaline; palea minute, linear-oblong. Lodicules 2, hyaline. Stamens 3; anthers oblong. Styles free. Grain free, obliquely ovoid-lanceolate.

Species 1.—From Senegal to Sind.

#### 1. LATIPES SENEGALENSIS Kunth.

##### PLATE 146.

*Latipes senegalensis* Kunth Rev. Gram. I (1829) 261, t. 42, Enum. Pl. I (1838) 171, Suppl. 125; Duthie Grasses N. W. Ind. (1883) 13, Fodder Grasses N. Ind. (1888) 22; Hook. f. Fl. Brit. Ind. VII (1896) 97; Cooke Fl. Bomb. II (1908) 1015.

*Lappago Latipes* Steud. Syn. Pl. Glum. (1855) 112.

*Tragus senegalensis* J. Gay ex Kunth Enum. Pl. I (1838) 171.

**Etymology :** *Latipes* is derived from *lotus*, broad, and *pes*, foot or footstalk, alluding to the flattened pedicels.

**Description :** Stems 7-5-30 cm. long, wiry, creeping, with many erect or spreading branches, leafy. Leaves 2-5-7-5 cm. long, subulate, convolute; sheaths glabrous, the mouth hairy; ligule 0.

Racemes 5-15 cm. long; rhachis glabrous; pedicels distant, 2\*5 mm. long, cuneate, flattened, with winged and ciliate margins, bearing at the broad apex 2 purplish brown spikelets one perfect, the other not. Glumes 3; lower involucre glume rather more than 3-2 mm, long, lanceolate, narrow, recurved, 3-nerved, with pectinate margins, purplish brown, upper involucre glume rather more than 2-5 mm. long, ovate-lanceolate, purplish brown, tuberculate on the back; floral glume solitary, 1-6 mm. long, ovate-oblong, acute, hyaline.

**Locality :** *Sind:* (Woodrow !); Karachi (Burns !); 20 miles north of Karachi (Woodrow); Jemadar ka Landa, near Karachi (Stocks 1186).

**Distribution :** Baluchistan, Arabia, Abyssinia, Senegal.

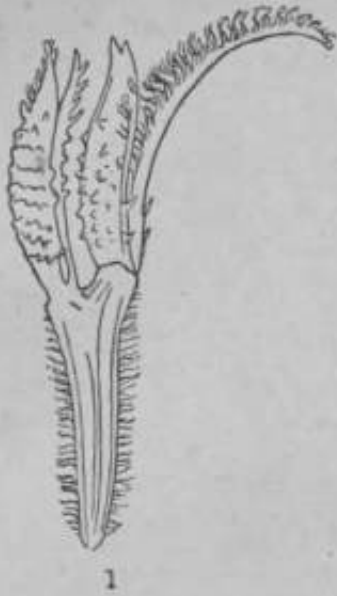
**Explanation of Plate 145 :** *Latipes senegalensis* Kunth.

1. Spikelets.
2. Lower invol. glume.
- 3\* Upper invol. glume.
4. Floral glume.
5. Palea of floral glume.
- G. Stamens and grain.

#### 78. OSTEBDAMIA Neck.

(*Zoysia* Willd.).

**A small rigid glabrous grass, with a long wiry rootstock giving off short erect leafy branches terminating in solitary pedunculate spike-like racemes. Leaves distichous subulate, concave, pungent.**





OSTERDAMIA MATRELLA O. KUNTZE.

*Delin: B. K. Bhide.*

Spikelets ovoid, laterally compressed, 1-flowered, articulate on short or rather long stout angular pedicels appressed to a rigid rhachis. Glumes 2; involucrel glume empty, rigidly coriaceous, the margins closely appressed as if connate, with a membranous tip, nerveless; floral glume much smaller than and completely enclosed in the involucrel glume, ovate-lanceolate, hyaline, 1-nerved; palea linear-oblong, hyaline. Lodicules 0. Stamens 3; anthers long. Styles very long, connate below; stigmas plumose, exerted at the top of the spikelet. Grain oblong, free within the glume and palea.

Species about 10.—Tropical Asia to Australia and New Zealand, Mauritius; in Japan alone there are 7 species (See: Honda Masaji, Revisio Gram. Japoniao I., in Bot. Mag. Tokyo 37 (1923) 113-124).

1. *OSTERDAMIA MATRELLA* O. Euntze.

**PLATE 146.**

*Osterdamia Matrella* O. Euntze. Rev. Gen. PL II (1891) 781; Hitchcock Genera of Grasses Unit, St. in Unit. St. Dept. Agric. Bull. 772 (1920) 166.

*Agrostis matrella* Linn. Mant. II, 185; Roxb. Fl. Ind. I (1832) 317.

*Matrella juncea* Pers. Syn. PL I (1805) 73.

*Zoysia pungens* Willd. in Ges. Naturf. Fr. Neue. Schrift. III (1801) 441; Br. Prodr. X, 208; Beauv. Agrost. I, t. 4, fig. 1; Miq. Fl. Ind. Bat. III, 478; Hook. f. FL Brit. Ind. VII (1896) 99; Cooke FL Bomb. II (1908) 1016; Haines Bot. Bit. and Or. (1924) 979.

*Z. aristata*, *Brownii*, *Griffithiana* et *sedoides* C. Muell. in Bot. Zeit. XIII (1855) 272, 273, 274.

*Z. sinica* Hance in Joura. Bot. VII (1869) 168.

*Z. setacea* Nees ex Steud. Norn. ed. 2 (1840) 801.

*Z. tenuifolia* Trin. in Mem. Acad. Petersb. ser. VI, IV, Be. Nat. II (1836) 96.

*Panicum Crinum-ursi* Bory ex Steud. Nom. 1. c. 255.

**Vernacular name** : Manila Grass.

**Description** : Rootstock rigid, wiry, up to 60-90 cm. long, the branches interlaced and rooting, sending up short leafy stems 15-25 cm. high. Leaves 2-5-7-5 cm. long, coriaceous, dorsally rounded, subulate, concave, pungent; sheaths short; ligule a narrow ciliolate membrane.

Racemes 2-5-3-8 cm. long, strict, erect. Spikelets 3-2 mm. long, erect; pedicels usually short, angular. Involucrel glume biconvex, much compressed at the membranous tip, smooth and shining, thickly coriaceous; floral glume shorter and much narrower, hyaline; palea linear-oblong, nerveless.

**Locality** : *Gujarat*: Daman, on sand hills (Herb. Econ. Bot.!, Lisboa).

*Konkan*: Alibag, sandy shore (Ezekiel!); Juvem (McCann 4314!); Bombay, Walkeshwar, seashore, rocks (Sabnis!), Marine Lines (Hallberg 9873!); Versova, marsh (McCann 9875!).

*N. Kanara*: Karwar (Talbot 1531!, McCann!).

**Ecology** : A seaside plant, on rocks, sand and in salt marshes?.

**Distribution** : Tropical Asia.

**Economic uses** : As it creeps to a great length it is a good sand binder.

**Explanation of Plate 146** : *Osterdamia Matrella* O. Euntze.

1. Invol. glume, with pedicel.
2. Floral glume.
3. Stamens, ovary and styles.
4. Palea of floral glume.

79. *PEROTIS* Ait.

Small annual or subperennial grasses; stems tufted, leafy. Leaves usually broad, rigid and ciliate; ligules hyaline or 0.

Spikelets very small, linear-lanceolate, sessile or subsessile on the continuous rhachis of a spike or a lax spike-like raceme, articulate on and falling entire from the rhachis or the very short pedicels. Glumes 3; involucrel glumes equal, linear-lanceolate, rigidly membranous, with a strong midrib produced into a long capillary awn; floral glume solitary, lanceolate, acute, hyaline, 1-nerved, 2-sexual; palea narrow, hyaline, nerveless. Lodicules 2, broad,



cuneate. Stamens 3. Styles short; stigmas plumose, laterally exerted. Grain cylindrical, slender, exerted from the unchanged floret and enclosed with it in the involucre glumes.

Species 4.—Tropics of the Old World and subtropical Australia.

1. PEROTIS INDICA (Linn.) O. Kuntze.

PLATE 147.

*Perotis indica* O. Euntze Rev. Gen. PL II (1891) 787.

*Anthoxanthum indicum* Linn. Sp. PL (1753) 28.

*Perotis latifolia* Ait. Hort. Kew. I (1789) 85; Beauv. Agrost. (1812) t. 4, fig. 9; Roxb. Fl. Ind. I (1832) 233; Grah. Cat. Bomb. PL (1839) 237; Dalz. & Gibs. Bomb. FL (1861) 296; Duthic Grasses N. W. Ind. (1883) 13; Miq. Fl. Ind. Bat. III, 479; Hook. f. Fl. Brit. Ind. VII (1896) 98; Cooke FL Bomb. II (1908) 1016; Haines Bot. Bih. and Or. (1924) 978.

*P. Burmanni* Steud. Norn. ed. I, 605.

*P. cubana* Wright in Sauv. Fl. Cub. (1873) 202.

*P. glabrata* Steud. Syn. PL Glum. (1855) 186.

*P. kordeiformis* Nees ex Steud. Norn. ed. II, II (1840) 306.

*P. longiflora* Nees in Hook. & Am. Bot. Beech. Voy. 247.

*P. patuh* Nees ex Steud. Nom. I. c.

*P. rara* R. Br. Prodr. (1810) 172.

*P. scabra* Willd. ex Trin. Diss. II, 172.

*P. spicieformis* Beauv. ex Steud. Nom. ed. I, 605.

*Perotis lixifolia* Beauv. I. c. 6.

*Saccharum spicatum* Linn. Sp. PL (1753) 54.

*Agrostis spiciformis* Linn. f. Suppl. (1781) 108.

*Xystidium barbatum* Presl. Reliq. Haenk. I (1830) 228.

*X. maritimum* Trin. Fund. Agrost. (1820) 102, t. 2.

Rheede Hort. Mai. XII, t. 62.

**Vernacular name:** Kuras.

**Etymology:** The root of *Perotis* is *peros*, mutilated. The allusion is not clear.

**Description:** Stems tufted, geniculate, suberect, ascending, 7-5-38 cm. long, glabrous. Leaves 1-3-3\*8 cm. by 3-8 mm., ovate or lanceolate, from a broad amplexicaul base, acute or acuminate, flat or somewhat undulate, glaucous, with rigidly ciliate margins; ligule 0.

Racemes slender, 5-20 cm. long, dense; rachis subterete, glabrous. Spikelets 2 mm. long, narrowly linear, subtetate, scaberulous. Involucral glumes equal and similar, often triple, linear-lanceolate, each with a long scaberulous awn reaching sometimes as much as 16 mm. long, purple or yellow; floral glume solitary, very narrowly linear, rather shorter than the involucre glumes. Grain 1-6 mm. long, almost cylindrical.

Easily recognized by its purplish squirrel-tail-like inflorescence.

**Locality:** *Gujarat:* Baroda (Cooke); Surat (Lisboa); Domas near Surat (Dalzell & Gibson); Daman, on sand hill (Bhide!); Ahmedabad (Sazton 1052 !); Balsar (Herb. St. X. C.!).

*Konkan:* Juvem (McCann 4312!); Versova (McCann 4304!); Alibag, sandy shore (Ezekiel!); Bassein (Bhide!, McCann!); Malwan (Woodrow).

*W. Ghats:* Londa (Bhiva!).

*S. M. Country:* Mallapur Hill, Bagalkot (Paranjpye!); Gokak (Shevade!); Badami (Bhide !, Cooke, Woodrow); Gokak Falls (Sedgwick!).

*N. Kanara:* Eala Nuddi (Sedgwick & Bell 4287 !); Karwar (Talbot 1068!, McCann!); Honavar (Talbot 1068 !).

**Ecology:** A common species of sandy tracts, particularly along the shores of the Presidency well above high water mark. Specimens 60-90 cm. high have been seen at the estuary of the Kala Nuddi River, N. Eanara.

**Distribution:** More or less throughout India, Ceylon, S. Africa.

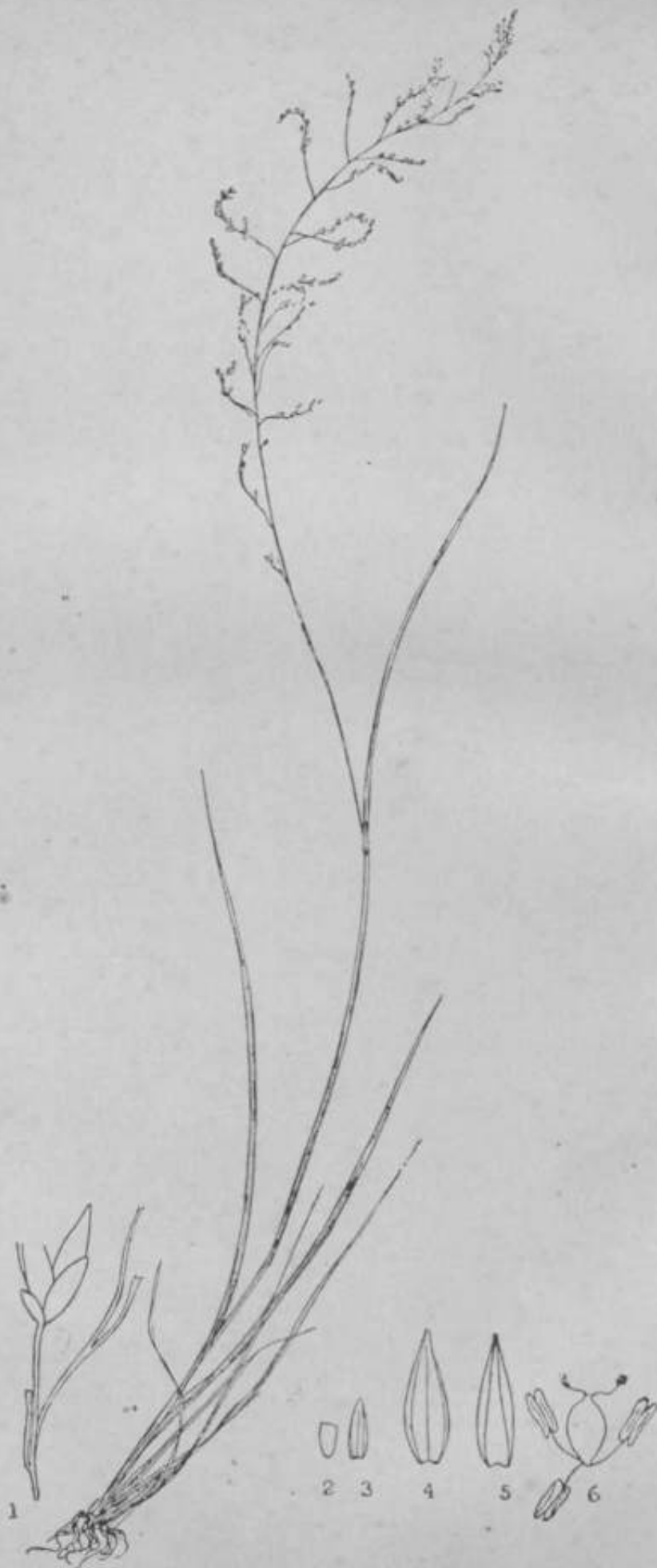
**Explanation of Plate 147:** *Perotis indica* O. Euntze.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume with floral glume.
4. Palea.
5. Grain.



PEROTIS INDICA O. KIVJZF

*Delin. B. K. Bhide.*



SPOROBOLUS DIANDES BEACV

Delin. B. fi. Thibe.

**TRIBE X: Sporoboleae.**

Involucral and floral glumes very similar. Floret 1. Rhachilla very rarely continued beyond the floret. Floral glume membranous, acute or obtuse, not changed when ripe, 1- or more or less distinctly 3-nerved, awnless, usually olive-green or olive-grey; side-nerves, if present, delicate, evanescent above. Seed often free in the delicate pericarp.

See key page xix.

**80. SPOBOBOLUS R. Br.**

Perennial (rarely annual) glabrous grasses, erect or prostrate, or creeping. Leaves narrow, flat or convolute.

Spikelets 1-flowered, small or minute, in effuse or contracted panicles, articulate on their pedicels; rhachilla not produced beyond the palea. Glumes 3, usually membranous, 1-nerved or nerveless; involucral glumes empty, unequal, separately caducous; floral glume not articulate at the base, ovate or oblong, obtuse or acute; callus very short, glabrous; palea as long as the glume and of similar texture, broadly oblong, often dorsally narrowly inflexed along the median line, with a nerve-like ventral ridge along which the palea splits between the two very close often very obscure nerves. Lodicules very minute or 0. Stamens 2-3; anthers short or long. Styles 2, free; stigmas very short. Grain oblong, obovoid or pyriform, free within the glume and palea, with a loose hyaline pericarp.

Species about 100.—Warm regions of both hemispheres, most abundant in America.

Cooke describes 10 species. We retain all of them changing *S. arabicus* into *S. pallidus* and add 3 others: *S. virginicus* Eunth, *S. scabrifolius* Bhide, and *S. tremulus* Eunth.

**A. Involucral glumes both shorter than the floral glume.****I. Stamens 2.**

1. Culms 30-90 cm. high; panicle reaching 25 cm. . . . . **1. 8. diander.**
2. Culms scarcely 15 cm. high; panicle reaching 20-25 cm. . . . . **2. 8. indicus.**

**II. Stamens 3.**

1. Panicle narrow, 12^20 mm. broad. Spikelets reaching 2-5 mm. . . . . **3. 8. indivus.**
2. Panicle reaching 7-5 cm. broad.
  - a. Panicle 30-45 cm. long. Spikelets 1 mm. long. . . . . **4. 8. minutiflorus.**
  6. Panicle 10-15 cm. long. Spikelets 2 mm. long. . . . . **5. 8. iodado8.**

**B. Lower involucral glume as long as the floral glume or nearly so. Panicle interrupted.**

- I. Spikelets 2-5-2 mm. long. Leaves very pale . . . . . **6. 8. virginicus.**
- II. Spikelets 1-5 mm. long. Leaves glaucous . . . . . **7. 8. glaucifolius8.**

**<C. Lower involucral glume much shorter than either of the two others.****I. Panicle contracted.**

1. Perennials.
  - a. Margins of leaves smooth . . . . . **8. 8. tremulus.**
  6. Margins of leaves serrulate . . . . . **9. 8. orientalis.**
2. Annual . . . . . **10. 8. jriliferus.**

**II. Panicle effuse.**

1. Spikelets 2-5 mm. long . . . . . **11. 8. pallidus.**
2. Spikelets 1-1-5 mm. long.
  - a. Floral glume ovate, acute . . . . . **12. 8. scabrifolius.**
  - b. Floral glume ovate-lanceolate, acuminate **13. 8. coromandelianus.**

**1. SPOBOBOLUS DIANDER Beauv.****PLATE 148.**

*Sporobolus diander* Beauv. Agrost. (1812) 26; Jacq. Eclog. Gram. t. 28; Link Enum. Hort. Reg. Berol. I (1827) 87; Kunth Enum. PL I (1838) 213; Griff. Notul. III, 46, Ic. PL Asiat. 1.139, fig. 85; Dalz. & Gibs. Bomb. Fl. (1861) 296; Aitchis. Cat. Panjab PL (1869) 165; Duthie Grasses N. W. Ind. (1883) 29, Fodder Grasses N. Ind. (1888) 40, t. 68; Miq. Fl. Ind. Bat. III, 375; Hook, f. Fl. Brit. Ind. VII (1896) 247; Cooke Fl. Bomb. II (1908) J017.

*Agrostis diandra* Retz. Obs. V (1789) 19; Roxb. Fl. Ind. I (1832) 317.  
*Vilfa erosa* Trin. in Mem. Acad. Petersb. ser. VI, Sc. Nat. II (1840) 86.  
*V. Retzii* Steud. Nom. ed. II, II (1840) 768, Syn. Pl. Glum. (1855) 162.

**Vernacular name** : Chireya-ka-dana.

**Etymology** : *Sporobolus* is derived from the Greek *spora*, a seed ; and *bolus*, a throw or cast. — *Diander* means having 2 stamens.

**Description** : Annual or perennial; stems tufted, 30-90 cm. high, slender, smooth; nodes glabrous. Leaves 10-25 cm. by 1-1\*6 mm., with filiform tips, flat or convolute, smooth, strongly nerved ; sheaths smooth, ribbed, the lower short, the upper very long; ligule a very narrow ridge of minute hairs.

Panicle reaching 25 by 5 cm., erect, narrowly pyramidal; i-hachis slender, quite smooth; branches capillary, erect or spreading, naked at the base 0-6-5 cm. long, with numerous very minute spikelets racemosely arranged along the branchlets. Spikelets 1-2-1-4 mm. long; pedicels very short. Glumes 3; lower involucral glume very short, scarcely 0-5 mm. long, broadly" oblong, nerveless, hyaline, with erose tip; upper involucral glume about 0-8 mm. long, broadly elliptic-oblong, hyaline, obscurely 1-nerved; floral glume 1-2-1\*4 mm. long, broadly ovate-oblong, subacute, 1-nerved; palea plicate in the median line. Stamens 2. Grain obovoid, truncate, obtusely quadrangular, umbonate by the loose pericarp, red-brown, rugulose.

**Locality** : *Sind*: Jamesabad, fields (Sabnis B927 !).

*Gujarat*: Ahmedabad (Sedgwick!).

*Konkan*: Bombay (Blatter 5267 !).

*W. Ghats*: Khandala (McCann 5409 !); Panchgani (Blatter & Hallbeyg B1318 !); Londa (Bhide!).

*Deccan*: Deolali (Blatter 4549!); Chattarshinji Hill, Poona (Ezekiel!, Jacquemont 352); Eatraj Ghat (Shevade !).

*S. M. Country*: Dharwar (Sedgwick 2658 !).

*N. Kanara*: Dandeli, 1,800 ft., rainfall 100 in. (Sedgwick & Bell 4221!).

**Ecology** : A sporadic species. Common in the Dharwar Dist. Likes moist pasture ground.

**Distribution** : India, Ceylon, Asia, tropical Australia.

**Economic uses** : It is described as a favourite fodder grass for cattle and horses.

**Explanation of Plate 148** : *Sporobolus diander* Beauv.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea of floral glume.
- ti. Stamens, grain and styles.

## 2. SPOROBOLUS SLNDICUS Stapf.

*Sporobolus indicus* Stapf in Cooke El. Bomb. II (1908) 1018.

**Description** : A low perennial 10-12-5 cm. high ; roots stout, wiry ; stems densely tufted\* the barren ones subwoody, 2 mm. diam., clothed below with numerous withered leaf-sheaths, the flowering stems lateral from the barren ones, slender. Leaves pungent, those of the barren stems crowded, short, ovate-lanceolate to narrowly lanceolate, 6-13 mm. long, with spinous margins, those of the flowering stems narrowly linear, acuminate, distant, often with distantly spinous margins ; sheaths closely appressed to the stem, ribbed; ligule a very narrow ciliate membrane.

Panicle 2-2-5 cm. long, contracted, often spike-like; branches erect or ascending, filiform, densely clothed with spikelets. Spikelets 1-6-2 mm. long, ovoid, acute ; pedicels short. Glumes 3, hyaline; lower involucral glume 1 mm. long, ovate, acute, nerveless; upper involucral glume 1-2 mm. long, oblong, obtuse, nerveless ; floral glume 1-6 mm. long, ovate, obtuse (acute when folded), 1-nerved ; palea shorter than the glume, oblong, truncate. Stamens 2. Grain 0-8 mm. long, broadly obovoid, compressed, reddish brown.

**Locality** : *Sind*: 20 miles from Karachi (Woodrow).—We have not seen this species.

**Distribution** : So far endemic.

## 3. SPOROBOLUS INDICUS E. Br.

*Sporobolus indicus* E. Br. Prodi. (1810) 170; Link Hart. Reg. Berol. I (1827) 87 • Kunth Enum Pl t (1838) 211; Duthie Fodder Grasses N. Ind. (1888) 49; Hook. f. Fl. Brit.

Ind. VII (1896) 248; Trim. Fl. Ceyl. V, 261; Praia Beng. Pl. 1213; Cooke Fl. Bomb. II (1908) 1018; Haines Bot. Bit. and Or. (1924) 974.

*Agrostis indica* Linn. Sp. Pl. (1753) 63.

*A. elongate* Lamk. Ill. 1, 142.

*A. tenacissima* Jacq. Collect. I, 85, Ic. Rar. 3, 1, 16 (*exd. syn.*).

*Sporobolus tenacissimus* Beauv. Agrost. (1812) 26; Duthie Fodder Grasses N. Ind. (1888) 49.

*Vilfa capemis & elongate* Beauv. Agrost. (1812) 16; Trin. Gram. Diss. I, 154; Steud. Syn. PL Glum. (1855) 159.

*V. exilis* Trin. in Mem. Acad. Petersb. ser. 6, Sc. Nat. II (1840) 89.

*V. indica* Trin. ex Steud. Norm. ed. II, II (1840) 767, Syn. PL Glum. (1855) 162.

*V. tenacissima* H. B. & K. Nov. Gen. et Sp. I (1816) 138; Trin. Sp. Gram. Ic. t. 60.

**Hitchcock has separated 8. *berteroanus* and 8. *elongatus* from *S. indicus*.**

**Vernacular name:** Ghorla.

**Description :** Perennial; stems 60-90 cm. high, densely tufted, stout; internodes long; nodes glabrous. Leaves mostly crowded near the base, 30-60 cm. long, very slender, wiry, flexuous, convolute (rarely flat), with long filiform tips, quite smooth; sheaths smooth, ribbed; ligule a ridge of minute hairs.

Panicles 30-45 cm. long by 13-20 mm. broad, often interrupted; rachis slender, smooth; branches very short, densely crowded, erect, covered to the base with imbricate green spikelets. Spikelets 2-2\*5 mm. long; pedicels very short. Glumes 3; lower involucre glume about 0-5 mm. long, broadly oblong, nerveless, hyaline; upper involucre glume 1 mm. long, broadly oblong, hyaline, nerveless; floral glume 2-2.5 mm. long, broadly ovate, 1-nerved; palea plicate in the median line. Stamens 3. Grain 1\*2 mm. long, obovoid, quadrangular, truncate, unilobate by the loose pericarp, red-brown, rugulose.

**Locality :** *W. Ghats:* Castle Eock, 1,600 ft., rainfall 250 in. (Sedgwick 2851!),

*Deccan:* Ghattarshinji Hill, Poona (Ezekiel!); Lina Hill, Nasik Dist. (Blatter A59 !); Kolhapur (Woodrow).

**Ecology :** A sporadic grass. It grows well on almost any kind of land, but does best on rich moist soil. It stands drought well. It is a widespread ruderal species in warm countries.

**Distribution :** Most warm countries.

**Economic uses :** Considered a good fodder grass, especially when young. "In the United States this grass is of considerable value for grazing purposes if frequently cut or grazed down, but if allowed to remain untouched long, cattle and horses will not eat it unless they are very hungry, as it becomes tough and unpalatable. It is not used to any considerable extent for hay, but makes splendid feed if cut while young and as a pasture plant." (Duthie).

#### 4. SPOROBOLUS MINUTIFLORUS Link.

*Sporobolus minutiflorus* Link Hort. Reg. Berol. I (1827) 88; Kunth Enum. PL I (1838) 214;

Hook, f. Fl. Brit. Ind. VII (1896) 248; Cooke Fl. Bomb. II (1908) 1019.

*Vilfa minutiflora* Trin. Gram. Diss. 1, 158; Steud. Syn. Gram. 158.

*V. capillaris* W. & A. ex Wight. Cat. no. 2036 (*non* Miq.).

*7. mangahrica* Hochst. ex Miq. Anal. Bot. II, 24; Steud. 1. c. 158.

*7. tenuissima* Schult. Mant. II, 47.

*Panicum tenuissimum* Mart, ex Schrank in Denkschr. Bot. Ger. Regensb. II (1822) 26.

**Etymology :** *Minutiflorus* means having minute flowers.

**Description :** Stem 60-90 cm. high, slender, smooth; nodes glabrous. Leaves 15-25 cm, by 2-3 mm., flat, finely acuminate, with smooth margins; sheaths long, ribbed, smooth; ligule a minute ring.

Panicle 30-45 cm. long, reaching 7-5 cm. broad, effuse, supra-decompound; branches capillary. Spikelets 1 mm. long, dark coloured. Glumes 3; lower involucre glume about 0-4 mm. long, subquadrate; upper involucre 0-5 mm. long, broadly ovate, subobtusely, nerveless; floral glume 1 mm. long, ovate-oblong, subobtusely, nerveless; palea shorter, broad, truncate. Stamens 3, quickly falling with age. Grain 0\*8 mm. long, obovoid, compressed.

**Locality :** *Konkan:* Bombay Island, very common (McCann 42961 36361); Parel (Woodrow); Mulgaum (McCann 3660 !).

*N. Kanara:* Dandeli, 2,000 ft., rainfall 100 in. (Sedgwick & Bell 4220 !); Eumpta (Chibber 1).

**Distribution :** W. Peninsula.

## 5. SPOROBOLUS IOOLADOS Nees.

*Sporobolus ioclados* Nees FL Afr. Austr. (1841) 161; Hook. f. Fl. Brit. Ind. VII (1896) 249; Gooke EL Bomb. II (1908) 1019.

**Description** : An elegant perennial grass; stems 25-45 cm, long, densely tufted, rather stout, erect, smooth, glabrous; nodes glabrous. Leaves 5-10 cm. by 2\*5-3 mm., flat or convolute, linear, tapering to a fine point; sheaths ribbed, glabrous, smooth; ligule a pubescent ridge.

Panicle 10-15 by 5-7-5 cm., ovate or subpyramidal, effuse; branches opposite, or alternate, or the lower whorled, spreading, remotely branched, filiform, smooth. Spikelets 2 mm. long, oblong-lanceolate, pale. Glumes 3; lower involucre glume 0\*8 mm. long, oblong-lanceolate, hyaline; upper involucre glume 14 mm. long, ovate, acute, 1-nerved; floral glume 2 mm. long, ovate-lanceolate, acute, 1-nerved; palea slightly shorter than the **glume**, oblong, obtuse. Stamens 3, anthers 0\*8 mm. long. Grain linear-oblong, 0\*8 mm. long.

Locality : *Sind* (Stocks).

**Distribution** : **S. Africa.**

## 6. SPOROBOLUS VIRGINICUS Eunth.

## PLATE 149.

*Sporobolus virginicus* Eunth Eev. Gram. I (1829) 67, Enum. Fl. I (1838) 210, Suppl. 167; Hook. f. PL Brit. Ind. VII (1896) 249.

*Agrostis virginica* Linn. Sp. PL (1753) 63; Labill. PL Nov. HoL I, 20, t. 23.

*A. barbata* Pers. Syn. I (1805) 75.

*A. littoralis* Lamk. HI. 161.

*A. pwngens* Pursh FL Am. Sept. 64.

*Podosemum virginicum* Link Enum. Hort. Berol. I (1827) 85.

*VUfa virginica* Beauv. Agrost. (1812) 16; Trin. Diss. 1,155; Sp. Gram. Ic. t. 48; Baker FL Maurit. (1877) 449.

*V. barbata* Beauv. 1. c.

7. *Uttoralis* Beauv. L c.

*Sporobolus Uttoralis* Eunth II. cc. 68, 213.

*Calotheca sabulosa* Steud. in Flora XII (1829) II, 488.

*Grypsis maritima* Munro ex Macowan in Cape Monthly Mag. N. S. III, 1871, Suppl. 7.

**Description** : Perennial. Stems erect or ascending from a decumbent woody creeping base, branched, hard and often tortuous at the base, 15-30 cm. high. Leaves strict, close-set, distichous, erect-patent, 2\*5-7-5 cm. long or more, narrow and almost terete from the involute tip, pungent, very pale, glabrous or scabrous above, striate; sheaths terete, short or long; ligule of long soft hairs.

Panicle 2-5-10 cm. long, elongate, narrow, subspiciform, interrupted, very pale; branches very short. Spikelets 2-5-2 mm. long, very shortly pedicelled, crowded. Glumes 3, all 1-nerved, keels glabrous or obscurely scabrid towards the tip. Involucre glumes oblong-lanceolate, acute, the lower shorter than the upper. Palea oblong, narrowly truncate. Grain broadly obovoid, with a pericarp loosened if moistened.

**Locality** : *Kathiawar*: Porbandar (Clubber I). Chibber was the first to find this species on the shores of continental India.

**Ecology** : This is a variable seashore plant.

**Distribution** : India, Ceylon, westward to Africa and America, eastward to Australia.

**Explanation of Plate 149** : *Sporobolus virginicus* Eunth.

1. Lower invol. glume.
2. Upper invol. glume.
3. Floral glume.
4. Palea of floral glume.

## 7. SPOROBOLUS OLAUOIFOLIUS Hochst.

## PLATE 150.

*Sporobolus glaudfolius* Hochst. in Flora XXV, pt. 1 (1842) Beibl. 133 (*nomen nudum*); Hook. f. Fl. Brit. Ind. VII (1896) 250; Cooke Fl. Bomb. II (1908) 1019.

*Vilfaglaucifolia* Steud. Syn. PL Glum. (1855) 154.

7. *scabrifolin* Hochst. ex Edgew. in Journ. linn. Soc. VI (1862) 196; Aitchis. Cat. Panjab, PL (1869) 165.

*Agrostis barbata* p, *senegaknsis* Pers. Syn. I (1805) 76.

*A. littoralis* (3, Lamk. III. 161; Poir. Encycl. Suppl. I, 251.

**Etymology** : *Ohfucifolius* means having glaucous leaves.



**СПОРОБОЛС ВІРГІНІЦС КУНТІІ.**

*Delin: H. K. Biele.*





*Onobolus muetifolius* HOCUST

Delin: R. K. Bhide.

**Description** : Perennial; stems 30-45 cm. long, densely tufted, leafy ; nodes glabrous. Leaves 3-8-12-5 cm. by 2-5-3 mm., narrowed from a subcordate base to an acuminate tip, strict, glaucous, flat or undulate, not pungent; sheaths ribbed, glabrous ; ligule a line of hairs.

Panicle 7-5-12-5 cm. long, contracted, interrupted, pale yellowish white ; branches short, erect. Spikelets crowded, 2 mm. long; pedicels very short. Glumes 3 ; lower involucre glume 1\*6 mm. long, lanceolate, hyaline, acutely acuminate, 1-nerved ; upper involucre glume 2 mm. long, broader than the lower, ovate-lanceolate, acutely acuminate, hyaline, 1-nerved ; floral glume 1-6 mm. long, ovate, acute, 1-nerved ; palea as long as the glume. Stamens 3 ; filaments very short; anthers 0-8 mm. long.

**Locality**: *Sind*: Mirpurkhas (Bhide!); fallow fields (Sabnis B1191 !); Jacobabad Bhide); Magarpir, near Karachi (Sabnis B224 !); Karachi (Woodrow 18).

*Kathiawar*: Porbandar (Woodrow 21 !).

*Gujarat*: Road to Gogha (Chibber!); dry ricefields, Chaudola, Ahmedabad (Sedgwick!).

*Konkan*: Bombay, fore-shore (Sedgwick 2568 !); Sion (McCann 3677 !).

*S. M. Country* : Khanapur, 2,500 ft., rainfall 60 in. (Sedgwick 3011!).

**Ecology** : Grows chiefly on sandy salt land and fallow fields.

**Distribution** : Punjab, Sind, tropical Africa.

**Explanation of Plate 150** : *Sporobolus glaudfolius* Hochst.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea of floral glume.
6. Grain and styles.

#### 8. SPOROBOLUS TREMULUS Kunth.

*Sporobolus tremulus* Kunth Rev. Gram. I (1829) 67, Enum. Pl. I (1838) 210, Suppl. 166 ; Hook. f. Fl. Brit. Ind. VII (1896) 250 ; Sedgwick & Saxton in Rec. Bot. Surv. India VI, 219 ; Haines Bot. Bih. and Or. (1924) 974.

*Agrostis tremula* Willd. Sp. Pl. I, 372 (*exd. syn.*).

*A. juncea* Lamk. Bncycl. I, 60, 111. t. 41, fig. 2.

*A. tenacissima* Roxb. Fl. Ind. I (1832) 316 (*exd. syn.*).

*Vilfa tremula* Trin. Diss. I, 155.

*V. geniculata* Nees *ex* Steud. Syn. Pl. Glum. (1855) 156.

*F. orientalis* Wight Cat. no. 1745 (*partim*).

*Sporobolus geniculatus* Nees *ex* Aitchis. Cat. Panjab Pl. (1869) 165.

*S. orientalis* Trim. Cat. Ceyl. Pl. 108 (*non* Kth.).

**Etymology** : *Tremulus* means trembling.

**Description** : A small grass, 2-5-30 cm. high, erect or prostrate, wiry, strict, often tufted, from a hard, knotted stoloniferous stock, stolons 15-45 cm. long, stout or slender, leafy, flexuous. Leaves short, 1-5 cm. long, rigid, subulate or filiform, flat or convolute, pungent, narrowed from the usually hairy base to the tip, margins smooth. Ligule a few hairs.

Panicle narrow, 2-5-10 cm. long, subspiciform, sometimes longer, flexuous and interrupted, with erect branches, rarely a few spreading. Spikelets crowded, 1-5 mm. long, articulate on very short pedicels half their own length or less, very pale; rhachilla readily disarticulate above the lowest glumes and these also separately falling. Glumes all 1-nerved. Lower involucre glume about f of the floral glume, lanceolate; upper involucre glume and floral glume subequal. Palea as long as its glume. Stamens 3. Grain oblong.

In habit it resembles *Cynodon* and is liable to be passed over.

**Locality** : *Gujarat*: Sides of the Chandola Tank which are submerged in the monsoon (Sedgwick!).

*S. M. Country*: Kunnur, margins of tanks, 2,000 ft., rainfall 35 in. (Sedgwick & Bell 4936 !); Marrikop, margins of tanks, west of Dharwar, 1,800 ft., rainfall 35 in. (Sedgwick & Bell 4495!); Ranibennur, grass/ plains near water (Bhide!).

**Ecology** : Grows on grassy margins of tanks. A gregarious plant.

**Distribution** : India, Ceylon, Burma, Tonkin, Cambodia.

#### 9. SPOROBOLUS ORIENTALIS Kunth.

*Sporobolus orientalis* Kunth Enum. Pl. I (1838) 211; Dalz. & Gibs. Bomb. Pl. (1861) 295; Hook. f. Fl. Brit. Ind. VII (1896) 251; Cooke Fl. Bomb. II (1908) 1020; Duthie Fodder Grasses N. Ind. (1883) 49 ; Trim. Fl. Ceyl. V, 263.

*Agrostis orientalis* Nees Agrost. Bras. 393 (*exd. syn.* Roxb.).

*A. tenacissima* Linn, f. Suppl. (1781) 107 (*exd. syn.* Jacq.).

*A. elongate* Roth Nov. Sp. PL (1821) 41.

*Vilfa orientalis* Nees ex Trin. in Mem. Aoad. Petersb. ser. VI, Sc. Nat. II (1840) 65; Steud. Syn. PL Glum. (1855) 156.

*V. diandra* Trin. Diss. 1,154 (*exd. syn.* Retz.).

*Sporobolus humifusus* Trim. Cat. Ceyl. PL 108 (*non* Kunth).

**Vernacular name** : Shapia, Kal, Usar-ki-ghas.

**Description** : Stoloniferous, growing on saline soils; stolons stout or slender, rooting at the nodes; stems 15-45 cm. high, stout at the base, hard, branching; branches and flowering stems usually geniculate below. Leaves coriaceous, variable, 2-5-20 cm. by 2-5-4 mm., usually more or less pungent, tapering to the tip, glabrous or hairy above and with scabrous or subserrulate margins; sheaths close, glabrous; ligule a slender ciliate membrane.

Panicle narrow, oblong; branches 13-20 mm. long, suberect. Spikelets 2-5 mm. long. Glumes 3, hyaline; lower involucre glume 0-7 mm. long, ovate-oblong, obtuse, nerveless; upper involucre glume 2-5 mm. long, ovate, subobtuse, 1-nerved; floral glume ovate-oblong, obtuse, scarcely longer than the upper involucre glume, 1-nerved; palea ovate-oblong, obtuse, slightly shorter than the glume.

Locality: *Gutch*: Earie Roa (Blatter 3771!).

*Gujarat*: Prantij Taluka, low grounds liable to inundation (Sedgwick!); Umrat, on salt land (Woodrow!).

*Konhan*: Bassein (McCann 4481!).

*N. Kanara*: Karwar, borders of ricefields (Talbot 1531!).

**Ecology** : This grass grows in dry, sandy or saline soils. See Duthie, Fodder Grasses of N. India 49.

**Distribution** : Punjab, W. Peninsula, Ceylon.

**Economic uses** : Considered as good fodder grass.

#### 10. SPOROBOLUS PILIFERUS Eunth.

##### PLATE 151.

*Sporobolus piliferus* Kunth Enum. Pl. I (1838) 211; Hook. f. FL Brit. Ind. VII (1896) 251 •  
Cooke Fl. Bomb. II (1908) 1020.

*Vilfa pilifera* Trin. Diss. I, 157, II, 23, Sp. Gram. Ic. t. 58.

*Sporobolus ciliatus* Munro in Herb. Ind. Or. Hook, f. & T. *ex* Hook, f. Fl. Brit. Ind. VII (1896) 251; Duthie Grasses N. W. Ind. (1883) 29 (*non Vilfa dliata* Presl).

*Triachyrum nilagiricum* Steud. in Hohen. Pl. Ind. Or. no. 931.

**Etymology** : *Piliferus* means hair-bearing.

**Description** : Annual; stems 7-5-30 cm. high, tufted, erect; roots fibrous. Leaves 2-5-10 cm. by 1-6-2-5 mm., chiefly radical, narrowed from the base to a fine point, flat or convolute, with scabrid or subserrulate margins; sheaths hairy at the mouth; ligule a minute narrow line.

Panicle linear, 2-5-7-5 cm. long, strict, erect, dense-flowered, often interrupted; branches very short, erect. Spikelets 1-6-2 mm. long, pale brown; pedicels short. Glumes 3; lower involucre glume 1-2 mm. long, ovate-lanceolate, hyaline, nerveless; upper involucre glume 2 mm. long, oblong-lanceolate, 1-nerved, slightly longer than the floral glume; floral glume 1-6 mm. long, oblong, obtuse, 1-nerved, palea oblong. Stamens 2. Grain ellipsoid, compressed, with a very loose pericarp, reddish brown.

**Locality** : *W. Ghats*: Panchgani, Tableland, 4,300 ft., rainfall 60 in. (Sedgwick & Bell 4693 !, Blatter & Hallberg B1319! B1320 !, McCann!).

8. *M. Country*: Dharwar (Bhide!); Belgaum (Bitchie 836).

**Ecology** : A subgregarious plant.

**Distribution** : W. Himalaya, Khasia Hills, Nilgiris, W. Peninsula, Malacca.

**Explanation of Plate 151** : *Sporobolus piliferus* Kunth.

1. Spikelet.
2. Lower invol. glume.
8. Upper invol. glume.
4. Floral glume.
5. Palea of floral glume.
6. Stamens, ovary and styles.



SPOROBOLDS PILIFERITS KDNTH.



SPOROBOLUS PALLIDUS BOISS.

Delin: B. K. Thida.

## 11. SPOROBOLUS PALLIDUS Boiss.

## PLATE 152.

*Sporobolus pallidus* Boiss. Fl. Or. Y (1884) 514 (*non* Lindl.); Aitchis. Cat. Panjab PL (1869) 165 (*excl. syn.*).

*VUfa pattida* Nees *ex* Trin. in Mem. Acad. Petersb. ser. VI, Sc. Nat. II (1840) 62; Steud. Syn. PL Glum. (1855) 155.

*Sporobolus arabwus* Boiss. Diagn. PL ser. I, XIII (1853) 47; Hook. f. FL Brit. Ind. VII (1896) 252; Cooke Fl. Bomb. II (1908) 1020.

*VUfa arabica* Steud. l. c. 241.

Hook. f. calls the synonymy of this plant a perplexing one, "owing to the double use of the specific name *pallidus*, and to the fact of *VUfa* being now regarded as a synonym of *Sporobolus*. This name (*pallidus*) was applied by Nees in 1840 to the Arabian plant described above, under *VUfa*; and by Lindley in 1848 to a very different Australian one, under *Sporobolus*. Bentham (Fl. Austral. VII, 623), assuming that Nees had referred his plant to *Sporobolus*, renamed Lindley's *S. Lindleyi*. Lastly, Boissier, when he founded his *S. arabicus*, was not aware that it was Trinius's *VUfa pattida*, which he erroneously cites in FL Orient., under *Sporobolus pallidus*, Trin. In this case the proper course appears to me to be to retain the name *Sp. pallidus*, Lindl., for the Australian plant, and *Sp. arabicus*, Boiss., for the Arabian and Indian." In spite of these reasons we have to call this species *S. pallidus* Boiss., as *VUfa pallida* Nees is the oldest name for the Indo-Arabian species. Another name will have to be found for the Australian plant.

**Etymology** : *Pallidus* means pale.

**Description** : Perennial; stems many from a woody stoloniferous base, sometimes as thick as the middle finger, and sending out rigid often geniculate stolons and stout or slender flowering branches 15-60 cm. high. Leaves 2-5-25 cm. by 3-4 mm., rigid, narrowed to the tip from the rounded base, flat or convolute, scaberulous above, with finely ciliate-serrulate margins; sheaths glabrous; ligule a fringe of hairs.

Panicle 5-15 cm. long, effuse; branches whorled, capillary, reaching 3-8 cm. long, naked below, with spikelets spicately arranged on the short branchlets. Spikelets 2-5 mm. long; pedicels short. Glumes 3; lower involucral glume 0\*8 mm. long, ovate, subobtusate, hyaline, nerveless; upper involucral glume 2\*5 mm. long, oblong, obtuse, 1-nerved; floral glume as long as the upper involucral glume, oblong, obtuse, 1-nerved; palea as long as the glume. Grain subglobose.

**Locality** : *Sind*: (Burns!); Laki (Bhide !); Mirpur Sakro (Blatter & McCann D672 ! D677 ! D678 !); Gharo (Blatter & McCann D673 ! D676 !); Tatta (Blatter & McCann D674 ! D675!); Jemadar ka Landa, near Karachi (Stocks 663); Karachi (Woodrow); between Karachi and Nagar Peer (Wykeham Perry).

**Distribution** : Punjab, Waziristan, Bajputana Desert, Afghanistan, Baluchistan, Arabia.

**Explanation of Plate 152** : *Sporobolus pallidus* Boiss.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea of floral glume.
6. Stamens and grain.

## 12. SPOROBOLUS SCABRIFOLIUS Bhide.

*Sporobolus scabrifolius* Bhide in Journ. & Proc. As. Soc. Beng. new ser. VIII (1912) 312, pi. XXV; Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 33 (1929) 485.

**Etymology** : *Scabrifolius* means having scabrous leaves.

**Description** : Stems erect, 20-75 cm. high. Nodes glabrous. Leaves 2-5-12 cm. long, 3-9 mm. broad, lanceolate, rounded or subcordate at the base, hairy on both surfaces with bulbous based hairs, margins slightly thickened and spinulosely serrulate; sheaths glabrous; ligule a fringe of hairs.

Panicle 7-5-17-5 cm. long, 2-5-9 cm. diam.; branches whorled or fascicled, a few solitary ones or twins intervening. Spikelets about 1 mm. long. Glumes 3; involucral ones empty, ovate, acute, membranous, 1-nerved, the lower one § the size of the upper; flowering glume just a little shorter than the upper involucral, ovate, acute, membranous, 1-nerved, apleate, bisexual; pale shorter than the glume. Stamens 3; styles 2; stigmas plumose. Grain rounded, slightly beaked at the extremities; lodicules minute.

**Locality** : *S. M. Country*: Banibennur (Bhide!); Haveri (Talbot 2176!).

**Distribution** : So far endemic.

## 13. SPOROBOLUS COROMANDELIANUS Link.

## PLATE 153.

- Sporobolus coromandelianus* Link Hort. Reg. Berol. I (1827) 89 (*in nota*); Kunth Rev. Gram. I (1829) 68 ; Dalz. & Gibs. Bomb. Fl. (1861) 296 ; Hook. f. Fl. Brit. Ind. VII (1896) 252 ; Cooke Fl. Bomb. II (1908) 1021; Haines Bot. Bih. and Or. (1924) 975.
- Agrostis coromandeliana* Retz. Obs. IV (1786) 19; Vahl Symb. I, 10; Roxb. Fl. Ind. I (1832) 316.
- A. indiai* Forsk. Fl. Aeg.-Arab. (1775) 104.
- VUfa corotnandeliana* Beauv. Agrost. (1812) 15; Trin. Sp. Gram. Ic. t. 11 (*omittens gluman involucris inferiorem*); Steud. Syn. PL Glum. (1855) 153.
- V. commxdata* Trin. Diss. 1, 156.
- V. discospora* Trin. in Mem. Acad. Petersb. ser. VI, Sc. Nat. II (1841) 59.
- F. Soxburghii* Nees ex Trin. 1. c.
- V. Roxburghiana* Nees ex Wight Cat. no. 1742 ; Steud. Nom. ed. II, II, 59.
- Sporobolus commutatus* Kunth Enum. I, 214 ; Miq. Fl. Ind. Bat. III, 376 (*exd. syn. pulchello*) ; Boiss. Fl. Or. V (1884) 513; Aitchis. Cat. Panjab PL (1869) 165 ; Duthie Grasses N. W. Ind. (1883) 29.
- S. discosporus* Nees FL Afr. Austr. (1841) 158.
- Triachyrum cordofanum* Hochst. ex Steud. Syn. PL Glum, (1855) 176.

**Description** : Annual, densely tufted; stems 10-30 cm. long, erect, ascending or often spreading from the root, copiously leafy at the base. Leaves 2-5-7-5 cm. by 3-6 mm. linear-lanceolate, narrowed from the subcordate base to the acuminate tip, spinulosely toothed especially towards the base; lower sheaths short, terete or compressed, the upper long, hairy at the mouth; ligule a narrow membrane fringed with long fine hairs.

Panicle 5-10 by 2-5-6-3 cm., ovate or pyramidal; branches capillary in rather distant whorls of 3-6, horizontally spreading, naked below, sparingly shortly divided upwards, bearing short minute red spikelets about 1-2 mm. long on short pedicels. Glumes 3, hyaline; lower involucral glume very minute, suborbicular, nerveless; upper involucral glume 1-2 mm. long, ovate-oblong, subacute, 1-nerved ; floral glume as long, oblong, obtuse, 1-nerved; palea as long as the glume. Stamens 3 ; anthers small. Grain broadly ellipsoid, compressed, smooth, enclosed in the loose somewhat fleshy reticulate pericarp, pale reddish brown.

**Locality** : *Sind*: Jemadar ka Landa, near Karachi (Stocks).

*Gujarat*: Shady places at Dhansura, Modasa-Petha (Sedgwick!).

*Khandesh*: Bor, Bori River (Blatter & Hallberg 4426!).

*Konkan* : Kennedy seaface, Bombay (Sabnis 4295 !); Bombay (Law).

*Deccan*: Poona, College Farm (Khomne!); Gungapur (Blatter A56 !).

*8. M. Country*: Dharwar, 2,400 ft., rainfall 34 in. (Sedgwick 2832 !).

**Ecology** : A sporadic species. Common in the Camatic.

**Distribution** : Punjab, Orissa, Burma, W. Peninsula, Ceylon, Afghanistan, Africa.

**Explanation o! Plate 153** : *Sporobolus coromandelianus* Link.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea.
6. Stamens and grain.

## TRIBE XI: Eragrosteae,

Spikelets pedicelled and variously paniced, or sessile or subsessile in spikes (or spike-like racemes) which are racemosely arranged on an elongated common axis. Florets usually numerous (1 in *Leptochba* sp.) and far exserted from the involucral glumes. Involucral and floral glumes rather similar in general appearance. Floral glumes membranous to subcoriaceous, very often olive-green or olive-grey, entire or slightly emarginate with the nerves evanescent above or percurrent to obscurely excurrent, mucous, mucronulate, very rarely with a very short awn from below the tip (*Diplachne* sp.).

See key page xix.



**BPOROBOLUS COROJANOELIANUS LIN'F.**

*Detin: R. K. Bhide.*



81. ERAGROSTIS Beauv.<sup>1</sup>

Annual usually slender glabrous grasses of various habit; stems erect or ascending. Leaves narrow; ligule usually reduced to a line of hairs.

Spikelets 2-many-flowered, in open or contracted panicles (rarely spicate), strongly laterally compressed, ovate-oblong or linear, not (or rarely) articulate on their pedicels on a simple terminal rhachis; rhachilla disarticulating above the involucre glumes and between the floral ones, or tough and persistent, not produced beyond the upper floret. Glumes many, broad, obtuse, acute or mucronate, never awned, thin, dorsally rounded and keeled; involucre glumes much shorter than the spikelet, equal or unequal, empty, persistent or separately deciduous, 1- (rarely 3-) nerved, usually membranous; floral glumes imbricating, at length deciduous from the rhachilla, 3-nerved, all 2-sexual or the uppermost and rarely the lowest imperfect, ovate to lanceolate, membranous to chartaceous, usually glabrous, the lateral nerves short, not reaching the midnerve; paleae equal to their glumes or slightly shorter, membranous, 2-keeled, deciduous or persistent on the rhachilla. Lodicules 2, small, cuneate, more or less fleshy. Stamens 3 (rarely 2). Styles distinct; stigmas plumose, laterally exerted. Grain minute, globose, oblong, ovoid or obovoid, free in the glume and palea.

Species about 250.—Tropical and temperate regions.

Cooke describes 15 species. Of these *Eragrostis cynosurcrides* Beauv. has been put under *Desmostachya*. The other species are being retained, with the exception that *E. tenella* var. *viscosa* Stapf is considered as a distinct species (*E. viscosa*). Of 4 species the names had to be changed, viz., *E. rupestris* is substituted for *E. ciliata*, *E. amabilis* is here called *E. unioides*. *E. stenophylla* becomes *E. mitans*, and *E. maior*, *E. dianensis*. *E. papposa* and *E. brachyphylla* are new to the Presidency.

## A. Spikelets panicle.

## AA. Rhachilla of spikelets more or less jointed and breaking up from above downwards.

- I. Panicle spiciform, compact, 5-7-5 cm. by 8 mm.; rhachis bearded at the nodes; margins of flowering glumes ciliate . . . . . 1. *E. rupestris*.
- II. Panicle open or more or less contracted; margins of flowering glumes not ciliate.
  1. Spikelets 5 mm. long; panicle large, lax, thyrsioid, 20-50 by 10-15 cm. . . . . 2. *E. aspera*.
  2. Spikelets 2-5 mm. long; panicle short, compact, cylindric, 12-40 mm. long . . . . . 3. *E. ciliaris*.
  3. Spikelets 2-5-4 mm. long; panicles 5-20 cm. long.
    - a. Grain ovoid. Stamens 3.
      - aa. Not sweet-scented . . . . . 4. *E. tenella*.
      66. Sweet-scented . . . . . 5. *E. viscosa*. \*
    6. Grain obovoid. Stamens 2 . . . . . 6. *E. interrupta*.

## BB. Rhachilla of spikelets tough, persistent; flowering glumes falling away from its base upwards.

- I. Spikelets flat, ovate-elliptic or oblong; lateral nerves of flowering glumes very prominent, straight, almost percurrent; paleae deciduous with their glumes . . . . . 7. *E. unioides*.
- II. Spikelets less compressed, linear or linear-oblong; lateral nerves less prominent. When spikelets compressed or lateral nerves prominent, then with persistent paleae.
  1. Spikelets more or less fascicled on the primary or secondary branches or shortly pedicellate in narrow racemes.
    - a. Leaves glaucous; grain oblong . . . . . 8. *E. gangetica*.
    6. Leaves not glaucous; grain globose or nearly so . . . . . 9. *E. nvtans*.

<sup>1</sup> Hitchcock ascribes the genus to Host because Host was the first to describe a species of *Eragrostis* (*Gram. Anstr.* 4 (1800) 1\*, pi. 24). Host, however, did not give a diagnosis of the genus and so we retain Beauvois who first diagnosed the genus, l. c.

2. Spikelets not fascicled; long-pedicellate, more or less divaricate when ripe.
- a. Leaf-margins glandular.
- aa. Lower involucrel glume 1-3-nerved; upper 3-nerved . . . . . 10. *E. cilianensi*\*.
- bb. Both involucrel glumes 1-nerved . . . . . 11. *E. minor*.
- b. Leaf-margins eglandular; involucrel glumes 1-nerved.
- aa. Spikelets versatile, 2\*5 cm. long or longer, narrowly linear; branches of panicle solitary . . . . . 12. *E. tremula*.
- bb. Spikelets small, 4 mm. long or less.
- § Mouth of leaf-sheath naked . . . . . 13. *E. tenuifolia*.
- §§ Mouth of leaf-sheath bearded.
- \* Perennial. Grain obovoid . . . . . 14. *E. papposa*.
- II Annual. Grain ellipsoid . . . . . 15. *E. pihsa*.
- B. Spikelets distichously spreading, secund, in a long, simple terminal spike.
1. Keels of palea distinctly winged . . . . . 16. *E. bifaria*.
2. Keels of palea not winged . . . . . 17. *E. brachyphylla*.

## 1. ERAGROSTIS RUPESTRIS Steud.

*Eragrostis rupestris* Steud. Syn. PL Glum. (1855) 265.

*Poa rupestris* Roth Nov. PL Sp. (1821) 71.

*Eragrostis ciliata* Nees Agrost. Bras. (1829) 512, Obs. 1 (*nomen nudum*); Wight Cat. no. 1788; Steud. Syn. Pl. Glum. (1855) 265; Dalz. & Gibs. Bomb. El. (1861) 298; Hook. f. Fl. Brit. Ind. VII (1896) 313; Cooke EL Bomb. II (1908) 1022; Haines Bot. Bih. and Or. (1924) 956.

*Poa ciliata* Roxb. Fl. Ind. I (1832) 334.

**Etymology** : *Eragrostis* is derived from the Greek *eros*, love, and *agrostis*, grass, in allusion to the loose dancing spikelets.—*Rupestris* means rocky, a habitat name.

**Description** : Perennial; stems 30-75 cm. long, erect or geniculately ascending, terete. Leaves linear-lanceolate, finely acuminate, spreading, 5-15 cm. by 2-5-4 mm., flat or convolute, smooth, glabrous; sheaths bearded at the mouth; ligule of a few hairs.

Panicle spiciform, 5-7\*5 cm. by 8 mm., cylindrical, compact; branches much shortened; rhachis finely bearded at the nodes. Spikelets 2-5-4 mm. long, much compressed, 6-12-flowered. Involucrel glumes ovate, acute, hyaline, ciliate; floral glumes 1-6-3\*2 mm. long, broadly ovate, cuspidately acuminate, subhyaline, very minutely scaberulous, the margins ciliate and the nerves prominent; palea shorter than its glume with ciliate keels. Grain ovoid to ellipsoid, 0\*5 mm. long, terete.

**Locality** : *Gujarat*: Dorcas, near Surat (Dalzell & Gibson).—We have never come across this species.

**Distribution** : India, Cochin-China.

## 2. EKAGROSTIS ASPERA Nees.

*Eragrostis aspera* Nees EL Afr. Austr. (1841) 408; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 3&6; Hook. f. EL Brit. Ind. VII (1896) 314; Cooke El. Bomb. II (1908) 1023.

*E. paniculata* Steud. Syn. Gram. 278.

*Poa pankulata* Roxb FL Ind. I, 340.

*P. aspera* Jacq. Hort. Vindob. III (1770-76) 32.

**Etymology** : *Aspera* means rough.

**Description** : Annual; stems 20-50 cm. high (excluding the panicle), stout, suberect, usually tufted, smooth and shining; nodes glabrous. Leaves 20-45 cm. by 4-6 mm., linear, flat, glabrous; sheaths bearded at the mouth, otherwise glabrous; ligule a fringe of long hairs.

Panicle lax, open, thyrsoform, oblong to obovate-oblong, 20-50 by 10-15 cm., rhachis terete, scaberulous, bearded at the nodes; branches solitary or falsely whorled, capillary, loosely and repeatedly divided from near the base; pedicels longer than the spikelets, very slender. Pedicels scattered, linear-oblong, 5 by 1 mm., erect, 4-16-flowered; rhachilla very slender breaking up. Involucrel glumes subequal, oblong, obtuse, 1 mm. long, 1-nerved;

floral glumes about 1-6 mm. long, obliquely ovate-oblong, with, prominent nerves; palea obscurely and obtusely 3-lobed, the keels scabrid. Stamens 3; anthers 0-5 mm. long. Grain subglobose, about 0.4 mm. diam.

**Locality** : *KonJan* (Lisboa!).

*S. M. Country*: Hubli, in water-hole, 2,000 ft., rainfall 30 in. (Sedgwick & Bell 4230 I); in a small tank near Dharwar, 2,500 ft., rainfall 34 in. (Sedgwick 1814!); common in the water-holes in the Naval Tract (Sedgwick).

*N. Kanara* (Lisboa!).

**Ecology** : Very abundant in muddy places where water stagnates. A subgregarious species.

**Distribution** : W. Peninsula, S. India, Ceylon, tropical and S. Africa, ~~Isle of France, Mauritius.~~

### 3. ERAGBOSTIS CILIARIS Link.

#### PLATE 164.

*Eragrostis dliaris* Link Hort. Reg. Berol. I (1827) 192; Boiss. EL Or. V (1884) 582; Baker EL Maurit. (1877) 456; Duthie Grasses N. W. Ind. (1883) 37, Fodder Grasses N. Ind. (1888) 62; Aitchis. Cat. Panjab PI. (1869) 169; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 380; Hook, f. EL Brit. Ind. VII (1896) 314; Cooke Fl. Bomb. II (1908) 1023.

*Poa dliaris* Linn. Sp. PI. (1753) 102.

*Eragrostis lobata* Trin. in Mem. Acad. Petersb. ser. VI, I (1831) 396.

*E. lepida* Hochst. ex A. Rich. Tent. Fl. Abyss. II (1851) 424.

*E. plumosa* Boiss. Fl. Or. V (1884) 582 (*exd. syn.*).

*E. pulchella* Parl. in Hook. Niger Fl. (1841) 186.

*E. arabica* Jaub. & Spach. III. PI. Or. IV, 31, t. 322.

*Megastachya dliaris* Beauv. Agrost. (1812) 74.

Stapf (in Hook, f. Fl. Brit. Ind. 1. c.) distinguishes 2 varieties:

a. *var. dliaris proper* Stapf. Panicle spiciform, more or less lobed or interrupted.

b. *var. brachystachya* Boiss. Fl. Or. V, 582. Panicle short, compact, cylindric.

In our opinion the many intermediate forms make it practically impossible to keep up this varietal distinction. The above synonymy and the following description are such as to include both varieties.

**Vernacular names** : Undar-puncho, Tor chandbol, Burbudi.

**Etymology** : *Ciliaris* means ciliate, alluding to the long-ciliate keel of the pale.

**Description** : Annual. Stem 15-60 cm. high, procumbent below and geniculately ascending, slender, glabrous, smooth. Leaves very narrow, flat, tapering to a fine point; sheaths striate, usually bearded at the mouth with long hairs; ligule a fringe of short hairs.

Panicle 1-15 cm. long, spiciform, more or less lobed or interrupted, or short, compact and cylindric, appearing hairy from the long cilia of the paleae; branches very short, divided from the base, glabrous; nodes of glabrous rhachis naked; pedicels very short, glabrous. Spikelets 2-5 mm. long and broad, crowded, 6-12-flowered, strongly compressed, very pale; rhachilla breaking up. Involucral glumes subequal, ovate-lanceolate, acute, 1-5 mm. long. Floral glumes about 1 mm. long, oblong, subtruncate, mucronulate, spreading, lateral nerves submarginal. Paleae equal to their glumes and falling with them, the keels with long rigid cilia. Stamens 3; anthers very short. Grain elongate-ovoid, about 0.5 mm. long.

**Locality** : *Bind*: Karachi (Burns!); Jemadar Ea Landa, near Karachi (Stocks); Mirpurkhas (Sabnis B1175 !); Mirpurkhas Farm, Mankad (Herb. Econ. Bot. !); Jamesabad, in fields (Sabnis B1109!); Nasarpur, clayey soil (Sabnis B1058); Sanghar (Sabnis B757!); Tatta (Blatter & McCajm D649!).

*Cutch*: Bhuj Hill (Blatter!).

*Kaihiaivar*: Porbandar (Bhide !).

*Gujarat*: Baroda (Woodrow); Domas, near Surat (Bhide 1); Nadiad (Chibber!); Broach (Woodrow !); Sungiri (Gammie 16553 !); Perim Isl., Gulf of Cambay (Blatter!).

*Khandesh*: Taner, Tapti bank (Blatter & Hallberg 5166 !); Nim, Tapti bed (Blatter & Hallberg 5400 !); Tapti Isl. near Bor, on sand and mud (Blatter & Hallberg 4394 !); Bor, Bori Eiver (Blatter & Hallberg 4423!); Amalner, Bori River (Blatter & Hallberg 5114!).

*Konkan*: St. Xavier's College, compound (McCann 4596! 4527!) ; Alibag, -sandy shore (Ezekiel!).

*Deccan*: Trimbak, Nasik Dist. (Chibber 1).

*N. Kanara*: Honavar (McCann!).

**Ecology** : Grows generally in sandy soil. This grass which is abundant at Surat, is not found in the Carnatic.

**Distribution** : India, Arabia, tropical Africa and America.

**Economic uses** : Affords good grazing, wherever it is found in sufficient quantity.

**Explanation of Plate 154** : *Eragrostis ciliaris* Link.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea.
6. Grain.

4. ERAGROSTIS TENELLA P. Beauv.

*Eragrostis tenella* P. Beauv. ex Roem. & Schult. Syst. II (1817) 576 ; Stapf in Hook. f. Fl. Brit. Ind. VII (1896) 315; Cooke Fl. Bomb. II (1908) 1023.

*Poa amabilis* Linn. Sp. Pl. (1753) 68.

*Poa tenella* Linn. Sp. Pl. (1753) 69.

A. Camus in Lecomte's Flore G n rale de l'Indo-Chine has adopted the name *Eragrostis amabilis* for this species. Mr. Hubbard of Eew has informed us that, according to the Vienna Rules of nomenclature (Art. 46) this does not seem to be correct. *Poa amabilis* Linn. is the same as *Poa tenella* Linn., and *Eragrostis tenella* P. Beauv. ex Roem. & Schult. is based on *Poa tenella* Linn. Apparently Stapf (in Hook. f. F. B. I. VII, 315) was the first to unite the two species ; as the name first used when the species were united takes precedence over the other, we have to retain the name *E. tenella* P. Beauv.

**Vernacular names** : Dhane, Bharbhuri, Bharbusi, B ra-churbhura, Ichooi.

**Etymology** : *Tenella* means tender, delicate.

**Description** : Usually a small, very elegant and slender annual grass, very variable, rarely 45 cm. high. Stems many, slender, densely tufted. Leaves slender, narrow, acuminate, attaining 12 cm. by 5 mm., usually much less ; sheaths long-ciliate near the mouth.

Panicles decompound, excessively branched, 5-20 cm. long, contracted or spreading, pale green or purplish, oblong-ovate or cylindrical, never with the long interrupted rachis and pseudo-verticillate branches of *E. interrupta*. Spikelets innumerable, minute to small on capillary branchlets and pedicels, 1-4 mm. by 1 mm. or less, not strongly compressed, 3-9-flowered. Involucral glumes subequal or unequal. Flowering glumes oblique, not mucronate, lateral nerves remote from the margins; keels of palea usually obscurely ciliate. Stamens 3. Grain broadly ovoid, pale brown, polished.

VAR. FLUMOSA Stapf.

PLATE 155.

*Vdr. flumosa* Stapf in Hook. f. Fl. Brit. Ind. VII (1896) 315 ; Cooke Fl. Bomb. II (1908) 1024 ; Haines Bot. Bih. and Or. (1924) 957.

*Eragrostis plumosa* Link Enum. Hort. Berol. I (1827) 192 (*non* Boiss.); Duthie Grasses N. W. Ind. (1883) 38, Fodder Grasses N. Ind. (1888) 64, t. 38, 77 ; Aitchis. Cat. Panjab PL (1869) 170 ; Lisboa in Journ. Bomb. Nat. Soc. VI (1893) 385.

*Poa plumosa* Retz. Obs. IV (1786) 20; Kunth Enum. PL I (1838) 338 ; Roxb. FL Ind. I (1832) 337.

*P. tenella* Linn. Sp. Pl. (1753) 69 ; Burm. Fl. Zeyl. t. 47, fig. 3 ; Retz. Obs. V (1789) 19.

*P. despiciens* Link Enum. Hort. Berol. I (1827) 88.

*Eragrostis despiciens* Schult. Mant. II, 318.

**Description** : Stems tufted, sometimes reaching 40 cm. high and more, and as well as the panicle eglandular. Panicle delicate, open, often flexuous ; branches capillary, rachis bearded at the nodes; pedicels distinct, often long. Spikelets 1-2.4 mm. long, 3-9-flowered, rachilla subarticulate. Involucral glumes unequal, the lower distinctly shorter than the upper. Floral glumes less than 1 mm. long. Keels of the palea pectinately ciliate with long hairs. Anthers minute. Grain ovoid, less than 0.5 mm. long.

**Locality** : *Sind*: Mirpurkhas, on banks of dry watercourse (Sabnis B1023!).

*Gujarat*: Surat (Bhide !, Woodrow).

*Khandesh*: Bor, Tapti Island, sandy mud (Blatter & Hallberg 4395!); Umalla, Tapti bank (Blatter & Hallberg 5230!); Chanseli (McCann 9978!).

*Konkan*: Common (Lisboa); Byculla, common in Bombay Island (McCann Al 1); Uran (Hallberg & McCann 5124! 5131!).

*Deccan*: Sholapur (D'Almeida 9977!); Poona (Cooke, Woodrow).

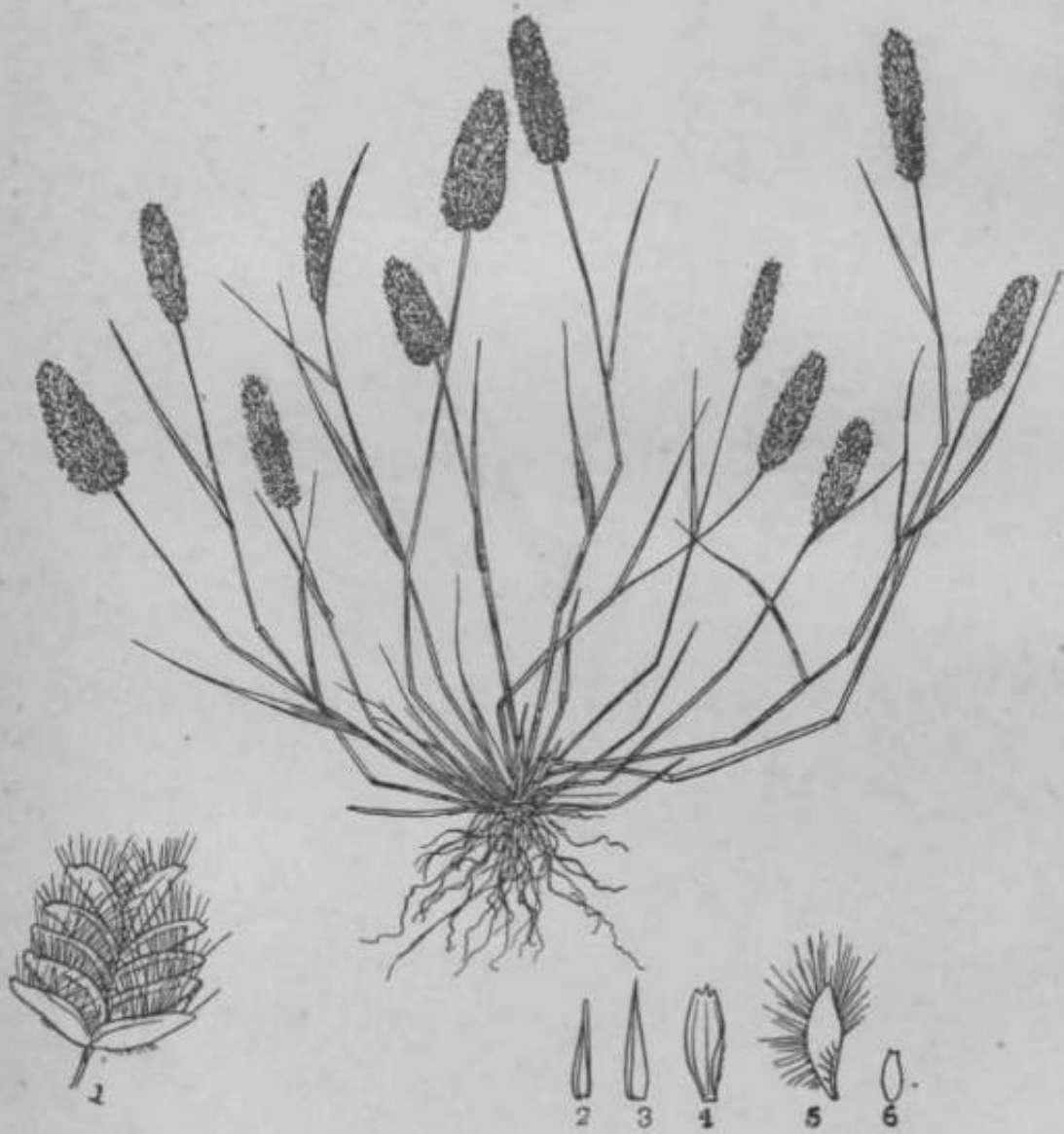
*8. M. Country*: Dharwar, 2,400 ft., rainfall 34 in. (Sedgwick 2830!) • Yelvim 1 800 ft, rainfall 30 ip. (Sedgwick 2035!); Badami (Bhide!); Gokak (Shevad  1) -

*N. Kanara*: Falyal (Talbot 2383!).



ERAGBOSTIS TENELLA P. BEAUV. VAR. FLUJMOsa &TA>c.

Delin: R. K. Bh...



ERAGROSTIS CILIARIS

Delin.:

**Ecology** : A subgregarious species. Common in pasture ground.

**Distribution** : Throughout India and Ceylon.

**Economic uses** : Eaten by cattle both fresh and dry. The grain is said to be nutritious\*

**Explanation of Plate 155** : *Eragrostis tenella* Beauv. var. *plumosa* Stapf.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Falea.
6. Grain.

*Var. riparia* Stapf in Hook. f. FL Brit. Ind. VII, 315 ; Cooke. Fl. Bomb. II (1908) 1024.

Cooke included this variety on the authority of Graham (Cat. Bomb. Fl. p. 236, under *Poa Tenella*). Graham does not give any locality; Cooke has not seen any specimens from the Presidency, and we have not found it anywhere in our area. We, therefore, drop this variety.

#### 5. ERAGROSTIS VISCOSA Trin.

*Eragrostis viscosa* Trin. in Mem. Acad. Petersb. ser. 6, I (1831) 397; Dalz. & Gibs. Bomb. FL (1861) 298; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 386; Haines Bot. Bilu and Or. (1924) 957.

*Poa viscosa* Betz. Obs. IV (1786) 20; Roxb. Fl. Ind. I (1832) 336; Grah. Cat. Bomb. PL (1839) 236; Eunth Enum. PL I (1838) 336.

*Eragrostis tenella* var. *viscosa* Stapf in Hook. f. FL Brit. Ind. VII (1896) 315; Cooke Fl. Bomb. II (1908) 1024.

**Vernacular names** : Bhurbur, Bhurbusi, Chikti, Bhulni, Chipal.

**Etymology** : *Viscosa* means viscid, alluding to the microscopic glands on many parts of the plant.

**Description** : A tufted, sweet-scented grass, 15-40 cm. high, the panicles occupying the greater part of the plant. Stem and rhachis of panicle, pedicels and glumes with scattered microscopic glands. Leaves mostly convolute, erect-patent, 2-5-3-5 cm. long with rigid tips, base and mouth of sheath with very long cilia.

Panicles dense, cylindrical or oblong, 7-13 cm. long and up to 3-5 cm. broad. Branches very numerous, more or less spreading, equal, sometimes opposite or 2-nate, but never in interrupted whorls as in *E. interrupta*; rhachis usually glabrous, rarely obscurely bearded at the nodes\* Spikelets 5-20-flowered, often purplish, usually about 3 mm. long; rhachilla readily breaking up. Involucral glumes nearly equal or the lower very slightly shorter than the upper. Floral glumes broadly ellipsoid, obtuse or rounded, with the keel minutely scaberulous. Palea nearly as long as the glume, rigidly ciliate on the keels. Grain pale brown, polished, about 0-5 mm. long.

Locality : *Kaihiawar*: Junagad (Blatter 3282 ! 3791!).

*Khandesh*: Bor, Bori River (Blatter & Hallberg 4430!); Amalner, Bori River (Blatter & Hallberg 5113 !); Nim, Tapti bank (Blatter & Hallberg 3829!); Dadgaum (McCann All I).

*JConkan*: Malabar Hill, Bombay.

*W. Ghats*: Ehandala; Panchgani (Blatter & Hallberg B12801).

*S. M. Country*: Dastikop, fields, 2,500 ft., rainfall 35 in. (Sedgwick & Bell 1898!).

*N. Kanara*: Sulgeri, 500 ft., rainfall 200 in. (Sedgwick & Bell 3250!); Birchy (Talbot 2102!).

**Ecology** : A subgregarious species. Common in damp places.

**Distribution** : From the Gangetic Plains southward, Ceylon, tropical and S. Africa.

**Economic uses** : Eaten by cattle both fresh and dry.

#### 6. ERAGROSTIS INTERRUPTA Beauv.

*Eragrostis interrupta* Beauv. Agrost. (1812) 71 (*non* Roem. & Schult. *neque* Trin.); Stapf in Hook. f. Fl. Brit. Ind. VII (1896) 316; Cooke Fl. Bomb. II (1908) 1024; Haines Bot. Bih. and Or. (1924) 957.

*Poa interrupta* Lamk. III I, 185; Poir. Encycl. V, 87; Heyne *ex* Roth Nov. Sp. (1821) 67; Koen. *ex* Roxb. FL Ind. I (1832) 335.

*Poa Koenigii* Eunth Enum. PL I (1838) 346.

*Eragrostis Koenigii* Link Enum. Hort. Berol. II, 294; Steud. Syn. PI. Glum. (1855) 260.

- Eragrostis interrupta* Beauv. var. *Koenigii* Stapf in Hook. f. Fl. Brit. Ind. VII (1896) 316; Cooke Fl. Bomb. II (1908) 1024; Haines Bot. Bih. and Or. (1924) 957.
- E. hapalantha* Trin. in Mem. Acad. Petersb. ser. VI, I (1839) 409 (*partim*).
- E. minutiflora* Presl. Bel. Haenk. I (1830) 274 (*excl. syn.*); Lisboa in Journ. Bomb. Nat. Hut. Soc. VII (1893) 386.
- E. mossulensis* Steud. Syn. Pl. Glum. (1855) 264.
- E. nvtans* Nees in Wight Cat. no. 1776; Steud. Norn. ed. II, I (1840) 563; Duthie Grasses N. W. Ind. (1883) 38, Fodder Grasses N. Ind. (1888) 63, t. 76; Lisboa l. c. 381; Boiss. FL Or. V (1884) 583.
- E. Bothii* Steud. Syn. 1. c. 267.
- E. stricta* Steud. 1. c. 264.
- E. vertidllata* Nees in Wight Gat. no. 1784.
- Poa nutans* Koen. ex Both 1. c. 64; Boxb. Fl. Ind. I (1832) 335 (*non* Betz.).
- P. diarrhena* Schult. Mant. 616.
- Eragrostis diarrhena* Steud. Syn. 1. c. 266.
- E. interrupta* var. *diarrhena* Stapf 1. c.
- Poa diandra* Boxb. 1. c. 336 (*non* Br.).
- Eragrostis diandra* Aitchis. 1. c. 169 (*non* Steud.); Duthie Grasses N. W. Ind. 37
- Diplachne elongata* Hochst. ex Steud. 1. c. 268.
- Eragrostis diplachnoides* Steud. 1. c.
- E. interrupta* var. *diplachnoides* Stapf 1. c.
- E. caudate* Nees ex Steud. 1. c. 264; Duthie Grasses N. W. Ind. (1883) 37.
- E. japonica* Trin. in Mem. Acad. Petersb. ser. VI, I (1831) 405.
- E. tenellu* p, Boem. & Schult. Syst. II (1817) 356.
- E. tenella* Benth. Fl. Hongk. (1861) 431, Fl. Austral. (1878) VIII, 643 (*non* Beauv.); Duthie Fodder Grasses N. Ind. (1888) 65, t. 78.
- E. teneUula* Steud. 1. c. 279.
- E. tenuissima* Schrad. ex Nees Fl. Afr. Austr. (1841) 409, 410.
- E. interrupta* var. *tenuissima* Stapf 1. c.; Sedgwick & Saxton in Bee. Bot. Surv. Ind. VI, 219; Haines Bot. Bih. and Or. (1924) 958.
- Poa japonica* Thunb. Fl. Jap. (1784) 31.
- P. tenella* B. Br. Prodr. (1810) 181 (*non* Beauv.); Boxb. Fl. Ind. I (1832) 337.
- P. teneUula* Eunth Enum. PL I (1838) 338.

We have examined a great number of specimens from all parts of the Presidency. Most of them cannot be classed under any of the 4 varieties mentioned by Stapf. If we wanted, to classify them we would have to greatly multiply the number of varieties which could not be satisfactory neither from a theoretical nor practical point of view. Cooke puts the Bombay material under *E. interrupta* var. *Koenigii* Stapf. But then he has seen only one specimen from Surat. We have dropped all the varieties as can be seen from the above synonymy. The following description comprises them all.

**Vernacular names** : Pohe, Poche, Dhuria, Ghodila, Ghorila, Ghiksi, Madia, Shetpatra.

**Description** : A very variable slender grass from 5-90 cm., annual or perennial. Stems smooth and polished, tufted, geniculate and ascending from the base, branched or not, nodes glabrous. Leaves slender, up to about 25 cm. long, narrow, flat, glabrous; sheaths glabrous\*. close; ligule a fimbriate membrane.

Panicle exceedingly variable, up to 60 cm. long, either contracted with appressed branches or interrupted with many tiers of rather short spreading subwhorled branches (either long narrow with short dense suberect or erect-patent pseudo-whorls—or long effuse or contracted with solitary or 2-3-nate branches, simple or if branched the whorl rarely overtopped by 1 or 2 branches, ultimate branches not divaricate—or long loose narrow, usually stiff, branches pseudo-whorled, spreading, ramified from the base, branchlets and pedicels divaricate—or long linear-oblong, branches up to 5 cm. long, hardly whorled, simple at the base, etc.). Spikelets usually very minute, from 1-6 mm. long, ovate to linear, few to many-flowered. Flowering glumes obtuse, nerves slender, green or pale brown, rarely coloured, keels of palea scaberulous or smooth. Stamens 2. Grain obovoid.

**Locality** : *Sind*: Pad-Idan (Sabnis B513 !); Mirpurkhas, fallow fields (Sabnis B1175!) • Jamesabad (Sabnis B1164!); Ganja Hill, near Hyderabad (Sabnis B996!); Bhagar, Indus River (Blatter & McCann D650!).

*Gujarat*: In water-holes (Dalzell & Gibson); Dangs, 800 ft., rainfall 100 in. (Sedgwick & Bell 5392!); Surat (Gammie 16436!, Woodrow, Cooke); Kabirwad, Broach Dist. (Chibber !); Nadiad (Chibber !); road to Lasandra (Chibber!).

*Khandesh*: Tapti, Bhusawal N. E. (Blatter & HaUberg 4437!) • Bor Tapti Isl., sand and mud (Blatter k HaUberg 54751); Nim, Tapti, left bank (Blatter\* & Hallbörg



5221 !); Amalner, Bori River (Blatter & Hallberg 4433!); Muravat, Tapti bank (Blatter & Hallberg 5151! 5205 !); Bor (Blatter & Hallberg 5488 !); Chanseli Hill, northern slope (McCann 9986 !); Umalla, Tapti bank (Blatter & Hallberg 5214 !); Toranmal (McCann 9976 / 9995!).

*Konkan:* Tisgaon, near Kalyan (Garade !); Borivli to Kanari Caves (McCann 9989!); Vehar Lake (McCann 9996 !); Pen (McCann 8556 !); Kase Dohan, Thana Dist. (Ryan 1920 !); Ghatkopar, Horse-shoe Valley (McCann 9994 !); Parel (McCann 5417 !); Sion (McCann 5246 !); Bassein (Lisboa); Thana (Lisboa); Alibag, rocky river-bed (Ezekiel!).

*W. Ghats:* Khandala, very common in fields (McCann 9998 I); Khandala to Karjat (Blatter & Hallberg 5322 !); Igatpuri (Blatter & Hallberg 5193 !); Tangawadi, Igatpuri (Blatter & Hallberg 3834 !); Castle Rock, on banks of a tank (McCann 9393 !).

*Deccan:* Bhowdan, near Poona (Woodrow); Bahuli, 14 miles N. W. of Poona (Woodrow); Ganeshkhind Botanic Gardens (Gammie !); Trimbak (Chibber!); Dhond, along river (Bhide 1349!); Barsi River (Gammie 15766!); Bairawadi, Purandhar (McCann 5056!); Lohagad (McCann 9987 !); Vaslang, Sholapur (D'Almeida 9980!).

*8. M. Country:* Margin of tanks, Yelvigi, 1,800 ft., rainfall 28 in. (Sedgwick & Bell 3612 !); Dharwar, 2,400 ft., rainfall 34 in. (Sedgwick & Bell 4975 !); Dastikop, 2,500 ft., rainfall 35 in. (Sedgwick 2135!).

*N. Kanara:* Halyal, 1,800 ft. (Talbot 2100!) ; Kincholi (Talbot 944!).

**Ecology :** A subgregarious species. Grows in good damp soil near the banks of rivers and streams, in water-holes and borders of rice-fields. The colour of the inflorescence is very variable and also the angle at which the branches spread.

**Distribution :** India, Ceylon, tropical Asia and Africa.

**Economic uses :** Eaten by cattle when other food is not to be had. Considered to be a good fodder for buffaloes in Khandesh.

#### 7. ERAGROSTIS UNIOLOIDES Nees.

##### PLATE 156.

*Eragrostis unioloides* Nees ex Steud. Syn. PL Glum. (1855) 264; Duthie Grasses N. W. Ind. (1883) 38, Fodder Grasses N. Ind. (1888) 65 ; Aitchis. Cat. Panjab Pl. (1869) 170 ; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 383 ; Griseb. in Goett. Nachr. (1868) 76.

*Poa unioloides* Retz. Obs. V (1786) 19 ; Roxb. FL Ind. I (1832) 339; Kunth Enum. Pl. I (1838) 335 ; Grah. Cat. Bomb. Pl. (1839) 236.

*P. muUiflora* Roxb. 1. c. 338.

*P.\* polymorpha* R. Br. Prodr. (1810) 180.

*P. rubens* Lamk. 111. 1, 184, t. 45, fig. 2 ; Kunth 1. c. 335.

*Eragrostis amabilis* Wight & Arn. ex Nees in Hook. & Arn. Bot. Beech. Voy. 251 (*non* Linn.); Nees in Act. Acad. Nat. Cur. XIX. Suppl. I (1843) 205; Stapf in Hook. f. EL Brit. Ind. VII (1896) 317; Cooke EL Bomb. II (1908) 1025; Haines Bot. Bih. and Or. (1924) 958.

*E. polymorpha* Trin. ex Steud. Norn. ed. II, I (1840) 364, 562.

*E. rubens* Hochst. ex Miq. Anal. Bot. II, 26 ; Steud. Syn. Pl. Glum. (1855) 265.

*Brixa rubra* Lamk. 111. I, 187 ; Kunth 1. c. 371.

*Uniola indica* Spreng. Syst. I (1825) 349; Dalz. & Gibs. Bomb. Fl. (1861) 298.

*Megastachya polymorpha* Beauv. Agrost. (1812) 74.

Mr. Hubbard of Kew has helped us with regard to the synonymy of this species. He says in a letter: " The combination *E. amabilis* Wight & Arn. is based on *Poa amabilis* Linn., but the majority of the references, the description and the specimens refer to a different plant which has for a long time been known under this name. It cannot however be called *E. amabilis* Wight & Arn. and the next name for it is *Eragrostis unioloides* Nees (*Poa unioloides* Retz.). The fact that the name *E. amabilis* has been applied to a different species might be used as additional justification for rejecting it."

**Vernacular names :** Poi, Poke, Moti chava, Ghoti laniya, Laniya.

**Etymology :** *Unioloides* means resembling *Uniola*.

**Description :** Annual, glabrous; stem 15-45 cm. long, tufted, slender, erect or geniculately ascending, leafy chiefly at the base; internodes long. Leaves 7-5-15 cm. by 2-5-4 mm., narrowed from a broad subcordate base to an acute tip, smooth; sheaths smooth, glabrous; ligule 0 or obscure.

Panicle oblong or ovoid, 5-10 cm. long, sparingly branched; rachis and nodes glabrous. Spikelets 4-6 mm. long, compressed, ovoid-elliptic or oblong, 20-50-flowered, shortly pedicellate, often purple ; rachilla tough, internodes very short. Glumes elegantly distichous, spreading, keeled ; involucre glumes subequal or the upper slightly longer than the lower, 1-1\*6 mm, long, ovate, acute, 1-nerved ; floral glumes broadly ovate or suborbicular, mucronulate, 2 mm.

long, punctulate; palea shorter than its glume and deciduous with it. Stamens 3; anthers minute. Grain obovoid or ellipsoid, laterally compressed, about 0.8 mm. long, orange-brown, smooth.

**Locality** : *Sind*: Mirpur Sakro (Blatter & McCann D651!).

*Konkan*: Fen (Bhide!, McCann!); very common in the Bombay and Salsette Islands (McCann!); Aligbag (Ezekiel!); Uran (HaUberg & McCann 5130!); Parel, Bombay Island (Woodrow); Bassein (Woodrow).

*W. Ghats*: Igatpuri (Blatter & Hallberg 5192!, McCann!); Khandala, very common (Blatter 4375! 5440!, McCann!); Lonavla (Woodrow 165!); Panchgani (Blatter 5387!, Blatter & Hallberg B1243!); Mahableshwar (Talbot 4511!); Castle Bock (Gammie 15723!).

*Deccan*: Batfawadi, Purandhar (McCann 8739!); Lohagad, way up (McCann 9504!); Eatraj Ghat (Bhide!); Poona (Woodrow).

*S. M. Country*: Marshes north of Belgaum (Ritchie 846); Dharwar (Sedgwick 2114!).

*N. Kanara*: Earwar, sandy fields by the sea (Sedgwick & Bell 5086 !); Dud-sagar Falls (McCann 9985!).

**Ecology**: A sporadic species. A very hardy grass usually growing on foot-paths. Constant treading does not seem to affect its growth very much except that it becomes stunted. Very variable in size and colour of inflorescence. Graham calls it "the most elegant of grasses".

**Distribution** : India, Ceylon, tropical Asia.

**Economic uses** : A good grass for horses and cattle.

**Explanation of Plate 156** : *Eragrostis uniolooides* Nees.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea.
6. Grain.

#### 8. ERAGROSTIS GANGETIOA Steud.

*Eragrostis gangetica* Steud. Syn. Gram. (1855) 266; Trim. Fl. Ceyl. V, 293; Stapf in Dyer Fl. Cap. VII (1900) 617; Prain Beng. PL 1221; Cooke Fl. Bomb. II (1908) 1025; Haines Bot. Bill, and Or. (1924) 958.

*E. elegantula* Stapf in Hook. f. Fl. Brit. Ind. VII (1896) 318; Idsboa Bomb. Grasses (1896) 121.

*E. Brovmei* Nees ex Wight Cat. no. 1780 (*partim*); Duthie Grasses N. W. Ind. (1883) 36, Fodder Grasses N. Ind. (1888) 62.

*E. luzoniensis* Steud. l. c. 266.

*Poa chariis* Schult. Mant. I, 314.

*P. elegantula* Eunth Rev. Gram. I (1829) 340.

*P. degans* Eoxb. Fl. Ind. I (1832) 338.

**Vernacular names** : Todha, Asara, Chota asara, Ealuargi.

**Description** : Perennial; stems tufted, 30-90 cm. long, stout, smooth, shining, simple or branched, suberect. Leaves few, 5-20 cm. long, very narrow, convolute, rigid, quite smooth, glaucous, linear, tapering to a fine point; sheaths glabrous except the mouth which is sometimes bearded; ligule a minutely ciliolate rim.

Panicle oblong, 5-15 cm. long, nodding; branches solitary, rather distant, often long, suberect or the lower spreading; rachis glabrous; pedicels of spikelets short. Spikelets 4-6 mm. long, linear to linear-oblong, 10-30-flowered; rachilla tough, glabrous, persistent, the internodes short. Lower involucral glume 1.6 mm. long, ovate-oblong, acute, 1-nerved; upper slightly larger, 1-nerved; floral glumes broadly ovate, subacute, reaching to nearly 2-5 mm! long; palea deciduous, slightly shorter than its glume, with scaberulous keels. Stamens 3; anthers about 1 mm. long, yellow. Grain oblong, about 0.8 mm. long, brown.

"Very similar to *E. stenophyUa* in the character of the panicle and the slatey-blue spikelets but the longer striolate grain is correlated in all the specimens with the longer usually more acuminate glumes and slightly stouter pedicels than occur in *stenophyUa*." Haines.

**Locality** : *Konkan*: Vehear Lake (McCann 5096!); Campoli (McCann 94091).

*W. Ghats*: Igatpuri (Blatter & HaUberg 5198!); Khandala (McCann A101) • Khandala to Karjat (Blatter & Hallberg A3 !); Panchgani (Blatter & Hallberg B1218! B1276!) • Lingmala, Mahableshwar, 4,000 ft., rainfall 200 in. (Sedgwick & Bell 4654!) • Londa fBhirp iV

*Deccan*: Poona, Canal (Ezekiel!); Borkas, Mawal, Poona Dist. (Woodrow) on the margin of a tank, 2,000 ft., rainfall 30 in. (Sedgwick 3801!); Havasbhan, edge of a tank, 2,000 ft., rainfall 35 in. (Sedgwick 2110 I) • Tadas, tank, 2,500 ft., rainfall 35 in. (Sedgwick 19101); Dharwar, ricefield (Talbot 2637!) •



ERAGROSTIS UJTILOIDES NEES.

*Ddin; E. K. Bhide*



*ERAGROSTIS CUJANENSIS* (ALL.) LINK.

jMi»; S. K. Bhid



Kit AC. SUITES MINOR HOST.



ERAGROSTIS TREMULA HOCHST.

Bdin: S, S.. Bhid\*.

*N. Kanara*: Karwar (Talbot!); Halyal (Talbot 2381!); Tinai Ghat (Gammie 15808).

**Ecology** : A subgregarious species. Found in wet ground, very common on margins of tanks.

**Distribution** : Throughout tropical Asia and tropical Africa.

**Economic uses** : Eaten by cattle along with other grasses, either fresh or dry.

#### 9. ERAGROSTIS NUTANS (Retz.) Nees.

*Eragrostis nutans* (Betz.) Nees ex Steud. Nom. ed. 2 (1840) 563.

*Poa nutans* Retz. Obs. IV (1786) 19.

*Eragrostis stenophylla* Hochst. ex Miq. Anal. Bot. Ind. II (1851) 27; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 385; Stapf in Hook. f. Fl. Brit. Ind. VII (1896) 318 (*exd. aliq. syn.*); Prain Beng. Pl. 1221; Cooke Fl. Bomb. II (1908) 1026; Haines Bot. Bih. and Or. (1924) 959.

*E. Brownei* Nees in Wight Cat. (1833) no. 1780 (*partim*).

*JB. degantula* Nees l. c. 1781, a, p (now Steud.); Duthie Grasses N. W. Ind. (1883) 37, Fodder Grasses N. Ind. (1888) 63, t. 74.

**Vernacular names** : Fulia, Chikta, Chimanchara, Choti khidi, Jenkua, Ehari.

**Etymology** : *Stenophylla* means narrow-leaved.

**Description** : Perennial; stems densely tufted, 30-45 cm. high, erect or geniculately ascending, simple or branched; upper internodes long. Leaves 7.5-12.5 cm. long, very narrow, strict, rather stiff, usually convolute, smooth, quite flat, glabrous, not glaucous; sheaths smooth; ligule a narrow membranous line.

Panicle ovate, or oblong, or sublinear, suberect or nodding; branches rather distant, alternate, obliquely spreading when ripe, much divided upwards; rachis slender, smooth; pedicels of spikelets filiform. Spikelets 4-6 mm. long, linear-oblong, 20-30-flowered; rachilla zig-zag. Lower involucral glume 0.8 mm. long, ovate-oblong, subacute; upper involucral glume slightly longer, both hyaline, 1-nerved; floral glumes broadly ovate, subacute, about 1-6 mm. long, with smooth keels; palea linear-oblong, caducous with the glumes, the keels scabrid. Stamens 3; anthers minute. Grain globose or globosely ellipsoid, 2-5 mm. long, reddish brown, smooth.

**Locality** : *Khandesh*: Tapti Island, near Bor, on sand and mud (Blatter & Hallberg 5470!); Umalla, Tapti, on sand (Blatter & Hallberg 51801).

*Konkan*: Uran (Hallberg & McCann 5134!); Malwan (Woodrow).

*W. Ghats*: Khandala (McCann 5319!); Igatpuri (Blatter & Hallberg 5142 1); Panchgani (Blatter & Hallberg B1316!).

*Deccan*: Pashan, near Poona (Gammie!); Purandhar (McCann 5601!); Borkas, Mawal, Poona Dist. (Woodrow).

*S. M. Country*: Hbbudihal, on the margin of a tank (Sedgwick 2081!).

*N. Kanara*: Halyal (Talbot 2165!); Eulgi (Talbot 1).

**Ecology** : A sporadic grass. Very common in pastures in the Mallad tract of the Carnatic and as a garden weed.

**Distribution** : India, Ceylon, tropical Asia and Africa.

**Economic uses** : In Australia the plant is considered to be a good pasture grass.

#### 10. ERAGROSTIS CILIANENSIS (All.) Link.

##### PLATE 157.

*Eragrostis cilianensis* (All.) Link in Malpighia XVIII (1904) 386.

*Poa cilianensis* All. Fl. Pedem. II, 246, t. 91, fig. 2.

*Eragrostis maior* Host Gram. Austr. IV (1809) 14, t. 24; Hook. f. Fl. Brit. Ind. VII (1896) 320; Cooke Fl. Bomb. II (1908) 1026; Haines Bot. Bih. and Or. (1924) 959.

*E. flexuosa* Steud. Syn. Pl. Glum. (1855) 266; Duthie Grasses N. W. Ind. (1883) 37.

*E. megastachya* Link Enum. Hort. Berol. I (1827) 187; Kunth Bnum. Pl. I (1838) 333; Reichb. Ic. Fl. Germ. t. 91; Aitchis. Cat. Panjab Pl. (1869) 169; Duthie Grasses N. W. Ind. (1883) 38, Fodder Grasses N. Ind. (1888) 63, t. 75; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 382; Boiss. Fl. Or. V (1884) 580.

*E. muUiflora* Aschers. ex Boiss. l. c.

*Poa muUiflora* Forsk. Fl. Aeg.-Arab. (1775) LXI, no. 58, CiV, no. 69, p. 21.

*Eragrostis paeoides* Trin. in Mem. Acad. Petersb. ser. VI, I (1831) 404,

*E. vulgaris* var. *megastachya* Coss. et Dur. Fl. Alger. 148.

*Poa cilianensis* All. Fl. Pedem. II, 246, t. 91, fig. 2.

*P. ftecuosa* Roxb. Fl. Ind. I (1832) 339.

*P. Boxburghiana* Schult. Mant. II, 315.

*P. tortwosa* Spreng. Syst. Veg. I (1825) 345.

*Briza Eragrostis* Linn. Sp. PL (1753) 70; Schreb. Besch. Graes. II, 74.

*Poa Eragrostis* Cav. Ic. I (1791) 63, t. 92; Sibth. EL GTæc. t. 73.

*Megastachya Eragrostis* Beauv. Agrost. (1812) 74.

*Briza oblonga* Moench Meth. (1802) 185.

**Vernacular names** : Ban pohe, Pohe, Eaodia.

**Description** : Annual; stems 30-90 cm. high, usually stout and branched, leafy, erect or geniculately ascending, smooth, polished. Leaves reaching 20 cm. by 8 mm., narrowed to a fine point, flat, smooth, flaccid, glandular along the margins; sheaths sparingly bearded; ligule a ciliolate ridge.

Panicle 5-20 cm. long, erect, oblong or ovate-oblong, open or sometimes contracted, usually stiff; rachis strict, rather stout, smooth; branches spreading or suberect, capillary, stiff or flexuous, again branching from the near base, the branchlets short, capillary. Spikelets longer than their pedicels, usually crowded, ovate and 4-6 mm. long with 6-8 glumes, to linear-oblong rather narrowed upwards, and 8\*5-13 mm. long or more with many (up to 60) glumes, olive-grey or yellowish; rachilla tough, zigzag, the internodes short, smooth. Involucral glumes ovate, acute, with scabrid keels; lower smaller than the upper, 1- (sometimes 3-) nerved; upper slightly larger than the lower, 3-nerved; floral glumes broadly ovate, acute, sometimes apiculate, 2 mm. long, strongly nerved; palea obovate, much curved, shorter than its glume, with ciliolate keels. Stamens 3; anthers 0-4 mm. long. Grain globose, 0\*6 mm. diam., microscopically rugulose, reddish brown.

**Locality** : *Sind*: Sanghar (Sabnis B753! B897!); Mirpurkhas, on bank of dry water-course (Sabnis B1024!).

*Kathiawar*: Morvi (Woodrow).

*Gujarat*: Kibirwad, Broach (Gammie!).

*Khandesh*: Ghanseli, N. slope (McCann A14!); Nim, Tapti bank (Blatter & Hallberg 5109!); Umalla, Tapti sand (Blatter & Hallberg 5177!); Bor, Tapti sand (Blatter & Hallberg 5187!).

*Konkan*: Mahalazmi, Clerk Boad, along brackish water (Sabnis A13!).

*W. Ghats*: Ehandala, road (Blatter 5445!).

*Deccan*: Kannala, Sholapur Dist. (Mamlatdar of Kannala!); Purandhar (McCann 5039!); Eirkee (Gammie 896!); Poona (Jacquemont 349, Woodrow), Agricultural College Farm (Ezekiel!).

*S. M. Country*: Dharwar, 2,400 ft., rainfall 34 in. (Sedgwick 28341); Badami (Woodrow).

*N. Kanara*: Halyal (Talbot 2159!).

**Distribution** : India, Ceylon, westward to the Mediterranean, tropical and subtropical

**Abbr.**

**Economic uses** : Not used as fodder in this Presidency. Duthie says that it is used more or less as fodder.

**Explanation of Plate 157** : *Eragrostis cilianensis* (All.) Link.

1. Spikelet with part of rachis.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea.
6. Grain.

#### 11. ERAGROSTIS MINOR Host.

##### PLATE 158.

*Eragrostis minor* Host Gram. Austr. IV (1809) 15 *{in nota}* et in Fl. Austr. I (1327) 135; Stapf in Hook. f. FL Brit. Ind. VII (1896) 321; Cooke Fl. Bomb. II (1908) 1027; Haines Bot. Bih. and Or. (1924) 960.

*E. poaeiformis* Link Hort. Berol. I (1827) 188; Eichb. Ic. Fl. Germ. t 91

*E. poaeoides* Beauv. Agrost. (1812) 76; Duthie Grasses N. W. Ind. (1883) 38, Fodder Grasses N. Ind. (1888) 65; Aitchis. Cat. Panjab PL (1869) 170; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 387; Boiss. Fl. Or. V (1884) 580.

*E. poaeoides* p, Trin. in Mem. Acad. Potersb. ser. VI, I (1831) 404.

*Poa Eragrostis* Linn. Sp. PL (1753) 68 *{partim 1}*; Kunth Enum. PL I, 332; Schreb. Besch. Graes. II, t. 38; Host Gram. Austr. II, 50, t. 09.

*Briza Eragrostis* Vill. Fl. Delph. II, 50 *{rum Linn.}*.

**Vernacular name**: Sul.



**Description** : Annual; stems 15-45 cm. high, densely tufted, slender. Leaves 3-8-15 cm. by 2\*5-8 mm., linear, acute, usually glandular along the margins, flat; sheaths shortly bearded at the mouth; ligule a pubescent ledge.

Panicle oblong or ovate, rather stiff, 5-15 cm. long; rhachis glabrous; branches spreading when mature. Spikelets linear to ovate, 6 by 1-2 mm., up to 12-flowered, pale green to purplish or olive-grey; pedicels shorter than the spikelets, except the terminal ones; rhachilla tough. Involucral glumes subequal or the upper slightly larger, about 1\*2 mm. long, ovate, acute, 1-nerved; floral glumes about 1-6 mm. long, ovate, acute, strongly nerved; palea obovate-oblong, about 1 mm. long, shorter than the persistent glumes, the keels scabrid or slightly ciliate. Stamens 3; anthers about 0\*25 mm. long. Grain 0-5 mm. long or more, dorsally rounded or slightly flattened.

**Locality** : *Sind*: Jamesabad, in fields (Sabnis B1111!); Pad-Idan (Sabnis B510!); Larkana (Sabnis B476!); Sanghar (Sabnis B751! B752!).

*Gujarat*: Godra (Woodrow); Panch Mahals (Woodrow).

*Khandesh*: Umalla, Tapti sand (Blatter & Hallberg 5180!); Tapti Island near Bor, on sand and mud (Blatter & Hallberg 4449! 5470!); Manmad, Eedmond's garden (Blatter A12!); Tapti, Bhusawal, N. E. (Hallberg 5112!).

*Konkan*: Parel (McCann 5376!); Bombay (Lambert).

*W. Ghats*: Tangawadi, Igatpuri (Blatter & Hallberg 5835!).

*Deccan*: Purandhar (McCann 5601!); Bhimthadi, Poona Dist. (Mamlatdar of Bhimthadi!); Man, Satara Dist. (Mamlatdar of Man !); Poona (Jacquemont 350), Chattarshinji Hill (Ezekiel!); Nasik (Lisboa).

*S. M. Country*: Dharwar, 2,400 ft., rainfall 34 in. (Sedgwick & Bell 4487 !); Gokak Hills (Shevade!).

**Ecology** : Common at Dharwar as a garden weed. At Nasik " it grows in khar lands and has to be weeded out, or it destroys the rice plant." (Lisboa.)

**Distribution** : India, Afghanistan, tropical Africa.

**Economic uses** : Not known from the Presidency.

**Explanation of Plate 158** : *Eragrostis minor* Host.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea.
6. Grain.

## 12. ERAOBOSTIS TREMULA Hoehst.

### PLATE 159.

*Emgrostis tremula* Hoehst. in Schimp. Pl. Abyss, no. 6, in Flora (1842) I. Beibl., 134; Duthie Fodder Grasses N. Ind. (1883) 65, t. 79; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 382; Boiss. Fl. Or. V (1884) 581; Prain Beng. PL 1221; Stapf in Hook. f. Fl. Brit. Ind. VII (1896) 320; Cooke Fl. Bomb. II (1908) 1027; Haines Bot. Bih. and Or. (1924) 960.

*Poa tremula* Lamk. 111. I, 185.

*Eragrostis muhiflora* Trin. in Mem. Acad. Petersb. ser. VI, I (1841) 401; Dalz. & Gibs. Bomb. Fl. (1861) 298; Duthie Grasses N. W. Ind. (1883) 38; Aitchis. Cat. Panjab Pl. (1869) 169.

*Poa multiflora* Eoxb. Fl. Ind. I (1832) 338 (*non* Forsk.).

*Eragrostis rhachitricha* Hoehst. ex Miq. Anal. Bot. Ind. pt. II (1851) 25; Watt Diet. Econ. Prod. III, 256.

**Vernacular names** : Chiraka, Chirika ket, Ghirika chauvalia.

**Etymology** : *Tremula* means trembling. The very slender pedicels which support the long spikelets, give rise to the constant tremulous motion shown by this species.

**Description** : Annual; stems densely tufted, suberect, 15-60 cm. long. Leaves 5-12\*5 cm. by 2-4 mm., linear-lanceolate, tapering to a fine point; sheaths bearded at the mouth; ligule a minutely hairy line.

Panicle large, ovate, very diffuse; branches solitary, filiform; pedicels very slender, from the length of the spikelets to longer than them; rhachis glabrous or bearded at the nodes. Spikelets 2-5 cm. or more long, linear, narrower upwards, from 10-60-flowered. Involucral glumes subequal, 1\*2-1-6 mm. long, subobtusate, thin, 1-nerved; rhachilla tough, glabrous; palea glumes closely set, broadly ovate, subobtusate, 1-6-2 mm. long, with strong nerves; palea ovate-oblong, slightly shorter than its glume, persistent, with scabrid keels. Stamens 3; these minute. Grain scarcely 0\*5 mm. diam. globose or nearly so.

**Locality** : *Cutch*: Sumrasar (Blatter I).

*Kaihiawar*: Gogo (Dalzell & Gibson, Woodrow).

*Gujarat*: Sevalia (Clüßber!); Perim Island, Gulf of Cambay (Blatter!).

*W. Ghats*: Lonavla (Lisboa); Londa, on a rock in the river-bed (Bhide I).

*S. M. Country*: Gadag (Bhide!).

**Ecology** : A subgregarious species. It is a sand plant, very common in Gujarat sand. Reappears on sand in the estuary of the Eala Nuddi of N. Kanara. According to Roxburgh, it is found on dry elevated places.

**Distribution** : India, Afghanistan, tropical Africa.

**Economic uses** : Considered to be a good fodder at Ajmere. Not used in the Presidency.. The grain has been used at famine times in the Punjab.

**Explanation of Plate 159** : *Eragrostis tremula* Hochst.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea.
6. Grain,

#### 13. ERAGROSTIS TENUIFOLIA Hochst.

*Eragrostis tenuifolia* Hochst. in Flora 24 (1841) I. Intelligent. 20 (*nomen nudum*); Stapf in Hook. f. Fl. Brit. Ind. VII (1896) 322; Cooke Fl. Bomb. II (1908) 1027; Prain Beng-Pl. 1221.

*Poa tenuifolia* A. Kick Tent. Fl. Abyss. II (1851) 425.

*E. coUocarpa* E. Schum. in Engler's Pflanzenw. Deutsch.—Ost Afr. C. 114.

*E. farviglumis* Hochst. ex Steud. Syn. Pl. Glum. (1855) 268.

**Etymology** : *Tenuifolia* means narrow-leaved.

**Description** : Perennial; stem 60-90 cm. high, erect, slender, branched. Leaves long; very narrow ; mouth of sheath naked.

Panicle 7\*5-15 cm. long, oblong to ovate, very open; rhachis glabrous; branches solitary or 2-nate, distant. Spikelets 6 mm. long or less, linear, 5-15-flowered. Involucral glumes very unequal; lower minute, hyaline; upper remote from and larger than the lower, about 0-8 mm. long, ovate, subacute, usually nerveless; floral glumes 2 mm. long, ovate, subacute or apiculate; palea shorter than its glume, strongly curved, persistent, with scabrid keels. Stamens\* 3 ; anthers 1 mm. long. Grain 2 mm. long, obovoid-oblong, slightly compressed, dorsally grooved.

**Locality** : *W. Ghats*: Panchgani (Blatter & Hallberg B1313! B1317!).

*S. M. Country*: Belgaum (Ritchie).

*N. Kanara*: Dandeli, 1,800 ft., rainfall 100 in. (Sedgwick & Bell 4206 !).

**Distribution** : W. Peninsula, tropical Africa.

#### 14. ERAGROSTIS PAPPOSA Steud.

*Eragrostis papposa* Steud. Norn. ed. II, I (1840) 564; Stapf in Hook, f. Fl. Brit. Ind. VII (1896) 322.

*Poa papposa* Desf. in Boem. & Schult. Syst. II (1817) 585.

*P. nigra* Clem, ex Willk. & Lange Prodr. Fl. Hisp. I, 83.

*Eragrostis atro-virens* Lange in Koebj. Vedinsk. Meddel. (1860) (won Desf.).

*E. rigidifolia*-Hochst. Herb. Mem. Div. Forsk. (*nomen*).

*E. speirostachya* Coss. et Dur. ex Lange l. c.

*E. vulgaris* var. *speirostachya* Coss. et Dur. Fl. Alger. 148.

*E. verticillata* Coss. ex Lange l. c. (*non* Cav.).

**Etymology** : *Papposa* means having a pappus, alluding to the mouth of the leaf-sheath which is bearded with long silky hairs.

**Description** : An elegant perennial. Stems 30-50 cm. high, very slender, simple. Leave short, strict, very narrow, convolute ; mouth of sheath bearded with long silky hairs.

Panicle 10-20 cm. long, ovoid, very delicate, lax, open, sparingly branched; rhachis filiform, glabrous; branches solitary, alternate, rarely binate, spreading, almost capillary, below, loosely branched beyond the middle with capillary, spreading, stiff branchlets ; pedic long, capillary. Spikelets 4-8 mm. long, linear, 7-23-flowered, very pale yellow or dark or p\* olive-grey; rhachilla tough. Involucral glumes subequal or lower shorter, hyaline • lov involucral glume 1 mm. long, usually less, nerveless, upper slightly longer, faintly 1-nerv Flowering glumes broadly ovate, margins above hyaline, about 1-5 mm. long ; palea rat

shorter, obtuse, denticulate, persistent, keels scabrid. Stamens 3, anthers 0\*25 mm. long. Grain ob^void, about 0-5 mm. long, dorsally grooved.

**Locality** : *Sind* {ex Agharkar}.

**Distribution** : Punjab, Trans-Indus districts, westward to Arabia, N. Africa, Spain.

## 15. ERAGROSTIS PILOSA Beauv.

## PLATE 160.

*Eragrostis pilosa* Beauv. Agrost. (1812) 71; Reichb. Ic. Fl. Germ. t. 91; Duthie Grasses N. W. Ind. (1883) 38, Fodder Grasses N. Ind. (1888) 64; Aitchis. Cat. Panjab PL (1869) 170; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 381; Boiss. Fl. Or. V (1884) 581; Stapf in Hook. f. Fl. Brit. Ind. VII (1896) 323; Cooke Fl. Bomb. II (1908) 1028; Haines Bot. Bit. and Or. (1924) 960.

*Poa pilosa* Linn. Sp. Pl. (1753) 68; Host Gram. Austr. II, 168, t. 68.

*Eragrostis indica* Steud. Syn. Pl. Glum. (1855) 264.

*E. parviflora* Trin. in Mem. Acad. Petersb. ser. VI, I (1831) 411.

*E. pelvudda* Steud. l. c. 279.

*E. punctata* Link ex Steud. Norn. ed. II, I (1840) 561, Syn. Pl. Glum. (1855) 264.

*E. verticillata* Roem. & Schult. Syst. II (1817) 575; Reichb. Ic. Fl. Germ. t. 9; Aitchis. Cat. Panjab PL (1869) 170.

*Poa indica* Koen. ex Eottl. in Ges. Naturf. Fr. Berl. Neue Schrift. IV (1803) 194.

*P. parviflora et pellueida* R. Br. Prodr. (1810) 180.

*P. punctata* Linn. f. Suppl. (1781) 109; Kunth Enum. PL I (1838) 330; Roxb. FL Ind. I (1832) 338.

*P. verticillata* Cav. Ic. I, 63, t. 93; Kunth Enum. PL I (1838) 329.

**Vernacular names** : Burwai, Chiriaka-dana, Eutaki.

**Description** : Annual; stems 15-60 cm. high, tufted, erect or geniculately ascending, slender, flaccid. Leaves usually short and narrow (rarely elongate), generally convolute; sheaths appressed, glabrous, bearded at the mouth; ligule a softly hairy ridge.

Panicle 5-15 cm. long, erect or inclined, oblong to pyramidal, open or contracted; rhachis glabrous or hairy, filiform; branches fascicled or whorled, capillary, much divided. Spikelets scattered (not fascicled), 3-2-5 by 0\*8-1-2 mm., linear, 5-12-flowered, often purplish; pedicels longer or shorter than the spikelets; rhachilla tough, smooth, flexuous. Glumes all hyaline involucrel glumes very unequal; lower ovate, nerveless; upper much larger, ovate-lanceolate, acuminate, 1-nerved; floral glumes 1-6-2-5 mm. long; palea subpersistent, the keels scaberulous or nearly smooth. Grain ellipsoid, 1-4-1-7 mm. long, laterally apiculate at the base.

**Locality** : *Sind*: Sanghar (Sabnis B902 !).

*Konkan*: Byculla, common in Bombay Isl. (McCann A8 !); Karjat (Hallberg 3602 !); Kalyan (Garade !).

*W. Ghats*: Igatpuri (McCann 4590 !); Ehandala (McCann A7 !).

*Deccan*: Lina Hill, Nasik Dist. (Blatter & Hallberg 9975 !); Nasik (Lisboa); Deolali (Blatter & Hallberg 4559!); Gangapur (Blatter & Hallberg 4578!); Waghote, Mawal, Poona Dist. (Woodrow); Poona (Cooke), Chattarshinji (Ezekiel!); Ganeshkhind Bot. Gardens (Supt. of the Gardens !); Bairawadi, Purandhar (McCann 5068!).

*S. M. Country*: Dharwar (Sedgwick 2672 !, Woodrow).

**Ecology** : A sporadic grass. Grows usually in damp and swampy ground.

**Distribution** : Most warm countries.

**Economic uses** : Considered to be a good foddei. Liked by buffaloes.

**Explanation of Plate 160** : *Eragrostis pilosa* Beauv.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea.
6. Grain, stamens and style.

## 16. ERAGROSTIS BIFARIA Wight.

*Eragrostis bifaria* Wight ex Steud. Norn. ed. 2, I (1840) 562, Syn. Pl. Glum. (1855) 264, Suppl. 282; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 387; Stapf in Hook. f. FL Brit. Ind. VII (1896) 325; Cooke FL Bomb. II (1908) 1029.

*Poa bifaria* Vahl Symb. II, 19; Roxb. FL Ind. I (1832) 331; Kunth Rev. Gram. I (1829) 334, t. 80, Enum. PL I (1838) 327, Suppl. 282.

**Vernacular names** : Chiraka, Punya-sufed, Chota blankta, Moi.

Description : Perennial; stems 30-90 cm. high, densely tufted, erect, simple, subcompressed, glabrous, clothed at the base with the soft fibres of old sheaths. Leaves 5-10 cm. long, narrow, linear, acute, rigid, smooth; sheaths glabrous, keeled; ligule a pubescent line. Spikelets secund, distichously spreading in a long simple terminal spike 25-30 cm. long. Spikelets ovoid to oblong, 15-20-flowered, 6-8-5 mm/long (rarely linear, reaching 1\*7 cm. long and up to 40-flowered), laterally compressed, olive-grey or green. Involucral glumes strongly 1-nerved and keeled; lower involucral glume 4 mm. long, acutely acuminate, with scaberulous keel; upper involucral glume 2 mm. long, with stout rounded keel; floral glumes broadly ovate, subacute, 3\*2 mm. long; palea slightly shorter than its glume, with winged keels, the wings 0\*25 mm. wide, ciliolate. Stamens 3; anthers 1 mm. long.

Locality : *Korikan*: Bassein (Chibber!); Parsik, hill (Ryan 1147!); Wada range, Thana Dist. (Ryan 687!).

*W. Ghats*: Matheran (Gammie 16649 !); Ehandala (Woodrow).

*Deccan*: Sinhad, forests (Bhide!); Eirkee (Garade 479!); Chattarshinji Hill, Poona (Ezekiel!).

8. *M. Country*: Between Yelviggi and Savanur, dry hillside, 1,800 ft. (Sedgwick 2019 !); Hubli, dry hillsides, 2,000 ft., rainfall 28 in. (Sedgwick & Bell 4915 !); Badami <Talbot 2927 !); Haveri (Talbot 2179 !); Belgaum (Ritchie).

Ecology : Grows in sandy and rocky ground.

Distribution : W. Peninsula, tropical Africa.

Economic uses : A good fodder grass.

#### 17. ERAGROSTIS BRACHYPHYLLA Stapf.

*Mragrostis brachyphylla* Stapf in Hook, f. Fl. Brit. Lid. VII (1896) 327; Haines Bot. Bib. and Or. (1924) 961.

Etymology : *Brachyphylla* means short-leaved.

Description : Perennial. Stem erect, slender, 25-45 cm. high, from a tuft of old fibrous leaf-sheaths. Leaves nearly all radical, 5-10 cm. long, 2-5 mm. broad, coriaceous, linear, flat or conduplicate, obtuse or subacute, glabrous above.

Spikelets 7-20 cm. long, slender. Spikelets 6-18 mm. long, close set, linear or linear-oblong, secund, 2-seriate, slightly compressed, olive-green, about 20-flowered, lenticular in section. Glumes closely imbricate, involucral ones subequal, up to 2 mm. long, lower one acute, acutely keeled, upper obtuse, dorsally rounded. Flowering glumes up to 2-5 mm. long, rather turgidly broadly ovate (when unfolded) with rounded tip or obtuse, lateral nerves very weak, midrib microscopically scabrid. Palea as large, somewhat obovate, concave towards rhachilla, keels scabrid, narrow. Grain very small, shortly ellipsoid, obscurely trigonous, epicarp coarsely reticulate.

Locality : *Gujarat*: Sevalia (Chibber!).

*S. M. Country*: Badami Fort (Bhide!).

Distribution : Bihar, Central Provinces, W. Peninsula.

#### 82. HALOPYRUM Stapf

A tall stout perennial glabrous grass with a branching creeping sheathed rootstock. Leaves narrow, rigid, convolute.

Spikelets large, many-flowered, sessile or shortly pedicellate on the short alternate branches of an elongate panicle, ovoid, strongly laterally compressed, not jointed on their pedicels, nor are the pedicels jointed on their branches; rhachilla articulate at the base and between the flowering glumes, silky hairy. Glumes many, closely distichously imbricate, dorsally rounded, coriaceous, keeled; involucral glumes subequal, ovate-lanceolate, acuminate or apiculate; lower involucral glume 1-3-nerved; upper involucral glume 5-nerved; floral glumes 6-10, rather shorter than the involucral, mucronulate, 3-nerved; palea as long as the glume, subacute, 2-keeled. Lodicules 2, obcordate. Stamens 3. Styles short, free; stigmas elongate. Grain ellipsoid, compressed, deeply hollowed anticostally, free.

Species 1.—Coasts of India and Ceylon, Arabia, E. Africa.

#### 1. HALOPYRUM MUCRONATUM Stapf.

#### PLATE 161.

*Halopyrum mucronatum* Stapf in Hook. Ic. Pl. t. 2448; Hook. f. Pl. Brit. Ind. VII (1866) 338; Cooke Fl. Bomb. II (1908) 1029.

*Brizopyrum mucronatum* Nees in Wall. Cat. no. 8898.

*Desmazeria unioides* DeFl. Voy. Yemen 220.



FRAGROSUS VILLOSUS BR.

VIE 101.



BALOPTBI U MUCBONAIM STAFF.

*Delin. H. K. Thida.*

*Eragrostis mucronata* Trim. Cat. Ceyl. PL 109 (*non* Boem. & Schult.).

*Triticum repens* Thw. Enum. EL Zeyl. 376.

*Aeluropus* Aitchis. Cat. Fanjab PL (1869) 169.

*Eragrostis sp.* Sect. *Sderostachya* Benth. in Gen. PL III, 1187.

**Etymology** : *Halopyrum* is derived from *hals*, *Aalos*, the sea, and *pyros*, wheat, corn, alluding to the halophytic habit of the grass.

**Description** : Rootstock sending up hard woody stems 30-45 cm. high and as thick as a crow-quill, smooth, shining, with strict vermiform roots, the branches often fascicled and clothed at the base with pale coriaceous shining mucronate sheaths. Leaves 20-30 cm. by 3-4 mm., convolute (rarely flat), very narrow, glaucous, coriaceous, striate, quite smooth; sheaths terete, appressed, striate, hard with villous mouth; ligule a few hairs.

Panicle 30-40 cm. long, erect or nodding; rhachis and branches quite smooth, angular, wiry. Spikelets 13-16 mm. long, flat, sessile or shortly pedicellate, 10-15-flowered, smooth, white or pale yellowish; rhachilla very short, the hairs half as long as the glumes. Lower involucre glume 6 mm. long, scarcely longer than the lowest flowering glume, ovate-lanceolate, apiculate; upper involucre glume 8\*5 mm. long, strongly 5-nerved.

**Locality** : *Sird*: Clifton, near Karachi (Sabnis B796!); Manora Island, Karachi Harbour (Sabnis B832!).

*Kaihiawar*: Porbandar (Bhide!, Bhiva).

**Ecology** : This grass is a halophyte.

**Distribution**: Of the genus.

**Explanation Of Elate 161**: *Halopyrum mucronatum* Staf.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea.
6. Grain and lodicules.

#### 83. LBPTOCHLOA Beauv.

Annual grasses. Leaves flat or involute. Spikelets very minute, compressed, 1-many-flowered, sessile or shortly pedicelled, alternate and unilaterally 2-seriate on the very slender spiciform branches of a lax panicle, sessile or minutely pedicelled, not jointed at the base; rhachilla jointed at the base and beneath each glume, produced between each glume and often beyond the terminal. Glumes usually 2- (sometimes 1-) many-flowered, membranous. Involucre glumes subequal or unequal, oblong, lanceolate or almost linear-lanceolate, 1-nerved; lower and other flowering glumes ovate when unfolded, subacute or obtuse, 3-nerved, 1 nerve in the keel and usually 1 near each margin, nerves usually hairy; palea shorter, 2-nerved. Lodicules 2, cuneate. Anthers 3, short. Styles free. Grain subglobose, oblong, obovoid or 3\*4 gonous, closely invested by the glume or palea.

Hitchcock unites *Diplachne* with this genus.

Species probably 15.—In the warmer regions.

This genus is not represented in Cooke's Flora.

- |   |           |                    |
|---|-----------|--------------------|
| 1. Slender plant; spikes 5-7.5 cm. long; spikelets 2-3-flowered . . . . . 1.    | <i>L.</i> | <i>contracta</i> . |
| 2. More robust plant; spikes 5-10 cm. long; spikelets 4-6-flowered . . . . . 2. | <i>L.</i> | <i>chinensis</i> . |

#### 1. LEPTOCHLOA CONTRACTA Blatter & McCann, n<sup>s</sup>w. cowi&

*Poa contracta* Retz. Obs. III (1783) 11.

*P. panicea* Retz. 1. c.

*P. malabarica* Klein ex Steud. Nom. ed. 2 (1840) 303, 60.

*P. virgata* Roth Nov. Sp. (1821) 66.

*Airafiliformis* Roxb. FL Ind. I (1832) 326.

*Gynodon Neesii* Thw. Enum. Ceyl. PL 371.

*C. polystachyus* R. Br. Prodr. (1810) 187.

*O. virgatus* Nees ex Wall. Cat. No. 8894; Steud. Syn. PL Glum. (1855) 213<

*Leptochloa polystachya* Benth. FL Austr. VII (1878) 617 (*non* Xunth.); Ridley FL Malay Pen.

V (1925) 248; Hook, f. FL Brit. Ind. VII (1896) 298.

*L. Neesii* Benth. in Journ. Linn. Soc. XIX (1881) 108.

*L. filiformis* Roem. & Schult. Syst. II (1817) 580; Duthie Grasses N. W. Ind. (1883) 192 ; Hook, f. 1. c.

*Eragrostis chinensis* Duthie Fodder Grasses N. Ind. (1888) 59, t. 71,

**Etymology** : *Leptochloa* is derived from *leptos*, slender, and *chloa*, grass.—*Contracta* means contracted, alluding to the panicle which is sometimes contracted.

**Description** : A very slender grass, 30-90 cm. high. Stems tufted and geniculately ascending. Leaves flat, flaccid, 10-25 cm. long, finely acuminate, sometimes sparsely hairy on the nerves and on the sheaths ; ligule short, erose or setosely lacerate.

Panicle 10-25 cm. long, contracted or diffuse. Spikes 1-7.5 cm. long, exceedingly filiform with 2-nerved rhachis. Spikelets about 1 mm. long, 2-3-flowered, distant nearly their own length on the rhachis on very short pedicels. Involucral glumes linear- or oblong-lanceolate. Flowering glumes 2-3, broadly ovate, rather shorter than the upper involucral glumes, with median nerve and submarginal nerves microscopically hairy; palea rather shorter, reduplicate. Grain fusiform-oblong, deeply grooved on one side, pericarp adherent, but slightly produced each end.

**Locality** : *Gujarat*: Surat, near Athwa Farm (Bhide!); Ahmedabad, in garden (Sedgwick!).

*Konkan*: Parel, Bombay Isl. (Talbot!); Victoria Gardens, Bombay Isl. (McCann 5351 ! 5568 !); BycuUa, Bombay Isl. (McCann A40 !).

**Ecology** : A weed in cultivated ground.

**Distribution** : Throughout India and Burma, Ceylon, tropical Asia, Africa and America.

## 2. LEPTOCHLOA CHINENSIS Nees.

*Leptochloa chinensis* Nees in Syll. Ratisb. I (1824) 4, Agrost. Bras. 432 ; Bentl Fl. Hongk. (1861) 430, Fl. Austral. VII (1878) 617 ; Duthie Grasses N. W. Ind. (1883) 35 (*excl. syn.*), Fodder Grasses N. Ind. (1888) 59, t. 71 ; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 372 (*exd. syn. tenerrima*); Hook. f. Fl. Brit. Ind. VII (1896) 299; Haines Bot. Bih. and Or. (1924) 972.

*Poa chinensis* Linn. Sp. PL (1753) 69 (*excl. syn. Burm.*); Roxb. Fl. Ind. I (1832) 332.

*P. malabarica* Retz. Obs. V, (178H) 19.

*P. asthmes* Roem. & Schult. Syst. II (1817) 574.

*P. decipiens* R. Br. Prodr. (1810) 181.

**Vernacular names** : Chenhel, Jhira, Phulkia.

**Description** : Stem tall, stout, 60-120 cm. high, erect or geniculately ascending. Leaves 15-45 cm. long, flat or convolute, scaberulous; sheaths loose ; ligule short, lacerate.

Panicle 15-25 cm. long. Branches numerous, slender, simple, opposite or alternate, suberect or spreading, 5-10 cm. long. Spikelets 4-6-flowered, about 2-5 mm. long, alternate, short-pedicelled, distant or approximated, narrow. Involucral glumes somewhat unequal, lanceolate, acute or subulate. Flowering glumes broader, lower apiculate with pilose nerves; nerves of palea pilose. Grain loose, obtusely trigonous, subrugose.

**Locality** : *Gujarat* (*ex* Lisboa).

*Konkan*: Parel, Bombay Isl. (*ex* Lisboa).

*S. M. Country*: Kilgerry Tank (Talbot!).

**Ecology** : Grows on the borders of watercourses and places with much moisture.

**Distribution** : Throughout India and Burma, Ceylon, Malaya, China, Japan, Australia.

**Economic uses** : Cattle eat the grass.

## 84. DESMOSTACHYA Stapf.

(*Eragrostis* Beauv. *partim*).

This genus agrees with *Eragrostis* Beauv., except in the following points: Spikelets very closely packed, imbricate, laterally very much compressed, secund, sessile and articulate on the very short densely crowded branchlets of a tall narrow racemiform panicle, acute and deciduous : rhachilla subarticulate.

Species 1.—India to Syria and N. Africa.

## 1. DESMOSTACHYA BIPINNATA Stapf.

PLATE 162.

*Desmostachya bipinnata* Stapf in Fl. Cap. VII, 632.

*Briza bipinnata* Linn. Syst. Nat. ed. X (1759) 875.

*Viola bipinnata* Linn. Sp. Pl. ed. II. 104.





DESMOST.U'JIYA «I PINK ATA STAFF

Delin: R. K. Bhide.



•PLAI HNE FUBOA BEADV

Delin: R. K. Bhide.

*JLeptochha bipinnata* Hochst. in Flora XXXVIII (1855) 422.

*Eragrostis cynosuroides* Beauv. Agrost. (1812) 71, 162; Steud. Syn. PL Glum. (1855) 264; Wight Cat. no. 1774, 17746; Trin. in Mem. Acad. Petersb. ser. VI, I (1831) 415; Dalz. & Gibs. Bomb. Fl. (1861) 298; Aitchis. Cat. Panjab Pl. (1869) 169; Duthie Grasses N. W. Ind. (1883) 37, Fodder Grasses N. Ind. (1888) 62, t. 40; Boiss. FL Or. V (1884) 583; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 387; Hook. f. Fl. Brit. Ind. VII (1896) 324; Cooke FL Bomb. II (1908) 1028; Prain Beng. PL 1221.

*Poa cynosuroides* Retz. Obs. Fasc. IV (1786) 20; Roxb. FL Ind. I (1832) 333; Del. Fl. d'Egypte 159, 1.10; Grah. Cat. Bomb. PL (1839) 236; Kunth Enum. PL I (1838) 227.

*Desmostachya cynosuroides* Stapf in Haines Bot. Bih. and Or. (1924) 962; Blatter, McCann & Sabnis in Journ. Ind. Bot. VI (1927) 76.

*Cynosurus durus* Forsk. FL Aegypt.-Arab. (1775) 71.

**Vernacular names** : Darbha, Dab, Dhab, Dib, Eussa, Koosha, Drab, Dabvi, Durper.

**Description** : Perennial, tall, branched from the base; rootstock stout, creeping; stolons very stout, covered with shining sheaths; stems 30-90 cm. high, tufted, smooth, erect, stout. Leaves many, the basal fasciated, reaching sometimes 50 cm. long and 10 mm. broad at the base, rigid, acuminate, with filiform tips and hispid margins; sheaths glabrous; ligule a hairy line.

Panicle 15-45 by 1-3-3-8 cm., strict, erect, narrowly pyramidal or columnar, often interrupted; rhachis puberulous; branches many, short, scarcely reaching 2-5 cm. long, crowded, clothed from the base with sessile imbricating spikelets. Spikelets sessile, secund, 2-seriate and crowded, deflexed, pale brown, rather shining, 13 mm. long, up to 30-flowered; rhachilla tough. Involucral glumes very unequal; lower 0-5 mm. long; upper 1-6 mm. long, obtuse; floral glumes 1-6-2 mm. long, ovate, acute, coriaceous; palea shorter than its glume, subcoriaceous, with minutely scabrid keels. Stamens 3; anthers 0-8 mm. long. Grain 0-5-0-6 mm. long, obliquely ovoid, laterally compressed, obscurely 3-gonous.

**Locality** : *Sind*: Jaobabad (Bhide!); Hyderabad (Bhide!, Woodrow); Sukkur (Sabnis B550!, Bhide!); Miani forest, Hyderabad (Bhide!); Larkana (Sabnis B100!); Sehwan to Laki, foot of hills (Sabnis B66!); Sehwan, sand dunes (Sabnis B674!); Sita Road (Sabnis B360!); Ehairpur Mirs, forest (Sabnis B328!); Phuleli Canal, on banks, at Hyderabad (Sabnis B181!); Sanghar (Sabnis B895!); Pad-Han (Sabnis B517!); Ghulamalla, fields (Blatter & McCann D643!); Mirpur Sakro (Blatter & McCann D644! D646! D647!); Gharo (Blatter & McCann D645! D648!).

*Catch* (Blatter!).

*Kathiawar*: Mandvi (Woodrow).

*Gujarat*: Surat (Gammie!); Nadiad Farm (Supt. of Farm!); road to Lasandra (Chibber!); Charodi (Gammie 16526!).

*KonJcan*: Palghar, Mahim (Ryan 2189); Bassein (Patwardhan!); Dahana, Thana Dist. (Burns!).

*Deccan*: Nasik (Lisboa).

**Ecology** : A species frequently met with in the drier parts of the Presidency in open waste land and often in fields and on their borders. Its coarse inflorescence easily distinguishes it from any species of *Eragrostis*. It is tufted and very finely rooted which makes it difficult to obtain the whole plant.

**Distribution** : India, Syria, Egypt, Nubia.

**Economic uses** : Cattle do not eat it, though the grass is liked by buffaloes. In Afghanistan it is considered to be a good fodder grass. The fibre is used for making ropes.

**Medicinal uses** : An infusion of the root is used as a diuretic. See Dymock.

**Sacred uses** : See Watt. Diet. Ec. Prod. III, 254.

**Explanation of Plate 162** : *Desmostachya bipinnata* Stapf.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea.
6. Stamens, ovary and styles.

#### 85. DIPLACHNE Beauv.

Tall tufted perennial (?) grasses; stems erect or ascending, stout or slender, simple or sparingly branched. Leaves flat or convolute, narrow.

Spikelets few- or many-flowered, sessile, 1-seriate on the slender spike-like branches of a contracted subsimple erect panicle, not articulate at the base, strongly laterally compressed; rhachilla articulate between the flowering glumes, not produced beyond the uppermost neuter.

Involucral glumes unequal, membranous, 1-nerved, obtuse, persistent; floral glumes rather longer, elliptic-oblong, 1-3-nerved, the tip 2-4-toothed, mucronate or awned; palea linear. Lodicules 2, broadly cuneate. Stamens 3; anthers short. Styles short, distinct, with distant bases and short plumose laterally exerted stigmas. Grain oblong, stipitate, concave-convex, free in the glumes.

Species about 12.—Warm regions.—Only 1 species in the Presidency.

1. *DIPLACHNE FUSCA* Beauv.

PLATE 163.

*Diplachne fusca* Beauv. Agrost. (1812) 163; Boiss. PI. Or. V (1884) 561; Hook, f. PL Brit. Ind.

VII (1896) 329; Cooke PI. Bomb. II (1908) 1030; Haines Bot. Bih. and Or. (1924) 962.

*Festuca fusca* Linn. Sp. PI. (1753) 109; Del. Fl. d'Egypt. 24, t. XI, fig. 1.

*Uralespis fusca* Steud. Syn. Pl. Glum. (1855) 247.

*Diplachne indica* Spreng. Syst. I (1825) 351.

*Tridens indicus* Nees in Wight Cat. no. 1794.

*Festuca indica* Betz. Obs. IV (1786) 21; Kunth Enum. (1838) 412.

***Eragrostis procera* Steud. 1. c. 266.**

*Poa procera* Boxb. PL Ind. I (1832) 332.

***Uralespis Drummondii* Steud. 1. c.**

*Triodia ambigua* R. Br. Prodr. (1810) 183.

*Bromus polystachios* Porsk. PI. Aeg.-Arab. (1775) 23.

Bheede Hort. Mai. XII, t. 45.

**Vernacular names** : Shoti gandar. (Known in Australia as Brown-flowered Swamp Grass.)

**Etymology** : *Diplachne* is derived from *diplous*, double, and *achne*, chaff, very likely alluding to the 2-4-toothed flowering glumes.

**Description** : Stems tufted, 60-120 cm. high, stout, erect or geniculately ascending, simple or branched (sometimes proliferously), terete, polished, with long internodes. Leaves 15-25 cm. by 1-2-2-5 mm., flat or convolute, strict, erect, smooth, finely acuminate; sheaths smooth, the mouth truncate (not auricled); ligule oblong, membranous, lacerate.

Panicle 15-30 cm. long, erect, narrowly oblong, rhachis smooth; branches spike-like, the lower 2-5-10 cm. long. Spikelets erect, rather distant, 6-13 mm. long, linear-oblong, 4-10-flowered; rhachilla slender; pedicels short. Lower involucral glume 2 mm. long, oblong-lanceolate; upper involucral glume nearly 3-2 mm. long, ovate-oblong, subacute, broader than the lower; floral glumes 4 mm. long (including mucro), elliptic, thinly coriaceous, 3-nerved, the tip 2-toothed, mucronate by the produced midrib; palea oblong, obtuse, the keels silkily hairy. Anthers 1-2 mm. long.

**Locality** : *Sind*: Tatta, Kullan Kote Lake (Blatter & McCann D639 !).

*Konkan*: Parsik, side of railway line (McCann A24 I); Bassein (Bhide!); Sion (McCann 5238 !); Alibag, ricefields near salt marshes (Ezekiel!); Lower Parel (Blatter 4283 !); Antop Hill (McCann 3614!); Mahim to Matunga (McCann 5139!); Matunga, near Bombay, in ricefields (Woodrow 10).

*N. Kanara*: Near Karwar, maritime marsh (Sedgwick & Bell 5095 !).

**Ecology** : Likes rich moist ground, is distinctly hygrophilous.

**Distribution** : Upper Gangetic Plain, Bengal, Orissa, W. Peninsula, Ceylon, Egypt, tropical Asia, Africa, and Australia.

**Economic uses** : Buffaloes are said to like this grass.

**Explanation of Plate 163** : *Divlachne fusca* Beauv.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
1. Floral glume.
5. Palea.
6. Stamens, ovary, styles and lodicules.

## TRIBE XII: Chlorideae.

Spikelets sessile or subsessile in 2-ranked, secund, usually very dense, rarely loose s<sub>ir</sub> (or spike-like racemes), or the spikelets more or less pediceUed and paniced; spikes soft or digitate or racemosely arranged on a common axis, rarely in a spike-like panicle or red to a fascicle of a few spikelets. Floral glumes generally membranous to chartaceous, ent

emarginate or 2-4-lobed, 3-nerved, nerves subparallel, distant, the lateral submarginal and usually ciliate or villosulous (additional side-nerves close to the midnerve occur in *Eleusine* sp.); awn, if any, straight, fine, from the truncate or notched tip or all 3 nerves running out into mucros or awns.

See key page XIX.

#### 86. OROPETIUM Trin.

Dwarf densely tufted erect perennial or annual grasses. Leaves short, filiform.

Florets 1-3, hermaphrodite or the upper rudimentary, shorter than the upper involucrel glume. Spikelets minute, half immersed in the alternating distichous cavities of a simple slender curved inarticulate spike, sessile, not articulate on the rhachis; rhachilla bearded, articulate at the base, not produced beyond the flowering glume. Lower involucrel glume minute, hyaline, persistent; upper involucrel glume linear-lanceolate, rigid, recurved in fruit, tip subobtusate or emarginate; floral glumes concealed by the upper involucrel glume which closes the cavity in which the floral glume is hidden, sessile, ovate or elliptic, hyaline, 1-nerved; callus very short, bearded with silky hairs; palea as long as the glume; keels smooth. Lodicules very minute, obliquely cuneiform. Stamens 3; anthers oblong. Styles short; stigmas plumose, laterally exerted. Grain oblong, smooth, brown, free in the glume.

Species 6.—India, Ceylon, Algeria, S. Africa.

#### 1. OROPETIUM THOMAEUM Trin.

*Oropetium Thomaenum* Trin. Fund. Agrost. (1820) 98, t. 3; Kunth Enum. Pl. I (1838) 464; Suppl. 375; Miq. Fl. Ind. Bat. III, 403; Duthie Grasses N. W. Ind. (1883) 45, Fodder Grasses N. Ind. (1888) 69; Hook. f. Fl. Brit. Ind. VII (1896) 366; Cooke Fl. Bomb. II (1908) 1046; Haines Bot. Bih. and Or. (1924) 964.

*Nardus Thomaea* Linn. f. Suppl. (1781) 105; Sm. in Trans. Linn. Soc. 1, 116.

*Rottboelia Thomaea Koemigii* SeAw. XXIII (1788) 210; Willd. Sp. Pl. I, 464; Roxb. PL Corom. II, 17, 1. 133, Fl. Ind. I (1832) 357; Dalz. & Gibs. Bomb. Fl. (1861) 300.

*B. pihsa* Willd. 1. c. 465.

**Etymology** : *Oropetium* is derived from *oros*, a mountain, and *pegnumi*, to fasten together, a habitat name.

**Description** : Whole plant 5-7-5 cm. high, forming hard tufts with capillary root-fibres; stems compressed. Leaves shorter or longer than the stems, erect or curved, filiform, acute, coriaceous, striate, sparsely ciliate with long hairs; sheaths membranous, compressed; ligule an erect lacerate membrane. Spikes 2-5-3-8 cm. by 0-8 mm., erect, straight or slightly curved; rhachis undulating, 4-gonous. Spikelets reaching 2-5 mm. long, acute, 1-flowered. Lower involucrel glume minute, hyaline; upper involucrel glume 2 mm. long, linear-lanceolate, rigid, recurved in fruit; floral glume 1-6 mm. long, semicircular in profile, 2-fid, hyaline; callus bearded. Anthers 0-5 mm. long. Grain 0-8 mm. long, somewhat fusiform, reddish brown.

There seem to be two forms, one branched and the other unbranched. Our Dharwar form is the unbranched one.

**Locality** : *Konkan*: Trombay, on rocks (McCann A32!); Antop Hill (McCann 36111-2449!).

*Deccan*: Gungapur (Blatter A33! 584!); Poona (Woodrow); Junnar, near Poona (Woodrow).

*S. M. Country*: Dharwar Dist., dry uplands, 2,400 ft., rainfall 34 in. (Sedgwick 2656!); Badami, Fort (Bhide!, Talbot 2923!); Ranibezmur (Chibber).

**Ecology** : Very xerophytic. Not uncommon on barren uplands at Dharwar. It is a very short-lived monsoon plant.

**Distribution** : Throughout the plains of India, Ceylon.

**Economic uses** : Not known.

#### 87. MICROCHLOA K. Br.

Slender usually perennial grasses. Leaves narrow, often subsetaceous; ligule a minutely ciliate rim.

Spikelets 1-flowered, small, sessile, unilateral, crowded on the flattened rhachis of a solitary terminal slender curved spike, alternately 2-scriate from near the margins of the rhachis or in a single row; rhachilla disarticulating above, the involucrel glume more or less produced. Floret hermaphrodite. Glumes 3; involucrel glumes subpersistent, strongly 1-nerved, flattened on the back or keeled, subequal; floral glume small, oblong, hyaline, awnless; palea nearly equalling the glume, 2-keeled. Lodicules 2, cuneate, glabrous. Stamens 3; anthers linear. Styles distinct; stigmas plumose, laterally exerted. Grain oblong, glabrous, free, within the glumes.

Species 7.—1 distributed throughout the tropics, 3 in Africa, 3 in Australia.

## 1. MICBOCHLOA INDICA Beauv.

## PLATE 164.

*Microckloa indica* Beauv. Agrost. (1812); O. Kuntze Rev. III (1893) 356; Hackel in Fedde: Repert. Nov. Sp. VII (1909) 373; Merrill in Philipp. Journ. Sc. Bot. VII (1912) 74; Druce in Rep. Bot. Exch. Cl. Brit. Isles (1916) 635.

*Nardus indica* Linn. f. Suppl. (1781) 105.

*Microchloa setacea* R. Br. Piodr. (1810) 208; H. B. & K. Nov. Gen. et Sp. I (1816) 84, t. 22; Beauv. Agrost. (1812) 115, t. 20. fig. 8; Nees Agrost. Bras. (1829) 441; Fl. Afr. Austr. 247; KuHth Enum. PL I (1838) 258; Doell in Mart. Fl. Bras. II, III, 76. t. 21; Steud. Syn. Pl. Glum. (1855) 202; Benth. Fl. Hongk. (1861) 428, Fl. Austral. VII (1878) 608; Hook. f. Fl. Brit. Ind. VII (1896) 283; Cooke Fl. Bomb. II (1908) 1031; Prain Beng. PL 1226; Haines Bot. Bih. and Or. (1924) 964.

*Rottboellia setacea* Roxb. Fl. Ind. I (1832) 357, Corom. PL II, 18, t. 132.

**Etymology** : *Microchloa* is derived from *micros*, small, and *chloa*, a grass.

**Description** : Perennial; stems tufted, 5-15 (rarely reaching 25) cm. high, very slender, branched or almost simple, compressed below, glabrous, smooth. Leaves 1-3-3-8 cm. long, crowded at the base, subsetaceous with an acute or callus point, plicate, firm, the lower often curved, usually glabrous.

Spike solitary, 2-5-7-5 cm. (rarely reaching 15 cm.) long; very slender, usually curved, often purplish; rhachis minutely ciliate. Spikelets 1-flowered, dorsally compressed, in a single row, 2-3-2 mm. long, erect, glabrous. Involucral glumes subequal, lanceolate-oblong, acute or acuminate; floral glume up to 1-7 mm. long, abruptly and shortly acuminate, sometimes mucronulate, hairy along the nerves; palea ciliate on the nerves. Anthers about 0-6 mm. long. Grain oblong, subfusiform, 1.2 mm. long, smooth.

**Locality** : 8. *M. Country* : Dharwar (Woodrow), on dry hillsides, 2,400 ft., rainfall 34 in. (Sedgwick 2908 !); Dumbal (Talbot 2949 !).

*N. Kanara*: Halyal (Talbot 2387 !).

**Ecology** : A sporadic grass. Common on barren uplands of Dharwar; often growing on old walls. Has a brief life in the monsoon.

**Distribution** : Tropics of the Old and New World.

**Explanation of Plate 164** : *Microchloa indica*-Beauv.

1. Lower invol. glume.
2. Upper invol. glume.
3. Floral glume.
4. Palea.
5. Stamens, ovary, styles and lodicules.

## 88. GRACILEA Koen,

Small tufted grasses. Leaves short.

Spikelets 2-flowered, collected in turbinate fascicles which are sessile and articulate on a slender spike. Spikelets not articulate at the base; rhachilla-usually produced beyond the upper glume, filiform, scaberulous; callus 0. Glumes 4; involucral glumes elongate-subulate, rigid, ciliate at the base and ending in rigid scabrid awns, persistent, collateral at base and laterally attached to base of spikelet; lower without hyaline margins; the upper with rather wide ones; lower floral glume 2-sexual, chartaceous, ovate-oblong, cymbiform, shortly awned, 3-nerved, the palea as long as the glume, 2-cuspidate and with scaberulous keels, the lodicules minute, cuneiform, truncate; upper floral glume like the lower, but much smaller, bicuspidate, male; sometimes an imperfect flower of 2 empty glumes at the end of the rhachilla. Stamens 3; anthers of 2-sexual flowers large, of male flowers small. Styles free; stigmas slender, with short simple hairs, laterally exerted. Grain linear-oblong, free within the glumes.

Species 2.—India and Africa.

## 1. GRACILEA ROYLEANA Hook. f.

## PLATE 165.

*Gracilea Royleana* Hook. f. Fl. Brit. Ind. VII (1896) 284; Prain Beng. PI. 1226 • Coot\* IN II (1908) 1031; Haines Bot. Bih. and Or. (1924) 965.

*MeUnocenchnis Royleana* Nees in Proc. Linn. Soc. I (1841) 95 (*nomen tantum*) • Aitnl • r Punjab PI. (1869) 168 (*excl. syn.*); Duthie Grasses N. W. Ind. (1883) 33 • vJSI n • 46. N. Ind. (1888) 54, t. 67; Lisboa in Journ. Bomb. Nat. Hist. Soc. VIII (1893) 370 • rase\*\*



MIUCHIOA IXDICA BEAUV.

Drawn: B. K. TihUh.



GRACILLIA ROYLEANA HOOK. F.

Delin: B. K. Bhide.



than the glume, 2-keeled. Lodicules 2, minute, obovate-cuneate, glabrous. Stamens 3. Ovary glabrous; styles distinct, slightly shorter than the plumose stigmas. Grain oblong, subterete, free within the glumes.

Hitchcock (U. S. Dept. Agric. Bull. No. 792 (1920), 178) considers *Panicum dactylon* Linn, as the type species. He justifies the change of *Cynodon* into *Capriola* in these words : " *Capriola* Adans., Fam. PL 2 : 31, 532, 1763." The genera are indicated and distinguished by Adanson in a much abbreviated and often unsatisfactory manner. The tabular arrangement of the genera of *Phalarides*, his first section of the grass family or *Gramina*, includes *Capriola*, with the following diagnosis, interpreting the table: Summit of leaf sheath hairy; flowers in digitate spikes; glumes laterally compressed; lemma awnless. In the index there is given as a synonym under *Capriola*, ' *Gramen dactylon* *Offic.*'<sup>9</sup> The last phrase appears in the first edition of the Species Plantarum in the synonymy under *Panicum dactylon* as ' *Oramen dactylon, radice repente* 8. *offidnarum*, Scheuch. gram. 104.' thus connecting *Capriola* Adans. with *Panicum dactylon*.

" *Cynodon* Bich\*; Pers Syn. 1: 85, 1805. Only one species described, *C. dactylon*, based on *Panicum dactylon* L."

In spite of this we have to retain *Cynodon*. Mr. Hubbard of the Kew Herbarium informs us that *Cynodon* is on the list of *nomina conservanda* and according to International Bulea must be used, although it is antedated by *Capriola* Adans. (1763).

Species 7.—India, S. Africa, Australia.—Only one in the Bombay Presidency.

#### 1. CYNODON DACTYLON Pers.

##### PLATE 166.

*Cynodon dactylon* Pers. Syn. I (1805) 85; Dalz. & Gibs. Bomb. Fl. (1861) 297; Duthie Grasses N. W. Ind. (1883) 32, Fodder Grasses N. Ind. (1888) 52; Hook, f. Fl. Brit. Ind. VII (1896) 288; Cooke Fl. Bomb. II (1908) 1032.

• *C. erectum* Presl Reliq. Haenk. I (1830) 290.

*C. jttiformis* Voigt Hort. Subsub. Calc. 712.

*C. linearis* Willd. Enum. Hort. Berol. I (1827) 90.

• *C. maritimus* H. B. & K. Nov. Gen. et Sp. I (1816) 170.

*C. radiatus* Roth Nov. PL Sp. (1821) 38.

*CUoris Cynodon* Trin. Gram. Unifl. 229.

• *C. maritima* Trin. l.e. 226.

*Fibichia umbellata* Koel. Gram. Gall, et Germ. 308.

*Digitaria Dactylon* Scop. Fl. Cam. Ed. 2, 1, 52.

*D. littoralis* Salisb. Prodr. 19.

*Panicum dactylon* Linn. Sp. PL (1753) 58; Grah. Cat. Bomb. PL (1839) 236; Rozb. FL Ind. I (1832) 289.

*P. lineare* Burm. FL Ind. (1768) 25, 1. 10, fig. 2.

*Paspalum dactylon* DC. FL Franc. III, 16.

*Agrostis bermudiana* Tussac ex Eunth Enum. PL I (1838) 259.

*A. filiformis* Eoen. ex Eunth l. c. 261.

*A. linearis* Retz. Obs. IV (1786) 19.

Rheede Hort. Mai. XII, t. 47.

**Vernacular names** : Doub grass, Bermuda grass, Wire grass, Couch grass, Dhoob, Durba, Durva, Harala, Haryeli, Dubra dub, Nilidub.

**Etymology** : *Cynodon* is derived from *Jcyon*, a dog, and *odoits*, tooth, therefore dog's tooth. —*Dactylon* is the Greek *dactylos*, finger, alluding to the shape of the inflorescence.

**Description** : Stem slender, prostrate, widely creeping, forming matted tufts, with slender erect or ascending flowering branches 7-5-30 cm. high. Leaves 2-10 cm. by 1-2-3 mm., narrowly linear or lanceolate, finely acute to pungent, more or less glaucous, soft, smooth, usually conspicuously distichous in the barren shoots and at the base of the stems; sheaths tight, glabrous or hairy, sometimes bearded at the mouth; ligule a very fine ciliate rim. Spikes 2-6, radiating from the top of a slender peduncle, 2-5-5 cm. long, green or purplish; rhachis slender, compressed or angled, scaberulous.

Spikelets 1-7-2-5 mm. long; rhachilla produced, very slender, equalling half the length of the spikelet. Involucral glumes lanceolate, acute to subulate-mucronulate, the lower 1-1\*6 ~~mm~~ long, the upper slightly longer; floral glume obliquely oblong to semiovate, about 2 mm. long. Anthers oblong, 1 mm. long. Grain 1 mm. long.

**Locality** : *Sind*: Sita Koad (Sabnis B361!); Jamesabad, fields (Sabnis B907 ! B1108!); Sanghar (Sabnis B896 !); near Phuleli Canal, cultivated fields (Sabnis B135 !); Mirva Canal, sandy banks (Sabnis B265!); Sehwan to Laid, foot of hills (Sabnis B300!); Mirpurkhas,

*M. Jacquemontii* Jaub. & Sp. 111. PL Or. IV (1850-53) 36, t. 325.

*Pommereulla Royleana* Steud. Norn. ed. II, II (1840) 379.

**Vernacular names** : Guli, Bedari, Dongri, Landgeya-kussal, Landga-kussal.

**Etymology** : *Gracilea* is derived from *gracili* graceful, slender.

**Description** : Annual; stems 7-5-20 cm. high, densely tufted, very slender. Leaves 2-5-5 cm. long, scarcely reaching 1/3 mm. broad, flat or convolute, linear-lanceolate, acutely pointed, glabrous or nearly so, the margins ciliate; sheaths with a few long scattered hairs; ligule a hairy ridge.

Spikes filiform, 1-3-5 cm. long, flexuous, often recurved; rachis 3-gonous, smooth. Clusters of spikelets 6-8-5 mm. long (including the awns), green or purple; awns of involucral glumes longer than the glumes; awn of floral glumes short.

**Locality** : *Cutch* : Bhuj Hill (Blatter 3764!).

*Gujarat*: Daman (Bhide!).

*Khandesh*: Toranmal, rocks (McCann A54!); Amalner, Bori River (Blatter & HaUberg 4451!); Tapti, Bhusawal (Blatter & HaUberg 5453!); to Naradana (Blatter & Hallberg 5212!).

*Konkan*: Bandra (Ryan 1432!); Parsik (Ryan 1215!); Trombay (McCann A52!); Worli Hill, common along seashore (McCann 5516!); Antop Hill (McCann 3612!).

*W. Ghats*: Panchgani (Blatter & HaUberg B1278!); Khandala to Campoli (McCann A57!).

*Deccan*: Katraj (Bhide!); Sinhagad forest (Bhide!); Near Poona (Jacquemont 383); Poona (Woodrow!); Pashan, near Poona (Gammie!); Chattarshinji Hill, Poona (Ezekiel!); Kirkee (Gammie!); Deolali (Blatter A53! 4545!).

*S. M. Country* : Dharwar Dist., 2,000 ft., rainfall 35 in. (Sedgwick 2278!); Telvigi, dry hillsides, 1,800 ft., rainfall 28 in. (Sedgwick & Bell 4902!); Dharwar (Talbot 2008!); Belgaum (Stocks, Ritchie 831).

*N. Kanara*: Yellapur (Talbot!); Karwar (McCann!).

**Ecology** : Common in stony and barren places, near the sea or far inland up to considerable elevations.

**Distribution** : Bihar, Rajputana, W. Peninsula, Socotra, Nubia.

**Economic uses** : "It is said to be a good grazing grass when young, though rather too small to be of much use." (Duthie).

**Explanation of Plate 165** : *Gracilea Royleana* Hook, f.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea.
6. Grain.
7. Upper floral glume.
8. Palea of upper floral glume.

#### VAR. PLUMOSA Hook, f.

*Var. plumosa* Hook, f. Fl. Brit. Ind. VII (1896) 284; Cooke Fl. Bomb. II (1908) 1031.

*Melanocenchris plumosa* Jaub. & Sp. 1. c. 37; Hochst. in Flora (1855) 273, 417,

*Pennisetum plumosum* Hochst. ex Steud. Syn. Gram. 201.

*PtUonema plumosum* Steud. 1. c.

*Eutriana abyssinica* R. Br. ex Fresen. in Mus. Senkenb. II (1837) 142.

**Description** : Clusters of spikelets larger, 13 mm. long including the awns.

**Locality** : *Sind*: Jemadar ka Landa near Karachi (Stocks 646).

**Distribution** : Punjab, Sind, Arabia, Abyssinia.

#### 89. CYNODON Rich.

Perennial glabrous grasses; stems creeping, rooting at the nodes and emitting from them fascicles of barren shoots and flowering stems.

Spikes 2-6, in terminal umbels. Spikelets 1-flowered, laterally compressed, sessile, imbricate, alternately 2-seriate and unilateral on a slender keeled rachis; rachilla disarticulating above the involucral glumes, produced or not beyond the floral glume. Floret hermaphrodite. Involucral glumes narrow, keeled, acute or subulate-mucronate, the upper usually deciduous with the floral glume, the lower subsistent; floral glume exceeding the involucral glume. Navicular, firmly membranous, 3-nerved, awnless, the keel ciliate; palea somewhat short



CYNODON DACTYLON PERS.

Delin: R. K. Blide.

farrow fluids (Sabnis BI190 !); Baghar (Blatter & McCann D690); Giiri, near Karachi (Sabnis B783 I); Lurk-ana (Sabnis B458 ! B477 J).

*Httah* (Blatter 8553!).

*Katkiawar*: Junagad (Blatter 37851).

*Gujrat*: Dakor (Chibber !).

*Klmidesh*: Anka Hill (Blatter!); Bor, Bori Kiver (Blatter & Hallberg 5482 I).

*Konkan*: Very common in Bombay and Salsotte Islands (McCann!); Parsik, railway line (McCann A181!); Vihar Lake (McCann 182 I).

*W. Qhats*: Igatpuri (Blatter & Hallberg 548G!, McCann 1); Khundala, very common (McCann 5433 ! 5301 !); Panehgaui (Blatter & Hallberg B1264 ! B1270 ! B13a9 !).

*Dvccati*: Deolali (Blatter & Hallberg 4570 I); Furandhur, north foot and top (McCann 50\*2 ! 5604 ! bis); Wai (Mamlatdar of t ai !).

*S. M. GuaidTij*: Devarnyi forests, 1,800 ft. (Sedgwick & Bell 1102 I); Dhunvar (Sedgwick !); Haveri (Talbot!).

*N. Kanara* (McCann !).

Ecology : Grows everywhere abundantly and flowers throughout the year. Propagates readily by its rhizomes and stolons and, therefore, may become a pest in cultivated fields.

Distribution : Cosmopolitan.

Economic uses : This is one of the most important pasture grasses ; under favourable conditions it may even grow sufficiently rank to be cut as hay ; also widely utilised as a lawn grass.

**Explanation of Plate 166** : *Cynodost dactyhm* Peia.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume,
4. Floral glume.
5. Palea.
6. Stamens, ovary and styles.

#### 90. ENTSTROPOGON New.

Tall, slender, perennial grasses. Leaves long, very narrow.

Spikelets very narrow, 1-2-flowered (lower flower perfect, upper if present male or neuter), unilateral in a solitary terminal slender spike, not jointed at the base; rachilla jointed at the base. Glumes 3 or 4. Lower involucral glumes unequal, narrow, hyaline, 1-nerved, persistent ; lower floral glume much larger, linear, rigid, scabrid, dorsally rounded, 3-nerved, tip entire, or acutely bifid with a short erect awn in the cleft; callus bearded. *Palea* lanceolate, 2-toothed keels scabrid. Lodicules 2. Anthers very long. Styles distinct. Grain narrow, free within the hardened glumes.

Species 4.—India, tropical Africa and Asia.

#### 1. ENTEROPOGON BADAMICUH Bhide.

*Enteropogon badamiomn* Bhide in Journ. & Proc. As. Soc. Bng. new series, VII (1911) 517.

**Description** : Stem CO-75 tan., slender, erect, glabrous. Leaves narrow, 10-18 cm. by 3-6 mm., tapering to a fine acumination, glabrous ; sheath glabrous, finely long-ciliate at the mouth and sides ; ligule a short membrane with a fine fringe of hairs. Spike solitary, terminal, 15 cm. long.

**Spikelet** ^-seriate and secund on a flattened, trigonous, slightly scabrid rachis, subsessile or very shortly pedicelled. Involucral glumes persistent, empty, scarious, 1-nerved, glabrous or very minutely pubescent, the lower less than half of the upper, more or less an equal-sided and sometimes slightly lobed on one side, ovate, subacute and erose at the apex.; upper shortly unequally 2-dentate at the apex with a short micro between. Lower floral glume slightly longer than upper involucral, 2-dentate at the apex, 3-nerved with a dorsal stiff awn about as long as the glume, scabrid at the back and sides, ventrally grooved, the groove corresponding with the dorsal ridge which is continuous with the awn. Callus bearded with short white silky hairs. Palea a little longer than the glume, scabrid at the back and on the keels 2-nerved, apex slightly bifid and erose, with a bisexual flower. Grain oblong, flattened, as long as the palea. Upper floral glume like lower, but smaller and also bisexual. Rachilla produced beyond the upper floral glume and bearing a sterile awned glume which is much smaller than the upper floral glume.

Locality : *S. M. Count*, Badwani (Bhide ! Tallot 2924!).

Distribution : So far endemic.

## 91. CHLORIS Swartz.

Annual or perennial grasses. Leaves flat or convolute. Spikes solitary or several, in terminal umbels or short racemes, erect or stellately spreading.

Spikelets of 2-4 florets (1 only or rarely more fertile), sessile, crowded, unilateral, 2-seriate on a slender rhachis; rhachilla disarticulating above the involucre glumes, more or less produced; lowest floret hermaphrodite, the second male or barren (rarely fertile), the following if present barren, often minute (some occasionally fertile in *C. tenella*). Involucral glumes 2, persistent, narrow, keeled, membranous, 1-nerved, acute, mucronate or the upper awned. Hermaphrodite floret: floral glume narrow or broad, 3-nerved, acute or obtuse, minutely 2-toothed, usually awned from below the apex, often ciliate; palea almost equalling the glume, 2-keeled. Lodicules 2, minute. Stamens 3. Ovary glabrous; styles distinct, short; stigmas laterally exerted. Male floret: glume and palea as in the hermaphrodite flower but smaller and glabrous. Rudimentary florets glabrous, awned or awnless, small to minute, usually without a trace of a palea.

Species about 75.—Tropical and subtropical regions of the Old and New World.

Cooke has 4 species. We add 5 more: *C. pallida*, *C. quinquesetica*, *C. virgata*, *C. montana* and *C. gayana*.

- A. Rhachilla not at all produced beyond the lower flowering glume. . . . . 1. *C. pallida*.
- B. Rhachilla produced beyond the lower flowering glume.
- I. Rhachilla produced beyond the flowering glume and  
    Wring 1 awn. . . . . 2. *O. incompleta*.
- II. Rhachilla produced beyond the flowering glume and  
    bearing 1-4 reduced empty glumes.
1. Spikes 1-3. Lower flowering glume broadly  
            cuneiform. . . . . 3. *C. tenella*.
2. Spikes 1-3. Lower flowering glume ovoid, hirsute  
            all over. . . . . 4. *C. villosa*.
3. Spikes 2-10. Lower flowering glume bearded at  
            the base and on the margins above the  
            middle.
- a. Rhachilla bearing 1-2-awned, tubular or  
            inflated glumes.
- \* Upper involucral glume awned . . . . . 5. *C. virgata*.
- \*\* Upper involucral glume awnless . . . . . 6. *C. barbata*.
- b. Rhachilla bearing 3-4 empty glumes.  
                Spikelets 4-awned altogether . . . . . 7. *C. montana*.
4. Spikes 5-18.
- a. Spikes 2-5-5 cm. long . . . . . 8. *C. quinquesetica*.
- b. Spikes 6-10 cm. long . . . . . 9. *C. gayana*.

## 1. CHLORIS PALLIDA Hook. f.

## PLATE 167.

*Chloris pallida* Hook, f. Fl. Brit. Ind. VII (1896) 289; Haines Bot. Bih. and Or. (1924) 967.

*Schoenfeldia pallida* Edgew. in Journ. As. Soc. Beng. XXI (1852) 161, 183; Aitchis. Cat. Panjab PI. (1869) 166; Duthie Grasses N. W. Ind. (1883) 32, Fodder Grasses N. Ind. (1888) 52, t. 64.

*S. gracilis* Kunth Rev. Gram. I (1829) 283, t. 53, Enum. PI. I (1838) 258; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 365.

**Etymology** : *Chloris* is derived from *cMoros*, green.—*Pallida* means pale.

**Description** : A slender tufted annual, 25-45 cm. high; stems simple or branched, almost filiform. Leaves 10-20 cm. long, linear, very narrow, flaccid, tips capillary, sparsely hairy inside towards the base, ligule of a few hairs.

Spikes 1-3, erect, digitate, golden-yellow, 7-13 cm. long, up to 5 mm. broad, closely pectinate with the two rows of erecto-patent long-awned spikelets. Spikelets narrow, tapering, about 2 mm. long without the awn, ~~subsessile. The involucre glumes are lanceolate, suberistately~~ acuminate, 1-nerved, keels ~~pubescent, lower 1 shorter than the upper. Lower floral glumes rather~~ longer than the lower involucre ~~glumes, 1-nerved, bearded, tip minutely~~ notched, awn 15-25 mm. long, capillary, curved. Palea narrow, keels ciliate, tip 2-dentate.



CHLOHIS PALIJU HOOK. F.

Delin: R. K. Bhide.



1 a 3 4 5  
CHLORIS INCOMPLETA HOTH.

Ddtn: S. K. Bhide.

Grain linear, very slender, pericarp loose. Rhachilla not produced beyond the lower floral glume. No rudimentary upper floral glume.

**Locality** : Gujarat: Sevalia (Chibber!); Lasandra (Chibber!); Khaxaghoda, dry salt ground (G. C. H. 537!).

W. Ghats: Lonavla (Gammie!).

Deccan: Charodi (Gammie 16531!).

**Ecology** : A subgregarious species. Grows in dry sandy places.

**Distribution** : Bundelkhand, Bihar, Central India, W. Peninsula.

**Explanation of Plate 167** : *Chloris pallida* Hook, f.

1. Spikelet.
2. Lower and upper invol. glume.
3. Floral glume,
4. Palea.
5. Grain.

## 2. CHLORIS INCOMPLETA Both.

### PLATE 168.

*Chloris incompleta* Roth Nov. Pl. Sp. (1821) 60; Steud. Syn. Pl. Glum. (1855) 207; Hook. f. Fl. Brit. Ind. VII (1896) 290; Cooke Pl. Bomb. II (1908) 1034; Achariyar S. Ind. Grasses (1921) 258; Haines Bot. Bih. and Or. (1924) 968.

*Ohhris digitata* Steud. 1. c.; Duthie Grasses N. W. Ind. (1883) 23; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 369 (excl. syn.).

*C. radiata* Heyne ex Roth 1. c. 61.

*O. Roxburghii* Edgew. in Journ. As. Soc. Beng. XXI (1853) 160, 183; Duthie Fodder grasses N. Ind. 54, t. 65; Lisboa 1. c. 368.

*O. tetrameris* Trin. Gram. Unifl. (1824) 235; Steud. 1. c. 206.

*Digitaria elongata* Spreng. Syst. I (1825) 271.

*Gymnopogon digitatus* Nees in Wight Cat. no. 1753 (ex Hook, f.); Steud. Nom. ed. II, I (1840) 713.

*Melica digitata* Roxb. Fl. Ind. I (1832) 326; Kunth Enum. Pl. I (1838) 37.

*Ctenium digitatum* Spreng. 1. c. 274.

*Cynodon elongatus* Trin. in Spreng. N. Entdeck. II, 64.

**Vernacular names** : Euncha, Bamna, Mathanya, Nika gadi.

**Etymology** : *Incompleta* means incomplete.

**Description** : Perennial; stems procumbent, or erect when growing amongst bushes, reaching a height of 1-5 m., ending in a very long naked peduncle. Leaves 15-30 cm. by 4-13 mm., narrowed into a fine point, flat, glabrous or slightly hairy; sheaths long, smooth, the mouth hairy; ligule of long hairs.

Spikes 4-6, in terminal whorls, 10-23 cm. long; rhachis filiform, scabrid. Spikelets 5 mm. long (excluding the awns), narrowly fusiform, imbricating, erect, closely appressed; rhachilla slender, bearing 1-6 mm. from its base a tuft of hairs, a little above, which is a barren glume terminated by a long awn reaching 8-5 mm. long. Glumes 4; lower involucre glume 2-5 mm. long, lanceolate, acute; upper involucre glume 5 mm. long (excluding awn), narrowly lanceolate, membranous, 2-toothed at the apex with a strong midnerve which is produced into an awn 1-2 mm. long; floral glume of fertile floret as long as the upper involucre glume, oblong-lanceolate, 2-toothed at the apex, with an awn 1 mm. long; palea as long as the glume, acuminate; callus bearded; IVth glume small, rudimentary.

**Locality** : Gujarat: Bulsar, in the shade of trees (Sedgwick 1114!).

Khandesh: To Toranmal, in a stony watercourse (McCann 9773! 9774!).

Konkan: Thana (Lisboa).

Deccan: Nasik (Lisboa).

8. M. Country: Deciduous forests west of Dharwar, 2,000 ft., rainfall 40 in. (Sedgwick & Bell 4499!).

N. Kanara: (Woodrow); Goond (Talbot 2203!); Halyal (Talbot 2382! 2220!).

**Ecology** : A sporadic grass. Likes hedges, thickets, and attains then a considerable height.

**Explanation of Plate 168** : *Chloris incompleta* Roth.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea, and production of rhachilla bearing an empty awned glume.



## 3. CHLORIS TENELLA Koen,

## PLATE 169.

*Chloris tenella* Koen. ex Roxb. Hort. Beng. (1814) 82, FL Ind. I (1832) 329 ; Kunth Enum. PL I (1838) 267, Spreng. Neue Entdeck. III (1822) 126; Steud. Syn. PL Glum. (1855) 204; Dalz. & Gibs. Bomb. Fl. (1861) 296; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893), 368 ; Hook. f. Fl. Brit. Ind. VII (1896) 291; Cooke Fl. Bomb. II (1908) 1033 ; Achariyar S. Ind. Grasses (1921) 269.

*C. triangulate* Hochst. ex A. Rich. Tent. Fl. Abyss. II (1851) 409; Steud. 1. c. 203; Duthie Grasses N. W. Ind. (1883) 33.

*Ctenium indicum* Spreng. Syst. I (1825) 274.

*Tetrapogon tricmgularis* Hochst. Pl. Arab. Schweinf. no. 967 (ex Hook. f.).

**Vernacular name** : Kagya.

**Description** : Annual, very slender; stems 25-45 cm. long, weak, slender, branched from the base. Leaves 7-5-20 cm. by 3-6 mm., flaccid, linear-lanceolate, finely acuminate, the margins more or less ciliate towards the base; sheaths glabrous; ligule large, membranous, truncate.

Spike solitary, 2-5-5 cm. long, erect, flat. Spikelets large, reaching 6 mm. long, cuneate, bifarious, 3-awned. Glumes 5 or 6 ; lower involucral glume 4 mm. long, strongly 1-nerved; upper involucral glume longer and broader, with a strong midnerve which is produced into a short awn; glume of hermaphrodite floret 5 mm. long, broadly cuneate, the upper margin truncated, naked, and with a scaberulous awn 4 mm. long from the back below the apex, the palea elliptic with ciliate margins, and the callus densely hairy, the next or second floral glume smaller but similar, with a similar palea, the others still smaller fan-shaped awned. Sometime\* one or more of the normally infertile glumes are found to be fertile, at other times all are barren-

**Locality 2** *Sind*: Jemadar ka Landa, near Karachi (Stocks).

*Gujarat*: Surat, on the city walls (Dalzell).

*Khandesh*: West Ehandesh (Blatter !).

*Deccan*: Bijapuz (Woodrow).

*S. M. Country* : Badami Fort (Bhide !).

**Distribution** : Rajputana, W. Peninsula, S. India, Arabia, Abyssinia.

**Economic uses** : Considered to be a good fodder at Ajmere.

**Explanation of Plate 169** : *Chhris tenella* Koen.

1. Spikelet.
2. Lower and upper invol. glume.
3. First floral glume.
4. Palea of first floral glume.
5. Stamens, grain and styles of first floret.
6. Second floral glume.
7. Palea of second floral glume.
8. Stamens, ovary and styles of second floret.
9. Third floral glume.
10. Palea of third floral glume.
11. Stamens, ovary and styles of third floret.

## 4. CHLORIS VILLOSA Pers.

*Chloris villosa* Pers. Syn. I (1805) 87 ; Kunth Enum. PL I (1838) 267, Suppl. 217, t. 16, fig. 3 ; Jaub. & Sp. III. PL Or. IV, 40, t. 327; Coss. & Dur. Fl. Alger. 87 ; Aitchis. Cat. Panjab. PI. (1869) 167 ; Hook. f. Fl. Brit. Ind. VII (1896) 291; Cooke Fl. Bomb. II (1908) 1034.

*Chloris tetrapogon* Beauv. Agrost. (181?) 158.

*Tetrapogon villosus* Desf. Fl. Atlant. II, 388, t. 255; Trin. Fund. Agrost. (1820) 760; Boiss. FL Or. V (1884) 555; Duthie Grasses N. W. Ind. (1883) 33, Fodder Grasses N. Ind. (1888) 55, t. 68.

**Description** : Perennial, stout; stems 15-25 cm. long from a densely tufted stout woody base, clothed with equitant leaf-sheaths. Leaves 2-5-7-5 by 1-6-2-5 mm., linear, acute, flat, convolute or twisted, rigid; ligule obscure.

Spikes 1-3, erect, pale yellow, 3-8-6-3 cm. by 8-5-13 mm. Spikelets 3-2 mm. long, obconic with 4 unequal awns. Glumes 5 ; lower involucral glume 3-2 mm. long (including a short awn) oblong-lanceolate, hyaline; upper involucral glume 4 mm. long, oblong, hyaline, 2-toothed at the tip and shortly awned; glume of the hermaphrodite floret 3-2 mm. long, broadly ovate or suborbicular, concave, with an awn 6 mm. long or more, and broad hyaline margins bounded by the lateral nerves, hirsute all over with long silky hairs which are much longer than the glume; the palea elliptic-obovate with ciliate margins, hyaline; the next glume (IVth) barren about half as long, also hirsute, the next (Vth) small, cuneate, the VIth reduced to an awn.



CHLORIS TENELLA KOEJJ.

Dellin; R. E. Rhide.



CHLORIS VIRGATA SW.

**Locality** : *Sind*: Gharo (Blatter & McCann D655 !).

*Gujarat*: Ahmedabad (Sedgwick!).

8. *M. Country*: Sluavar, on dry bunds, 2,000 ft., rainfall 35 in. (Sedgwick :3095 !); Yelvigi, 2,000 ft., rainfall 30 in. (Sedgwick 1923 !).

**Ecology** 2 A *suhgregarious species*. Reappears on barren white soil of the Carnatic.

**Distribution** : Punjab, Bajputana, W. Peninsula, westward to the Canaries.

#### 5. CHLOBIS VIRGATA SW.

#### PLATE 170.

*CUoris virgata* Sw. EL Ind. Occ. I (1797) 203 ; Trin. Gram. Unifl. 136; Doell in Mart. EL Bras. II, III; Hook. f. El. Brit. Ind. VII (1896) 291; Achariyar S. Ind. Grasses (1921) 260; Haines Bot. Bih. and Or. (1924) 968.

*RabdocMoa virgata* Beauv. Agrost. (1812) 84.

*CKbris compressa* DC. Cat. Hort. Monsp. (1813) 94; Nees Agrost. Bras. (1829) 421; EL Afr. Austr. (1841) 240; Steud. Syn. PL Glum. (1855) 204.

*C. caudata* Trin. ex Bunge Enum. PL Chin. Bor. 70.

*C. cryptostachys* Steud. in Schmidt Fl. Cap. Virid. 148.

*C. decora* Nees in Herb. Boyle; Steud. 1. c. 205.

*C. elegans* Kunth Enum. PL I (1838) 264.

*C. meccano*, Hochst. & Steud. ex Schult. Ind. Sem. Hort. Hal. (1843) 7 ; Steud. 1. c.; Boiss. El. Or. V (1881) 554; Duthie Grasses N. W. Ind. (1883) 33.

*C. montana* Griseb. in Goett. Nachr. (1868) 84, Abhandl. 300; Duthie L c. (*non* Roxb.).

*C. pallida* Link Hort. Berol. I (1827) 56, II, 223.

*C. penicillata* Hort. ex Nees. 1. c. (*non* Poir.).

*C. polydactyla* Durand Diss. Chlorid. (1808) 14, 22; Jacq. Eclog. Gram. 12, t. 9 (*non* Sw.).

*C. tetrastachys* Hack. mss. (*ex* Herb. Duthie).

*Heterolejris elegans* Ehrt. ex Boiss. 1. c.

**Vernacular names** : Kharrut, Sikaliu, Gadhiu, Fulkalu, Faliu, Khariu, Gonde gavat, Ganjali hullu.

**Etymology** : *Virgata* means virgate, twiggy.

**Description** : A tufted leafy annual grass, 30-60 cm. high. Stems somewhat flattened, erect, leafy at the base, occasionally with creeping stems rooting at the lower nodes. Leaf-blades rather narrow, linear, flat, acute, glabrous when old, with scattered long hairs in the leaves of young branches, 5-25 and even 40 cm. long, 3 mm. or less broad. Sheaths glabrous, compressed, upper ones somewhat inflated, margins thin and membranous, mouth of sheath bearded with long hairs in the leaves of young branches, quite glabrous when old and in flower-bearing branches.

Ligule a thin, narrow, membranous ridge. Spikes 6-15, erect, crowded at the end of the peduncle, 2-5-6 cm. long, rhachis fine, angular, scaberulous on the edges. Spikelets about 2-5 mm. long excluding the awns, 2-awned, short-stalked, consisting of 4 glumes. Lower involucral glume slender, subulate, glabrous, with the keel glaberulous, 1-nerved, about half the upper; upper involucral glume oblong-lanceolate, 2-fid at the apex, glabrous except the scaberulous keel, nerve produced between the lobes into a scaberulous awn. Lower floral glume oblong-ovate, cymbiform and rather deep, bifid at the apex and awned in the sinus, margins slightly ciliate up to about the middle and then closely ciliate with long hairs almost to but not to the tip, awn about 6 mm. long, bearded at base, on each side of the dorsal nerve there is a shallow groove with short scattered appressed hairs. Palea much narrower and rather shorter, often reduplicate, toothed or notched. Rhachilla somewhat adnate to lower floral glume, shortly produced, bearing a curious semitubular or bucciniform truncate glume with 2 minute auricles at tip and an awn 8 mm. long. Grain fusiform, sometimes slightly curved, pericarp loose.

**Locality** : *Gujarat*: Sungiri (Gammie 16585!); Perim Isl., Gulf of Cambay (Blatter .3816! 3820!).

*Khandesh*: Bor, Bori River (Blatter & Hallberg 4425 I); Toranmal, S. E. slope (McCann A194!).

*Konhan*: Lower Parel (Blatter 4279!), very common in Bombay Isl. (McCann !); Parsik, railway line (McCann A195!).

*W. Ghats*: Igatpuri (Blatter & Hallberg 51181 5145 !).

*Deccan*: Abundant on old walls of houses in Poona (Achanyar) ; Mangiri, near Poona (Gammie 15342 !); Lina Hill, Nasik Dist. (Blatter & Hallberg A190 !), Sholapur (D'Almeida A193 !); Eatraj Ghat (Gammie 1042 !); Gangapur (Blatter & Hallberg 4574!).

*S. M. Country:* Hubli, 2,000 ft., rainfall 30 in. (Sedgwick & Bell 4219!); Dharwar, 2,500 ft., rainfall 34 in. (Sedgwick 1818!).

**Ecology** : A subgregarious plant. Abundant in dry places of the Carnatic.

**Distribution** : Kashmir (Ladak), Rajputana, Gangetic Plain, Bihar, Burma, W. Peninsula, Central and S. India, westward to Algeria; Mongolia, tropical and S. Africa and America.

**Explanation of Plate 170** : *Chloris virgata* Sw.

1. Lower and upper invol. glumes and floral glume.
2. Floral glume.
3. Palea.
4. Grain.
5. Second floral glume.

#### 6. CHLORIS BABBATA SW.

#### PLATE 171.

*Chloris barbata* Sw. Fl. Ind. Occ. I (1797) 200 ; Jacq. Eclog. Gram. 10, t. 8; Kunth Enum. Pl. I (1838) 264, Suppl. 209 ; Trin. Diss. I, 232, Sp. Gram. Ic. t. 306 ; Nees Agrost. Bras. 421; Steud. Syn. Gram. 204; Eoxb. Fl. Ind. I (1832) 329; Grah. Cat. (1839) 234; Aitchis. Cat. Panjab Pl. (1869) 167 ; Duthie Grasses N. W. Ind. (1883) 33, Fodder Grasses. N. Ind. (1888) 53, t. 34; Lisbjoa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 367 ; Griseb. Fl. Brit. W. Ind. (1864) 539 ; Benth. Fl. Hongk. (1861) 429, Fl. Austral. VII (1878) 613 (*excl. syn. decora*); Doellin Mart. FL Bras. II, III, 67 ; Hook. f. Fl. Brit. Ind. VII (1896) 292 ; Prain Beng. PL 1227 ; Watt Diet. Econ. Prod. II, 269 ; Cooke FL Bomb. II (1908) 1035 , Achariyar S. Ind. Grasses (1921) 264; Haines Bot. Bih. and Or. (1924) 969.

*Andropogon barbatus* Linn. PL Jam. Pugill. 30, Mantiss. II, 302.

Rheede Hort. Malab. XII, t. 51.

**Etymology** : *Barbata* means bearded, alluding to the lower floral glume.

**Description** : Perennial; stems tufted, with strong root-fibres, rather stout, 60-90 cm. high, geniculately ascending, branching upwards, leafy, quite smooth; lower internodes 5-7.5 cm. long, as thick as a crow-quill, shining; upper very long, slender; nodes often bearing equitant tufts of leaves. Leaves 15-45 cm. long, narrowly linear, flat or folded, finely acuminate ; sheaths smooth, the lower open; ligule a very narrow membrane;

Spikes 5-20, digitately arranged in a truncate fascicle, 1-3-10 cm. long, on a slender peduncle, often purplish. Spikelets 2-5 mm. long (excluding the awns), green or purple, 3-awned ; rachilla produced, but not beyond the fertile glume bearing 2 small turgid obovate awned barren glumes 1-6 mm. long, the awns 3-2-4 mm. long. Involucral glumes hyaline, lanceolate, acute (not awned); lower 1-6 mm. long ; upper 2-5 mm. long ; floral glume of hermaphrodite floret, 2-5 mm. long, broadly elliptic, shortly apiculate, with a slender awn 3-2-4 mm. long and with densely bearded margins above the middle ; palea nearly as long as the glume, oblanceolate.

**Locality** : *Sind* : Mirpur Sakro (Blatter & McCann D656!); Tatta (Blatter & McCann D657!).

*Khandesh*: Nim, Tapti bank (Blatter & Hallberg 5399!); to Naradana (Blatter & Hallberg 5163 ! 5182 !); Umalla, Tapti Bank (Blatter & Hallberg A188 !).

*Konkan* : Parel, very common in Bombay Isl. (McCann 5381!); Sion (McCann 5220! 5245 I).

*Deccan*: Chattarshinji Hill, Poona (Ezekiel !); Jeur, Ahmednagar Disk (Woodrow!).

*S. M. Country:* Dharwar Dist., 2,000 ft., rainfall 35 in. (Sedgwick 1962 i); Haveri (Talbot 2215!).

*N. Kanara*: Kulgi (Talbot 2311!); Yellapur (Talbot 1524!)

**Ecology** : Grows in large tufts on pasture ground especially on sandy soils.

**Distribution** : Tropics generally.

**Economic uses** : Cattle eat it up to the time of flowering; afterwards they do not seem, to touch it. (Duthie).

**Explanation Of Plate 171** : *Chloris barbata* Sw.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume with palea.
5. Grain and styles.
- 6 and 7, Succeeding floral glumes.



CHLORIS BARBATA SW.

Delin: B. K. White.

## 7. CHLORIS MONTANA Roxb.

*Chloris montana* Koxb. Hort. Beng. (1814) 82, Fl. Ind. I (1832) 329; Kunth Enum. PL I (1838) 265; Spreng. Neue Entdeck. III, 127; Steud. Syn. PL Glum. (1855) 204; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 369; Hook. f. PL Brit. Ind. VII (1896) 292; AcKariyar S. Ind. Grasses (1921) 270; Haines Bot. Bih. and Or. (1924) 969.

*C. decora* Thw. Enum. 317 (excl. syn.).

*C. barbata* var. *decora* Trim. Cat. Ceyl. PL 109.

**Etymology** : *Montana* means mountainous, a habitat name.

**Description** : Perennial. Stems erect, tufted, geniculately ascending from a creeping base, rooting at the nodes, quite glabrous, 10 cm. to 1-2 m. high. Leaf-blades narrow-linear, finely acuminate, rounded at the base, glabrous, folded flat inwards, 1-20 cm. long, 1-5-3 mm. broad; sheaths shorter than the internodes, flat, compressed, glabrous, with a few hairs or none at the mouth and with membranous margins, uppermost sheath spathiform, enclosing the inflorescence when young; ligule a thin ridge of short hairs densely arranged. Nodes glabrous dark-ringed.

Spikes 2-6, very rarely up to 9, 2\*5-7-5 cm. long, connate at the base, erect and never spreading. Peduncle slender, long, glabrous, but copiously pubescent just below the base of the connate spikes; rhachis angular, slender, scabrid. Spikelets about 3 mm. long excluding the awns, short-pedicelled, unilateral, biseriate, thin, slender, 1-flowered, pale or purple tipped, disarticulating above the 2 lower empty glumes which persist on the rhachis, generally 4-, rarely 3- or 5-awned, awns pale or purple, 3-5 mm. long; pedicel short, angular, scaberulous with a few pilose hairs; rhachilla produced, but is shorter than the flowering glume. Glumes usually 6, very rarely 5 or 7. Lower involucral glume hyaline, awnless, white or lightly purplish, about 1-5 mm. long, lanceolate, finely acuminate, 1-nerved, and with a scabrid keel; upper twice as long as the lower, hyaline, oblong-lanceolate, finely acuminate or obtuse and shortly awned, 1-nerved. Lower floral glume broadly oblong, chartaceous, 3-nerved, bearded with long hairs along the margins from a little above the base and with a tuft of hairs at the base, awned at the apex; upper floral glume much smaller, cuneate, conduplicate, awned from the truncate tip, embracing glumes V and VI; glume V cuneate or subglobose, small, enclosing the still smaller or minute glume VI, both awned. Palea oblong, a little smaller than its glume, folded along the margins. Stamens 3, anthers pale yellow. Styles white with purple stigmas. Lodicules narrowly cuneate.

**Locality** : *Deccan*: Nasik (Lisboa).

**Distribution** : Upper and lower Gangetic Plain, southward to Ceylon, Coromandel Coast.

## 8. CHLORIS QUINQUESETICA Bhide.

*Chloris quinquesetica* Bhide in Journ. and Proc. As. Soc. Beug. (new series) VIII (1912) 311;

Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 33 (1929) 759.

**Etymology** : *Quinquesetica* means having 5 setae or bristles.

**Description** : A glabrous, perennial grass, creeping and rooting at the lower nodes and there forming small tufts of leaves and an erect flowering stem 60 cm. high; nodes glabrous. Leaves 2-15 cm. long and 3-5 mm. broad, sparsely, delicately long-ciliate when young, ultimately glabrous, lanceolate, acuminate, truncate at the base, margins minutely scabrid; ligule a narrow imbricate membrane.

Spikes 5-18, 2-5-5 cm. long, crowded in a very short racemose fascicle the branches of which are often decurrent into the peduncle for a short distance and form ridges on it which are also studded with stray spikelets. Peduncle below the spikes and the rhachises hairy. Spikelets 6 mm. long including the awns. Glumes 7: I and II empty, III flowering, awned, paleate, IV-VII barren, epaleate, gradually smaller and rounder, all awned. Lower involucral glume 1-5 mm. long, elliptic-lanceolate, membranous, strongly 1-nerved, slightly oblique; upper 1½ times as long as the lower, elliptic-oblong, membranous, shortly mucronate, strongly 1-nerved. Lower floral glume without the awn as long as the upper involucral, elliptic-obovate, cuneate, coriaceous, 3-nerved, and with a dorsoterminal awn 5 mm. long, lateral nerves densely bearded with long white hairs nearly from the base. Palea as long as the glume but narrower, slightly hairy at the back, very shortly 2-fid at the apex, 2-keeled, keels minutely ciliate. Stamens 3, styles 2, stigmas plumose. Grain plano-convex or trigonous. Lodicules minute.

**Locality** : *Sind*: Jamesabad, in fields (Sabnis B1116!).

*Cutch* : Bhuj, Bhodir Maka (Blatter S748 !); Runn of Cutch (Blatter 3732 !).

*Konkan*: Versova (McCann A185 !); Papadi, Bassein, growing on the bunds of ricefields, in semi-salt land (Bhide !); Colaba, near a swamp, on rocks, very common (McCann A198 I A199 ! A200 !).

*N. Kanara* : Karwar, on red mud near the shore (Hallberg & McCann A197 !).

**Distribution** : So far endemic.

## \* 9. CHLORIS GAYANA Kunth.

*Chloris gayana* Kunth Rev. Gram. I (1829) 89, 293, t. 58, Enum. I (1838) 267, Suppl. 216 ; Nees Fl. Afr. Austr. (1841) 240; Steud. Syn. PL Glum. I (1855) 207 ; Oliv. in Trans. Linn. Soc. 29, 174; Durand & Schinz Consp. Fl. Afr. V, 861.

*C. abyssinica* Hochst. ex A. Rich. Tent. FL Abyss. II (1851) 406 ; Engl. Hochgebirgs Si. Trop. Afr. 132; Schweinf. in Bull. Herb. Boiss. II, App. II, 32; Duiand. & Schinz Consp. 1. c. 860.

<7. *glabrato* Anders, in Peters Reise Mossamb. Bot. 557.

**Vernacular name** : Rhodes Grass.

**Description** : Perennial or annual, 0.6-1.2 m. high; culms erect or geniculately ascending, or prostrate at the base, simple or branched, often emitting fascicles of barren shoots or short runners from the lower nodes, often robust, 3-9-noded, compressed below, glabrous, smooth, upper internodes usually exserted; sheaths glabrous or sparingly hairy near the mouth, smooth, the lower strongly compressed, keeled, keels sometimes scabrid, the uppermost sometimes tumid; ligules membranous, very short, long-hairy; blades linear, long-tapering to a fine point, 15 to more than 30 cm. by 6-8 mm. when expanded, flat or folded, glabrous or hirsute near the base, green, smooth below, rough above on the margins.

Spikes 6-15, umbelled, sessile, suberect, rarely spreading, 6-10 cm. long, greenish or brownish; rachis scabrid; spikelets 3 mm. long, 3-4-flowered, shortly 2-awned, glumes very unequal, the lower involucrel ovate-lanceolate, acute, subhyaline, 1-1.5 mm. long, the upper oblong, obtuse, mucronate, 2-3 mm. long, firmer, scaberulous; lower floral glume oblong, subobtuse or acute, minutely 2-toothed, ciliolate along the marginal nerves\* and shortly bearded below the tips or only finely bearded or almost glabrous, with a (sometimes minutely hairy) groove on each face; awn as long or slightly longer than the glume, straight; callus minutely bearded, palea glabrous, keels scabrid. Anthers 1-5 mm. long; second floral glume with a male flower, like the preceding, but glabrous, 2 mm. long, awn 2 mm. long or less; Vth and VIth glume rudimentary, cuneate in profile, empty, awnless.

**Locality** : Deccan: Poona (Burns!). See also Mann in Bull. 77, p. 72 of Dept. Agric. Bombay.

**Ecology** : The stems are prostrate at the base and often form stolons.

**Distribution** : S. and tropical Africa. Introduced in N. America, Australia, and the Hawaiian Islands.

## 92. ELEUSINE Gaertn.

Annual or perennial; leaves long, flat or folded, flaccid or firm.

Spikes in interrupted spikes or the upper or all in a terminal umbel, straight, suberect, spreading or deflexed; spikelets glabrous, 3-6-flowered, laterally compressed, densely imbricate, alternately biseriate, unilateral, sessile on a flattened rachis, the uppermost terminal, perfect; rhachilla disarticulating above the involucrel glumes and between the flowering glumes, or tough, produced, sometimes terminating with a rudimentary glume. Flowers bisexual. Involucrel glumes 2, subequal, persistent, obtuse or obscurely mucronate, membranous, strongly keeled, 3-5-nerved, the lateral nerves close to the keel, the lower shorter, with the keel crested. Flowering glumes very similar, 3-nerved near the base; lateral nerves submarginal above, with 1-2 short additional nerves close to the keel. Paleae slightly shorter than the glumes, 2-keeled, keels winged. Lodicules 2, minute, cuneate. Stamens 3. Ovary glabrous; styles slender from a broadened base, distinct; stigmas plumose, laterally exserted. Grain broadly-oblong to globose broadly grooved; pericarp loose, delicate, breaking up irregularly or almost circumscissile; seed finely striate; embryo suborbicular, basal; hilum punctiform, basal.

Species 10.—Tropical and subtropical Africa and Asia, 1 widely spread through the tropics.

Of the 5 species mentioned by Cooke, 2 have been transferred to *Dactyloctenium* viz., *E. aegyptiaca* and *E. aristata*. We add 2 species new to the Presidency: *E. verticillata* and *E. bremfolia*.

A> Erect.

## I. Spikes digitate.

## 1. Spikes slender, nearly glabrous at base. Seed

oblong, obtusely trigonous . . . . . 1. *E. iidica*.

## 2. Spikes stout, often incurved, pubescent at base.

Seed globose . . . . . 2. *E. coracana*.

II. Spikes scattered or whorled . . . . . 3. *E. verticillata*.





ELJCPFINE INDICA GAERTN.

Delin: H. K. Bhids.

4. Floral glume.
5. Palea.
6. Grain.

## \*2. ELEUSINE CORACANA Gaertn.

## PLATE 173.

*Eleusine coracana* Gaertn. Fruct. & Sem. I (1788) 8, 1. 1; Lamk. HL. t. 28; Schreb. Gram. II, t. 35; Trin. Sp. Gram. Ic. t. 70; Panz. in Muench Denkschr. IV (1814) t. 8; Roxb. It Ind. I (1832) 342; Grah. Cat. (1839) 235; Dalz. & Gibs. Suppl. (1861) 97; Duthie Grasses K. W. Ind. (1883) 34, Fodder Grasses N. Ind. (1888) 57, t. 69, Field & Gard. Crops 15, t. 28; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 373; Hook. f. It Brit. Ind. VII (1896) 294; Cooke It Bomb. II (1908) 1039; Prain Beng. PL 1229; Haines Bot. Bih. and Or. (1924) 970.

{*Jynosurus coracanus* Linn. Syst. ed. II, 875.

*Eleusine cerealis* Salisb. Prodr. 19.

*E. sphaerosperma* Stokes Bot. Mat. Med. 1, 149.

*E. stricta* Roxb. 1. c. 343.

*E. Tocussa* Fresen. in Mus. Senkenb. II (1837) 141.

Rheede Hort. Mai. XII, t. 78.

Vernacular names : Korakan, Dagussa, Mandua, Marua, Ragi, Nachani, Nachni, Nagii, Ragi, Makra, Nanguli.

Etymology : *Coracana* comes from *hurac*. Jean, its Ceylon name.

Description : Very like *Eleusine indica*, but stouter, up to 1-5 m. high. Leaves often far overtopping the stem, 5-6 mm. broad; sheaths compressed, loose : ligule of hairs.

Spikes 4-7, suberect, with their ends or whole spike frequently incurved, rhachis of spikes often pubescent at base, somewhat 3-gonous or back flattened. Spikelets much congested, awnless, 3-6-fid. Flowering glumes more broadly ovate than in *E. iwlica*, and often with 1-2 nerves in the sides, variable in size, up to 5 mm. long. Seed globose, dark brown, smooth in some varieties, in other cases somewhat rugose, with a depressed black hilum and slightly flattened on one side. A cultivated form of *E. indica*.

Locality : Extensively grown chiefly in the hilly districts of the Presidency. In the Kaira and Ahmedabad Districts heavy crops are produced.

Ecology : It grows almost on any soil, rich and poor. See Watt III, 237-240.

Distribution : Cultivated in the tropics of the Old World for its seed.

Economic uses : The grain is eaten largely by the poor classes, it is not considered to be very wholesome. The straw is excellent fodder for cattle and is said to improve by keeping. "It is often said to be a good fodder. This is not my experience, the leaves though soft have very tenaceous vascular strands and I have noticed animals frequently reject them after chewing a few times." (Haines). A fermented liquor, called bojah or bojali, is prepared from grain in the Mahratta country. It is asserted that the grain is never attacked by insects.

Explanation of Plate 173 : *Eleusine coracana* Gaertn.

1. Spikelet.
2. Dorsal view of palea showing the keels strongly winged.
3. Lower invol. glume.
4. Upper invol. glume.
5. Floral glume.
6. Palea.
7. Grain and styles.

## 3. ELEUSINE VERTICILLATA Roxb.

## PLATE 174.

*Eleusine verticillata* Roxb. Fl. Ind. I (1832) 346; Aitchis. Cat. Panjab PL (1869) 168; Duthie Grasses N. W. Ind. (1883) 34, Fodder Grasses N. Ind. (1888) 58, t. 70; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 377; Hook. f. Fl. Brit. Ind. VII (1896) 295; Saxton & Sedgwick Plants of N. Gujarat in Rec. Bot. Surv. Ind. VI (1918) 322.

*E. racemosa* Heyne in Roth Nov. Sp. (1821) 80.

*Aerachne elmsinoides* Wight & Am. in Wigh\* Cat. no. 1760; Nees ex Steud. 1. c.

*A. verticillata* Lindl. Introd. Nat. Syst. ed. II, 381.

Vernacular names : Chinkhe, Kuri-chinke, Kanjsi, Jaura.

Etymology : This species is called verticillata because the spikes are arranged in verticels.

Description : An annual grass. Stems 30-90 cm. high, erect, stout or slender, simple or branched, soft. Leaves flat, rather broad, flaccid, acuminate, glabrous; sheath compressed; ligule a few hairs.

B. Prostrate or creeping and rooting.

- I. Ligule hairy. Spikes digitate . . . . . 4 . *E. flagellifera*.  
 II. Ligule obsolete. Heads of spikes globose . . . . . 5 . *E. brevifolia*.

1. ELEVSINK otntcuk Gaertn.

PLATE 172.

*Euaaim indicum* Gaertn. Fruct. I (1788) 8; Umk. III I, 203 t. 48; Kunth Euum. Pl. I (1838) 273, Suppl. 224, t. 16, fig. 4; Stood. Syii. Pl. Glum. (1885) 311; Roxb. Fl. Ind. I (!) 332 345; Grah. Cat. Bomb. Pl. (1839) 235; Griff. Notul. III, 52, 53. Ic. PL Asdat. t. 119, fig. 156 & t. 150, fig. 1; Aitcbis. Cat. Punjab Pl. (1859) 168; Duthie Grasses X. W. Lid. (1883) 34, Fodder Grasses X. Ind. (1888) 57. t. 69; Boiss. Fl. Or. V (1881) 556.

*E. fataehya* Trin. ex Stead. Nom. ed. II, 1(1840) 549.

*E. distent* Mfitch Meth. (1794) 2HL

*E. dotaingensu* Sielj. ex Schutt. Mant. 11. 323.

*E. G<ndm, inaequalis, ruffidifolia* and *scitkm* Fourn. ex Hemsl. Biol. Centr. Amer. I, 565.

*E. gracilis* Salisb. Prodi. 19.

*E. marginat* Liliid. in Mitch. Three Exped. I, 188.  
*E. tritaekya* Umk. 1. c; KuntL Rwis. Gram. I (1829) & 2, Enum. I (1838) 273; Hook. f. Fl. Brit. Ind. VII (1896) 293; Cooke Fl. Bmh. II (1908) 1037; Achariyar S. Ind. Grasses. (1921) 273, fig. 206; Haines Bot. Bih. and Or. (1924) 970.

*Cynosurus indicus* Lian, Sp. Pl. (1753) 7<sup>1</sup>.

*Panicum cottiitressum* Forisk. F3. Aeg. Arab. (1775) 18.

*Paspalum dissection* Kniphof. Cent. Eot. in Orig. t. II.

*Urochloa getminatom* Spreng. Syst. I (1825) 326.

*Agropyron gminakm* Schult. Mant. 111. 655.

Rheede Hort. Mai. XII, t. 69.

Vernacular names r Crowfoot grass, Crab grass, Mendla, Medha, Guder, Kbuid, Khurd-mendi.

Etymology : B& "•••" is derived from *Eleusis*, where there was a temple of Ceres.

Description : Annual, erect; stem 30-60 cm. high, tufted, slightly compressed, glabrous; roots of strong fibres. Leaves distichous, flat or folded, as long as the stem, 3-6 <sup>mm</sup> broad, linear, glabrous or sparsely hairy, with nearly smooth margins; sheaths compressed, the mouth not axicled but often with a few hairs; ligule a thin slightly hairy membrane.

Spikes 2-7 or more, 5-12.5 cm. long, with sometimes one or two detached below the umbel, digitate, suberect or slightly recurved, the axils hairy and bulbous; rachis flat. Spikelets pointing forward at an acute angle with the rachis of the spike, variable in size, 2.5-4 mm. long, 3-jointed, glabrous. Involucral glumes unequal, membranous; lower 1-6 mm. long, ovate-oblong, acute, 1-nerved; upper 2-5 mm. long, ovate-oblong, subacute, very shortly apiculate, with 3-7 green nerves; floral glumes gibbously ovate-oblong, obtuse, 3-2 mm. long; palea shorter than the glume, oblong-lanceolate, subacute. Nerves 0.8 mm. long. Grain oblong, obtusely trigonous, obliquely striate, reddish brown.

Locality ; *Cutdi* : Bhuj Hill (Bkstor 8519!).

*Khet* : Umatla, Tapti bank (Blatter & Hallberg WSM 1); North slope of Chanseli (McCann A202!).

*Konlth* : Byculla (McCann A2d7 !); very common in Bombay and Sulstote Isls. (McCann !); Alibag (Ezekiel!); Vatora (Sabnia 335951); Bassein (McCann 4478!).

*W. Ghats* : Khawdala, very common (McCann 9407 !); Khandala to Karjat (Slatter & Hallberg 5321 !); [gatpni] [Blatter A 1111cri! 51B91).

*Deccan* : Poona (Woodrow).

*S. M. Country* : Dhanror, 2,400 ft. tainfaH U in. (SedRwick & BeU 4988!).

*X. Humirti* : Yelkpm- (Talhot 1633!); Hslyal (Tslbdt 31(B !); Nencholi, near bants (Talbot ^ D).

Ecology : A "sporadic grass. Grows in large tufts on light ground and roadsides. Sodgwick thinks it is rather a companion of man.

Distribution : Throughout the plains of India, tropics of the Old World.

Uses : (considered to be a good fodder grass in some districts. Highly esteemed as a pasture grass in Australia and N. America.

Explanation of Plate 172 : *fifeuww iniica QtedaL*

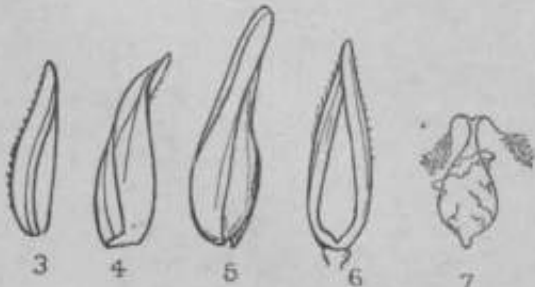
1. Spikelet.
2. Lower invol. glume
3. Upper in vol. glume.



1



2



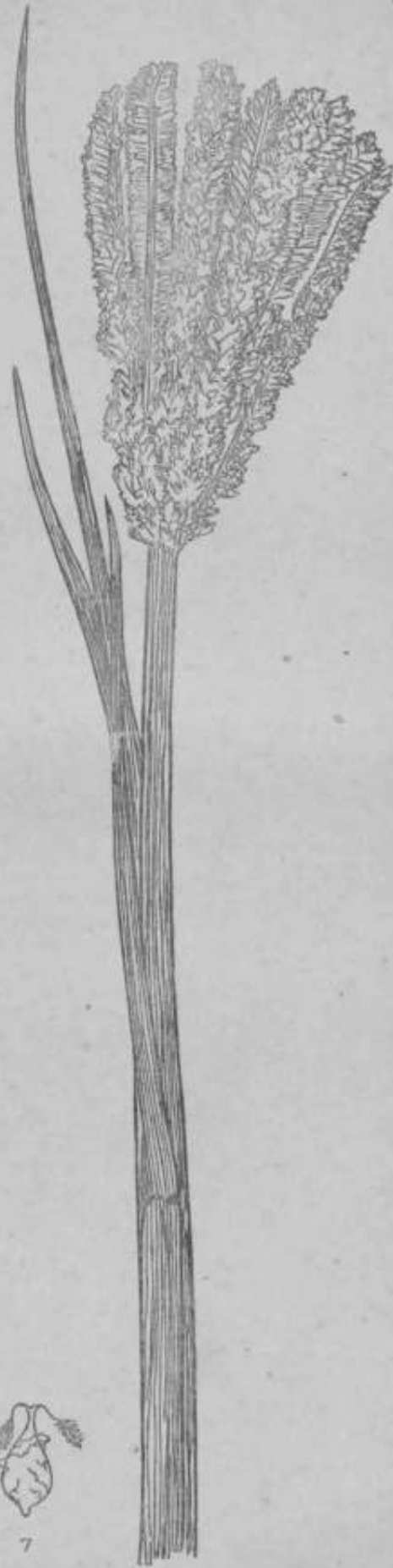
3

4

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ELEUSINE COHCANA G. & GRIN.

Del. titi: S. K. Bb<dt.



ELKUSINE VERTICILLATA ROXB.

Delin; R. K. Bhide.

Spikes few or many, scattered or whorled, or opposite or alternate, suberect, 2-7-5 cm. long, very many-flowered. Spikelets 4-6 mm. long, 8-12-flowered, shining; glumes small, acute, glabrous. Involucral glumes broadly ovate, finely acuminate or aristulate. Flowering glumes 2 mm. long, very broadly ovate, 3-nerved, keel excurrent, lateral nerves ending in small teeth. Grain rugose, pericarp caducous.

**Locality** : Gujarat: Ahmedabad, compounds, lanes and banks, common (Saxton & Sedgwick!).

**Ecology** : A sporadic grass.

**Distribution** : Tropics of the Old World.

**Economic uses** : Said to be a good fodder grass for cattle.

**Explanation of Plate 174** : *Eleusine verticillata* Boxb.

1. Spikelet.
2. Floral glume.
3. Palea.
4. Stamens, ovary and styles.
5. Grain.

#### 4. ELEUSINE FLAGELLIFERA Nees.

##### PLATE 175.

*Eleusine flagellifera* Nees in Linnaea XVI (1842) 220 ; Steud. Syn. PL Glum. (1855) 211 ; Duthie Grasses N. W. Ind. (1883) 34, Fodder Grasses N. Ind. (1888) 57, t. 37 ; Boiss. FL Or. V (1884) 655 ; Hook. f. Fl. Brit. Ind. VII (1896) 294 ; Cooke Fl. Bomb. II (1908) 1038.

*E. arabica* Hochst. ex Steud. 1. c ; Aitchis. Cat. Panjab PL (1869) 167 ; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 377 ; Watt Diet. Econ. Prod. III (1890) 241.

**Etymology** : *Flagellifera* means having *flagella*, alluding to the proliferous branching of the plant.

**Description** : Perennial, prostrate, proliferously branched, glaucous; stems smooth, stiff, widely spreading, rooting at the distant thickened leafy nodes and sending up slender branches ; internodes 10-20 cm. long. Leaves 1-3-3-8 cm. by 1\*6-3 mm., linear-lanceolate, acuminate, rigid, distant, flat or tortuous, recurved, the upper very short; sheaths glabrous; ligule a hairy line.

Spikes 3-6, digitate, 2-3-8 cm. by 4-8-5 mm., rhachis slender, flezuous, pubescent. Spikelets imbricate, subsessile or very shortly pedicellate, 4-6-flowered, 3-2-8-5 mm. long. Lower involucral glume rather less than 3-2 mm. long, ovate, acute, membranous; upper involucral glume 4 mm. long, lanceolate, aristate, coriaceous, with broad membranous margins; floral glumes b mm. long, ovate, acute, apiculate, charfaceous, 3-nerved, the midnerve compound, the margin membranous, hairy below; palea oblong with ciliate keels. Anthers 1-6 mm. long.

**Locality** : *Sind*: Jacobabad (Bhide!); Mirpurkhas (Jhaveri!); Sanghar (Sabnis B88 9! A236 !); Umarmot, sand hills (Sabnis B1002 ! B1017 !); Sehwan to Laki, foot of hills (Sabnis ,B616!); Pad-Idan (Sabnis B511!); Gharo (Blatter & McCann D605!).

*Cutch*: Bhuj Hill (Blatter 3746!).

*Khandesh* (Lisboa).

*Deccan*: Poona (Lisboa).

**Ecology** : Exclusively sand plants.

**Distribution** : Punjab, W. Peninsula, Afghanistan, N. Africa.

**Economic uses** : Good fodder for cattle and horses,

**Explanation of Plate 175** : *Eleusine flagellifera* Nees.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea.
6. Stamens, ovary and styles.

#### 5. ELEUSINE BREVIFOLIA R. Br.

*iElewdne brevifolia* E. Br. in Wall. Cat. no. 3815; Hook. f. Fl. Brit. Ind. VII (1896) 294;

Acharyar S. Ind. Grasses (1921) 274.

*Koeleria brevifolia* Spreng. Pugill. II, 21.

*K. lagopoides* Panz. ex Spreng. 1. c.

*Dactylis brevifolm* Koen. ex Willd. Sp. PL I, 410 (*exd. syn.*); Roxb. FL Ind. I (1832) 341.

*J. cynosuroides* Koen. ex Both Nov. Sp. (1821) 74 (*non* Linn.).

*Pea-brerifolia* Kunth Rev. Gram. I (1829) 111, Enum. PL I (1838) 324.

*Aeluropus brevifolius* Nees ex Steud. Norn. ed. II, I (1840) 30.

*A. laetis* Trin. Fund. Agrost. (1820) 143, t. 12.

*A. jwbescens* Steud. Nom. 1. c.

*Eragrostis brevifolia* Benth. in Hook. Ic. Pl. XIV, 51.

*Triodia cynosnroides* Spieng. Syst. Veg. I (1825) 331.

Etymology : *Brevifolia* means short-leaved.

Description : An annual grass. Stems creeping and spreading from the root, ascending: from a decumbent base, generally slender and small, sometimes large and proliferously branched, leafy, 7-18 cm. long. Leaf-blade linear, acute with a subcordate or rounded base, 2-5 cm. long, 3-4 mm. broad; sheath compressed and glabrous; ligule a very short membrane, ciliate at the margin or obsolete.

Spikes usually many, sessile and crowded in globose heads, varying in diameter from 8-16 mm. Spikelets sessile, biseriate, ovate-oblong, 3-4 mm. long, 4-10-flowered. Involucral glumes membranous, ovate-oblong, acuminate, shortly awned, glabrous, the lower shorter than the upper, 1-3-nerved, the upper 3-5-nerved, and the nerves very close to the middle one in the keel. Lower floral glume and the succeeding ones ovate, cuspidately acuminate, 3-nerved, nerves villous below the middle and paleate. Palea oblong, lanceolate, truncate and rfrbrately 2-toothed, keels villous\* below the middle. Anthers small. Lodicules small and cuneate. Styles long and slender. Grain orbicular to ovate, concavo-convex, red-brown, and transversely iugose.

Locality : S. M. Ccuntiy: Sanibennur (Bhide!).

Ecology : Exclusively a sand plant along the coast of the sea.

Distribution : Coicmandel and Carnatic coasts.

### 93. DACTYLOCTEMUM Willd.

Annual or perennial; leaves flat, subflaccid; spikes in umbels of 2-6, erect or stellately spreading ; tips of the rhachis barren, mucroniform, usually curved.

Spikelets 3-5-flowered, laterally compressed, densely imbricate, biseriate, sessile, unilateral on a flattened rhachis, the uppermost reduced; rhachilla tardily disarticulating above the\* empty glumes, tough between the flowering glumes. Flowers bisexual, the uppermost rudimentary. Involucral glumes 2. unequal, strongly keeled, the lower ovate, acute, thin, persistent, the upper elliptic-oblong in profile, obtuse, mucronate or awned, firm, deciduous. Flowering glumes ovate, subacuminate, 3-nerved, mucronate or awned, deciduous with the<sup>4</sup> grains. Paleae about as long as the flowering glumes, 2-keeled, subpersistent. Lodicules 2., cuneate, minute. Stamens 3. Ovary glabrous; styles distinct, very long, subterminally-exserted. Grain subglobose, slightly laterally compressed, not grooved or hollowed, rugose or punctate; pericarp very delicate, irregularly breaking away; embryo scarcely equalling-£ the length of the grain ; hilum basal, punctiform.

Species 5.—Warm regions.

- |                             |   |   |   |   |                          |
|-----------------------------|---|---|---|---|--------------------------|
| 1. Annual; grain subglobose | . | . | m | . | 1. <i>D. aegyptium</i> . |
| 2. Perennial; grain ovoid   | . | . | . | . | 2. <i>D. indicum</i> .   |

### 1. DACTYLOCTENIUM AEGYPTIUM Richt.

#### PLATE 176.

*Uactyloctenium atgyptium* Richt. PL. Europ. I (1889) 68; Muschlet Fl. Egypt I (1912) 10# (nomen atribulum Wittenducio per error.).

*Cynosmus aegyptius* Linn. Sp. Pl. (1753) 72.

*Dactyloctenium atgyptiacum* Willd. Enum. Pl. (1809) 1029; Beauv. Agrost. (181?) 72, t. 15., fig. 2; Kunth Enum. Pl. I (1838) 261, Suppl. II, 204; Grah. Cat. Bomb. Pl. (1839) 235; Dalz. & Gibs. Bcmb. Fl. (1861) 297; Aitchis. Cat. Panjab Pl. (1869) 167; Boiss. Fl. Or. V (1884) 55t.

*Ehvbine ae&yptiaia* Desf. \*1. Atlant. 1 (1768) fc5; Roxb. Fl. Ind. I (1832) 344; Griff. Notul. III, 51, Ic. Pl. Asiat. t. 139, fig. 79 ; Duthie Grasses N. W. Ind. (1883) 34, Fodder Grasses N. Ind. (1838) 56, t. 35 ; Hook. f. Fl. Brit. Ind. VII (1896) 295; Lisboa in Journ. Bomb. Kat. Hist. See. VII (1893) 374; Prain Beng. Pl. 1229; Cooke Fl. Bomb. II (1908) 1038 \*.. Achariyar S. Ind. Grasses (1921) 276; Haines Bot. Bih. and Or. (1924) 970. \*

*E. dliaia* Bafin. in Desv. Journ. Bot. IV (1814) 273.

*E. eweiata* Laink. Iii. I, 203, t. 48, fig. 2.

*E. mucromta* Stokes Bot. Mat. Med. 1,150; Lisboa in Journ. Bomb. Nat. hist Sue VII Q893> 376.



ELEOSINE FLAGELLIFERA NEE3

Delin; R. K. Thide.





DACTYLOCTENIUM Aegyptium L.

Delin: R. K. Bhide.

- \**E. pectinate* Moench Metk. (1794) Suppl. 68.  
*E. prostrate* Spreng. Syst. I (1825) 350.  
*E. radulans* R. Br. Prodr. (1810) 186.  
*Dactyloctenium distachyum* Bojer Hort. Maurit. (1837) 370.  
*D. Figarei* Notar. in Ann. Sc. Nat. Ser. III, IX (1848) 325.  
*D. meridionale* Ham. Prodr. Pl. Ind. Occ. 6.  
*D. mueronatum* Willd. 1. c ; Trin. Sp. Gram. Ic. t. 69.  
*D. prostratum* Willd. 1. c.  
*D. radulans* Beauv. Agrost. (1812) 72; Kunthall. cc. 262, 204.  
*Oynosurus distachyus* Rottl. ex Steud. Norm. ed. II, I (1840) 465.  
\**CJdoris mucronata* Mich. XI. Am. Bor. I, 59.  
*Cenchrus aegyptius* Beauv. Agrost. (1812) 157.  
*Rhabdochloa mucronata* Beauv. 1. c.  
*Aegilops saccharinus* Walt. Fl. Carol. I, 249.  
Rheede Hort. Mai. XII, t. 69.

**Vernacular names** : Gandhi, Anchi, Manchi, Tagar sammi, Hakki kalin hullu.

**Description** : Annual of variable habit, 30-45 cm. high; stems sometimes prostrate, tooting from the proliferously branched nodes, geniculately ascending, compressed, glabrous, smooth. Leaves linear, 2-5-12-5 cm. by 2-4 mm., tapering to a fine point, flat, glaucous, glabrous or hairy or hispidly ciliate with bulbous-based hairs; ligule a slightly ciliolate line.

Spikes 2-6, digitately radiating, 1-3-3\*8 cm. long; rhachis trigonous or dorsally flattened, rigid, often excurrent into a pungent mucro. Spikelets many, 3-5-flowered, spreading at right angles to the rhachis, up to 3-2 mm. long. Glumes divaricate; lower involucral glume ovate, acute, 2 mm. long; upper involucral glume 2 mm. long (excluding the awn), suborbicular, the midnerve produced into a usually curved awn often as long as or sometimes longer than the glume; floral glumes gibbously ovate, up to 3-2 mm. long, mucronate or awned; palea rather shorter than its glume, ovate-oblong, obtuse or 2-fid. Anthers about 1\*2 mm. long. Grain subglobose, reddish, very rugose, 1 mm. diam.

**Locality** : *Sind*: Ghulamalla, garden (Blatter & McCann D599!); Tatta (Blatter & McCann D600!); Indus Delta (Blatter & McCann D601!); Karachi (Bhide!); Mirpurkhas (Bhide!, Sabnis B1170!); Umarmot (Sabnis B1001!); Hyderabad, cultivated fields (Sabnis B50 !); Sukkur, cultivated fields (Sabnis B540!); Nasarpur (Sabnis B1138 ! B1059 !); Sanghar (Sabnis B8S8!).

*Cutch*: Sumrasar (Blatter 3759 !); Bhuj Hill (Blatter 8551!).

*Gujarat*: Perim Isl, Gulf of Cambay (Blatter 3818 !).

*Khandesh*: Muravat, Tapti Bank (Blatter & Hallberg 5164!); Bor, Bori River (Blatter & Hallberg 5483 !).

*Konhan*: Wada range, Thana Dist. (Ryan 685!); Juvem (McCann 4264!); Vetora (Sabnis 33592 !); Mulgaum (McCann A208!); Versova (McCann A205 !); Uran (Hallberg & McCann 5135!); Marine Lines, Bombay Isl (Hallberg A206 1); very common in Bombay Isl. (McCann!); Eatnagiri (Woodrow 41).

*W. Ghats* : Khandala to Campoli (McCann A209 !); Khandala (Gammie 15395 !, McCann!); Igatpuri (Blatter & Hallberg 5195 !, McCann!).

*Deccan*: Poona (Jacquemont 399, 486), Agricultural College garden (Garade 665 !); Bopodi, near Poona (Gammie 15310 !); Manmad; river-bed (Blatter A211!); Sharanpur, near Nasik (Woodrow).

*8. M. Country*: Yelvigi, 1,800 ft., rainfall 25-30 in. (Sedgwick 2002!); Gokak (Shevade!); Badami (Woodrow 12).

*N. Kanara*: Dandeli, 1,800 ft., rainfall 100 in. (Sedgwick & Bell 4215!); Halyal (Talbot 2303 !); Karwar, seashore and near sea (Talbot 1298 !).

**Ecology** : A sporadic grass. Grows in barren places and fields in the drier parts of the Camatic.

**Distribution** : Spread throughout tropical and subtropical regions.

**Economic uses** : Considered to be a very nutritious fodder grass for cattle, being both fattening and milk-producing (Duthie).—The grain is eaten by the poorer classes, especially at times of scarcity.

**Medicinal uses** : In Africa a decoction of the grain is well known as an alleviator of pains in the region of the kidney, and the herbaceous parts are applied externally for the cure of ulcers (Le Maout *et* Decaisne).

**Explanation of Plate 176** : *Dactyloctenium aegyptium* Eichl.

1. Spikelet.
2. Lower invol. glume.

3. Upper invol. glume.
4. Floral glume.
5. Palea.
6. Grain.

## 2. DACTYLOCTENIUM SCINDICUM Boiss.

*Dactyloctenium scindicum* Boiss. Diagn. sei. 2, fasc. 4 (1859) 131, Fl. Or. V (1884) 557.

*Eleusine scindica* Duthie Fodder Grasses N. Ind. (1888) 58; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 377.

*Dactyloctenium glaucophyllum* Courb. in Ann. Sc. Nat. Ser. IV, XVIII (1862) 133.

*Eleusine glaucophylla* Munro ex Benth. in Journ. Linn. Soc. XIX (1881) 107.

*E. aristata* Ehrenb. ex Boiss. FL Or. V (1881) 557; Hook. f. Fl. Brit. Ind. VII (1896) 296; Cooke Fl. Bomb. II (1908) 1039.

**Vernacular names** : Mandjiro, Bhobra, Bobiia.

**Description** : Perennial, slender, prostrate, proliferously branched; stem smooth, stiff, widely spreading, rooting at the distant thickened woody leafy nodes and sending up very slender branches 10-30 cm. long; internodes 5-10 cm. long. Leaves 2-5-10 cm. by 1-6-2\*5 mm., acuminate or pungent, glaucous, sparsely hairy, and the margins ciliate with bulbous-based hairs; sheaths glabrous or sparsely hairy; ligule obsolete.

Spikes 3 or more, 6-13 mm. long, spreading or decurved, bearded at the base; rhachis excurrent into a pungent point. Spikelets about 4 mm. long (including the awns). Lower involucre glume 2\*5 mm. long, ovate, acute or apiculate, 1-nerved, with ciliate keel; upper involucre glume 3\*2 mm. long (including an awn 0-8 mm. long), suborbicular; floral glumes nearly 4 mm. long, broadly ovate, acute, cuspidate, glabrous, keeled, membranous, with a strong midnerve and weak lateral nerves; palea broad, the keels scaberulous. Anthers 1-2-2 mm. long. Grain ovoid, rugose.

**Locality I Sind** : Karachi (Burns !), seeds grown, taken from a bird's crop (Ticehurst!); Sangha, (Sabnis B893!); Indus Delta (Blatter & McCann D602!); Mirpur Sakro (Blatter & McCann D603 !); Gharo (Blatter & McCann D604 !); Mundgiro (Stocks 637).

**Gujarat**: Ahmedabad (Woodrow), dry open hills (Sedgwick!); Sevalia (Chibber!).

**Konkan**: Batnagiri (Woodrow).

**Ecology** : A sand plant.

**Distribution** : Punjab, Bajputana, W. Peninsula, Baluchistan, Afghanistan, Arabia, Nubia.

**Economic uses** : Considered to be a good fodder plant.

## 94. DINEBRA Jacq.

An annual leafy grass. Leaves flat.

Spikelets 2-3-flowered, 2-seriate, secund and imbricating on short slender spreading or deflexed spikes collected in narrow pyramidal racemes, not jointed at the base; rhachilla slender, jointed at the base, produced beyond the flowering glumes and bearing an imperfect glume. Glumes 4-5; involucre glumes persistent, much longer than the floral, lanceolate, awned, 1-nerved, keeled; lower involucre glume shorter than the upper; floral glumes small, broadly ovate, subacute, hyaline, 1-nerved; palea hyaline, shorter than the glume, linear-oblong, obtuse with finely ciliate keels. Lodicules 2, minute. Stamens 3; anthers minute, didymous. Styles free, short; stigmas exerted at the apex of the glume, shortly penicillate. Grain narrowly ovoid, obscurely trigonous.

Species about 10.—India, Ceylon, Afghanistan, westward to the Mediterranean and tropical Allies.

Cooke describes one species: *Dinebra arabica*, which name has to cede to *Dinebra retroflexa* Panzer.

## 1. DINEBRA RETROFLEXA Panzer.

## PLATE 177.

*Dinebra retroflexa* Panzer in Denkschr. Acad. Munich (1814) 270, t. 12; Boiss. FL Or. V (1884) 557; Muschler Fl. Egypt I (1912) 106.

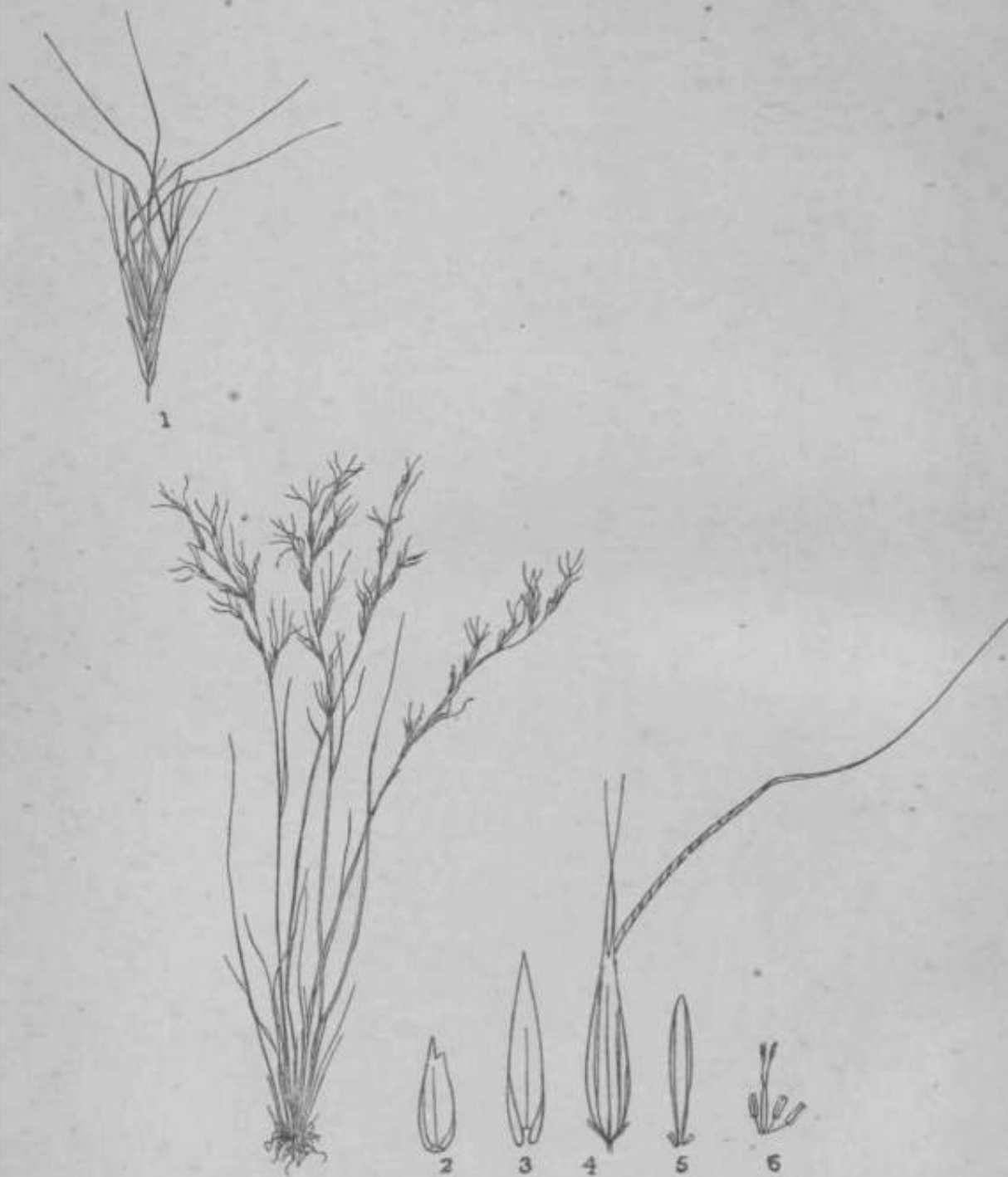
*Cynoburus retroflexus* Vahl Symb. II, 90.

*Dinebra arabica* Jacq- Fragm. (1809) 77; Beauv. Agrost. (1812) 98, 1.16, fig. 2 (*DmOa*); Duthie Grasses K. W. Ind. (1883) 34, Fodder Grasses N. Ind. (1888) 55; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 372; Hook. f. Fl. Brit. Ind. VII (1896) 297; Prain Beng. Pi. 1230; Watt Diet. Econ. Prod. III (1890) 115; Cooke Fl. Bomb. II (1908) 1039 • Achárivw S. Ind. Grasses (1920) 279; Haines Bot. Bih. and Or. (1924) 971. \*



DINEBRA BETROFLSJLA PANZER.

Delin: J. K. Bida.



TRIPODON PAUFERCOHJB STAFF

Delin: R. K. White

*Leptochloa arabica* Kunth Rev. Gram. I (1829) 91; Enum. PL I (1838) 271, Suppl. 221; Wight Cat. no. 1756; Aitchis. Cat. Panjab PL (1869) 167.  
*Dinaeba aegyptiaca* Del. Fl. d'Eg. 25, t. XI, fig. 3.  
*Lerptochloa calycina* Kunth Fl. cc. 91, 272; Dalz. & Gibs. Bomb. EL (1861) 297.  
*Elmsine calycina* Roxb. El. Ind. I (1832) 346.  
*Dactylis paspahides* Willd. Enum. Hort. BeroL (1827) 111.

**Vernacular names** : Kali kauli, Kharia, Lona, Halligyan hullu, Halgyan hullu, TJJulgyan hulhi, Nari baluda hullu.

**Etymology** : *Dinebra* is the Arabic name of the species.— *Retroflexa*, which means bent back, refers to the spikes which are at last deflexed.

**Description** : Stems 30-90 cm. high, tufted, stout or slender, erect or geniculately ascending, leafy throughout; nodes glabrous. Leaves 7-5-20 cm. by 3-5 mm., linear, finely acuminate, flaccid, glabrous or sparsely hairy, contracted at the insertion; sheaths thin, loose, glabrous<sup>m</sup>, ligule a narrow lacerate membrane.

Spikes 1-3-3-8 cm. long, racemously arranged along the axis of an inflorescence 10-30 cm. long, alternate, single or in fascicles of 2-3 together; rhachis dorsally flattened, ventwdly trigonous. Spikelets 5 mm. long (including the awns), alternate, sessile. Involucral glumes lanceolate, hyaline, keeled, with slightly recurved minutely scaberulous awns, the lower involucral glumes shorter than the upper; floral glumes reaching 2-5 mm. long, ovate-oblong, subacute, white. Anthesis 0-6 mm. long. Grain ellipsoid-oblong, trigonous, 1-2 mm. long, pale brown.

**Locality** : *Kathiawar* : Morvi (Woodrow).

*Gujarat*: Banks of the Tapti above Surat (Dalzell & Gibson); Surat (Woodrow).

*Khandesh* : Dadgaum (McCann A37 !); Dhulia, Moti Tank (Chibber !); Antab, Bori River (Blatter & Hallberg 5147 !); Bor, Bori River (Blatter & Hallberg 5490!); Bor, Tapti River (Blatter & Hallberg 5469 !); Tapti River, Bhusawal (Blatter & Hallberg 5157 !).

*Konkan* : Bandra, damp fields at Khar (Vakil A35 !); Sion (McCann 5f.i2 !); Parel (McCann 5104); Byculla (McCann A39 !).

*Deccan*: Deolali (Blatter A34 !); Sholapur (D'Almeida B36 !); Dhond, along the river (Bhide 1346!); Bairawadi, Purandhar (McCann 5050!); Poona (Woodrow), Agricultural College Farm (EzekielS).

*S. M. Country*: Dharwar Dist. (Sedgwick 2101!); Kilgerry (Talbot 2623!) \* Haveri (Talbot 2184!).

*N. Kanara* : Yellapur (Talbot!).

**Ecology** : Very common as a weed of cultivation, growing, near bushes around fields.

**Distribution** : India, Ceylon, Afghanistan, westward to Egypt and Senegal.

**Economic uses** : " It is probably nutritious, but being only an annual and not plentiful, it does not take a high place as a fodder grass." (Duthie). In Sind it is a favourite food of buffaloes.

**Explanation of Plate 177** : *Dinebra retroflexa* Panzer.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Falea.
6. Grain.

#### 95. TRIPOGON Both.

Slender densely tufted grasses; stems erect, leafy below. Leaves narrow, rigid, flat or convolute.

Spikelet usually many-flowered (all except 1-2 terminal perfect), 2-seriate and unilateral on a very slender terminal spike, not articulate at the base; rhachilla produced between the glumes but not beyond them, slender, articulate at the base. Glumes many; involucral glumes unequal, distantly superposed, membranous, 1-nerved; lower involucral glume usually lodged in a furrow of the rhachis, toothed or lobed on one side; upper involucral glume entire or notched below the mucronate or apiculate tip; floral glumes ovate, dorsally convex, 2-fid and awned in the cleft or 4-fid with the outer lobes awned, the inner lobes membranous and rarely awned, awns all straight; callus short, bearded; palea broad or narrow, complicate, truncate, with ciliate keels. Lodicules 2, cuneate. Stamens 3; anthers long, linear-oblong. Styles short, distant at the base; stigmas short, plumose. Grain narrow, free in the glume.

Species about 13.—Tropical and subtropical Asia and Africa, one in America.

To the 4 species given by Cooke we add 3 others: *T. bromoides* Roth, *T. filiformis* Nees, and *T. Roxburghianum* Bhide.

A. Flowering glumes simply bifid with an interposed awn, the lobes awned or not.

T. Awn as long or longer than its glume.

1. Undei 8 cm. high. Leaves 2-5 cm. long. Ligule membranous, ovate. L. *T. pauperculus.*
2. 15-45 cm. high. Cauline leaves 15-20 cm. long. Ligule a ridge. 2. *T. capillatus.*

II. Awn shorter than its glume.

1. Lateral lobes of floral glume not awned.
  - a. Leaves 30-60 cm. long. Spikelets 5-12-flowered. Lower involucral glume 2 mm. long, lanceolate. 3. *T. Lisboa.*
  - b. Leaves 5-20 cm. long. Spikelets 10-20-flowered. Lower involucral glume 3 mm. long with a projecting lobe at one side. 4. *T. Jacquemontii.*
2. Lateral lobes of floral glume mucronate. 5. *T. roxburghianum.*

B. Flowering glumes 4-fid, outer lobes awned or not, inner membranous, sometimes very short or truncate.

- I. Upper involucral glume deeply notched or bifid at the apex. 6. *T. bromoides.*
- II. Upper involucral glume minutely 2-toothed below the tip. 7. *T. filiformis.*

#### 1. TRIPOGON PAUPERCULUS Stapf.

#### PLATE 178.

*Tripogon pauperculus* Stapf in HOOK. IC. PI. (1896) t. 2442 (*pauperulus per err.*); Hook, f. H. Brit. Ind. VII (1896) 285; Cooke FL Bomb. II (1908) 1036.

**Etymology** : *Tripogon* is derived from *treis*, three, and *pogon*, beard.

**Description** : Dwarf, 5-6-3 cm. high, annual, glabrous; stems capillary, densely tufted, leafy to the tip. Leaves setaceous, acute, 1-3-2-5 cm. long, involute; sheaths, the lowest lax, the uppermost close, striate; ligule membranous, ovate, obtuse.

Spikelets 2-3, remote (distant more than their own length from each other), or solitary at the apex of the stems, 8-5 mm. long (excluding the awns). Lower involucral glume 4 mm long, symmetrical, narrowly lanceolate, 1-nerved, very acute; upper involucral glume 6 mm long, lanceolate, cuspidately acuminate; floral glumes 4-1, with one or two empty above them, 5-6 mm. long (excluding the awn), linear-oblong, 3-nerved, the lateral lobes with capillary awns; median awn geniculate, twisted below the knee, nearly 13 mm. long; palea oblong with ciliolate keels. Anthers 3, minute, subglobose. Grain narrowly linear, cylindrical—A dwarf species easily distinguished from the other species by its small size.

**Locality** : *W. Ghats*: Matheran (Woodrow); Khandala, common on rocks {McCann A65! A66!}; on the crest of the W. Ghats (1,800 ft.) 8 miles south of Lonavla on *Ficus glomerata* in company with mosses and *Utricularia orbicidata* (Woodrow 25); Mahableshwar, rocky summit of Sindola plateau (Sedgwick & Bell 4845!); Panchgani (McCann!); Castle Rock on rocks (Bhide!).

*Deccan*: Near Karli on rocks (Woodrow!).

*S. M. Country*: Dudsagar (Talbot 2568 !); Poondra (Talbot 4306!).

*N. Eamra*: On rocks on a hill near Nagangari, 2,600 ft., rainfku 100 ;  
- W m -  
(Sedgwick 2895!).

**Ecology** : This grass usually grows on rocks together with mosses and other small plants during the wet season. It also grows on hard gravelly soil. It is subgregarious in September.

**Distribution** : Endemic in the W. Peninsula.

**Explanation of Plate 178** : *Tripogon pauperculus* Stapf.

1. Spikelet.
2. Lower invol. glume.



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niPOGON CAPILLATDS JALtl, < SPACH.

Delln: R. K. Bide.





TRIPSOGON LISBOAE STAPF.

Della: R. K. Thide.

3. Upper invol. glume.
4. Floral glume.
5. Palea and lodicules.
6. Stamens, ovary and styles.

2. *TRIOGON CAPILLATUS* Jaub. & Spach.

## PLATE 179.

*Tripogon capillatus* Jaub. & Spach. 111. PL Or. IV (1850-53) 47, t. 332; Hook. f. Fl. Brit. Ind. VII (1896) 285; Cooke Fl. Bomb. II (1908) 1036; Haines Bot. Brit. and Or. (1924) 966.  
*T. capitatus* (*per error.*) Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 371.

**Etymology** : *Capillatus* means having hairs, hairy, alluding to the tuft of hairs at the base of each flower.

**Description** : Whole plant 15-45 cm. high; stems densely tufted, erect or geniculately ascending, subfiliform, smooth. Leaves rigid, green, convolute, the radical leaves very short or reduced to sheaths, the cauline erect, elongate, 15-20 cm. by 3 mm., narrowly linear, finely pointed; sheaths glabrous, striate; ligule reduced to a ridge.

Spikes 12-5-30 cm. long, filiform or capillary, flexuous. Spikelets 3-4-flowered, distant (8 mm. apart or more) along the rachis of the spike, with many slender long awns. Involucral glumes lanceolate, thinly membranous; lower involucral glume 2\*5 mm. long, cuspidately acuminate; upper involucral glume 5 mm. long (including a short awn); floral glume 4 mm. long, ovate-lanceolate, 2-cleft at the apex, the lobes slender, shortly awned, the median awn reaching 13 mm. long or more; palea as long as its glume, narrow, oblanceolate-oblong, hyaline. Anthers 1-6 mm. long.—Easily identified by its pendulous form. Its delicate form and flaccid inflorescence distinguish it readily from the other species.

**Locality** : *Khandesh*: Toranmal, edge of plateau, 3,000 ft. (McCann A64!).

*W. Ghats* : Ehandala, common on trees and rocks (McCann A61!, Garade!); Matheran, on trees (Woodrow!, Lisboa); Panchgani (Blatter & Hallberg B1247! B ^ S !); Castle Rock, 1,800 ft., rainfall 300 in. (Sedgwick & Bell 4332 !).

*Deccan* : On trees about Foona (Jacquemont 580).

*S. M. Country*: Belgaum, on trees on Samboti Hill (Ritchie 866); Anmod, on trees (Talbot 2621!).

*N. Kanara* : Sampkhand to Sirsi, on trees (McCann !).

**Ecology** : This species, as a rule, grows on trees and is occasionally found on rocks.

**Distribution** : Bihar, W. Peninsula, Mt. Abu.

**Explanation of Plate 179** : *Tripogon capillatus* Jaub. & Spach.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea.
6. Stamens, ovary and styles.

3. *TRIOGON LISBOAE* Stapf.

## PLATE 180.

*Tripogon Lisboaae* Stapf in Kew Bull. (1892) 84; Hook. f. Fl. Brit. Ind. VII (1896) 286; Cooke Fl. Bomb. II (1908) 1036.

*Tripogon sp. nov.* Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 370.

**Description** : Perennial, 60-90 cm. high; stem stout or slender. Leaves 30-60 cm. by 4-8 mm., rigid, quite smooth, flat or convolute; sheaths glabrous; ligule obsolete.

Spikes 15-25 cm. long, narrow. Spikelets usually densely crowded, 4-13 mm. long, 5-12-flowered. Glumes coriaceous; involucral glumes vary unequal; lower involucral glume 2 mm. long, lanceolate, acute; upper involucral glume 5 mm. long, linear-oblong, with a single tooth or unequally 2-toothed at the apex; floral glumes 3-2 mm. long, ovate, shortly 2-toothed at the apex; the lobes not awned, but with a slender awn about 0-8 mm. long from the sinus; palea oblong, obtuse, shortly 2-fid. Grain narrowly oblong, terete, glabrous.

Distinguished from *T. Jacquemontii* by its larger leaves and spikes.

- **Locality** : *Konkan* : Parsik Hill (McCann A337 !).

*W. Ghats* : Khandala, common on rocks (McCann A334 !, Bhide !); Panchgani, on Tableland (Blatter A338 !).

*Deccan*: Purandhar (McCann 5009!); Karli, between Poona and Lonavla (Jacquemont 581).

**Ecology** : Generally growing on rocks overhanging watercourses and forming large tufts. A subgregarious species.

**Distribution** : Mt. Abu, W. Peninsula.

**Explanation of Plate 180** : *Tripogon Lisboa* Stapf.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea and lodicules.
6. Stamens, ovary and styles.

#### 4. TRIPOGON JAGQITEMONTH Stapf.

##### PLATE 181.

*Tripogon Jacquemontii* Stapf in Eew Bull. (1892) 85; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 370; Hook. f. Fl. Brit. Ind. VII (1896) 286; Cooke Fl. Bomb. II (1908) 1037; Haines Bot. Bib. and Or. (1924) 966.

**Etymology** : The specific name is commemorative of V. Jacquemont who travelled in India from 1828-32 and died in Bombay.

**Description** : Perennial, 30-60 cm. high. Leaves filiform, 5-20 cm. long, convolute, labrous.

Spikes 10-20 cm. long, narrow. Spikelets 8-5-20 mm. long, narrow, oblong, 10-20-flowered. Glumes subcoriaceous, the uppermost empty; involucrel glumes very dissimilar; lower involucrel glume 3-2 mm. long, acute, with a large projecting blunt tooth or lobe at one side extending half way up; upper involucrel glume 4 mm. long, lanceolate-oblong, acute; floral glume 4 mm. long, elliptic, shortly 2-fid at the apex, without lateral awns but with a median awn 1-2 mm. long. Grain narrowly oblong, terete, glabrous.

Sedgwick found specimens less than 8 cm. high near Dharwar.

**Locality** : *Gujarat*: Lasandra (Chibber!).

*Khandesh* : North slope of Chanseli (McCann A335!).

*Konkan*: Bombay district without precise locality (Lisboa).

*W. Ghats* : Matheran (Woodrow); Khandala (Blatter & McCann 3599!); Mahableshtar, west side of Plateau (Sedgwick!).

*Deccan*: Deolali (Blatter & Hallberg 4468!); Sholapur (Pinwill); near Ahmednagar (Mise Shatuck); Gangapur (Blatter & Hallberg A339!); Poona (Jacquemont 353, Woodrow); Agricultural College compound, Kirkee (Bhide!); Purandhar (McCann 5573!).

*S. M. Country*: Dharwar (Talbot 2301!); Belgaum (Talbot!); dry hillsides near Dharwar (Sedgwick 2896!).

**Ecology** : A subgregarious species. Growing mostly on rocks. Common on barren uplands of the Camatic; very common on the Fort wall at Dharwar.

**Distribution** : Bengal, Bihar, Central India, W. Peninsula.

**Explanation of Plate 181** : *Tripogon Jacquemontii* Stapf.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea.
6. Stamens, grain, styles and lodicules.

#### 5. TRIPOGON ROXBURGHIANUM Bhide.

*Tripogon roxburghianum* Bhide in Journ. & Proc. As. Soc. Beng. (new series) VII (1911) 515. *Upturns Roxburghianus* Hook, f. Fl. Brit. Ind. VII (1896) 365 (*forta&sis Steudel*).

**Etymology** : The specific name was given in remembrance of William Roxburgh (1750-1815), one of the greatest Indian botanists.

**Description** : 10-18 cm. high. Stems tufted. Leaves filiform, scarcely longer than 2-5 cm., ciliate with long hairs on the margin and at the ligule; sheaths glabrous, margins hyaline; ligule an oblong lacerated membrane.

Spike solitary, 5-6 cm. long. Spikelets 3 mm. long, 1-2-flowered, with the rhachilla jointed and produced beyond the upper flower and borne on a flattened rhachis, the internodes of which are alternately concave and convex. Lower involucrel glume hyaline, very oblique or slightly lobed on one side, broadly 1-nerved, remaining attached to the hollow in the rhachis when the spikelet is removed. Upper involucrel glume very coriaceous and thick, broadly 3-nerved.



TRIOGON JACUBMONTII STAFF

Delin: B. K. White.



TRIOGON BROMOIDES ROTH

*Delin: R. K. Bhdé.*

about 3J times as long as the lower. Lower flowering glume a little shorter than the upper involucre, dorsally hairy in the lower part, membranous, 3-nerved, 2-toothed with a short mucro between, teeth also shortly mucronate. Callus bearded. Palea nearly as long as the glume, 2-keeled, keels minutely scabrid. Stamens 3; Styles 2, distinct, stigmas plumose. Grain terete. Lodicules 2, cuneate. Upper flower also bisexual or imperfect or 0. When complete it is like the lower.

**Locality** : *Deccan*: Chattershinji Hill, Poona (Bhide!, Ezekiel I).

8. *M. Country*: Badami Fort (Bhide!); Dharwar, dry barren uplands, 2,400 ft. (Sedgwick!).

**Distribution** : So far endemic.

#### 8. TBIPOGON BROMOIDES Both.

##### PLATE 182.

*Tripogon bromoides* Both Nov. Sp. (1821) 79; Steud. Syn. PL Glum. (1855) 301; Stapf in Kew Bull. (1891) 85; Hook. f. FL Brit. Ind. VII (1896) 287.

*T. festucoides* Jaub. & Spach 111. PL Or. IV, 49, t. 333.

*T. lanatus* Hochst. ex Steud. 1. c.

*Plagiolytrum calycinum* Nees in Proc. Linn. Soc. I, 95.

*Avena mysorensis* Spreng. Syst. I (1825) 337.

**Etymology** : *Bromoides* means resembling *Bromus*, a genus of grasses.

**Description** : Stems 15-45 cm. high, stout or slender. Leaves usually short, but sometimes as long as the stem, flat or convolute, and filiform.

Spike long or short, 7-20 cm. long. Spikelets very variable, 4-12 mm. long, few- or many-flowered, close or distant. Lower involucre glume ovate or lanceolate, deeply notched on one side, membranous, nerve stout; upper oblong-lanceolate, deeply bifid, with a short awn in the cleft, membranous or coriaceous, with broad membranous margins. Lower floral glume and following bearded at the base, broadly ovate, strongly 3-nerved, 4-fid, outer lobes small, placed low down and margined with their awns half as long as the glume or longer, inner lobes often half as long as the glume, much larger than in any other species, awn rarely as long as its glume.

**Locality** : *Deccan* : Poona, Agricultural College Farm (Chirka !); Eatraj Ghat (Gammie !).

*W. Ghats*: Mahableshwar, 4,500 ft., rainfall 270 in. (Sedgwick & Bell 4567 !), summit of Sindola plateau (Sedgwick & Bell 4841!).

*S. M. Country*: Belgaum Fort, walls, 2,600 ft., rainfall 50 in. (Sedgwick 2950 !); from Belgaum southwards (*Teste* Hook, f.); Dharwar (Talbot 2301!); Bijapur Dist. (Talbot 2929 !); Badami (Bhide !).

**Distribution** : W. Peninsula, Ceylon.

**Explanation of Plate 182** : *Tripogon bromoides* Roth.

1. Spikelet.
2. Portion of leaf enlarged.
3. Lower invol. glume.
4. Upper invol. glume.
5. Floral glume.
6. Palea.
7. Stamens, ovary, styles and lodicules.

#### 7. TRIPOGON FILIFORMIS Nees. •

*Tripogon filiformis* Nees ex Steud. Syn. PI. Glum. (1855) 301; Duthie Grasses N. W. Ind. (1883) 33; Hook, f. Fl. Brit. Ind. VII (1896) 288; Collett Fl. Simlensis (1902) 619, fig. 196.

*T. semitruncatus* Nees et *T. unidentatus* Nees ex Steud. 1. c.; Duthie 1. c.

*Plagiolytrum filiforme* et *unidentatum* Nees in Proc. ~~Timi~~ Soc. I, 95.

*Catapodium filiforme* Nees ex Duthie 1. c.

**Etymology** : *Filiformis* refers to the filiform leaves.

**Description** : Stem 10-40 cm. high, very slender. Leaves filiform, as long as the stem. Spikes 4-25 cm. long.

Spikelets crowded, 4-10-flowered, 3-8 mm. long. Lower involucre glume ovate, broadly lobed on one side; upper narrowly lanceolate, sharply toothed on one or both margins near the tip. Flowering glumes 2-toothed at the tip teeth acute or jagged, a long awn inserted in the cleft and a shorter awn on the outer side of each tooth, the glume thus being 3-awned, middle awn twice as long as the glume or longer.

**Locality** : *Deccan*: Wai (Talbot 4485!).

*S. M. Country*: Belgaum (Talbot!).

**Distribution** : Temperate Himalaya, Ehasia Hills, W. Peninsula.

**TRIBE XIII: Pappophoreae.**

Floral glumes broad, cleft into 3 to many, sometimes subulate lobes with or without alternating fine straight awns from the sinuses, usually many-nerved.

See key page xx.

## 96. ENNEAPOGON Desv.

Perennial grasses. Leaves narrow, often convolute; ligules reduced to a line of hairs.

Spikelets 3-flowered, in contracted or spike-like panicles; rhachilla disarticulating above the glumes; lowest floret hermaphrodite, the intermediate male or barren, the uppermost rudimentary. Involucral glumes persistent, membranous, acute, obtuse or minutely truncate, 3-9-nerved. Hermaphrodite floret: glume very broad, much shorter (excluding the awns), than the involucral glumes, 9-nerved, 9-awned, the awns subulate, equal or subequal, plumose, ciliate, or scaberulous; callus minute, short; palea ovate-oblong, 2-keeled. Lodicules 2, minute cuneate, fleshy. Stamens 3. Ovary glabrous; styles distinct, short; stigmas laterally exerted, plumose. Grain oblong. Intermediate floret like the lower, but the floral glume shorter, glabrous, the ovary rudimentary or suppressed. Uppermost floret rudimentary or reduced to a tuft of hairs.

Species about 8.—In the dry warm regions of the Old World and in Australia; 1 species in Western N. America.

There is only 1 species in the Bombay Presidency.

## 1. ENNEAPOGON ELEGANS T. Cooke.

**PLATE 183.**

*Enneapogon elegans* T. Cooke in Cooke Fl. Bomb. II (1908) 1040.

*Pappophorum elegans* Nees in Wight Cat. no. 1771 (1833); Hook. f. Fl. Brit. Ind. VII (1896) 301; Steud. Syn. Pl. Glum. (1855) 199; Duthie Grasses N. W. Ind. (1883) 35.

*Calotheca elegans* Wight & Am. ex Steud. 1. c.

**Etymology** : *Enneapogon* is derived from *ennea*, nine, and *pogon*, beard, alluding to the 9-cleft floral glumes.

**Description** : Stem 7-5-45 cm. high, slender, wiry, erect or ascending from a subwoody, often thickened base; nodes often tomentose. Leaves 1-3-12-5 cm. long, usually convolute, pungently pointed, more or less softly pubescent; sheaths puberulous; ligule a line of hairs.

Panicles 2-5-7-5 cm. long; branches very short; rhachis villous. Spikelets with their awns up to 6 mm. long or more, sessile and pedicellate, softly tomentose, nearly white. Lower involucral glume 4 mm. long, lanceolate, acute, 5-7-nerved; upper involucral 5 mm. long, lanceolate, acute, 7-nerved; glume of hermaphrodite floret orbicular below, cleft above into\* 9 subulate awn-like lobes which are plumose in the lower half; palea ovate, 2-keeled, the keels pubescent.

**Locality** : *Sind*: Laki (Bhide!); Karachi Dist. (Woodrow).

**Distribution** : Peshawar, W. Peninsula, Buima.

**Explanation Of Plate 183** : *Enneapogon elegans* T. Cooke.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea.
6. Stamens, ovary and styles.

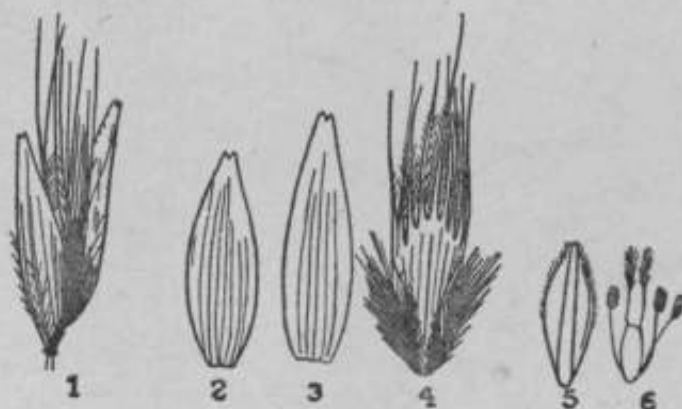
**TRIBE XIV: Oryzeae.**

Spikelets all alike or more or less heteromorphous and unisexual. Fertile floret 1, awnless, very rarely caudate-aristate, terminal with 2 minute empty florets (floral glumes) below it or solitary. Involucral glumes very minute or confluent into an annular rim or suppressed. Paleae 3-9-nerved. Stamens usually 6, rarely more or 3-1.

See key page xx.

## 97. HYGBOBYZA Nees.

A floating glabrous grass; stems stoutish, diffusely branched, rooting in dense mass\* at the nodes; branches short, erect, leafy. Leaves oblong, obtuse.



ENNEJtrOGON ELEGANS T. OOKE.

*Delin: B. K. Bhide.*





HYGROKRYZA ATUSTATA NEES

Delin: B. K. Bhide.

Spikelets few, erect, 1-flowered, articulated on the pedicels, but tardily deciduous, long-awned, lanceolate on the few widely-spreading branches of a shortly pedunculate panicle. Involucral glumes 0; floral glume solitary, thinly chartaceous, narrowed to an erect scaberulous awn, strongly 5-nerved, the nerves scabrid and ciliate, the lateral nerves marginal; palea much narrowed, 3-nerved, acuminate, with ciliate keel. Lodicules minute, suborbicular. Stamens 6; anthers long, very slender. Styles 2, free; stigmas plumose, laterally exerted. Grain oblong, narrowed at the base, obtuse, free within the glume and palea.

Species 1.—India, Ceylon, Tonkin.

1. HYGRORYZA ARISTATA Xees.

PLATE 184.

*Eygrvryza u, estate* Nees in Edinb. N. Phil. Journ. XV (1833) 380; Duthie Grasses N. W. Ind. (1883) 12, Fodder Grasses N. Ind. (1888) 20; Hook, f. Fl. Brit. Ind. VII (1896) 95.

*Pharus aristatus* Retz. Obs. V (1789) 23.

*Leersia aristata* Boxb. Hort. Beng. (1814) 26, Fl. Ind. II (1832) 207; Griff. Not. III, 3.

*Zizania aristata* Kunth Rev. Gram. I (1829) 8, Enum. Pl. I (1838) 10.

*Z. Retzii* fcprengr. Syst. II (1825) 136.

*PaUimocUoa Retzii* Griff. Journ. As. Soc. Beng. V (1836) 571, t. 24, fig. 2, Not. III, 8, Ic. Pl. Asiat. t. 139, fig. 147 & 1.140.

*Pharus natans* Herb. Russell ex Wall. Cat. (1828) no. 8638.

Rheede Hort. Mai. X, 1.12.

**Vernacular names** : Deobhat, Urodhan.

**Etymology** : *Hygroryza* is derived from *hygros*, moist, and *oryza*, rice, therefore water-rice.—*Aristata* means awned, alluding to the solitary glume.

**Description** : A glabrous floating grass; stem 30 cm. (and more) long, spongy, with feathery whorled roots at the nodes; internodes long or short. Leaves 2\*5-7\*5 cm. by 13-20 mm., linear or ovate-oblong, obtuse, more or less scaberulous above, smooth and glaucous beneath, subcoriaceous, with smooth or slightly scaberulous margins, base rounded or subcordate; midrib short; sheaths smooth, inflated, somewhat auricled at the mouth, compressed, with ciliate margins; ligule a narrow membrane.

Panicle about 5 cm. long and broad, triangular; rhachis and branches slender, stiff, smooth, the lower branches sometimes deflexed. Spikelets very narrow, 20 mm. long (including the awn), sessile or pedicellate. Floral glume about 1 cm. long (excluding the awn), lanceolate, with 5 strong nerves, the lateral nerves forming thickened margins, hairy on the nerves outside, tapering into a long scaberulous awn as long as the body of the glume; palea as long as the glume.

**Locality** : *Gujarat*: Chikli (Woodrow).

*KonTcan*: Bhiwandi, near Kalyan (Chibber!); Nagotna (Gammie 16063!); Eurnul, pond (Ezekiel!); bank of Yihar Lake (McCann!).

*Deccan*: Poona, Agricultural College garden (Bhide!, McCann!).

**Ecology** : A floating grass, forming pure mats on the surface of the water.—Frequently mixed with *Pseudoraphis aspera* Pilger, but it is readily distinguished from the latter by its broader leaves. Specimens growing in water have fewer leaves on the portion above the water level. Specimens growing on the banks have many leaves, and the plant itself is much more robust.

**Distribution** : Of genus.

**Economic uses** : This grass is liked by cattle.—The grain is eaten by poorer classes.

**Explanation of Plate 184** : *Hygroryza aristata* Nees.

1. Floral glume.
2. Palea.
3. Filaments, ovary and styles.

98. HOMALOCELNCHRUS Mieg.

(*Leersia* Sw.)

Tall perennial slender marsh-grasses. Leaves narrow, flat.

Spikelets 1-flowered (the florets 2-sexual), in slender contracted usually flaccid panicles with very slender branches, articulate on the pedicels above the rudimentary glumes, strongly laterally compressed. Involucral glumes reduced to an obscure hyaline entire or 2-lobed rim; floral glume solitary, oblong, acute, awnless, thinly chartaceous, 3-5-nerved,<sup>1</sup> the lateral nerves forming the thickened margins of the glume, the keel and margins pectioately ciliate; palea narrow, linear or linear-lanceolate, as long as the glume, rigid, 3-nerved, dorsally ciliate

and with hyaline margins. Lodicules 2. Stamens usually 6 (rarely 3 or fewer). Styles short, distinct; stigmas plumose, laterally exerted from the glume. Grain ovoid or oblong, compressed, free within the glume and palea.

We follow O. Kuntze (Rev. Gen.) and Hitchcock (Genera of Grass. Unit. St. in U. S. Dept. of Agric. Bull. 772 (1920), 205) in going back to the genus *Homahcenchrus*. Hitchcock says that one species is referred to the genus with certainty, another being doubtfully referred to it. No specific names are used, but under the first there are two citations which appear in the Species Flantarum under *Phalaris oryzoides* Linn, which Hitchcock considers as type species.

Species 14.—Tropical and temperate regions.

Only one species in the Presidency.

1. HOMALOCENCHBUS HEXANDRUS O. Euntze.

PLATE 185.

*Homahcenchrus hexandrus* O. Kuntze Rev. Gen. PL (1891) 777.

*Leersia hexandra* Sw. Prodr. Veg. Ind. Occ. (1797) 131; Kunth Enum. PL I (1838) 6; Duthie Grasses N. W. Ind. (1883) 12; Benth. Fl. Austral. VII (1878) 549; Hook. f. Fl. Brit. Ind. VII (1896) 94; Cooke Fl. Bomb. II (1908) 1042; Haines Bot. Bih. and Or. (1924) 981.

*Asprella hexander* Roem. & Schult. Syst. II (1817) 267.

*Leersia australis* R. Br. Prodr. (1810) 210; Kunth 1. c. 6.

*Asprella australis* Roem. & Schult. 1. c.

*Oryza australis* A. Br. ex Schweinf. Beitr. Fl. Aethiop. (1867) 300; Aschers.-Schweinf. III. Fl. d'Eg. 167, no. 1148.

*Leersia ciliata* Roxb. Hort. Beng. (1814) 26; Duthie 1. c, Fodder Grasses N. Ind. (1888) 21.

*L. dliaris* firriff. Not. III, 2.

*L. glaberrima* Trin. Oryz. 7.

*L. meodcana* H. B. & K. Nov. Gen. et Sp. I (1816) 195.

*Asprella meaAcana* Roem. & Schult. 1. c.

*thya mexicarta* Doell in Mart. Fl. Bras. II, II (1871) 10.

*Zizania ciliata* Spreng. Syst. II (1825) 136; Griff. Not. III, 1.

*Oryza hexandra* Dotll in Mart. Fl. Bras. II, II (1871) 10.

*Pharos ciliatus* Retz. Obs. V (1789) 23.

*Pseudoryza ciliata* Griff. Ic. PL Asiat. t. 144, fig. 1.

*Turraya nepalensis* Wall. Cat. 8637D.

*Blepharochloa ciliata* Endl. Gen. 1352.

*ifigroryza ciliata* Nees ex Steud. Nomencl. ed. II, I (1841) 783.

*Leersia brasiliensis* Spreng. Nov. Prov. (1819) 47.

*Asprella brasiliensis* Roem. & Schult. Mant. II (1824) 153.

*Leersia contracta* Nees Agrost. Bias. (1829) 516.

*L. luzoniensis* Presl Rel. Haenk. I (1830) 207.

*L. parviflora* Desv. Opusc. (1831) 61.

*%. abyssinica* Hochst. ex A. Rich. Tent. Fl. Abyss. II (1851) 356.

*Asprella purpurea* Bory Hort. Maurit. (1837) 376.

*Leersia elongate* Willd. Herb. no. 1511 ex Trin. in Mem. Acad. Petersb. 6, ser. III (1839) 172.

*L. mauritanica* Salzm. ex Trin. 1. c. 174.

*L. Triniana* Sieb. ex Trin. 1. c. 174.

*L. gradlis* Willd. Herb. no. 1512 ex Trin. 1. c. 173.

*L.ferox*. Fig. & De Not. in Mem. Ac. Torin ser. II, XIV (1833) 319.

*L. Griffithiana* C. Mill, in Bot. Zeitg. XIV (1856) 345.

*L. capensis* C. Mill. 1. c. 345.

*L. Gouini* Fourn. ex Hemsl. Biol. Centr.-Am. Bot. III (1885) 514 (*nomen*).

*Homahcenchrus Gouini* O. Kuntze Rev. Gen. (1891) 777.

*Leersia aegyptiaca* Fig. & De Not. 1. c. 317.

Etymology : *Homalocenchrus* is derived from *homals*, flat, perhaps alluding to the leaves, and *kenchros*, a kind of millet.—*Hexandra* means having 6 stamens.

Description : Perennial; stems rooting in\* the mud, with floating flexuous branches 60-120 cm. long, sending up erect or ascending slender leafy branches 60-120 cm. high, usually slender and weak, smooth, striflte; nodes hairy with deflexed hairs. Leaves 7-5-20 cm. by 3-8 mm., linear, tapering to a fine point, suberect, rather rigid, nearly glabrous, with scaberulous margins, base narrow; sheaths nearly smooth, glabrous, the margins eciliatbj ligule short, obliquely truncate or 2-lobed> membranous.



*Hymalocenchrus hexandrus* O. Kuntze.

D<lin, B. K. *India*.



ORYZA COARCTATA ROXB

*Delin: B. K. Bhat.*

Panicle 5-10 cm. long, pedunculate, oblong, laxly branched, narrow; rhachis filiform; branches filiform, flexuous, angular, smooth. Spikelets nearly 4 mm. long. Floral glume nearly 4 mm. long, ovate-oblong, somewhat boat-shaped, acute, shortly mucronate, strongly keeled, ciliate on the keel and margins, 5-nerved, the lateral nerves forming a thickened margin; palea as long as the glume, linear-lanceolate, subacute.

**Locality** : *W. Ghats* : Castle Bock, in ricefield (Bhide !); Londa (Woodrow).

*S. M. Country*: Devarayi (Sedgwick & Bell 4463!); Sadambi Tank, Tadas (Sedgwick 2052!); Sluavar, in tanks (Sedgwick 2289!); Kunnur, margin of tank (Sedgwick 4930!).

*N. Kanara* : (McCann!); Halyal Tank (Talbot 1345 1 2147 !).

**Ecology** : A gregarious grass. Common on the margins of tanks in the Mallad tract of the Carnatic ; seldom absent from an old or natural tank.

**Distribution** : More or less throughout India; Ceylon, Africa, America, Australia.

**Economic uses** : Horses and cattle like this grass. See: Qrdoveza, Bamon, C. The culture and cost of production of barit (*Homalocenchrus hexandm* Sw.) in Bay, Laguna, Philipp. Agric. 17 (1928) 137-47.

**Explanation of Plate 185** : *Homalocenchrus hexandrus* O. Euntze.

1. Spikelets on rhachis.
2. Floral glume.
3. Palea.
4. Stamens, ovary and styles.

#### 99. OBYZA *Ṭjīna*.

Tall annual or perennial grasses. Leaves long, narrow, flat.

Spikelets 1-flowered, loosely arranged on the branches of an elongate panicle disarticulating<sup>^</sup> above the 2 lowest glumes. Glumes 5; the 2 lower involucral glumes below the articulation of the spikelet minute, scale-like (rarely absent); the 2 next involucral glumes above the articulation of the spikelet subulate; floral glume solitary, dimidiate-oblong, coriaceous or chartaceous, 5-9-nerved, awnless or with a short or long straight terminal awn; palea linear or lanceolate, as long as the glume, 3-5-nerved, coriaceous, with membranous margins. Lodicules 2, entire or 2-lobed. Stamens 6; anthers linear. Style short, free; stigmas laterally exerted from the glume. Grain narrowly oblong, compressed, closely covered by or adnate to the glume and the palea.

The spikelet of *Oryza* has been variously interpreted. Hook, f. has the following description : " Glumes 2-3, I and II much the smallest, empty, scale or bristle-like, rarely 0; III chartaceous, obtuse acute or awned, strongly 3-5-nerved; palea as long as the glume."

Cooke speaks of 5 glumes, " the 2 lower involucral glumes below the articulation of the spikelet minute, scale-like (rarely absent); the 2 next involucral glumes, above the articulation of the spikelet subulate; floral glume solitary, dimidiate-oblong, coriaceous or chartaceous, 5-9-nerved, awnless or with a short or long straight terminal awn; palea linear or lanceolate, as long as the glume, 3-5-nerved."

Stapf thinks that the usual 2 outer empty involucral glumes are absent, that the next 2 (scales or bristles) are empty florets (valves). He also takes the IVth glume to be a palea.

Species about 17.—Tropical.—2 species in the Bombay Presidency.

1. Ligule very short, scarcely longer than broad, fringed with short hairs . . . . . 1. *O. coarctata*.
2. The lower ligules very long, up to 4 cm., always much longer than broad . . . . . 2. *O. sativa*.

#### 1. ORYZA COARCTATA Roxb.

#### PLATE 186.

*Oryza coarctata* Boxb. Hoit. Beng. (1814) 87, El. Ind. II (1832) 206; Griff. Notul. III, 8, Ic.

PL Asiat. t. x42, fig. 1; Hook. f. FL Brit. Ind. VII (1896) 93; Prain Beng. Pl. 1184;

Cooke Fl. Bomb. II (1908) 1042; Prodoehl. Oryzæe in Bot. Arch. I (1922) 232.

*O. triticoides* Griff. Notul. I. c.

*Sclerophyllum coarctatum* Griff. L. c.

**Etymology** : *Oryza* is the Greek name for rice.—*Coarctata* means compressed, perhaps alluding to the pedicel which is contracted below the cupular tip.—Hamilton figures and describes the plant as having the inflorescence composed of smaller spikes appressed to the common axis in such a manner as to simulate *Triticum* or even *Lolium*. (Hamilton Icon. t. CXLH). This might be another explanation of the word *coarctata*.<sup>^</sup>

**Description** : Stem 1-2-1-8 m. high, erect from a stout creeping rhizome, smooth hard and polished. Leaves 15-38 cm. by 6-13 mm., coriaceous, linear, caudate-acuminate, with spinulose margins; sheaths glabrous, polished, reticulate like basket-work; ligule very narrow, fringed with short hairs.

Panicles 10-20 cm. long, spike-like; rhachis and branches trigonous, stiff, smooth. Spikelets reaching 16 mm. long (including the awn). Glumes 5, the outer (below the articulation of the spikelet) consisting of 2 opposite minute appressed rounded or truncate thick scales, one attached lower than the other; the 2 glumes above the articulation of the spikelet subulate, the lower of the pair 2-5 mm., the upper 4 mm. long. Floral glume solitary, 16 mm. long, lanceolate, boat-shaped, rounded and with a large projecting wing on the back, cuspidate with a stout hard glabrous white awn about 4 mm. long, 7-9-nerved, the lateral nerve forming a thickened margin to the glume. Palea (upper floral glume of some authors) 13 mm. long, linear-lanceolate, cuspidately acuminate, with 5 strong nerves and hyaline margins. Lodicules large, membranous, subquadrate or trapeziform.

**Locality** : *Sind*: Karachi, in Herb. Kew without collector's name; covering large flats at the mouth of the Indus River (Blatter & McCann!); Shikarpur (Dr. King's collector); Keti (Blatter & McCann D666 !); after Keti (Blatter & McCann D665 !).

*N. Kanara* : Sulgeri (Sedgwick & Bell 4241!).

**Ecology** : Evidently a sand plant in the vicinity of the sea. Forming dense mats and covering miles of flat land at the mouth of the Indus River within tidal influence, being covered at high tide. Common in the estuary of the Kala Nuddi (N. Kanara).

**Distribution** : Sundribuns, W. Peninsula.

**Explanation of Plate 186** : *Oryza coarctata* Roxb.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea.
6. Grain.

## 2. ORYZA SATIVA Linn.

### PLATE 187.

\**Oryza sativa* Linn. Sp. PL (1753) 333; Gaertn. Fruct. II, 5, t. 80, fig. 5; Host. Gram. Austr. IV, t. 325; Roxb. Fl. Ind. II (1832) 200; Griff. Ic. PL Asiat., 1.139, fig. 149; Duthie Grasses N. W. Ind. (1883) 12, Field and Gard. Crops 15, t. 4, Fodder Grasses N. Ind. (1888) 20; Hook, f. FL Brit. Ind. VII (1896) 92; Cooke FL Bomb. II (1908) 1043.

\**O. communissima* Lour. FL Coch. (1790) 267.

\**O. glutinosa* Lour. 1. c. 267.

*O. montana* Lour. 1. c. 267.

*O. montana* Ham. in Wall. Cat. (1828) 8633.

*O. praecox* Lour. 1. c. 267.

*O. perennis* Mnch. Meth. (1794) 197.

*O. palustris* Hamilt. Prodr. (1796) 25.

*O. latifolia* P. Beauv. Agrost. (1812) 27 (*non* Desv.).

*O. parviflora* P. Beauv. 1. c.

\**O. denudata* Desv. ex Steud. Nomencl. ed. I (1821) 577.

\**O. ehngata* Desv. ex Steud. 1. c.

\**O. marginata* Desv. ex Steud. 1. c.

\**O. mutica* Lour, ex Steud. 1. c.

*O. pubescens* Desv. ex Steud. 1. c.

*O. rubribarbis* Desv. ex Steud. 1. c.

-*O. emarginata* Steud. Nomencl. ed. II (1841) 234.

*O. pumila* Host ex Steud. 1. c. 234.

\**O. rufipogon* Griff. Not. III (1851) 5.

*O. glumaepatula* Hochst. ex Steud. Syn. PL Glum. I (1854) 3.

*O. nepalensis* Don ex Steud. L c. 3.

\**O. repens* Herb. Ham. ex Steud. 1. c.

*O. segetalis* Rüss. ex Steud. 1. c.

*O. sorghoides* Desv. ex Steud. 1. c.

*O. caudata* Trin. ex Doell in Mart. FL Bras. II, 2 (1871) 8.

**Vernacular names** : Tandula, Bhat, Ghokha, Sari, Chauval, Dangar Bhatta, Nellu, Akki.

**Description** : Annual. Stems creeping or floating, 60 cm. to 3 m. high. Leaves 30-60 cm. by 6-8 mm. or more, striate, scaberulous, 1-nerved; sheaths smooth; ligule long 2-partite.



ORYZA SATIVA LINN.

Oeift: H, X. *Bhid*.\*





ELYTROPHORUS ARTICULATUS BEAUV.

Delin: M. E. Hitch.

Spikelets loosely paniced, not imbricating, awn 7-13 cm. long, yellow or reddish, shining. Involucral glumes  $\frac{1}{2}$ - $\frac{2}{3}$  the length of the floral glume, lanceolate; floral glume hispid above, dorsally spinescently ciliate, awn very long.

This is Hook, f.'s description prepared from the plant which Roxburgh and other Indian writers consider to be the indigenous Rice.

For a note on the inflorescence see : S. G. Bhalerao: The Morphology of the Rice Plant and of the Rice Inflorescence. In Journ. of Ind. Bot. Soc. V (1926) 13.

**Locality** : The area occupied by Rice in 1922-23 was 1,885,602 acres. Rice is chiefly confined to the Konkan and to the Deccan close to the W. Ghats. A fairly large area is also found in Gujarat, Thana, Kolaba, Ratnagiri and Kanara.

For distribution, cultivation, economic and medicinal uses we refer to the following works:—

Watt. G. : Dictionary of Economic Products of India V (1891).

Watt, G.: Commercial Products of India (1908).

Heuzl: Les Aliments des Indes (1899) 14-116.

Mollison: Textb. Ind. Agric. III (1901) 32-44.

Sender: Trop. Agrik. III (1903) 1-48.

Copeland, E. B.: Rice (1924).

Winkler, H.: Reis. Hamburg (1826).

Statistical Atlas of the Bombay Presidency (1925).

**Diseases** : See: Butler, E. J.—Diseases of Rice.—Agric. Res. Inst. Pusa Bull., 34 (1913).

„ „ „ The rice worm (*Tylethorus angustus*) and its control. Mam. Dept. Agr. India (Bot. Ser.) X (1919) 1.

**Explanation of Plate 187** : *Oryza sativa* Linn.

1. Spikelet.

2. Lower invol. glume.

3. Upper invol. glume.

4. Floral glume.

5. Palea.

6. Stamens, ovary and styles. (Detail from an indigenous plant growing in a tank.)

#### WILD RICES.

We possess little reliable information regarding the Wild Rices of the Presidency. S. G. Bhalerao (in Agric. Coll. Mag. XX (1928) 45) has published a paper on " The Wild Rice (*Oryza sativa*) of the Bombay Presidency ", which contains a number of interesting observations.

According to him the wild type of Rice " occurs abundantly on the Western Ghats and occupies the zone where the rainfall is over 30-35 inches. As an annual aquatic, it occurs in marshy areas, in small pools and ponds and on the margins of the big tanks. It is rarely found in more than 3 feet depth of water and on land without and standing water as well ".

We have found a Wild Rice in pools on Tableland at Panchgani (rainfall 60 in.).

See also: Schweinfurth, G.: Ueber wild gesammelte Arten von Reis in Africa. Ber. Deutsch. Bot. Ges. 44 (1926) 165-67.

Roy, S. C.: A preliminary classification of the wild rices of the Central Provinces and Berar. Agr. Journ. India XVI (1921) 365.

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### TRIBE XV: Festuceae.

Involucral glumes more or less resembling the floral glumes in general appearance. Fruiting florets 2-many, very rarely 1, often much exserted from the involucral glumes. Floral glumes 5- or more-nerved, very rarely 3- or 1-nerved, then neither with the side-nerve sub-marginal nor with the spikelets in 2-ranked spikes; awns, if present, terminal or subterminal, never kneed.

See key page xx.

#### 100. ELYTROPHOBUS Beauv.

An annual, erect, glabrous grass. Leaves very narrow, flat.

Inflorescence of globose clusters of minute sessile spikelets crowded together in long continuous or interrupted catkin-like spikes (rarely on the short spike-like branches of a very contracted raceme). Spikelets short (many imperfect or reduced to empty glumes), strongly laterally compressed, not articulate at the base, 4-6-flowered; rhachilla very short, articulate at the

base and between the flowering glumes, but not beyond the upper. Involucral glumes subequal, lanceolate, aristately acuminate, hyaline, 1-nerved, glabrous or ciliate, keeled; floral glumes lather longer, with a long awn, 3-nerved, with ciliate margins, the uppermost neuter; palea shorter than the glume, very broad, truncately 3-lobed, the lobes ciliate, keels distant, winged, smooth. Lodicules 2, obliquely oblong. Stamens 1-3; anthers minute. Styles free, long; stigma with hairs very short. Grain minute, fusiform or narrowly oblong; pericarp loose at both ends.

Species 1.—Tropical Asia, Africa and Australia.

1. ELYTKOPHORUS ARTICULATUS Beauv.

PLATE 188.

*Elytrophorus articulatus* Beauv. Agrost. (1812) 67, t. 14, fig. 7; Duthie Grasses N. W. Ind. (1883) 36, Fodder Grasses N. Ind. (1888) 61, t. 72; Lisboa Bomb. Grasses (1896) 117; Hook, f. FL Brit. Ind. VII (1896) 306; Cooke Fl. Bomb. II (1908) 1044.

*Echinalysium articulatum et strictum* Trin. Fund. Agrost. (1820) 142.

*Dactylis spicata* Willd. in Ges. Naturf. Fr. Neue Schrift. III (1801) 416.

*Sesleria spicata* Spreng. Fugill. II, 21.

*Elytrophorus spicatus* A. Camus.

**Vernacular names** : Kemshi, Jungli rala, Ghimansar, Poshe, Suria, Eet kapuri.

**Etymology** : *Elytrophorus* is derived from *elytron*, a cover, and *phorein*, to bear, perhaps alluding to the palea.

**Description** : Annual, 15-60 cm. high; stems erect from a densely fibrous root, as thick as a crow-quiU or less. Leaves longer or shorter than the stem, linear, acute, 2.5-3 mm. broad, smooth, flaccid, base narrow; sheaths membranous, loose; ligule small, membranous, lacerate.

Inflorescence 15-30 cm. long, often longer than the rest of the plant. Spikelets 5 mm. long (including awns), as broad as long. Lower involucral glume 2-5 mm. long; upper involucral glume 3\*2 mm. long; floral glume (including awn) 5 mm. long, ovate-lanceolate; palea 2\*5 mm. long, broadly oblong, truncately 3-lobed.

**Locality** : *Gujarat*: Godra (Woodrow).

*Konkan*: Alibag, ricefield near water works (Ezekiel!); Pen (McCann 5504 I .5509 !); Conditia (McCann 4242 !); Bhandup, in damp ricefield (Nana A46 !); Kalyan (Woodrow).

*W. Ghats*: Khandala, Bushy Lake, in dry bed (McCann 9392 I); Igatpuri {Blatter & Hallberg 5144! 5494!}; Matheran (Gammie 1664!); Londa (Woodrow).

*Deccan*: Earjat, Honad Taluka (BLonsle!).

*S. M. Country*: Chabbi, ricefield, 2,000 ft., rainfall 30 in. (Sedgwick 3705 !).

*N. Kanara*: Halyal (Talbot 1370!).

**Ecology** : A sporadic grass. Grows in watercourses and ricefields.

**Explanation of Plate 188** : *Elytrophorus articulatus* Beauv.

1. Lower invol. glume.
2. Upper invol. glume.
3. Floral glume.
4. Palea.
5. Stamen, ovary and styles.
6. Spikelets.

101. AELUROPUS Trin.

Low much-branched very rigid perennial leafy grasses. Leaves distichous, short, strict, usually convolute, coriaceous, pungent.

Spikelets 6-many-flowered, minute, sessile, densely crowded in terminal villous heads, laterally compressed, not articulate at the base; rachilla obscurely jointed at the base, not produced beyond the upper glume; internodes very short. Glumes many, oblong, membranous, apiculate, the margins and tips broadly hyaline. Involucral glumes unequal, persistent; lower involucral glume narrowly oblong, 1-5-nerved; upper involucral glume much larger, 5-7-nerved from below the hyaline tip; floral glumes oblong, apiculate, 7-9-nerved; palea very large, broadly cuneate, 3-lobed, the lobes erose, flaps broad, keels nearly smooth or ciliolate. Lodicules obliquely truncate. Stamens 3; anthers minute. Styles short, free; stigmas short, plumose. Grain oblong or obovoid, free within the glumes.

Species 5.—From the Mediterranean and Caspian regions to the Punjab, Sind, and S. India.—Only 1 species in the Bombay Presidency.

## 1. AELUROPUS REPENS (Desf.) Parl.

- Aeluropus repens* (Desf.) Parl. Fl. Ital. I (1848) 462.  
*A. villosus* Trin. ex C. A. Meg. Verg. Pfl. Cauc. (1831) 18; Hook. f. EL Brit. Ind. VII (1896) 334; Cooke Fl. Bomb. II (1908) 1045.  
*A. arabicus* Steud. Norn. ed. 2, I (1840) 30.  
*A. brevifolius* Wall. Cat. no. 8897; Duthie Grasses 9. W. Ind. (1883) 39.  
*A. concinnus et siniacus* Fig. & Notar. in Mem. Acad. Torin. ser. 2, XII (1852) 257.  
*A. hgopodioides* Trin. ex Trim. Cat. Ceyl. PL 110.  
*A. littoralis var. repens* Coss. & Dur. Expl. Sc. Alger. 155; Boiss. Fl. Or. V (1881) 594.  
*A. mucronatus* Aschers. in Schweinf. Beitr. Fl. Aeth. (1867) 297.  
*A. niliacus* Steud. Norn. ed. 2, I (1840) 30.  
*A. niloticus* Edgew. in Journ. Linn. Soc. VI (1862) 196.  
*A. pungens* C. Koch in Linnaea XXI (1848) 408,  
*A. repens* Parl. Fl. Ital. I, 462.  
*Dadylis hgopodioides* Dalz. & Gibs. Bomb. Fl. (1861) 298 (*excl. syn.*).  
*D. lagopoides* Linn. Mant. (1767) 33; Roxb. Fl. Ind. I (1832) 341; Grab. Cat. Bomb. PL (1839) 236 (*excl. syn.*).  
*JO. repens* Desf. Fl. Atlant. I (1798) 79, t. 15.  
*Poa tunetana* Spieng. Pug. II, 20.  
*Galotheca arabica, niliaca et repens* Spreng. Syst. Veg. I (1825) 347, 348; Duthie l. e. (*per errorem miliacea*).  
*Festuca mucronata* Foisk. Fl. Aeg.-Arab. (1775) 22.  
*F. pungens* Vahl Symb. I, 319.

**Vernacular name : Luni.**

**Etymology** : *Aeluropus* is derived from *ailouros*, a cat, and *pous*, foot.

**Description** : Perennial, rigid, tufted; stems 7-5-20 cm. long, crowded on a woody root\* stock with stout root-fibres, as thick as a crow-quill, simple or branched, smooth and polished; branches sometimes elongate, divaricate, 15-25 cm. long, resembling stolons, giving off branchlets at the nodes but not rooting; nodes glabrous; internodes short or long. Leaves 4-25 mm. long, narrowly lanceolate, acuminate, flat or convolute and subulate, erect or spreading, glabrous or sparsely ciliate; sheaths short, terete or inflated, glabrous or ciliate; ligule a shortly hairy ridge.

Heads of spikelets shortly pedunculate, subglobose or oblong. Spikelets reaching 3-2 m. long, 4-8-flowered, crowded, sessile, villous with soft hairs, pale green or white. Lower involucral glume 2-5 mm. long, ovate-oblong, subacute, hairy and with ciliate margins; upper involucral glume 3-2 mm. long, similar; floral glumes 3-2 mm. long, ovate, subobtuse, apiculate, many-nerved, hairy and ciliate, the lower 2-4 sometimes neuter; palea broad, 3-lobed. Anthers 1-6 mm. long, oblong. Grain 0-6 mm. long, obovoid-oblong, dorsally compressed.

**Locality** : *Sind*: Near salt creeks in Sind (Stocks 506); Gharo (Blatter & McCann D6591 D660 !); Mirpur Sakro (Blatter & McCann D658 !); Karachi (Bhide, Woodrow); Laki (Bhide !); Eotri, banks of Indus (Sabnis B370 !); Sehwan, clayey plains (Sabnis B606 !); Sehwan to Laid, foot of hills (Sabnis B108 !); Sanghar (Sabnis B891 !).

*Cutch*: Karie Boa (Blatter 3770 ! 3773 !); Kala Pachan Isl. (Blatter 3739 !); Runn of Cutch (Blatter 3730! 3731!).

*Kathiawar*: Porbandar (Bhide !).

*Gujarat*: Surat, mud-flats, mouth of Tapti River (Hallberg A29 !); Dharasana (Chibber!); road to Gola (Chibber!).

*Konkan*: On salt ground near the sea (Graham, Lisboa); Bandra, salt marsh (Vakil A28!); Pen (McCann A31!); Bassein Creek (Chibber!); Nagaon, Sion, salt marsh (McCann 5240 !); Salsette (Wight 53).

**Ecology** : Grows on salt ground near the sea, also on alkaline soils.

**Distribution** : Punjab, Sind, W. Peninsula, in salt ground, Ceylon, Afghanistan, Persia. Caspian region, Arabia, Mediterranean region.

## 102. CENTOTHBCA Desv.

Tall leafy perennial grasses. Leaves broadly oblong or lanceolate, with trabeculate veins. Spikelets 1-3-flowered, on the long spike-like branches of a lax subsimple panicle, not articulate at the base, laterally compressed, all perfect or 1 or more upper neuter; rachilla slender, articulate at the base and between the flowering glumes, not produced beyond the uppermost. Involucral glumes distant at their insertions, ovate-oblong, persistent, empty, 3-5-nerved; upper involucral glume larger than the lower; floral glumes broadly ovate, obtuse, apiculate, dorsally rounded, 7-nerved, naked or the upper usually bearing soft erect at length deflexed

tubercle-based spines or bristles; palea narrow, with ciliolate keels. Lodicules 0. Stamens 2-3; anthers linear. Styles short, free; stigmas narrow, with short hairs. Grain ovoid, acute, terete, free within the glumes.

Species 4.—Tropical Africa, Asia, Australia.—One species in the Presidency.

I. CENTOTHECA LAPPACEA Desv.

PLATE 189.

*Centotheca lappacea* Desv. in Nouv. Bull. Soc. Philom. II (1810) 189; Griff. Notul. III, 62, Ic.

PL Asiat. 1.152, fig. 1; Lisboa in Journ. Bomb. Nat. Hist. Soc. VII (1893) 388; Hook. f.

FL Brit. Ind. VII (1896) 332; Cooke Fl. Bomb. II (1908) 1043.

*C. latifolia* Trin. Fund. Agrost. (1820) 141.

*C. pawiflora* Anderss. in Peters. Reise Mosamb. Bot. 559.

*Hokus latifolius* Osbeck. Iter. 247; Linn. Syst. ed. X, 1305.

*Illelica lappacea* Easp. in Ann. Sc. Nat. Ser. I, V (1825) 443.

*M. diandra* & *refracta* Roxb. Fl. Ind. I (1832) 327.

*Poa latifolia* Forst. f. Prodr. 8.

X *P. malabarica* Linn. Sp. PL (1753) 69; Buim. FL Ind. (1768) 27, 1.11, fig. 2.

*P. nemoralis* Heyne ex Wall. Cat. no. 3826 A.

*Towesia biflora* Roem. & Schult. Syst. II (1817) 515.

*Vniola lappacea* Trin. in Act. Petrop. VI, I (1831) 358.

*Cenchrus lappaceus* Linn. Sp. PL ed. II, 1488.

*Festuca latifolia* Roth Nov. PL Sp. (1821) 75.

*F. bkpharophora* Roem. & Schult. Syst. I. c.

*F. ciliaris* Heyne ex Roem. & Schult. I. c.

*F. virgata* Heyne ex Steud. Norn. ed. II, I (1840) 633.

**Etymology** : *Centotheca* is derived from *Tcemtein*, to prick, and *theca*, a receptacle, alluding to the retrorse spines on the flowering glumes.

**Description** : A stout erect grass; stem 30-90 cm. high, erect from a woody rootstock with stout root-fibres. Leaves 10-25 by 2.5-3.2 cm., oblong-lanceolate, acute or acuminate, more or less unequal-sided, thin, smooth, glabrous or sparsely hairy, 9-11-nerved, base narrowed; sheaths usually glabrous except at the mouth: ligule a broad sometimes lacerate membrane.

Panicle 20-25 cm. long and broad, branches slender, suberect. Spikelets 5 mm. long, oblong-lanceolate, acute. Involucral glumes distant; lower 2.5-3.2 mm. long, ovate, acute, apiculate, 3-nerved; upper 3.2-4.3 mm. long, ovate-oblong, acute, apiculate, 3-5-nerved; lower floral glume 4-5 mm. long, broadly ovate-oblong, obtuse, apiculate, 7-nerved; upper floral glume about as long as the lower, oblong, obtuse, 7-nerved, finely apiculate, with tubercle-based ultimately deflexed bristles close to each margin in the upper part of the glume, sometimes naked; palea 2.5-3.2 mm. long, narrowly lanceolate, acute, ciliolate.

**Locality** : *Korikan*: Vetora (Sabnis 33564 ! 33727!).

*W. Ghats*: Castle Rock, evergreen forests, 1,600 ft., rainfall 250 in. (Sedgwick 2714!, Gammie 15693!).

*JV. Kanaia*: Guddehalli, Eaiwar (Hallberg & McCann A25 !); Katgal (Hallberg & McCann A26 !); Devimane Ghat (Hallberg & McCann A27 !), on a fern stem (Woodrow!).

**Ecology** : Grows in shady evergreen forests. It is subgregarious.

**Distribution** : Himalayas, Khasia Hills, Central India, Buima, W. Peninsula, Ceylon, Malaya, China, Polynesia, tropical Africa.

**Explanation of Plate 189** : *Centotheca fopyacia* Desv.

1. Spikelet.
2. Lower invol. glume.
3. Upper invol. glume.
4. Floral glume.
5. Palea.
6. Grain.

## TRIBE XVI: Hordeae.

Spikelets sessile, singly or in clusters on the notches of a simple spike, sometimes partially branched in hollows of the rachis. Florets 1 or more.

See key page xx.

THE BOMHAY GRASSES.

103. LEITCRUS R. Br.

Small, slender grasses. Leaves flat or convolute.

Spikelets 1-2-flowered, sessile, solitary, half-immersed in hollows of the rachis of a simple terminal, articulate M not-straight or incurved spike, with cluster of the lowest floral glumes opposite the rachis: inferior glumes jointed. Glumes 3 or 4. Lower involucre glume minute or 0. Upper longer than the flowering glumes, linear, rigid, acute, 5-nerved, erect or at length deflexed; flowering glumes shining smooth (the upper involucre glume, hyaline; palea 2-keeled. Lodicules 2, cuneate, us lobed. Stamens 1. Ovary glabrous: styles short, distant. Grain narrow or oblong, glabrous, hirsute.

Species 1. The Himalayas.—One species in the Presidency, new to it.

L. LEPTUROS BKPENS K. Br.

*Lepturus repens* B. Br. Prodr. (1810) 207; Bwmgn. in Duperr. Voy. E-t. 57, t. 11 j Kunth Enum. Pl. 1 (1838) 463, Suppl. 374; Steud. Syn. Pl. Glum. (1855) 357; Benf. F] Austral. VII (1878) 668; Hook. I PL Brit. 1ml. VII (s. 396) 305.

*Lepturus repens* Korxt. Prodr. i.

*Lepturus repens* Bemiv. Agrost. (1810) 1 [7.

*Lepturus repens* Steud. 1. o. 3C7.

*Lepturus repens* Forst. in Herb. Paris, Steud. Nom. Bot. (1840) 64.

etymology: *Lepturus* is derived from *leptos*, slender, and *uros*, a tail, alluding to the spikes.

Description: A perennial grass. Stem elongate, woody, 1-anchored and widely creeping below. Leaves 7 to 15 cm. long, 3-6 mm. broad, spreading or erect, acuminate, glaucous; sheaths glabrous or mouth villate; ligule inaequal-jucous.

Spikelets shortly peduncled, fragrant. Spikelets 2-flowered; rachilla elongate, bearing an upper imperfect flower. Involucres glumes 1 (OT 2 in the uppermost spikelet) first rigid, 6-12 mm. long, closely appressed to the rachis; flowering glumes shorter than the involucre, elliptical. Palea 2-keeled. Lodicules fleshy, obliquely truncate or 2-lobed glabrous. Grain oblong.

Locality: N. Kanara: 1 mile Irwalya (Bhidi).

Distribution: N. Kanara, Ceylon, Malay and Pacific Islands, Australia.

104. TAMOUS Linn.

Annual or perennial grasses with flat leaves.

Spikelets sessile, terminal, 1-flowered, spikelets with the sides opposite the articulation.

Isolate or articulate rachis, bostrychoid in the cavity. Glumes 3 or 4, often unequal-sized; involucre glumes empty, obtuse or shortly awned, 5-nerved, pendulous; floral glumes oblong or ventricose, dorsally rounded or keeled above, awned or 1-3-awned, 5-9-nerved, lateral nerves not conniving with the central; neuter flower male or neuter; palea 2-keeled; lodicules entire, villate. Stamens 3. Styles vary short. Grain grooved ventrally, often hairy, free or adherent to the pericarp.

Species 2.—India and Western Asia, Mediterranean, Europe.

1. TRITICUM ALEXANDRINUM Linn.

*Triticum aestivum* Linn. 8p. PL (1753) B6: Boss. FJ. Ind. I (1832) 359; Grah. Cat. Bomb. Pl. (1837) 234; IWB. & Gibs. Bomb. Fl. Suppl. (1851) 77.

*Triticum aestivum* Linn. F. HI (1778) 625; Ehrh. Fl. Grasse S. W. Ind. (1881) 45, Folia, i. h. aeam N. Ind. (1888) 68.

*Triticum aestivum* Vahl. Hist. Di. Di. II. I. 133; Hook. f. m. Brit. End. VII (18W) 367.

Why the specific name *aestivum* has to be adopted has been explained by Hitchcock in Boil. 772, U.S. States Dept. Agric. (1910) 51:

"Linnaeus described seven species, *T. aestivum*, *T. hybernum*, *T. turgidum*, *T. tpeka*, *T. monoaxum*, *T. repens*, *T. caninum*. The citation in the Genera Plantarum is to Tourn. Fort's figures 2m and 293 srioli represent; the first, bearded wheat, and the second, bearded wheat. These two forms, henricke's and bearded, are named by Linnaeus *T. aestivum*, the beardless wheat and *T. tpeka*, the beardless wheat. *Triticum aestivum* was chosen as the type because it has priority of position in the Species Phoeniceae. Linnaeus divides the genus into two groups "umua" and "peremaa". The latter group, including *Triticum repens* and *T. caninum*, is now referred to *Agropyron*."

Vernacular names: Wheat) Qaha, Qodlu, Kanik.

Description: Tufted, annual grasses. Culms tufted; awns 1-2; ligule a lacerated membranous rib. Leaves glabrous or hairy on one or both surfaces.

Spike glabrous or hairy, awned or awnless; spikelets 2-ranked, compressed, parallel to the rachis, closely or loosely imbricate. Glume I keeled upwards; glume II sometimes paleate; glumes III and IV paleate and hermaphrodite, larger than V and succeeding glumes when present. Stamens 3; stigmas short and never protruded; ovary truncate and hairy on top. Grains in each spikelet, usually 3, the 2 lateral larger than the single terminal one (in examples when there are 4 grains in a spikelet the 2 lower ones are invariably larger than the upper 2), in shape they are oblong, swollen more or less according to the quality, with a groove on one face, blunt at both ends or pointed, surrounded by a hairy tuft.

**Locality** : The total area under wheat in 1922-23 was 1,526,344 acres, chiefly in Nasik, Dharwar, Ahmedabad, W. Khandesh, Ahmednagar and Belgaum. The total area in Sind at the same time was 405,401 acres.

## VARIETIES.

We are not in a position and this is not the place to discuss the many varieties or faces that are cultivated in the Presidency. We refer to some literature which may help those who wish to make further inquiries into this very complicated question.

Hackel in Engler & Prantl. Pflanzenfam. II, 80.

Murray in Watt, Dictionary of Economic Prod. VI, pt. 4, 89.

Koemecke & Werner, Handbuch des Getreidebaues. Bourn, 1815.

Howard, A. and Howard, G. L. C., The varietal characters of Indian wheats. Mem. Rept. Agr. Ind. (Bot. ser.) II (1908), and many other papers on wheat which were mostly published by the Dept. of Agriculture in India. (See Bibliography.)

Schulz, A., Die Abstammung des Weizens, Mitt. Dtsch. Ges. Halle a. S. I (1912) 14-17.

Percival, J., The wheat plant: a monograph. 463 p., 218 f. London 1921.

Huber, J. A., Ueber Abstammung und Systematik des Weizens. In Naturforscher III (1927) 577-582.

**Diseases** : See Butler; Fungi and Disease in Plants (1918).

## 105. HORDEUM Linn.

Erect annual, rarely perennial grasses. Leaves flat.

Spikelets 1-flowered, 2-3-nate in the hollows or at the nodes of a simple cylindrical spike, the lateral often imperfect; rachilla jointed at the base of the floral glume and produced above it with sometimes an imperfect glume. Glumes I and II empty, very narrow, rigid, persistent, the outer of each cluster of spikelets often together resembling an involucre; III dorsally rounded, 5-nerved above, narrowed into an erect or recurved awn; palea 2-keeled. Lodicules 2, ciliate. Stamens 3. Styles very short. Grain grooved in front, tip usually villous, adherent to the palea or free.

Species 25.—Temperate regions of both hemispheres. \*

## \*1. HORDEUM VULGARE Linn.

*Hordeum vulgare* Linn. Sp. Pl. (1753) 84; Duthie Grasses N. W. Ind. (1883) 45, Fodder Grasses N. Ind. (1888) 69, t. F., fig. 32; Hook. f. Fl. Brit. Ind. VII (1896) 371; Lisboa Bomb. Grasses (1896) 135.

*H. sativum* Pers. Syn. I (1805) 108.

**Vernacular name5** : Barley, Satu, Jave godhi, Jawa, Java satu, Kushuli satu, Sadhe satu.

## \*VAR. HEXASTICHON Aitch.

*Var. hwastichon* Aitch. Cat. Panj. PL (1869) 171.

*Hordeum hexastichon* Linn. Sp. Pl. (1753) 85; Roxb. Fl. Ind. I (1832) 358; Grah. Cat. Bomb. PL (1839) 234; Dalz. & Gibs. Bomb. Fl. Suppl. (1861) 96.

**Etymology** : *Hexastichon* means 6-ranked, alluding to the arrangement of the spikelets.

**Description** : Height 75 cm. Boots woolly as in wheats. Culms<sup>1</sup> membranous, tufted, stout, succulent; nodes waxy, concealed within the leaf-sheaths which are smooth, loose, striate, ligule membranous; base of leaf distinctly auricled; auricles subspirally lanceolate acuminate. Leaves sharply ascending, linear-lanceolate acuminate on both surfaces; midrib distinct, white; blades 23-30 cm. long, 13-16 mm. broad.

Spike emerging from the inflated sheath of the flag; length with awns 15-20 cm., without awns, 5-7-9-5 cm.; spikelets 10 in each of the 6 ranks. Glume 1,15 mm. long; subulate, slightly awned, white hairy on base; glume II similar but awn 13 mm. long; glume III glabrous, bony, white, transparent, with 5 strong nerves which are slightly ciliate on the back; margins strongly

incurved, awn long, flattened, palea oblong, truncate, nerves 2, strong, green, not keeled, the glume and palea tightly enclosing the seed; lodicules obovate, long ciliate above; ovary cuneately obovoid, top, cuneately hairy; stigmas short, white, plumose, included; stamens 3, anthers white short.

\*VAR. *DISTICHON* Hook. f.

*Var. distichon* Hook. f. EL Brit. Ind. VII (1896) 371.

*Hordeum distichon* Linn. Sp. PL (1753) 85.

**Etymology** : *Distichon* means 2-ranked, referring to the arrangement of the spikelets.

**Description** : Height about 90 cm. Leaves scabrid on both surfaces, 15-25 cm. long, by 6-13 mm. broad.

Spikes emerging from leaf-sheaths, 2-ranked, length with awns 18-20 cm., without awns 7\*5-9 cm.; spikelets in each row 10 to 15, 2 rows of barren spikelets alternating with each row of fertile, surfaces smooth; barren spikelets with glumes I and II, slender, awned, about 13 mm. long, slightly exceeding III, which is linear-oblong, rounded at apex, ciliolate, 5-nerved, palea slightly smaller; glume IV rudimentary; fertile spikelets with glumes I and II subulate, awned 1-nerved; glume III 5-nerved, palea 2-nerved both closely embracing the grain.

**Locality** of the two varieties : Not extensively grown in Bombay. Cultivated as a rabi crop in Sind, Ahmedabad, Kaira, Panch Mahals, Satara, Sholapur, Poona and Ahmednagar.

For further and fuller information we refer to:—

Watt, Diet. Econ. Prod, 4 (1890) 274.

Koern. & Wern., Handbuch des Getreideb. II, 600.

Schulz, A., Die Abstammung der Saatgerste, *Hordeum sativum*. Mitt. Natf. Ges. Halle a. S. I (1912) 18-27.

Wiggins, B. G., A classification of the cultivated varieties of Barley. Cornell. Agr. Exp. Stat. Mem. 46 (1921) 365-456.

Blaringhem, L., Sur les caracteres d'especes elementaires d'Orges (*Hordeum*). , Bulk Soc. Bot. France 71 (1924) 623-27.

## TRIBE XVII: Bambuseae.

Shrubs or trees, rarely perennial herbs. Blades flat, many-nerved, articulated on the sheath. Spikelets all of one kind. Florets few to many, rarely 1. Involucral glumes distinct or indistinctly differentiated, *i.e.*, passing below into more or less numerous bracts and sometimes having like them flowering branchlets or spikelets in their axil, and at the same time resembling the floral glumes. Floral glumes subherbaceous to subcoriaceous, 5-many-nerved, generally awnless. Lodicules usually 3. Stamens 3, 6 or more. Styles 2 or 3.

See key page xxL

106. BAMBUSA Schieb.

Shrubs or trees, usually large and caespitose (rarely climbing); stem-sheaths broad, the blade often triangular. Leaves shortly petiolate, not tessellate by nervulea but sometimes BO by pellucid glands; sheaths variously auricled.

Spikelets 1-flowered, usually arranged in a large leafless panicle bearing heads or spiciform branches, or in leafy panicles, or in paniculate spikes. Lower glumes 1-4, empty or bulbiferous; flowering glumes ovate-lanceolate, the uppermost imperfect; palea 2-keeled. Lodicules 2 or 3» membranous, ciliate, rarely obsolete. Stamens 6, free. Ovary oblong or obovoid, with a hairy tip; styles short or long; stigmas 2-3. Grain oblong or linear-oblong, furrowed on one side; pericarp thin, adherent to the seed.

Species 73.—Eastern Asia, Australia.—One species indigenous in the Presidency, and 2 commonly cultivated.

I. Stem and branches unarmed.

1. Spikelet subcylindric; fertile flowers 5-9

1. *B. nana*.

2. Spikelet compressed, flattened, distichous, fertile flowers 5-6.

2. *B. vulgaris*.

II. Stem and branches armed

3. *B. arundinacea*.

\*1. BAMBUSA\* NANA Koxb.

*Bambusa nana* Eoxb. Hort. Beng. (1814) 25, Fl. Ind. II (1832) 190; Munro Monogr. Bamb. in Transact. Linn. Soc. XXV (1866) 89; Gamble Ind. Bamb. Ann. Itoy. Bot. Gard. VII (1896) 40, t. 38; Brandis Ind. Trees. 669; Camus Bambus6es (1913) 121, pi. 37, fig. B.



*B. glaucescens* Siebold Cat. ex Munro.

*B. glauca* Lodd. Cat.

*B. caesia* Sieb. & Zucc. ex Munro.

*B. sterilis* Kurz. in Miquel Ann. Mus. Bot. Lugd. Bat. II, 285.

*B. viridi-glaucescens* Carriere in Eevue Hort. (1869) 292 (non Eiv.).

*B. aurea* Franchet & Savatier (non A. & C. Eivi&re).

*Ischurochhafloribunda* Biise in Miq. Pl. Jungh 390; Miquel Fl. Ind. Bat. III, 422.

*Arundinaria glaucescens* P. Beauv. Agrost. (1812) 144; Euprecht in Act. Acad. Caes. Petrop. (1840) 23, t. 1, fig. 3; Munro Monogr. 1. c. 22.

*Panivum arborescens* Linn.

*Triglossum arundinaceum* Fisch. apud Eoem. & Schult. Syst. (1817) 846.

*Ludolfia glaucescens* Willd. in Mag. Gesell. N. F. Berlin (1808) 320.

**Vernacular names** : Dwarf Bamboo, Barik bambu.

**Etymology** : *Bambusa* was formed from its Malayan name.—*Nana* means dwarf.

**Description** : Stems densely tufted, 2-3 m. high, rarely more, 3 cm. in diam., glabrous, green when young, then yellow, unarmed, hollow, much branched from the base; branches fascicled, semiverticillate, often dichotomous. Sheaths of young shoots glabrous, striate, very long, attenuate, apiculate, lanceolate, truncate at the apex, surmounted by an imperfect limb rather long-acuminate and decurrent into 2 ciliate auricles. Leaves often small, 2-5-7-5 cm. long, the larger ones often attaining 14 cm. by 5-7 mm., rounded at the base, long-acuminate, smooth or pubescent below, scabrous on the margins, glaucous-bluish; secondary nerves 5-7 pairs, not tessellate, but provided with pellucid glands.

Spikelets 12-45 mm. long, few, clustered or solitary on the branches of short diffuse panicles, straw-coloured, shining, 5-9-flowered; sometimes with bractifonn subfoliaceous scales at their bases; rhaciiilla glabrous, flattened. Glumes all flowering or rarely the lowest empty, ovate, acute, many-nerved. Palea shorter than the glumes, keels minutely ciliate at or near the tip only., Stamens long-exserted, pendulous; anthers obtuse or finely apiculate, yellow. Ovary obovoid, pubescent at the apex. Style very short, divided from almost the base into 3 long and hairy stigmas. Grain elliptic, furrowed, shortly beaked, top hairy.

**Locality** : Cultivated in gardens.

**Distribution** : China, Japan.—Cultivated in Manila, Luzon, Java, Malay Peninsula, India, Europe.

**Economic uses** : Makes good hedges.

#### \*2. BAMBUSA VULGARIS Schrad.

*Bambusa vulgaris* Schrad. apud Wendl. Collect. Pl. II (1810) 26, t. XLVII; Eupr. in Act. Acad. Caes. Petrop. (1840) 137, t. XI, fig. 47; Munro Monogr. 107; Bedd. Fl. Sylv. CCXXXII; Brandis Ind. Trees 670; A. & C. Riviere Les Bambous 191; Gamble Ind. Bamb. 43, pi. 40 and in Hook. f. Fl. Brit. Ind. VII (1896) 391, Camus Les Bambus&s (1913) 122, pi. 76; fig. A.

*B. Thoursii* Kunth Not. Gen. Bambus. in Journ. Phys. (1822) 148; Eupr. Bambus. 48, t. XI, fig. 48.

*B. surinamensis* Rupr. in Act. Acad. Caes. Petrop. (1840) 49, t. XI, 49.

*B. Sieberi* Griseb. Fl. Brit. W. fad. (1864) 528.

*B. arundinacea* Moon Cat. 26; Ait. Hort. Kew. ed. II, 316.

*B. auriculata* Kurz apu Houz. de Lehais.

**Vernacular names** : Kulluk, Udha-bans, Yellow bamboo.

**Description** : Stems unarmed, 6-15 m., 5-10 cm. in diam., first green, then yellow, or striped, polished; nodes hardly raised, with usually a ring of blown tails; internodes 25-45 cm. long, walk xatW tWnr Stem-skeatos 15-25 cm. ty 17-23 cm., often streaked with yellow thickly hairy above, top rounded, retuse; blade 5-15 cm., appressed hairy on i J ^ S S base rounded, decurrent with rounded, falcate, fimbriate auricle8; ligulo broad, toothed or fimbriate. Leaves linear-lanceolate 15-25 cm. by 16-40 cm., pale, petioled, glabrous, tessellate by pellucid glands, tip twisted, scabnd, nerves 6-8; sheath laxly haify; ligule short, auricle roundad.

Panicle large, leafy. Spikelets 15-20 mm., in bracteate clusters of 3-10 obloim bifid, empty glumes, 1-2 ovate, many-nerved with the tip ciliate; flowering glumes 6-10 acute, Palea as long as the glume, keels white ciliate. Lodicles 3 winged, ciliate. At Sffi hairy, apiculate, purple.. Ovary narrow, hairy; style long.

**Locality** : Cultivated in Bombay, Poona, Satara, Kolhapur and elsewhere

**Distribution** : Mauritius, Bourbon, Madagascar, Hawaii, Java.—Cultivated in other countries. vum,\*

## \*VAR. STRIATA Auct.

- Bambusa striata* Lodd. ex Lindl. in Penny Cyclop. III (1835) 357; Munro Monogr. 121; Curtis. Bot. Mag. XXX (1974) t. 6079.  
 Var. *viUata* A. & C. Bivifera 1. c.  
*B. vulgaris vel culmis variegatis* Hort. Gall.  
*B. variegata* Hort.  
 Var. *aureo-variegata* Hort.

**Vernacular names** : Striped bamboo. Green striped bamboo.

**Description** : Bather smaller in size. The stems are striped with yellow and green, the stripes alternating at every node; the branchlets are yellow and the leaves somewhat smaller and paler. On drying the stripes disappear.

**Locality** : Often cultivated in gardens.

**Distribution** : Probably the result of cultivation in China and Japan.

## 3. BAMBUSA ARUNDINACEA Betz.

- Bambusa arundinacea* Betz. Obs. V (1789) 24 sub *Bambos*; Willd. Sp. PL II (1799) 245; Boxb. Corom. PI. I, 56, t. 79, Fl. Ind. II (1832) 191; Poir. Encycl. VIII, 701; Bupr. in Act. Acad. Caes. Petiop. (1840) 51, t. XIII, fig. 50; Munro Monogr. 103; Brandis Ind. Trees (1911) 617; Bedd. Fl. Sylv. CCXXI; Gamble Ind. Bamb. 52 et in Hook, f. Fl. Brit. Ind. VII, 395; Duthie Fodder Grasses N. Ind. (1888) 70; Cooke Fl. Bomb. II (1908) 1046; Camus Les Bambus&s (1913) 128, pi. 75, fig. A.  
*B. Arundo* Klein ex Nees in Linnaea IX (1834) 471.  
*B. Nee&iana* Am. ex Munro 1. c.  
*B. orientalis* Nees 1. c. 475.  
*B. pungens* Blanco Fl. Filip. ed. I, 270.  
*B. spinosa* Bozb. Fl. Ind. II (1832) 198.  
*Arundo Bambos* Linn. Sp. PL (1753) 81.  
*A. indica arborea* Auct.  
*Nastys arundinaceus* Sm. in Bees Cycl. XXIV, no. 1.

**Vernacular names** z Kalak, Mundgay.

**Etymology** : *Arundinacea* means reed-like.

**Description** : Thorny; stems many, tufted on a stout rootstock, 24-30 m. high by 15-18 cm. diam., usually graceful and curving; nodes prominent (the lowest rooting), the lower emitting horizontal, almost naked shoots armed at the nodes with 2-3 stout recurved spines sometimes 2-5 cm. or more long; internodes up to 45 cm. long; walls 2-5-5 cm. thick; stem-sheaths coriaceous, variable in shape, up to 30-38 by 23-30 cm., striate, with rounded tip and plaited margins, when young orange yellow streaked with green or red and thickly ciliate with golden hairs, blade up to 10 cm. long, triangular, acuminate, glabrous outside, densely hirsute inside, the margins decurrent, thickly ciliate; ligule narrow, entire or fringed with pale hairs. Leaves up to 18-20 by 2-5 cm., linear or linear-lanceolate, tip stiff, glabrous or puberulous beneath, one or more margins scabrous, base rounded, ciliate, midrib narrow, nerves 4-6 with 7-9 intermediate and a few transverse pellucid glands; leaf-sheath ending in a thick callus and shortly bristly auricle; ligule short.

Inflorescence an enormous panicle often occupying the whole stem; branchlets bearing loose clusters of pale, suberect, lanceolate, acute, glabrous spikelets 1-3-2-5 cm. by 5 mm. Involucral glumes 2 or 0, ovate-lanceolate, acute or mucronate, 5-8-5 mm. long, many-nerved, empty; floral glumes 3-7, the uppermost 1-3 male or neuter; palea subacute with 2 ciliate keels. Lodicules 3, ovate or subovate, hyaline, ciliate, 1-3-nerved. Anthers yellow, obtuse. Style short. Grain 5-8-5 mm. long, oblong, beaked by the style-base, grooved on one side.

**Locality** : *Gujarat*: (Gamble); Dangs (Woodrow).

*Konkan*: Kanari Caves (McCann A215 ! A216 !); Wada Range (Ryan 494 !); Vetora (Sabnis 33282 !).

*W. Ghats*: (Gamble); Igatpuri (McCann A218 !); Ehandala, St. Xavier's Villa (McCann "A224! A225 !).

*Deccan*: Earli (Gammie 16169 !).

*N. Karma*: Earwar (Hallberg & McCann A217 !); 3 miles from ftCrjan (Hallberg & McCann A220!).

**Ecology** : Gregarious along the banks of rivers and nalas on alluvial soil in moist monsoon-forests, absent from rain-forest. Flowers after long intervals. See E. Blatter, The Flowering of Bamboos in Journ. Bomb. Nat. Hist. Soc. 33 (1929) 899, 34 (1930) 135, 34 (1930) 447.

**Distribution** : Injlia, Burma, Ceylon.—Often cultivated.

**Economic uses** : The stems are used for construction, mats, bājketā and many other purposes.

## 107. OXYTENANTHERA. Munro.

Arborescent or scandent bamboos, usually of a medium or small size, unarmed, often gregarious; rootstock stout, usually creeping and stoloniferous; stem-sheaths various, usually rather narrow, the imperfect blade also narrow. Leaves variable, shortly petiolate.

Inflorescence a large panicle of spicate heads of few or many spikelets. Spikelets narrow, elongate, conical, 1-3-flowered, the uppermost usually fertile. Involucral glumes 1-3, empty; floral glumes ovate, elongate, mucronate. Palea of lower florets 2-keeled, of upper florets convolute with obscure or obsolete keel. Lodioules 0. Stamens 6; filaments connate in an ultimately elongated membranous tube. Ovary ovoid; style slender; stigmas 1-3, more or less plumose. Grain elongate, beaked, grooved, smooth.

Species 16.—Malay Peninsula, Siam, India, tropical Africa.—2 in the Bombay Presidency.

- |  |                         |
|--|-------------------------|
| 1. Spikelets 1-flowered; style glabrous. | 1. 0. <i>Ritcheyi</i> . |
| 2. Spikelets 2-flowered; style hairy.    | 2. 0. <i>Stocksii</i> . |

## 1. OXYTENANTHERA RITCHEYI Blatter &amp; McCann.

*Oxytenanthera Ritcheyi* Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 33 (1929) 773.

*Bambusa Ritcheyi* Munro in Trans. Linn. Soc. 26 (1868) 113.

*Oxytenanthera monostigma* Bedd. For. Man. in Fl. Sylv. (1873) CCXXXIII, et Ic. Pl. Ind. Or. (1874) 56, t. 234; Gamble Ind. Bambus. (1896) 74, t. 65; Cooke Fl. Bomb. II (1908) 1048; Brandis Ind. Trees (1911) 674; Talbot For. Fl. Bomb. II (1911) 571; Camus Bambusées (1913) 148; Troup Silv. Ind. Trees III (1921) 1006.

*Schizostachyum hindostanicum* Kurz in Proc. As. Soc. Beng. 52, II (1873) 252.

Why we made the change from *O. monostigma* to *O. Ritcheyi* is evident from the synonymy.

**Vernacular name** z Choua.

**Etymology** : *Oxytenanthera* is derived from *oxytes*, sharpness, and *anthera*, anther, alluding to the filaments being connate in an ultimately elongated membranous tube.

**Description** : A medium-sized bamboo; stems 3-4.5 m. high by about 2.5 cm. diam., solid, covered with soft pale yellow velvety tomentum; nodes not very prominent; internodes long; stem-sheaths 15-25 cm. long by 7-5 cm. broad at the base, narrowed to the 2-lobed tip; blade in the sinus imperfect, about 7-5 cm. long, linear-lanceolate, striate; ligule long, fimbriate. Leaves variable, pale green, 15-20 by 3-8 cm., linear-lanceolate, acuminate, unequally rounded at the base into a flat petiole, ending above in a setaceous twisted point, glabrous or nearly so above, sparsely hairy and pale beneath; midrib below yellow, shining; nerves 7r12; leaf-sheaths striate; ligule often 8\*5 mm. long, acute or rounded.

Panicle large, terminal, of spicate branches bearing dense globular often large heads of spikelets up to 6-3 cm. diam. Spikelets 2-2.5 cm. long, less than 2-5 cm. broad, 1-flowered, with a long spinous apiculation, very numerous, the fertile and sterile about equal in numbers. Involucral glumes 2-3, mucronate, empty; floral glume long, narrow, linear-lanceolate, convolute, with a long mucro; palea shorter than its glume, concave, not keeled, obtuse. Stamens exerted; anthers long, bristly-apiculate, the bristles somewhat hairy at the tip. Style long, glabrous; stigma at length curved, thickened. Grain narrow, linear-oblong, grooved, tipped with the conic style-base.

**Locality** : *W. Ghats*: (Talbot, Woodrow); Sakhar Pathar Hill near Lonavla (Woodrow); Mahableshwar (Fagan).

*Deccan*: Satara Ghats (BrandisJ; Poona District (Wroughton); Ahmednagar (Wilkins).

8. *M. Country* (Ritchie 820).

*N» Kanara*: (Woodrow); Wuddermone (Talbot 252 ! 905 !); Arbail Ghat (Talbot 906 !); Arbail (Talbot 251 ! 857 !); Guddehalli (Talbot 583 !); Supa (Talbot!).

**Ecology** : Grows usually in moist monsoon-forest.—Clumps or single culms are often found in flower; sometimes there is a general flowering over considerable areas.—The culms often grow separately.

**Distribution** : *W. Ghats* of Bombay Presidency, Anamalais.

**Economic uses** : The wood is somewhat soft and, therefore, little used.

## 2. OXYTENANTHERA STOCKSII Munro.

*Oxytenanthera Stocksii* Munro in Trans. Linn. Soc. XXVI (1868) 130; Bedd. For. Man. in VL Sylv. (1873) CCXXXIII; Gamble Bamb. Brit. Ind. (1896) 75, t. 66, et in Hook. f. Fl. Brit. Ind. VII (1896) 403; Cooke Fl. Bomb. 11, (1908) 1048; Talbot For. Fl. Bomb. II, 570; Camus Les Bambusées (1913) 149.

**Vernacular names** : Chivari, Konda, Mes, Oor-sheme.

**Description** : A slender bamboo; stems 9 m. high by 2-5-3-8 cm. diam., grey-green, covered when young with a white or grey deciduous tomentum; nodes with & softly pubescent

Ting; internodes 15-30 cm. long; stem-sheaths 15-23 cm. long by 7.5-18 cm. wide at the base, tapering upwards to a concavely truncate top, appressedly brown-hairy on the back, ciliate on the margins; blade imperfect, subulate, acuminate, rounded at the base and again expanded into a rounded, waved, long-fringed auricle on the top of the sheath; ligule 8.5 mm. long, deeply fimbriate, conspicuous. Leaves 10-20 by 1-2 cm., rounded or attenuated at the base into a very short petiole 2-5 mm. long, the top ending in a setaceous point, glabrous or nearly so above, glabrous or hairy below, with scabrous margins; midrib narrow; nerves 5-6; leaf-sheaths striate, glabrous or at first pubescent; ligule long dentate.

Panicle large, of spicate heads reaching 2-5 cm. diam., with many closely packed spinous spikelets, the heads supported by rounded chaffy bracts. Spikelets 10-13 mm. long, narrow, glabrous, mucronate, many fertile mixed with a few sterile. Involucral glumes 2, ovate, mucronate, 5-7-nerved, then 2 hermaphrodite florets; floral glumes ovate, subacute, with a strong mucro from the back; palea of the lower floret as long as the floret, 5-nerved between the 2 ciliate keels, obtuse, that of the upper floret concave, convolute, obtuse. Stamens long-exserted; anthers short, acute. Ovary ovoid, hairy; style long, hairy; stigma simple, plumose.

**Locality** : *Korikan* (Stocks).

*W. Ghats*: Fanchgani, planted (Woodrow).

*N. Kanara*: Kumpta, cultivated (Talbot 269 ! 3601!); Karwar (Talbot 856 !); -commonly cultivated along the coast; rare in the Ghat forests of N. Kanara (Talbot).

**Ecology** : Commonly cultivated in the Konkan and N. Kanara, near coast villages.

**Distribution** : W. Peninsula, Indo-China.

**Economic uses** : This is a stout strong bamboo with a small hollow; used for construction, umbrellas, baskets and punting poles.

#### 108. DENDROCALAMUS Nees.

Arborescent unarmed bamboos with densely branching rootstocks. Leaves shortly petiolate, the transverse nervules represented by pellucid glands.

Spikelets in globose clusters on the long branches of a compound panicle, ovoid, 2-6-flowered. Involucral glumes 2-3, empty, ovate, acute, many-nerved; floral glumes like the empty; palea of lower florets keeled, of the upper dorsally rounded, eciliate, Lodicules rare. Stamens 6; filaments free. Ovary hairy above, often depressed; stigma usually simple. Grain small; pericarp coriaceous or crustaceous.

Species 24.—Africa, Indo-Malaya, Philippines, China.

- |  |                           |
|--|---------------------------|
| 1. Stem-sheaths 7-30 cm. long; leaves up to 25 by 3 cm.                      | • 1. <i>D. strictus</i> . |
| 2. Stem-sheaths 50 cm. long, as broad at the base; leaves up to 50 by 10 cm. | 2. <i>D. giganteus</i> .  |

#### 1. DENDROCALAMUS STRICTUS Nees.

*Dendrocalamus strictus* Nees in *Linnaea* 9 (1834) 476; *Munro Monogr.* 147; *Bedd. Fl. Sylv. t. CCCXXV*; *Brandis Ind. Trees* (1911) 675; *Duthie Fodder Grasses N. Ind.* (1888) 71; *Gamble Bamb. Brit. Ind.* (1896) 78; t. 68, 69 *et in* *Hook. f. Fl. Brit. Ind. VII* (1896) 404; *Cooke Fl. Bomb. II* (1908) 1049; *Camus Les Bambus&s* (1913) 152, pi. 87, fig. B.

*Bambos stricta* Roxb. *Corom. PL I*, 58, t. 80.

*Bambusa stricta* Roxb. *Fl. Ind. II* (1832) 193; *Dalz. & Gibs. Bomb. Fl.* (1861) 299.

*B. verticillata* Rottl. *ex* *Munro in Trans. Linn. Soc. XXVI* (1868) 147.

*B. pubescens* Lodd. *ex* *Lindl in Penny. Cycl. III* (1835) 357.

*B. Tanaea* Ham. *ex* *Wall. Cat. no. 5038A*.

**Vernacular names**: Kania bans, Mes, Shib, Basa, Bans, Medar, Mace, Udha, Male bamboo.

**Etymology** : *Strictus* means close or narrow and upright or very straight.

**Description** : A deciduous densely tufted bamboo with strong stems 6-15 m. high by 2.5-7.5 cm. diam., which are solid or only with a small-cavity, glaucous-green when young, dull green or yellowish when old; nodes swollen, the lower often rooting; internodes 30-45 cm. long; upper branches decurved; stem-sheaths variable, the lower 7.5-30 cm. long, covered on the back with golden-brown stiff hairs (or in dry localities sometimes glabrous), striate, rounded on the top, ciliate on the margins, very slightly auricled, the imperfect blade triangular-subulate, hairy on both sides, especially so within; ligule narrow. Leaves 2-5.5 cm. long in dry localities, up to 25 cm. long in moist ones, 0.6-3.2 cm. broad, rounded suddenly at the base into a short petiole, gradually narrowed upwards into an acuminate twisted point, rough and often hairy above, softly hairy beneath, with scabrous margins; nerves 3-6 pairs, with interposed pellucid glands; leaf-sheaths striate, hairy; callus prominent, auricle short, ciliate with a few wavy deciduous hairs; ligule narrow, serrate.

Inflorescence a large branching panicle of dense globular heads about 2-5 cm. diam., 3-8-5 cm. apart; rhachis rounded, smooth. Spikelets usually hairy, spinescent, the fertile intermixed with many sterile smaller ones, 8-5-13 by 2-5-5 mm., with 2-3 fertile florets. Involucral glumes 2 or more, ovate, spinescent, many-nerved; floral glumes ovate, ending in a sharp spine, surrounded by ciliate tufts of hairs; galea ovate or obovate, emarginate, the lower ones 2-keeled, the uppermost keelless, 6-8-nerved. Stamens long-exserted; anthers yellow, shortly apiculate\*. Ovary stipitate, turbinate; style long; stigma simple, plumose. Grain 8-5 mm. long, ovoid to subglobose, brown, shining, hairy above, beaked with the persistent style-base.

**Locality** : *Bind*: Junnar Hill (Burns!).

*Kathiawar*: Junagad, Datar Hill (Chibber!).

*Gujarat*: Panch Mahals (Woodrow).

*Khandesh*: To Toranmal (McCann 9791<sup>#</sup>!); base of Toranmal (McCann A221 f).

*Konkan*: Planted (Woodrow).

*Deccan*: Rocky hills (Gamble); Earli (Gammie 16167!); Ganeshkhind B6tanic Gardens (Patwardhan!).

*S. M. Country*: Byadgi, Dharwar District (Talbot!).

*N. Eanara*: Karwar (Talbot!); Ambgaum (Talbot 1788 !); Dongi Nallah (Talbot 959 !).

**Ecology** : Gregarious over large areas in N. Eanara, S. Mahratta Country, Deccan and Konkan.—Flowers irregularly and sporadically or simultaneously over large areas.

**Distribution** : India, Java.

**Economic uses** : This strong elastic bamboo is used for building purposes, matting and basket work, spear-handles, punting poles, furniture, etc.—The leaves are a good fodder. See : D. Clouston and F. J. Plymen, Principal Fodders in the Central Provinces and Berar including the small bamboo. Agr. Journ. India XV (1920) 380.

#### \*2. DENBOCALAMUS GIGANTEUS Munro.

*Dendrocalamus giganteus* Munro in Trans. Linn. Soc. XXVI (1868) 150; Kurz Ind. Forester I, 346. Gamble Bamb. Brit. Ind. (1896) 88, t. 76, *et* in Hook. f. PL Brit. Ind. VII (1896) 406; Brandis Ind. Trees (1911) 678; Cooke Fl. Bomb. II (1908) 1050; Camus Les Bambusées (1930) 159, pi. 85, f. A.

*Bambusa gigantea* Wall. Cat. Bot. Gard. Calc. 79; Gardener's Chronicle pi. Sept. 1892.

**Vernacular name** : Giant bamboo.

**Description** : Stems 20-30 m. by 20-25 cm. in diam., branched above; nodes hairy, internodes rather short, grey-green, young with waxy scurf; walls thin. Stem-sheaths 50 cm. long, as broad at the base, deciduous, thinly strigose with golden hairs, top depressed; blade 12-40 by 9 cm., decurrent into glabrous, stiff, brown, wavy auricles, narrowed above into a short point; ligule 5-12 cm., stiff, black, margin serrate. Leaves up to 50 by 10 cm., oblong, cuspidately acuminate, tips twisted, young hairy beneath, midrib strong, nerves 12-16 pairs, with pellucid cross bars.

Panicle very large, branchlets slender, curved; heads up to 2-5 cm. diam., 1-2-2-5 cm. apart. Spikelets 12 mm. long, ovoid, acute, spinescent puberulous, sometimes all flowering; rhachilla produced with an imperfect glume. Involucral glumes ovate, mucronate, striate; flowering glumes 3-6, thin, mucronate, many-nerved. Anthers acuminate. Ovary ovoid and long style hairy; stigma simple. Grain oblong, obtuse, hairy above.

**Locality** : Sometimes grown in gardens.

**Distribution** : India (Tenasserim, Malay Peninsula, Penang, Malacca, Perak), Cochin-China.—Cultivated in gardens of India, Ceylon and Europe.

#### 109. TEINOSTACHYUM Munro.

Stems thin, overhanging, sometimes climbing. Stem-sheaths usually thin. Leaves various.

Panicle spiciform, on leafy branches. Spikelets up to 7\*5 cm. long, slender, many-flowered, sometimes pedunculate, in bracteate whorls, upper and lower flowers imperfect, Involucral glumes 1-2, mucronate; flowering glumes similar, mucros longer. Palea convolute, keels ciliate. Lodicules 3, 3-9-nerved. Stamens 6, filaments free, slender. Anthers obtuse or obtusely apiculate. Ovary ovoid or depressed globose, apex produced enclosing the style; stigmas 2-3, plumose. Grain ovoid, acuminate, beaked, pericarp crustaceous.

Species 5.-<sup>1</sup>India, Ceylon.—One species in the Bombay Presidency; not mentioned by Cooke.

#### 1. TEINOSTACHYUM WIGHTII Bedd.

*Teinostachyum Wightii*, Bedd. Fl. Sylv. t. CCCXXIII, Forest Man, CCXXXIII (*excl. syn.*); Gamble Bamb. Brit. Ind. (1896) 99, t. 87, *et* in Hook. f. Fl. Brit. Ind. VII (1896) 410;

Brandis Ind. Trees (1911) 679 ; Camus Les Bambusées (1913) 163.

**Etymology** : *Teinostachyum* is derived from *teino*, to stretch, extend, and *stachys*, an ear, fruit, perhaps alluding to the spiciform panicle.

**Description** : Stem 3-6 m. by 2\*5-3 cm., semiscandent; branches pendulous; nodes narrowly ringed; internodes bright green, rough above; walls thin. Stem-sheaths 25-30 by 2\*5-3 cm., papery, hirsute with black-brown hairs, top truncate, not auricled; blade subulate, 12-17 cm., decurrent on the sheath; ligule 2\*5 mm. Leaves, 15-40 cm. by 2\*5-5 cm., oblong-lanceolate, acuminate, tip scabrous, twisted, whitish and sparsely hairy beneath, midrib broad, yellowish, nerves 6-7 pair, tessellate by glands; sheath glabrous; ligule narrow.

Panicle large, with spiciform drooping branchlets; rhachis smooth, slender; rhachilla of spikelets slender, flattened and concave below, thickened and ciliate above. Spikelets 12-25 mm. Involucral glume 1, ovate, mucronate, 5-7-nerved, dorsally hirsute; flowering glumes 1 or 2, mucronate, nerved transversely. Lodicules ovate, short-ciliate, 3-5-nerved. Ovary stalked, depressed-globose, smooth, style included in the long beak of the ovary. Grain stoutly stalked, ovoid, beaked, glabrous.

**Locality** : Ghats of N. Kanara (ex Gamble and Camus).

**Distribution** : Nilgiris, Anamalais, about 3,300-5,000 ft. altitude. ↯

#### 110. OCHLANDRA Thw.

Shrubby gregarious reed-like bamboos; stems small, thin-walled, erect; internodes rather long; stem-sheaths thin, persistent, auricles small. Leaves small to moderate-sized, linear or oblong-lanceolate, acuminate, shortly petiolate; leaf-sheaths striate, fringed; ligule usually short.

Inflorescence a terminal spike or spike-like panicle on a leafy branchlet; spikelets verticillate, partly fertile, partly sterile. Spikelets 1-flowered, often very large.\* Involucral glumes 2-6, variable, usually mucronate, empty; floral glume similar to the last involucral glume, mucronate. Palea membranous, not keeled. Lodicules 1-septate, conspicuous, variable, usually appressed to the filaments. Stamens many, from 6 to 120; anthers large, narrow, usually apiculate. Ovary narrow; style elongate; stigmas 4-6, plumose or papillose. Grain large or very large, ovoid, long-beaked, supported by the persistent glumes; pericarp very thick, fleshy.

Species 11.—India, Ceylon, Malay Peninsula, Java, Madagascar.

Only one species in the Bombay Presidency.

#### 1. OCHLANDRA TALBOTTI Brandis.

*Ochlandra Talboti* Brandis Ind. Trees (1906) 684; Talbot For. EL Bomb. II (1911) 572; Cooke Fl. Bomb. II (1908) 1050; Camus Les Bambusées (1913) 181.

*O. stridula* Woodr. in Journ. Bomb. Nat. Hist. Soc. XIII (1901) 442 (non Thw.).

*Ochlandra Rheedii* var. *Sivagiriana* Gamble which Talbot (l. c.) identifies with *Ochlandra Talboti*, has been described as a distinct species by Camus under the name *Ochlandra Sivagiriana* in Les Bambusées (1913) 181.

**Vernacular names**: Huda, Wontenulyi.

**Etymology** : *Ochlandra* may have been derived from *ochleo*, to throw into confusion and *aner*, stamen, on account of the great number of stamens (6-120).

**Description** : Stems numerous in dense clumps, slender, 13-20 mm. diam., hollow, sometimes scandent; nodes thickened, shining, glabrous. Leaves glabrous, pale, lanceolate, long-acuminate, 20-30 by 3\*8-6\*3 cm., on a petiole 6 mm. long; leaf-sheaths glabrous, the bristles at the mouth early deciduous; ligule bearded.

Spikelets in half whorls on a terminal erect spike 10-20 cm. long, glabrous or with a few soft hairs at the tips of the glumes, the fertile spikelets few, 3-2 cm. long. Involucral glumes 3-6, empty. Lodicules 6, linear, nerved. Stamens 25-40; anthers 13 mm. long, minutely apiculate; filaments long, slender. Ovary prolonged into a slender style 3\*8 cm. long; stigmas 5, papillose. Grain ovoid, 5-7-5 cm. by 8\*5 mm., narrowed into a long beak, supported by 4 persistent glumes.

Easily recognized by the hollow stem.

**Locality**: N. Kanara: Gersoppa Falls (Talbot 3628!, McCann!); Katgal (Talbot 3506!, McCann!); Yellapur (Bell!); near Sulgeri (Bell 3357!); Dadmune (Talbot!); common throughout the Kanara forests (McCann!); Honavar, at Alanki (McCann!).

**Ecology** : Grows in monsoon and rain forest often along the banks of rivers and nalas on the S. Ghats.—Flowers at great intervals.

**Distribution** ; Endemic in N. Kanara.



LIST OF SPECIES—contd.

	Bluz.	Outok.	■	Chajent.	Edunokoh.	Keptak.	W. Gharia.	Imptoo.	B. M. Country.	N. Karna.
Coeloirhachis darkei Blatter & McCann										
Imperata cylindrica P. Beauv.	+			■		■	•		■	■
Saccharum spontaneum Hiinn. "officinatum Trin. arundinaceum Betz. Munja Roxb. Griffithii Munro Ravennae linn. fastigiatum Steud.	+			•	•	•	•	•	■	■
Spodiopogon albidus Benth.	+++			•	•	•	•	•	■	■
Eulalia argentea Brogn. fimbriata Blatter & MoCann					•	•	•	•	■	■
Sorghum halepense Pers. subglabrescens Schweinf. & Asobera. purpureo-soricum Asohers. & Sohweinf. nitidum Pers. vulgare Pers.				•	•	■	•	•	+++	•
Cleistachne Stocksii Hook, f.						■				
Vetiveria. Lawsoni Blatter & MoCann zizanioides Stapf				•		•			•	•
<del>Chyrtopogon</del> Gyrtopogon Hub Trin. reticulatus Trin. asper Heyne lancearius Haines Wightianus Nees montanus Trin. polyphyllus Blatter & McCann Aucheri Stapf	■		•	•	•	•	•	•	•	•
Arthraxon inarmitt Hook, f. serrulatum Hochst. Meeboldii Stapf lanceifolium Hochst. quartinianus Nash jubatum Hack.	•	•		•	•	•	•	•	•	•
Capillipedium assimile A. Camus Hugelii Blatter & McCann filiculme Blatter & McCann					•	•	•	•	•	•
Azphilophis compressa Blatter & McCann Woodrowii A. Camus pertusa Stapf Kuntzeana Haines ensifolmis Blatter & MoCann concanensis Blatter & McCann glabra Stapf odorata A. Camus				•	•	•	•	•	•	•
Bichanthium pachyganense Blatter & MoCann armatum Blatter & McCann McCannii Blatter oaricosum A. Camus annulatum Stapf serrafalcoides Blatter & McCann	•			•	•	•	•	•	•	•
Ereinopogon foveolatus Stapf Paranjpyeanum Blatter & McCann		•		•	•	•	•	•	•	•



LIST OF SPECIES—*contd.*

	Bomb.	Goah.	Kathiawar.	Calcutta.	Kanadob.	Koakan.	W. Ghats.	Deccan.	S. M. Country.	N. Kanara.
<i>Scbizachyrium</i> <i>brevifolium</i> Nees									*	
<i>Andropogon</i> <i>pumilus</i> Hook.				+	+				*	*
<i>Cymbopogon</i> <i>Schoenanthus</i> Spreng. <i>Jwarancusa</i> Sohult. <i>citratus</i> Stapf <i>Martini</i> Stapf <i>caesius</i> Stapf	**	*	*	++	+	*		*	*	*
<i>Heteropogon</i> <i>altissimus</i> Blatter & McCann <i>polystachyus</i> Blatter & McCann <i>indicus</i> Thw. <i>Ritchiei</i> Blatter & McCann <i>contortus</i> Boem. & Schnlt. " var. <i>genuinus</i> , subv. <i>typicus</i> " var. <i>genuinus</i> , subv. <i>hispidissimus</i>			*	*	*	*	++++	++++	++++	*
<i>Iseilema</i> <i>Gontheperoides</i> Hack, <i>iaxum</i> Hack. <i>Wightii</i> Adders.			+	+	+++	*	+++	+++	+++	+
<i>Tbeneda</i> <i>triajdra</i> Forsk. <i>quadrivalvis</i> O. <i>cymbaria</i> Hack, <i>tremula</i> Hack.				++	+++	+++	+++	+++	+++	+++
<i>Pseudanthistiria</i> <i>hispida</i> Hook. f. <i>heteroclita</i> Hook. f. <i>umbellata</i> Hook. f.				+		**	*	*	*	+
<i>Spinifex</i> <i>squarrosus</i> Linn.				+		*				+
<i>Digitaria</i> <i>ternata</i> Stapf <i>marginata</i> Link. var. <i>fimbriata</i> Stapf <i>pennata</i> Chiov. <i>pedicellaris</i> Prain <i>longiflora</i> Pers. <i>Royleana</i> Prain	*	*	*	*	*	*	*	+++	+++	*
<i>Alloteropsis</i> <i>cimicina</i> Stapf						+	*	*	*	*
<i>Pseudechinolaena</i> <i>polystachya</i> Stapf										+
<i>Eriocbloa</i> <i>ramosa</i> O. Kuntze	*			*		*			*	*
<i>Brachiaria</i> <i>Isachne</i> Stapf <i>mutica</i> JStapf <i>ramosa</i> Stapf <i>distachya</i> Haines	*	*		+	*	*	*	*	*	+
<i>Paspalum</i> <i>scrobiculatum</i> Linn. <i>dilatatum</i> Poir. <i>compactum</i> Roth <i>vaginatum</i> Sw.	*			*		+	+		*	*
<i>Paspalidium</i> > <i>flavidum</i> A. Camus <i>punctatum</i> A. Camus <i>geminatum</i> Stapf	*	*	*	*	+	*	*	+++	*	+
<i>Urochloa</i> <i>reptans</i> Stapf <i>setigera</i> Stapf <i>marathensis</i> Henr. <i>Helopus</i> Stapf	*		*	*	+	*	*	*	*	+

LIST OF SPECIES -contd.

	Ind.	Oriss.	Malabar.	Gojara.	Khamirsh.	Kashmir.	W. Ghats.	Deccan.	S. M. Country.	N. Kanara.
<i>Echinochloa</i> colona Link " *var. frumentacea Blatter & McCann Crus-GalliP. Beauv. stagnina Beauv.	■	■	■	◆	◆	◆	◆	■	■	◆
<i>Oplismenus</i> compositus P. Beauv. Burmanni P. Beauv.				◆	■	◆	◆	◆	◆	◆
<del><i>Hymenocleis</i></del> myuros Beauv.									◆	
<i>Panicum</i> turgidum Forsk. obscurans Woodrow trypheron Schult psilopodium Trin. "miliaceum Linn. *miliare T^m. subglume Trin. * maximum Jacq. paludosum Boxb. antidotale Retz. montanum Boxb.* auritum Presl	■		■	◆		◆		◆	◆	
<i>Sacciolepis</i> indica Chase mysuroides Haines interrupta Stapf	■					■	*	*	◆	■
<i>Pseudoraphis</i> aspera Pilger						◆	◆		■	◆
<i>Cyrtococcum</i> trigonum A. Camus pilipes A. Camus patens A. Camus						◆	◆	◆	◆	◆
<i>Setaria</i> plicata T. Cooke homonyma Chiov. glauca Beauv. intermedia Boem. & Schult. verticillata Beauv. *italica Beauv.	■	■	■	◆	◆	◆	◆	◆	◆	◆
<i>Tricholaena</i> Teneriffae Parlat Wightii Nees	◆					■	◆	■	■	
<i>Pennisetum</i> Alopecuroides Nees dichotomum Del. orientate Rich. pedicellatum Trin. setosum Rich. ciliare Link *spicatum Boen & Sohult. *purpureum Schum. & Thonn.	◆		■	◆	◆	◆	◆	■	◆	◆
<i>Cenchrus</i> biflorus Boxb. catharticus Del.	◆	◆		◆	◆					
<i>Isachne</i> Lisboae JEIook. f. elegans Dalz. anstnilis B. Br. roliacea Both	■			◆		◆	◆	◆	◆	◆

LIST OF SPECIES—*contd.*

	Bhyd.	Oriss.	Assam.	Gujarat.	Kanara.	Kerala.	W. Ghats.	Deccan.	S. M. Coorgly.	S. Kanara.
Arundinella										
avenacea Munro										
tuberculata Munro										
setoea Trin.										
tenella Nees & Wight										
pygmaea Hook. f.					*					
oiliata Nees						*				
Metzii Hochst.						*				
Lawii Hook, f.						*				
hispida Kuntze						*				
mutica Nees						*				
spicata Dalz.						*				
Tilosa Wight & Am.						*				
gigantea Dalz.						*				
Tristachya										
barbata Nees	*									
Arena										
*sativa Idmn.										
Coelachne										
pulchella R. Br.							*			
Danthonia										
Gammiei Bhide							*			
Thysanolaena "										
procera Mez.				*	*	*				
Phragmites										
maxima Blatter ft McCann	*	*		*	*			*	*	*
•Arando										
•Donax Linn.										
Heleochloa										
schoenoides Host	**		*							
setulosa Blatter ft McCann										
Oarnotia										
arborum Stapf						*	**	*		*
stricta Brogn.										
Polypogou										
monspeliensis Desf.	*									
Aristida										
Adscensionis Linn.	*	*	**	*	*		*	**	**	*
setacea Retz."										
Hystrix Linn, f.				*	*		*	*	**	*
mntabilis Trin. & Rupr.	*			*	*		*	*	*	*
<del>progenitoria Rolan.</del>	*			*	*		*	*	*	*
<del>hystrixoides Steud.</del>	*			*	*		*	*	*	*
hystrioides Edgew.	*			*	*		*	*	*	*
funiciflora Trin. ft Rupr.	*	*		*	*		*	*	*	*
reda6ta Sü>pf	*			*	*		*	*	*	*
Trachys										
muricata Steud									*	*
Nazia										
raeomosa Kuntze	*		*	*	*			*	*	*
Latipes										
songaleasis Kunth	*									
Osterdamia										
Matrella Kuntze				*	*					*
Perotis										
in<lica Kuntze				*	*		*	*	*	*





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These corrections incorporated in  
-to, k/h tr\* 19.1.1965. G.M. -J.M.

Errata to Scientific Monograph No. 5 of the Imperial Council of  
Agricultural Research entitled 'The Bombay Grasses', by  
E. Blatter and C. McCann.

- Page vi, item 124, *for* 'Arundinew' *read*<sup>c</sup> 'Arundinella'
- Page xv, line 3, *for* 'involucrant' *read* 'involucral'
- Page 3, line 3 of footnote, *for* 'traumatism' *read* 'traumatisme'
- Page 3, line 5 of footnote, from bottom. *Add* fullstop after 'Missbildungen'
- Page 3, line 2 of footnote from bottom. *Add* fullstop after 'Pembryon'
- Page 4, line 9 from bottom; *for* \* 'Dymnock' *read* 'Dymock'
- Page 29, line 22 from bottom, *for* 'Birt' *read* 'Brit'
- Page 36, under Explanation of Plate 25, after the bracket, *for* 'spikete' *read* 'kelet'
- Page 37, line 29, *for* 'of' *read* 'at'
- Page 43, line 13, *for* 'seems' *read* 'seem'
- Page 43, line 16, *for* 'Occology' *read*<sup>c</sup> 'Oecology'
- Page 44, line 26, *for* 'hillum' *read*<sup>d</sup> 'hilum'
- Page 44, line 31, *for* \* 'spikele' *read* 'spiklet'
- Page 49, line 5, *for* 'adaptions' *read* 'adaptations'
- Page 49, line 2 from bottom. *Add* 'rather' after 'generally'
- Page 52, under Explanation of Plate 34, after bracket, *for* 'Sessle' *read*<sup>c</sup> 'Sessile'
- Page 55, line 26 from bottom, *for* 'on the so widely spread a genus like Sorghum' *read* 'on so widely spread a genus as Sorghum'
- Page 85, line 28. *Delete* comma after 'College'
- Page 105, line 33, *for* 'Russa' *read* 'Busa'
- Page 112, line 25 from bottom. *Add* 'as' after 'long'
- Page 122, line 17, *for* 'xi' *read* 'xv'
- Page 123, line 4, *for* 'Jehu' *read* 'juhu'
- Page 128, line 17. *Add* semi-colon after 'Ceylon'
- Page 136, line 7 from bottom, *for* 'Commersoni' *read*<sup>d</sup> 'Commersonii'
- Page 137, line 22, *for* 'Commersoni' *read* 'Commersonii'
- Page 141, line 12 from bottom, *for* 'indigestable' *read* 'indigestible'
- Page 141, line 12 from bottom, *for* 'are' *read* 'is a'
- Page 161, line 2. *Add* 'it is' after 'but'
- Page 162, line 24 from bottom, *for* 'Yemem' *read* 'Yemen'
- Page 176, line 5. *Add* 'for' after<sup>c</sup> 'and'
- Page 176, line 24 from bottom, *for* 'Tenerife' *read* 'Teneriffe'<sup>9</sup>
- Page 178, line 23, *for*<sup>f</sup> 'Alopecuros' *read* 'Alopecurus'