

BIODIVERSITY OF *SEDGES* IN DERA ISMAIL KHAN DISTRICT, NWFP PAKISTAN

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ABSTRACT

The present account of *Cyperaceae* is based on the results of the Taxonomical research work conducted in Dera Ismail Khan (D.I.Khan) district, North West Frontier Province (NWFP), Pakistan, during May 2005 - April 2006. 20 plant species of the family, belonging to 9 genera, were collected, preserved and identified. Plant specimens were mounted and deposited as voucher specimens in the Department of Botany, Quaid-I-University, Islamabad. Complete macro & microscopic detailed morphological features of these species were investigated. Key to the species of the area was developed for easy and correct identification & differentiation. The genera with number of species are: *Bolboschoenus* (1sp.), *Cyperus* (6 sp.), *Eleocharis* (2 sp.), *Eriophorum* (1 sp.), *Fimbristylis* (5 sp.), *Juncellus* (1sp.), *Pycreus* (1 sp.), *Schoenoplectus* (2 sp.) and *Scirpus* (1sp).

Key words: Taxonomy, Sedges and Dera Ismail Khan, Pakistan.

INTRODUCTION

Dera Ismail Khan (D.I.Khan) is the southern most district of N.W.F.P. lying between 31°.15' and 32°.32' North latitude and 70°.11' and 71°.20' East longitude with an elevation of 571ft. from the sea level. It has a total geographical land of 0.896 million hectares and out of which 0.300 m.ha. is cultivated (Khan, 2003). Most of the D.I.Khan district is a dry alluvial plain commonly referred to as "Daman". The only hills, within the district, are those of Khisore Range which lies in the north - eastern part of the district. The Khisore Range is also known as the Ratta Koh or Koh-e- Surkh, meaning the red mountain. It runs close to Indus river, in north- east to south- west direction. The summer season is dry and hot. June is the hottest month during which the mean maximum and minimum temperature is recorded around 42 °C and 27 °C, respectively. December, January and February are the cold months. In January the mean maximum and minimum temperature is around 20 °C and 4 °C respectively. The district is bounded on the north by Tank and Lakki Marwat districts, on the east by Mian Wali and Bhakkar districts of Punjab, on the south Dera Ghazi Khan District of Punjab and on the west by Tribal Area Adjoining Dera Ismail Khan district (Anonymous, 1998).

Cyperaceae or the sedge-family is a group of grass-like or rush-like herbs spread throughout the world, showing a remarkable range of adaptability to varied ecological conditions, from sea level to alpine heights (Verma and Chandra, 1981). Sedges are mostly perennial rhizomatous or stoloniferous herbs, sometimes annuals, and are found in clumps in damp or marshy places and cultivated grounds especially in rice fields.

Among the characters of major economic importance

in this family are the underground parts, shape of the aerial stem, presence and arrangement of the leaves, type of inflorescence, number and length of involucre bracts, shape and size of the spikelets, arrangement of glumes, persistence of the rachilla, presence of the perianth bristles, the number of stamens, the number of style branches (i.e. number of stigmas), presence of the utricle and characters of the nut (Marwat *et al.*, 1996).

MATERIALS AND METHODS

The study was conducted during May 2005 - April 2006 in different parts of the area. Frequent field trips of the area were conducted in order to collect live specimens. The area was extensively surveyed for research work. Plants were collected, pressed in newspapers, and were identified with the help of available literature (Ali & Qaiser, 2001; Marwat *et al.*, 1996; Jafri, 1966; etc...) and by comparing with the already identified plant specimens of the herbarium, Quaid-i-Azam University, Islamabad. After correct identification the plants were given voucher numbers and deposited as voucher specimens in the herbarium of Botany Department, Quaid-I-Azam University, Islamabad, for future references. Detailed morphological features of each species were compiled. Taxonomic key was developed to differentiate closely related taxa.

RESULTS AND DISCUSSION

The family *Cyperaceae* has received relatively meager attention due to its insignificance, small inconspicuous flowers with complicated morphology and difficulties in their collection. On account of possessing such characters it has been given a separate status as family by taxonomists. In total 20 plant species, belonging to 9 genera, from D.I.Khan, were collected, preserved and identified. The plant

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species are: *Bolboschoenus affinis* (Roth) Drobov, *Cyperus alopecuroides* Rottb., *Cyperus difformis* L., *Cyperus iria* L., *Cyperus niveus* Retzius, *Cyperus pygmaeus* Rottb., *Cyperus rotundus* L., *Eleocharis geniculatus* (L.) Roem. and Schult., *Eleocharis palustris* (L.) Roem. and Schult., *Eriophorum comosum* (Wall. ex Roxb.) Nees, *Fimbristylis bisumbellata* (Forssk.) Bubani, *Fimbristylis dichotoma* (L.) Vahl, *Fimbristylis ferruginea* (L.) Vahl, *Fimbristylis quinquangularis* (Vahl) Kunth, *Fimbristylis tenera* Schultes var. *oxylepis* (Steudel) C.B. Clarke, *Juncellus laevigatus* (L.) C.B. Clarke, *Pycneus flavidus* (Retz.) T. Koyama, *Schoenoplectus litoralis* (Schrader) Palla, *Schoenoplectus triquetus* (L.) Palla and *Scirpus maritimus* (L.). Taxonomic account consists of family name, botanical name, English name, local name, habit and habitat, description, flowering and fruiting period, type, voucher specimen number and distribution in area, Pakistan and world. All the photographs have not been included in order to avoid the length of paper too long. However, pictures of eleven plants have been presented in Figures 1 - 11.

Key to the genera

- 1.+Glumes spirally arranged; spikelets not compressed; rachilla often straight; perianth mostly present in the form of bristles, occasionally absent (as in *Fimbristylis*)-----2
 - Glumes 2-ranked; spikelets usually compressed; rachilla grooved or zigzag; perianth absent-----7
- 2.+Perianth bristles absent-----5. *Fimbristylis*
 - Perianth bristles present-----3
- 3.+Perianth bristles dividing to the base into numerous cottony threads, much longer than glumes-----4. *Eriophorum*
 - Perianth bristles not dividing into cottony threads, shorter than glumes-----4
- 4.+Inflorescence umbellate or congested head; involucre bracts present-----5
 - inflorescence single terminal spikelet; involucre bracts absent-----3. *Eleocharis*
- 5.+Leaves well-developed; inflorescence terminal capitate or umbellate; involucre bracts
 - 2 (-4) in number, leaf-like-----6
 - Leaves reduced to sheaths; involucre bracts 1 (-2) in number, stem-like-----8. *Schoenoplectus*
- 6.+Perianth bristles usually 4; stigma predominantly 2; nut planoconvex or trigonous-----
 - 1. *Bolboschoenus*
 - Perianth bristles usually 6; stigma 3-branched; nut trigonous-----9. *Scirpus*
 - 7.+Nut trigonous; stigmas 3-----2. *Cyperus*
 - Nut compressed; stigmas 2-----8

- 8.+Nut dorsally compressed with one side against the rachilla-----6. *Juncellus*
 - Nut laterally compressed with one angle against the rachilla-----7. *Pycneus*

Bolboschoenus

Bolboschoenus affinis (Roth) Drobov

Basionym: *Scirpus affinis* Roth

Synonym: *Scirpus strobilus* Roxb.

Habit and Habitat: Perennial herb, found in shallow water, waste land pools, rice fields.

Description: Aerial stem sharply trigonous above, edges smooth or scabrous, Grey green. Leaves as long as stem; sheath up to 15 cm long; leaf blade up to 40 cm long and 2 - 7 mm, keeled. Inflorescence compact, formed by 1- 6 spikes, bracts many times longer than inflorescence. Spikes 1-2 cm long and 5-10 mm broad, ovoid, turgid, pale brown; glumes 5-9 x 2-3.5 mm, sides nerveless, yellowish brown or scarious, apex often ciliate, arista 1-2 mm, slightly recurved. Perianth bristles usually 4, easily detached, unequal, shorter than nut. Stamens 3. Stigmas predominantly 2, often 3. Nut ovoid or obovoid, trigonous and plano convex, white or yellowish brown, glossy, epidermal cells hexagonal.

Fl. & Fr. : January – July.

Type: Described from Southern India (Mysore), collection of Benjamin Heyne (Type probably in K).

Voucher specimen No.: 20

Distribution in Area: Near Darya Khan – D.I.Khan bridge and Baloch Nagar

Distribution in Pakistan: Rawalpindi; Makran: Ras Nuh, S Gwadar; Karachi: Hub River; Shikarpur Canal Bridge; Dera Ismail Khan.

Distribution in World: From Europe to India.

Cyperus

Key to the genera

- 1.+Perennial rhizomatous herbs-----2
 - Annual herbs, with fibrous roots -----4
- 2.+Stolons present, bearing tuber-like structure; spikelets loosely arranged--7. *rotundus*
 - Stolons usually absent, rarely present bearing no tuber like structure-----3
- 3.+Inflorescence compound anthelodium; rachilla winged-----2. *alopecuroides*
 - Inflorescence a single capitate of white spikelets ; rachilla wingless-----5. *niveus*
4. +Spikelets spicately arranged on the rachis; -----
 - 4. *iria*
 - Spikelets spirally arranged forming globose heads;-----5
 - 5.+Inflorescence a single globose head----6. *pygmaeus*
 - Inflorescence umbel of 5-8 rays each bearing a congested head-----3. *difformis*

***Cyperus alopecuroides* Rottb.**

Synonym: *Juncellus alopecuroides* (Rottb.) C.B.Clarke

Habit and Habitat: Perennial herb, found in ditches, rivers shores.

Description: Perennial, tufted with short rhizome. Aerial stem up to 140 cm long and 3-7 mm diam., trigonous, smooth. Leaves up to as long as stem; sheaths up to 35 cm, leaf blade up to 60 cm long and up to 10 mm broad, keeled, apex trigonous, scabrous. Inflorescence a compound umbel; involucre bracts up to 5-7, leaf-like, up to as long and as wide as leaf, primary branches 8-12; secondary branches up to more than 10, with several foliose bracts; some primary and most secondary bracts ending with cluster of spikes, sometimes with small tertiary antherodia; cluster of spikes 2-6 cm x 1-2 cm, each cluster with 70 spirally arranged spikes; spikes 5-15 x 1.5-2 mm, compressed; glumes c. 2 mm, keeled, midnerve strong, greenish, side yellowish or grey, with reddish-brown stripes, margins narrowly scarious; Stamens 2; stigmas 2 or 3. Nut elliptic to obovate-oval, biconvex, slightly flattened (or obcompressed-trigonous in tricarpellary pistil), yellowish brown, finely reticulate or almost smooth.

Fl. Per. : April - September

Type: "Arabia, *Forsskhl*"; not located at C-Hrb. Forsskal.

Voucher specimen No.: 209

Distribution in Area: common in water canal near Awan Petrol Pump, on Way to Mianwali; near Qureshi More.

Distribution in Pakistan: Peshawar District; Karachi District; Thatta District; Tharparkar.

It is also found in our area.

Distribution in World: In N. Tropical Africa, Madagascar, Macaronesia; West Indies, Guadelou; Pakistan, India, Malayasia, NE Australia.

***Cyperus difformis* L.**

Syn: *C. complanatus* Forssk.

English name: Variable flat sedge

Vern. / Local name: Bari Ghuien

Habit and Habitat: Annual herbaceous weed of marshy places and cultivated fields.

Description: Aerial stems 48-64 cm tall, sharply triquetrous, soft, glabrous. Leaves sessile, sheathed, 3-10 x 0.1-0.15 cm, leaf blade linear, glabrous, sheaths closed, surrounding the stems bases. Inflorescence umbellate; rays 5-8 in number, 0.5-3cm long, each bearing a congested head of small sessile spikelets; involucre bracts 3-4 in number, 6.25-10 x 0.15-0.4 cm, longer than the inflorescence, linear oblong, midvein and margins scabrous. Spikelets 3-4 x 1 mm, linear-oblong, distichous, 10-14 flowered; rachilla not winged; glumes 0.7-0.8 x 0.9 mm, sub-

orbicular, margins hyaline. Stamen 1; style 3-branched. Nut 0.5-0.6 x 0.3-0.4 mm, obovoid-ellipsoid, trigonous, yellowish-brown.

Fl. & Fr.: July - December

Voucher specimen No.: 199

Type: "Habitat in India"

Distribution in Area: Near Basti Dhappan wala, Darya khan – D.I.Khan Bridge.

Distribution in Pakistan: It has been reported from the following districts of Pakistan: Peshawar, Nowshera, Kohat, D.I.Khan, Attock, Rawalpindi, Mianwali, Sargodha, Lahore, Dadu, Karachi, Thar Parkar & Kashmir.

Distribution in World: Tropical and sub-tropical regions of the world.

***Cyperus iria* L.**

Synonym: *Chlorocyperus iria* (L.) Rikli

English name: Rice field flat sedge, umbrella sedge

Vern. / Local name: Bhuien, Burochoocha, Khanna

Habit and Habitat: Annual herb usually occurring in cultivated fields.

Description: Aerial stems 10-46 x 0.15-0.25 cm, solid, tufted, triquetrous, striate, glabrous. Leaves 3-ranked, longer than the stems, 3-6 mm in diam, linear, margins scabrous towards apex. Inflorescence compound umbel; involucre bracts 3-5 in number, 8-30 x 0.3-0.6 cm, longer than the inflorescence, linear, flat, margin and midvein scabrous; spikelets 6-9 x 1.5-1.75 mm, narrowly-oblong, ascending, comparatively closely applied to the rachis of the spike, 12-16 flowered, rachilla not winged; glumes 1.3-1.5 x 1.2-1.4 mm, broadly ovate or suborbicular, keel not winged, glabrous, 3-5-nerved, margins hyaline. Stamens 2; style 3-branched, very small, c.1/3 as long as the nut, style base not swollen. Nut 1.2-1.5 x 0.5 mm, obovoid-ellipsoid, trigonous, dark brown.

Fl. & Fr.: July - October

Type: Described from India, Osbeck (Type in LINN).

Voucher specimen No.: 200

Distribution in Area: Near Basti Dhappan wala, Darya khan – D.I.Khan Bridge.

Distribution in Pakistan: Common on borders of irrigation ditches and rice fields. Sindh, Punjab, Dir, Swat, Hazara, Poonch, Kashmir, plains to 6000'.

Distribution in World: Tropical, subtropical and temperate regions of the world.

***Cyperus niveus* Retzius**

Habit and Habitat: Perennial herb found in rock crevices and along road sides.

Description: Aerial stems 16-50 x 0.1-0.15 cm, tufted, erect, triquetrous, glabrous. Leaves 4-25 x 0.1-0.3 cm, basal, linear, shorter than the stems, mid-vein

and margins scabrous. Inflorescence capitate of sessile spikelets; involucre bracts 2-3 in number, 2-10 x 0.1 cm, leaf-like, linear. Spikelets 1.5-3.0 x 0.4-0.5 cm, narrowly-oblong, 8-54-flowered, white; rachilla not winged; glumes 4-4.5 x 2-2.5 mm, ovate-lanceolate, boat-shaped, mucronulate, 13-14-nerved. Stamens 3; style 3-branched. Nut 1.3-1.5 x 0.9-1 mm, obovoid-ellipsoid, trigonous.

Fl. & Fr.: April - October

Type: Described from Eastern India (Type in LD).

Voucher specimen No.: 365

Distribution in Area: Paniala

Distribution in Pakistan: Sind, Balochistan, Thal-Kurram, Peshawar, Kohat, Chitral, Swat, Barikot, Mingora, Hazara, Siran Vy., Nathia, Sakesar, Kahuta, Saidpur, Murree Road, Jhelum Vy., Kashmir, Poonch etc. common, 0 – 6000'

Distribution in world: Central, South and Southeast Asia.

Cyperus pygmaeus Rottb.

Synonym: *Juncellus pygmaeus* (Rottb.) C.B. Clarke

Vern./Local name: Unknown

Habit and Habitat: Annual, tufted, herb found in wet river bed.

Description: Aerial stem trigonous, smooth. Leaves as long as stem; sheath to 3 cm, soft, often reddish, mouth margin concave or almost straight; leaf blades to 15 cm long, 1 to 3 mm broad, keeled, margins often curved, apex trigonous, scabrous. Inflorescence 6-20 mm in diam., a regular globose head of 5-10 globose, sessile, spirally arranged partial inflorescences, tightly pressed together and separately indistinguishable; bracts 4-7 foliose, up to 80 mm long, much exceeding length of inflorescence, first erect, finely reflexed; partial inflorescences formed by 9-50 sessile spikes, tightly spirally arranged; spike 2.5-3.5 x 0.8-1.4 mm, narrowly obovoid, compressed, with 20-28 glumes, glume-like bract long-awned, glumes distichously arranged, mid-nerve green, raised, 1-3 nerved on both sides, margins scarious, brownish towards the apex. Stamen 1-0; stigma 2. Nut 1-1.1 x 0.4 mm, ellipsoid, lenticular or plano-convex, yellow-brown, papilose and finely reticulate.

Type: "Inter semina pro horto nostro a Domino Konigio e Regione Tranqvebarensis missus."

Fl. & Fr. Per.: June – November

Voucher specimen No.: 198

Distribution in Area: D.I.Khan: Near Basti Dhappan wala.

Distribution in Pakistan: Rawalpindi district: Rawal Lake; Thar Parkat: Nagar Parkar; Lohre: Bed of Ravi, , Chenab; Kashmir: Wular Lake

Distribution in World: Widely spread in Eurasia, from Mediterranean region East Africa through Asia

Minor and India to southern Asia, Malaysia and Australia.

Cyperus rotundus L.

Synonym: *C. tuberosus* Roxb.

English name: Brown nut sedge, Nut-grass.

Vern./Local name: Deela, Motha, Mork

Habit and Habitat: Perennial herb, commonly occurring throughout the area in lawns, moist road sides, waste places and in cultivated fields.

Description: Aerial stems 12-42 cm long, glabrous, triquetrous, erect, dilated at the base. Leaves many, 7.6-41 x 0.2-0.5 cm, linear, flat, scabrous towards the apex, sheaths truncate at the mouth. Inflorescence compound umbel; involucre bracts 3-4 in number, 3.5-10 x 0.2-0.3 cm, longer than the inflorescence, leaf-like, linear, margins minutely scabrous. Spikelets (3-5)-18-36 x 1-1.5 mm, linear-oblong, distichous, flat, 6-34-flowered, rachilla winged; glumes 3-3.5 x 1.5-2.5 mm, ovate, obtuse or slightly apiculate, 5-7-nerved, margins hyaline. Stamen 3; style 3-branched, branches longer than the style, glabrous. Nut 1.2-1.5 x 0.5-0.8 mm, trigonous, ovoid oblong, black.

A single plant can produce 686 new tubers within a period of one year in the tropical areas.

Fl. & Fr.: May - October

Type: Described from India (Type in Hermann Herb. BM)

Voucher specimen No.: 54

Distribution in Area: Commonly found throughout the area in fields, waste places.

Distribution in Pakistan: Commonly found throughout Pakistan in wet meadows, ditches, rice fields, waste places, moist road sides and on shores.

Distribution in World: This is a cosmopolitan weed distributed in tropical, sub tropical and temperate regions of the world.

Eleocharis

Key to the species

+Spikes 3-6 x 3-4 mm.; perianth bristles 6-8; stylopodium much wider than long-----**8. geniculata**
-Spikes 9-25 x 3-5 mm.; perianth bristles 4 (-5); stylopodium c.as high as wide-----**9. palustris**

Eleocharis geniculata (L.) Roem. and Schult.

Basionym: *Scirpus geniculatus* L.

Synonym: *Eleocharis capitata* R.Br.

Vern./Local name: Unknown

English name: Spike-rush.

Habit and Habitat: Annual herb found in marshland, wet meadows or rice fields.

Description: Aerial stems densely tufted in clumps, 7—30 cm tall and 0.5-1 mm broad, green, with 5-6 deep grooves. Leaves reduced to sheaths; sheaths up

to 5 cm long, oblique at the mouth, margins scarious. Spikes ovoid or somewhat globose 5- 8 x 4-5 mm, rounded at the base, apex obtuse, pale brownish. Glumes broadly elliptic to ovate, c. 2 mm long, obtuse at apex, membranous, pale-brownish, mid-vein greenish. Perianth bristles 6-8, as long as or longer than nut, brown; stamen 2-3; stigmas 2. Nut 0.8-1 x 0.6-0.8 mm (excl.stylopodium), obovoid, biconvex, apex rounded, basal part gradually tapering, obscurely reticulate, glossy, finely black; stylopodium much wider than long, white, clearly constricted from nut.

Fl.Per.: April – June.

Type: In Herb. Hortus Califfortianus (BM).

Voucher specimen no.: 281

Distribution in Area: Marshland near Paharpur water canal.

Distribution in Pakisitan: Reported from Karachi district (Sind) and Quetta District (Balochistan).

Distribution in World: Pantropic! Extending into subtrops; Europe (Italy), Africa, Madagascar, Egypt, from Iraq to Pakistan, India, China, Taiwan, Malaysia, Australia, N and S America.

This species resembles *Eleocharis palustris* (L.) Roem. and Schult., but differs from it in possessing Spikes 3-6 x 3-4 mm., perianth bristles 6-8 in number, stylopodium much wider than long. In *Eleocharis palustris* (L.) Roem. and Schult. the spikes are 9-25 x 3-5 mm., perianth bristles 4 (-5) in number, stylopodium c.as high as wide.

***Eleocharis palustris* (L.) Roem. and Schult**

Basionym: *Scirpus palustris* L.

Synonym: *Eleocharis intersita* Zinserl. ,

English name: Common spike-rush, Marsh spike-rush.

Vern./Local name: Unknown

Habit & Habitat: Perennial herb, with creeping rhizome, rooted in the mud.

Description: Aerial stem 9-26cm. long, terete. Leaves reduced to sheaths; sheath up to 5 cm. long with truncate mouth, reddish brown. Spikelets 8-22mm. long, ovoid- oblong, sterile glumes 2x1.5mm, obtuse, each glume surrounding one-half of the spikelet at the base; fertile glumes 3-3.5 x 1.5-2mm, ovate-lanceolate, obtuse, membranous, margin hyaline; keel green; perianth bristles 4 in number, unequal in length retrorsely scabrid; stamens 3; style 2-branched, villous, style base swollen and persistent. Nut obovoid, compressed, smooth, brown at maturity .

Fl. & Er.: April - June

Voucher specimen no.: 191

Type: Discribed from Europe (Type in Linn.)

Distribution in Area: Very common in Badri Dam (large pond like body) at Khaisore Range, in stagnant water along the spur c. 2 km from Qureshi More on way to Bhakkar.

Distribution in Pakistan: Attock district: Gali Jagir to Tanaza Dam, Ranawali Ban Gahar; Rawalpindi near Terlai Village; Chowinda, Pasroor; N.Waziristan, D.I.Khan; Gimbathai; Gilgit district: Gorikot; Diamir district: Astore; Baltistan district: Skardu, Burgay Nalla, Sandus.

Distribution in World: Temperate and Subtropical regions Northern Hemisphere.

Eriophorum

***Eriophorum comosum* (Wall. ex.Roxb.) Nees**

Basionym: *Scirpus comosus* Wall. ex. Roxb.

Vern./Local name: Unknown

Habit and Habitat: Perennial herb, found in rock crevices or shallow soil.

Description: Aerial stem 10-28 cm tall, obscurely triquetrous, glabrous, striate. Leaves 31-51 x 0.15-0.3 cm, linear, numerous, margins and midvein scabrid. Inflorescence compound umbel; involucre bracts 7.6-51 x 0.2-0.3 cm, leaf-like, margins scabrous. Spikelets 3-8 x 1.5-2.5 mm, numerous, cylindrical, many-flowered; glumes 2.5-3.5 x 1 mm, ovate-oblong, acute, concave, keel greenish, margins with brownish spots. Perianth bristles dividing into numerous cottony threads particularly in fruit, much longer than the glumes; stamens 2, linear-oblong, crested; style 3-branched. Nut 3-3.5 mm long, linear-oblong, trigonous, brownish-black.

Fl. & Fr.: January – October.

Type: Nepal, *Wallich* 3446 (K).

Voucher specimen no.: 267

Distribution in Area: Dara Zinda: Near water channel at the base of hill.

Distribution in Pakisitan: Reported from the following regions: Lohari Pass; Drosh; Gilgit district; Malakand; Dir; Swat district; Torkham; Abbottabad, Nathia Gali, Muzaffarabad to Abbottabad; Kaghan valley; Siran Valley; Kohat district; Cherat, SE Peshawar; From thal to kurrum; Attock district; Islamabad, Rawalpindi, Soan River, Kahuta; Kashmir: Jhelum Valley.

Distribution in World: Central, South and South East Asia.

Fimbristylis

Ket to the species

1. +Nut compressed; stigmas 2-----2
-Nut trigonous; stigmas 3-----4

2. +Inflorescence twice or thrice umbelled; glumes glabrous-----3

-Inflorescence simple or rarely compound umbelled; glumes hairy on the upper half---

- 13. *ferruginea*
 3.+Spikelets larger in size, 2-4 mm wide; glumes 3.5 x 2 mm; nut larger in size, 1-1.5 x 0.8-1mm. with 8-10 ridges on each face -----
 -----12. *dichotoma*
 -Spikelets smaller in size, 1.25-1.75 mm wide; glumes 1.5-2 x 1-1.25 mm; nut smaller in size, 0.7-0.8 x 0.5-0.6 mm, with 5-7 ridges on each face-----11. *bisumbellata*
 4. +Glumes deltoid-ovate, hairy on the upper half, tip slightly bent outwards; nut whitish relatively larger in size, 1-1.1 x 0.8-0.9 mm-----
 -----15. *tenera* var. *oxylepis*
 -Glumes ovate, glabrous, acute, tip not bent outwards; nut brownish, smaller in size, 0.5-0.8 x 0.4-0.6mm-----14. *quinquangularis*

Fimbristylis bisumbellata* (Forssk.) Bubani*Basionym:** *Scirpus bisumbellatus* Forssk.**Vern./Local name:** Unknown**Habit and Habitat:** Annual herb, found in moist, marshy places along irrigation channels.**Description:** Aerial stems 2-19 cm tall, slender, tufted, striate, glabrous. Leaves 2-16 x 0.1-0.15 cm, linear, sheath membranous, pubescent, ligule of short hairs. Inflorescence terminal, compound umbel, involucre bracts 2-3, unequal in length, 2-6.5 cm long, hairy at the base. Spikelets smaller in size, 2-5 x 1.2-1.75 mm, ovoid-oblong; glumes 1.5-2 x 1-1.25 mm, ovate, boat-shaped, mucronate, tip scabrous and slightly bent backwards, sharply keeled, 3-nerved, margins chestnut coloured. Stamen 1; style 2-branched, upper half villous, style base swollen. Nut smaller in size, c. 0.7-0.8 x 0.5-0.6 mm, obovoid, plano-convex, with 5-7 ridges on each face.**Fl. & Fr.:** April – October.**Type:** Described from Egypt: (Type in C).**Voucher specimen no.:** 22**Distribution in Area:** In river bed, near Basti Dhappan wali; near Darya Khan bridge.**Distribution in Pakistan:** Common in rice field. Sind: Sikarpur, Karachi; Balochistan: Match; NWFP: Timargirah, Swat, Saidu Sharif, Hazara, Peshawar valley, Charsada, Kohat, D.I.Khan, Kurram; Punjab: Rawalpindi, Lahore (along canal banks); Gilgit; Kashmir: Jhelum Valley, 0 – 5500 ft.**Distribution in World:** North Africa, West, South and Southeast Asia and Australia.***Fimbristylis dichotoma* (L.) Vahl****Basionym:** *Scirpus dichotomus* L.**English:** Forked fringerush, hooray grass**Synonym:** *Scirpus diphyllus* Retz.**Loc./vern:** Choti bhoin, Kalooro**Habit and Habitat:** Perennial herbaceous weed of marshy places.**Description:** Aerial stems 8-60 cm tall, tufted, erect, striate. Leaves 7-19 x 0.2-0.25 cm, linear, flat, sheath hairy, ligules in the form of short hairs. Inflorescence terminal, compound umbel, involucre bracts 2-3 in number, 3-5.7 x 0.1-0.2 cm, leaf-like. Spikelets 7-16 x 2.5- 3 mm, ovoid; glumes 3.5 x 2 mm, broadly ovate, mucronate, keel greenish, 4-nerved, margins nerveless. Stamen 1; style 2-branched, villous, style base swollen. Nut 1-1.5 x 0.8-1 mm, obovoid, biconvex with 8-10 ridges on each face, straw-coloured.**Fl. & Fr.:** July – October.**Type:** Described from India (Type in Herman Herb. BM).**Voucher specimen no.:** 268**Distribution in Area:** In river bed, near Basti Dhappan wali; near Darya Khan bridge.**Distribution in Pakistan:** Sind: Tatta, Hyderabad; Balochistan: Match; NWFP: Timargirah, chitral, Swat, Saidu Sharif, Madian, etc, Hazara, Peshawar valley, Charsada, Kohat, D.I.Khan, Kurram; Punjab: Rawalpindi, Lahore (along canal banks), Bhera, Murree, Burbhan; Gilgit; Kashmir: 0 – 6000 ft.**Distribution in World:** Tropical and subtropical regions of all the world, extending into the temperate areas.This is a very distinct species differing from *Fimbristylis bisumbellata* (Forssk.) Bubani in possessing prominent, upto 60 cm tall aerial stem; larger, 7-16 x 2.5-3 mm spikelets; nut with 8-10 ridges on each face. In *Fimbristylis bisumbellata* (Forssk.) Bubani the aerial stem is short, upto 19 cm tall, the spikelets are smaller, 2-5 x 1.25- 1.75 mm, and the nut bears 5-7 ridges on each face.***Fimbristylis ferruginea* (L.) Vahl.****Basionym:** *Scirpus ferrugineus* L.**Vern./Local name:** Unknown**Habit and Habitat:** Perennial herb of marshy places along riversides.**Description:** Aerial stems 10-61 cm long, slender, tufted, erect, trigonous, glabrous, striate. Leaves 3-38 x 0.1-0.2 cm, linear, margins incurved and scabrous, sheath with a truncate mouth, ligule a fringe of short hairs. Inflorescence terminal, simple or rarely compound umbel; involucre bracts 2-3 in number, 2.5-18 cm long, margins scabrous. Spikelets 4-9 x 1.5-4 mm, ovoid-oblong, cylindrical; glumes 3 x 2.5 mm, ovate, concave, mucronate, hairy on the upper half, keel green, margins coloured with irregular spots. Stamens 3; style 2-branched, villous. Nut 1.5 x 1-1.5 mm, obovoid, short-stalked, biconvex.**Fl. & Fr.:** June – November.**Type:** Described from Jamaica, West Indies(Type in Sloane Herb.BM).

Voucher specimen No.: 59

Distribution in Area: near stagnant water about 2 km from Qureshi More on way to Bhakkar.

Distribution in Pakistan: Sind: Tatta, Malir etc. NWFP: Peshawar, Chitral, Drosh; Punjab: Chenab banks, Attock, Hassan Abdal, Rawalpindi; Gilgit; Kashmir: Rammam, Jammu road, Pantropic in moist meadows and rice fields, 0 – 4000 ft.

Distribution in World: Warmer regions of the world.

***Fimbristylis quinquangularis* (Vahl) Kunth**

Basionym: *Scirpus quinquangularis* Vahl.)

English name: Five angle fimbry.

Vern./Local name: Unknown

Habit and Habitat: Annual herb found on wet ground, river banks and rice fields.

Description: Aerial stem upto c. 43 cm tall, tufted, erect, quadrangular, glabrous. Leaves reduced to sheath. Inflorescence decomposed umbel, 7-8.5 cm long, 3.5-5 cm in diam; bracts 3-4 in number, 2.4-3.2 cm long, leaf-like, narrow, shorter than the inflorescence. Spikelets numerous, 3-4 x 1.2-1.5 mm, ovoid, brownish; glumes 1.5-1.8 x 1-1.2 mm, ovate, boat-shaped, acute, keel greenish, 3-nerved. Stamen 1; style 3-branched, villose. Nut 0.5-0.8 x 0.4-0.5 mm, ovoid, trigonous, tuberculate, pale-brown.

Fl. & Fr.: September – October.

Type: Described from Old World tropics (Type C).

Voucher specimen No.: 234

Distribution in Area: Near Darya Khan – D.I.Khan bridge.

Distribution in Pakistan: Sind: Indus, Malir and Hub rivers, Larkana (Dokri), Dadu, Khairpur, Hyderabad, Tandojam; NWFP: Dir, Hazara, Peshawar, Peshawar valley, Dera Ismail Khan; Punjab: Rawalpindi --- Kahuta, Rawalpindi, Lahore.

Distribution in World: Widely distributed in the tropical regions of the Old World.

***Fimbristylis tenera* Schultes var. *oxylepis* (Steudel) C.B. Clarke**

Basionym.: *Fimbristylis oxylepis* Steudel.

Vern./Local name: Chhoti ghuien

Habit and Habitat: Annual herb, found in Indus river bed (Sandy soil).

Description: Aerial stems 11.5 x 28 cm tall, tufted, slender, erect, triquetrous, striate, scabrous. Leaves 10-15 x 0.1-0.15 cm, linear, slender with incurved scabrous margins. Inflorescence terminal, simple or compound umbel, involucre bracts 3-4 in number, 1.2-2.2 cm long, shorter than the inflorescence. Spikelets 3-7 x 1-2 mm, ovoid- oblong, cylindrical, brownish; glumes 2.5- x 1.5 mm, deltoid-ovate, mucronate, tip slightly bent outwards, margins hyaline, keel greenish, scabrous on the upper half, 3-

4-nerved. Stamen 1, anther linear-oblong; style 3-branched, branches hairy, style base swollen. Nut 0.8-0.9 x 0.6-0.8 mm, obovoid, trigonous, tuberculate.

Fl. & Fr.: August – September.

Type: Described from Old World tropics (Type in L or P).

Voucher specimen no.: 201

Distribution in Area: D.I.Khan: In Indus river bed near Basti Dhappan wali.

Distribution in Pakistan: Punjab: Rawalpindi district: Islamabad, Skakarparian, Sports complex, Quoid-i-Azam University Campus, Margalla Hills; Chenab River; Lahore; NWFP: Dera Ismail Khan; Sind.

Distribution in World: Tropical and sub-tropical areas of the world.

Juncellus

***Juncellus laevigatus* (L.) C.B. Clarke**

Basionym: *Cyperus laevigatus* L.

Synonym: *Pycnus laevigatus* (L.) Nees.

Vern./Local name: Unknown

Habit and Habitat: Perennial herb with creeping rhizome, occurring in sandy soil.

Description: Aerial stems 9-60 x 0.1-0.2 cm, tufted, glabrous. Leaves reduce to sheaths or very short, lamina 0.5-6 x 1-2 cm, sheaths 4.5-9 cm long. Inflorescence lateral head of spikelets; involucre bracts 2 in number, unequal in length, 0.7-5.2 cm long, the lower one seems to be continuation of the stem. Spikelets 3-8 x 1.5-2.5 mm, distichous, 16-24 flowered, ovate-lanceolate, acute, straw-coloured; glumes 2.25 x 1.75-2 mm, ovate, closely imbricate, concave, acute, 7-11-nerved, keeled, margins hyaline with small brownish spots; stamens 3, anther linear-oblong, red-crested; style 2-branched. Nut 1 x 0.5 mm, dorsally compressed.

Fl & Fr.: February- June.

Type: Described from material received by Linnaeus from a non-European country (Type probably in LINN).

Voucher specimen No.: 85

Distribution in Area: Paniala

Distribution in Pakistan: Punjab: Attock district: Taman, Makhad, Datal Nalla, Ahmadal; Rawalpindi district: Gujjar Khan, National Park, Islamabad: Chak Shahzad, CDA nursery, Quaid-i-Azam University Campus; Jhelum District: Kallar Kahar, Sohawa; Bahawalpur District: Bahawalpur, Minchinabad; N.W.F.P: Peshawar District: Peshawar; Bannu District: Kaki to Akra, Shamshi Khel, Lakki Marwat; D.I.Khan: Paniala; Balochistan: Quetta District: Mach, Quetta; Sind: Khairpur; Hyderabad District: Saran; Badin

Distribution in World: Africa, Southwestern, Southern and Southeastern Asia.

Stewart, 1972 cited this species under the genus *Cyperus* (i.e. *Cyperus laevigatus* Linn.), but it possesses 2-branched style and dorsally compressed nut which are the characters of the genus *Juncellus*. So the above cited species is *Juncellus laevigatus* instead of *Cyperus laevigatus*.

Pycreus

Pycreus flavidus (Retz.) T.Koyama

Basionym: *Cyperus flavidus* Retz.

Synonym: *Cyperus globosus* Allioni

Habit and Habitat: Annual herb with fibrous roots, found in marshy places, along river banks and rice fields.

Description: Aerial stem 5-28 cm tall, tufted, triquetrous. Leaves 10-18 x 0.1-0.2 cm, lamina linear, sheath with truncate mouth. Inflorescence umbellate; involucre bracts 2-3 in number, unequal, 2-20 cm long, leaf-like. Spikelets 6-18 x 1.5-2.5 mm, narrowly oblong, 8-40 flowered; glumes 2 x 1.5 mm, ovate, obtuse, boat-shaped, 3-nerved, margins hyaline. Stamens 2; style 2-branched. Nut 1.25 x 0.75 mm, ovoid-ellipsoid, laterally compressed with one angle facing the rachilla.

Fl. & Fr.: (March) July – August.

Type: Described from Old World tropics (Type in LD).

Voucher specimen no.: 63

Distribution in Area: About 3 km from Qureshi Mor on way to Bhakkar.

Distribution in Pakistan: NWFP: Dir district: Panakote, Timargarah; Swat district: Kalam, Mingora, Karakorum Highway; Burbhan, Nilishang; Peshawar district: Kachagani, Gulozai; Punjab: Rawalpindi District: Rawalpindi: Aub Park, Islamabad: Simly Dam, Quaid-i-Azam University Campus, Margalla Hills, Chakwal, Balochistan: Pathankote, Harnai; Kashmir: Rawla Kot, Muzaffarabad, Leepa Valley; Gilgit: Indus Valley near Bunji.

Distribution in World: S.Europe, Africa and Asia.

Stewart, 1972 cited this species under the genus *Cyperus* (i.e. *Cyperus flavidus* Retz.), but it possesses 2-branched style and laterally compressed nut with one angle facing the rachilla which are clearly the characters of the genus *Pycreus*. The above cited species, therefore, belongs to the genus *Pycreus laevigatus* instead of *Cyperus laevigatus*.

Schoenoplectus

Key to the species

+Perianth bristles 4 in number, plumose, longer than nut-----**18. litoralis**

-Perianth bristles 4-6 in number, retrorsely barbed, about equalling nut-----**19. triqueter**

18. *Schoenoplectus litoralis* (Schrad.) Palla

Basionym: *Scirpus litoralis* Schrad.

Habit & Habitat: Perennial, partially submerged aquatic herb, rooted in the mud.

Description: Perennial herb perenating by rhizome. Aerial stem 25-120cm x 3-6mm. erect, from sharply trigonous to obtusely trigonous above and terete below, glabrous, green. Leaves usually reduced to sheaths, rarely leaf-blade upto ca. 4 cm. long. Inflorescence mostly simple umbel, sometimes compound umbel. Involucral bract 1-2 in number, unequal in length, 5-10cm x 1.75-5mm, erect, triquetrous, resembling stem in structure. Spikelets unequal in length 5-10 x 1.75-5mm, ovoid-oblong, usually cylindric; glumes 3.5-4.5 x 2-2.5mm ovate, emarginated mucronate at the notch, glabrous. Flowers bisexual, perianth bristles 4 in number, plumose; stamens 3, anther long, linear oblong, crested; style 2-branched. Nut 1.75-2 x 1.5mm, obovoid, compressed, smooth, brown.

Type: Algeria: "Ruisseau d'e'coulement de la fontaine chaude, Ain-Salahin, Biskra".

Fl. & Fr.: March - July.

Voucher specimen No.: 266

Distribution in Area: Dara zinda: in stream water.

Distribution in Pakistan: Peshawar: NE Tangi; D.I.Khan, Tank; Mianwali: Kala Bagh Bridge; Attock: Hassan Abdal, Wah garden; Rawalpindi, Jhelum, Sargodha; Quetta: between Nushki and Quetta; Khairpur district; Makran district: Panjgur, NW gwadar; Karachi: Bund Murad, T.B.Sanatorium; Dadu district: Manchar Lake; Hyderabad: G.M. Barrage; Tharparkar: Umankot.

Distribution in World: Africa, Madagascar, Italy, Arabia, From Iran to Pakistan, India, Thailand, Australia, New Guinea, Micronesia

This species closely resembles *Schoenoplectus triqueter* (L.) Palla, but differs from it in possessing 4 plumose perianth bristles which are longer than the nut. In *Schoenoplectus triqueter* (L.) Palla the perianth bristles are 4-6 in number, retrorsely barbed and about equaling the nut.

19. *Schoenoplectus triqueter* (L.) Palla

Basionym: *Scirpus triqueter* L.

English name: Stream bank bulrush

Habit and Habitat: Perennial herb found in marshy grounds.

Description: Rhizome creeping or stoloniferous. 2-4 mm in diam., brown or reddish brown. Aerial stem 40-160 cm long and 2-8 mm in diam., distal parts sharply, proximal parts obtusely trigonous, smooth, glaucous green. Sheaths 3, mouth deeply oblique, margins widely scarious; blades mostly reduced to mucro, uppermost up to 50 mm. Inflorescence of (I-) 3-7 sessile spikes, 15-25 mm diam., or a multiple spikes. Spike 8-12 x 4-7 mm, ovoid; glumes rather loosely imbricate, 3-4.1 mm, mid-nrve mostly smooth, mucro barbed, up to 0.8 mm, sides inconspicuously nerved, brown or yellowish brown, smooth, apex rounded, often truncate, margins scarious, ciliate. Perianth bristles 4-6, about equalling nut; stamen 3; stigmas 2. Nut 2.2-3.2 x 1.3-2mm, ellipsoid or ovoid, biconvex or almost plano-convex, smooth, yellow brown, glossy.

Fl. & Per.: May – July.

Type: “Habitat in Europa australi.”

Voucher specimen no.: 265

Distribution in Area: Naivela : in stream bed.

Distribution in Pakistan: Peshawar: NE Peshawar, Gulozai; Sat: Mingora rice fields, D.I.Khan; Baltistan: Sardu, Shigar, Leh, Ladak; Gilgit Agency: Chalt, Nagar; Hunza, Baltit; Kashmir: Ganderbal, Aishmakam Plain to 11000’.

Distribution in World: Europe to Japan, china and Thaiwan, from Caucasus to Tajikistan, Pakistan and N. India; Egypt, S. Africa.

Scirpus

Scirpus maritimus L.

Synonym: *Scirpus tuberosus* Desf.

English: Bulrush, clubrush

Loc./vern: Deela, Kaseru deela

Habit and Habitat: Perennial herb with creeping rhizome, bearing black tubers, commonly occurring in moist, along irrigated channels, marshy places in fields.

Description: Aerial stem 16-63 cm long, erect, triquetrous, leafy throughout, scabrid towards upper portion. Leaves 5-40 x 0.25-0.5 cm, linear, scabrous on midvein and margins becoming glabrous with the

age; sheaths with truncate mouth. Inflorescence simple umbel, axes 5-35 mm long bearing 1-3 spikelets at their tips; involucre bracts usually 2-3, sometimes 4, unequal in length 3-7-8.0 x 0.25 cm, leaf-like. Spikelets 6-12-(15-18) x 2.5-6 mm, ovoid, reddish-brown; glumes 5-6.5 x 3.5-4 mm, ovate, emarginate, mucronate at the notch, hairy; keel 1-nerved, margins hyaline. Perianth bristles 6 in number, 1-2.5 mm long, retrorsely scabrous; stamens 3, anther crested; style 3-branched, glabrous. Nut c.3 x 1.75 mm, obovoid, trigonous, yellow or brown to black.

Fl. & Fr.: August – November.

Type: Described from Europe (Type in LINN or S).

Voucher specimen no.: 21

Distribution in Area: D.I.Khan: In river bed near Basti Dhappan Wali; Hathala; Ramak; Paroa.

Distribution in Pakistan: Punjab: Attock district: Ahmadal, Tanaza Dam; Rawalpindi District: Gujar Khan, National Park, Rawalpindi, Rawal Dam; Jhelum District: Near Airport, Jhelum, Jhelum Bridge, Dara Garden, Kallar Kahar, Sohawa; Mianwali District: Chashma Barrage; Sargodha District: Jauharabad; Sialkot District: Meetwali, Narowal; Bahawalpur District, Minchinabad; D.G.Khan District: Shah Sadar-ud-Din; Muzaffargarh District: Muzaffargarh; N.W.F.P: Bannu District: Shamshi Khel, Bharati Muchan Khel; D.I.Khan District: Musazai, Paniala, D.I.Khan, Hathala; Ramak; Paroa; Kurram Agency: Parachinar, Shalozan Road; Azad Kashmir: Mirpur District: Jatlan.

Distribution in World: Throughout Europe and South Asia.

This is a very distinct species differing from *Schoenoplectus litoralis* (Shrad.) Palla in possessing leafy stem, leaf like involucre bracts which are 2-4 in number and 6 retrorsely scabrous perianth bristles. In *Schoenoplectus litoralis* (Shrad.) Palla the leaves are reduced to sheaths, involucre bracts are 1-2 and stem like, the perianth bristles are 4 in number which are plumose.



Fig. 1. *Bolboschoenus affinis*



Fig. 2. *Cyperus alopecuroides*



Fig. 3. *Cyperus difformis*



Fig. 4. *Cyperus iria*



Fig. 5. *Cyperus pygmaeus*



Fig. 6. *Cyperus rotundus*



Fig. 7. *Eleocharis palustris*



Fig. 8. *Fimbristylis bisumbellata*



Fig. 9. *Juncellus laevigatus*

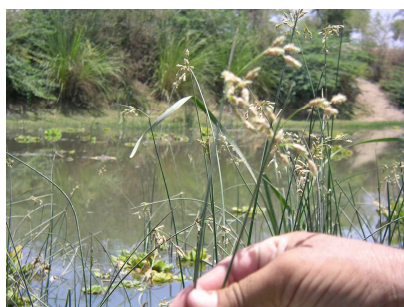


Fig. 10. *Schoenoplectus litoralis*



Fig. 11. *Scirpus maritimus* L.

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