# DIAGNOSTIC CHARACTERISTICS OF THE FRUITS AND FLORETS OF ECONOMIC SPECIES OF NORTH AMERICAN SPOROBOLUS

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## Introduction

This study is designed primarily for use in laboratories engaged in the testing of agricultural seed, where the identification of isolated seeds, fruits and florets is an integral part of the analytical procedure. Twenty of the twenty-nine species of *Sporobolus* occurring in North America are herein described. These were selected on the basis of their economic value and their possible occurrence in seed samples.

### Historical consideration

With the rapid growth of seed testing within the last 30 years the need for taxonomic descriptions of seeds has been intensified, but there are relatively few detailed descriptions, keys, or illustrations available. For the most complete list to such publications the reader is referred to the annotated bibliography by Murley (1951). U. S. Agriculture Handbook 30 (1950), contains descriptions, keys, and illustrations of many of the seeds handled as agricultural crops and occurring as incidentals in them; and the Handbuch der Samenkinde, by W. Bower and A. Stählin (1955), contains descriptions and illustrations of approximately 2,500 seeds, but it has no keys and the illustrations in general do not show much diagnostic detail.

The supplementary information as to the economic value and occurrence in seed samples was obtained principally by means of questionnaires sent to the Soil Conservation Service and to seed laboratory personnel.

Information pertaining to the geographic distribution and habit was taken from A. S. Hitchcock, "Manual of the Grasses of the United States" (2 ed., revised by Agnes Chase, 1950).

The only reference found to the diagnostic characteristics of the florets and fruits of *Sporobolus* appears in U. S. Department of Agriculture Handbook 30 (1950), which consists of a short descriptive key to five species, three of which are illustrated.

## Materials and methods

In order to arrive at a generalized or typical description for each species, fruits were examined from all of the mature specimens in the U. S. National Herbarium of the North American *Sporobolus* which were considered in this study.[1] In addition, bulk "seed" samples obtained from the Soil Conservation Service, U. S. Department of Agriculture, and from a few seed laboratories were studied.

The material was examined with the use of a binocular microscope largely at magnifications of 35, although certain structural details were frequently confirmed at magnifications of 45 or 60. Measurements, by means of a binocular eyepiece micrometer, were made of several fruits and florets from each specimen and averages for each species calculated. The number of individual fruits and florets measured for the various species ranged from 25 to 496, depending on the number of samples or specimens examined and the amount of variation in the material.

## Acknowledgements

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The manuscript was reviewed by Dr. Oren L. Justice of the Federal Seed Laboratory, Beltsville, Md., and the fruit key was tested by seed analyst Elizabeth Fleming. Seed analysts Mildred A. Mauldin and Lou Coffey submitted supplementary fruit and floret material for study.

The following members of the staff of the Soil Conservation Service were particularly helpful in contributing fruit or plant specimens for study and for submitting information as to the economic uses of *Sporobolus:* Dr. A. A. Hanson, Dr. Jack Harlan, M. D. Atkins, Jack E. Engleman, and Joe A. Downs.

Dr. D. B. Judd, of the National Bureau of Standards, assisted in the selection and use of the Munsell Pocket Edition Constant Hue Charts from which the basic fruit colors were determined.

## Structural and diagnostic characteristics

The florets of *Sporobolus* are from 1-flowered spikelets, so if free florets are found in seed samples there will be no rachilla present. The lemma and palea are membranaceous in the majority of species, although a few are found in which they are chartaceous, coriaceous, or indurate. The lemma is 1-nerved, awnless, and the palea is 2-

[1] For a complete list of the material examined the reader is referred to the original thesis on file in the library of the George Washington University.

nerved, the keels broadly winged. In most species the palea splits between the two nerves as the fruit ripens. The fruit is free from the lemma and palea, usually falling readily from the floret at maturity. It is this characteristic that necessitates fruit descriptions.

The fruit in the grass family as a whole is commonly known as a caryopsis, since the pericarp is adherent to the seed. However, in *Sporobolus* the pericarp is loose. In all but one species herein considered the pericarp is thin and finely striate or longitudinally reticulate, slipping off easily when moist. This type of fruit is referred to as an utricle. *Sporobolus heterolepis* has a pericarp which is thick, hard and brittle, not slipping off when moist. It is designated either as an utricle or as "nutlike."

The fruit characteristics found to have diagnostic value were: Shape, size, and color of the fruit and seed; texture and surface markings of the pericarp; shape, color, and relative measurements of the scutellum and the radicle-plumule axis in relation to each other and to the endosperm; and in one species, the appearance of the area around the hilum.

The florets did not have distinctive diagnostic characteristics in all instances. It was only possible to delimit certain species or groups of species by means of floret differentiations. The diagnostic characteristics found to be of value were: texture, indumentum, length and width, general shape, shape of the lemma and palea tips, and color.

### Use of keys and descriptions

Two keys were prepared. The key to the fruits is to individual species, while the key to the florets delimits certain species or groups of species. In cases where intact florets are found the latter key may ensure more rapid identification of the material. Owing to the slight differences in some of the species the fruit key is made very descriptive.

The descriptions of the species in the keys represent the most typical material studied. The full taxonomic descriptions should be used in order to identify correctly highly variable species.

Since color is an important diagnostic characteristic, an attempt was made to classify the colors of the fruits according to the Munsell color system. Munsell Pocket Edition Constant Hue Charts were used. The colors given are essentially the same as noted on the color chips with which the fruits were compared, but such terms as strong brown to designate a dark reddish brown were not used, in order to avoid confusion as to the exact shade meant. The detailed taxonomic descriptions of the fruits and florets of each species are preceded by the name and basonym, after which appears the following information in the designated order: Specimen illustrated; common

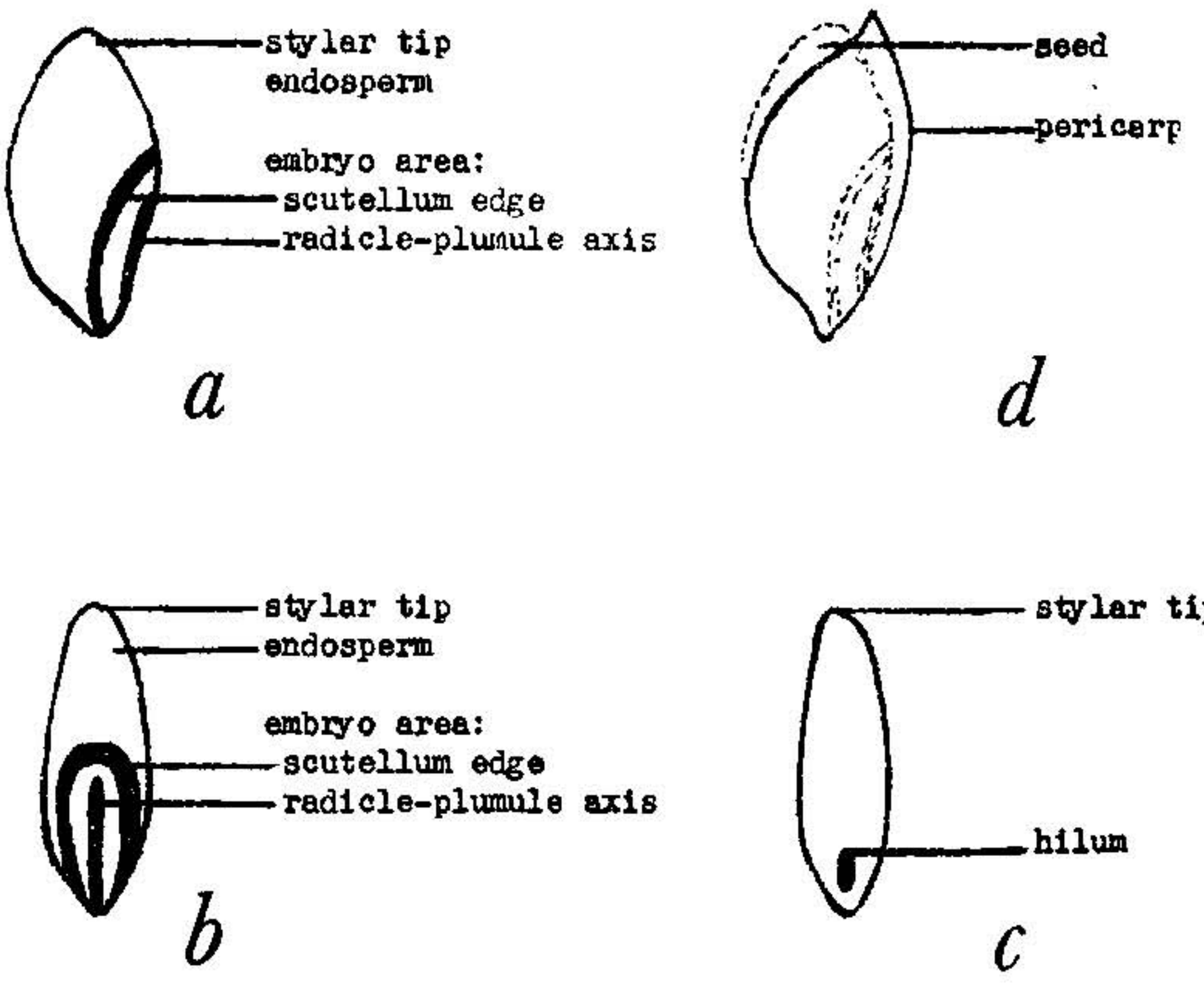



FIGURE 1.—Illustrations of terms used to designate fruit and seed morphology: *a*, Lateral view; *b*, dorsal view; *c*, ventral view; *d*, fruit with pericarp partially off.

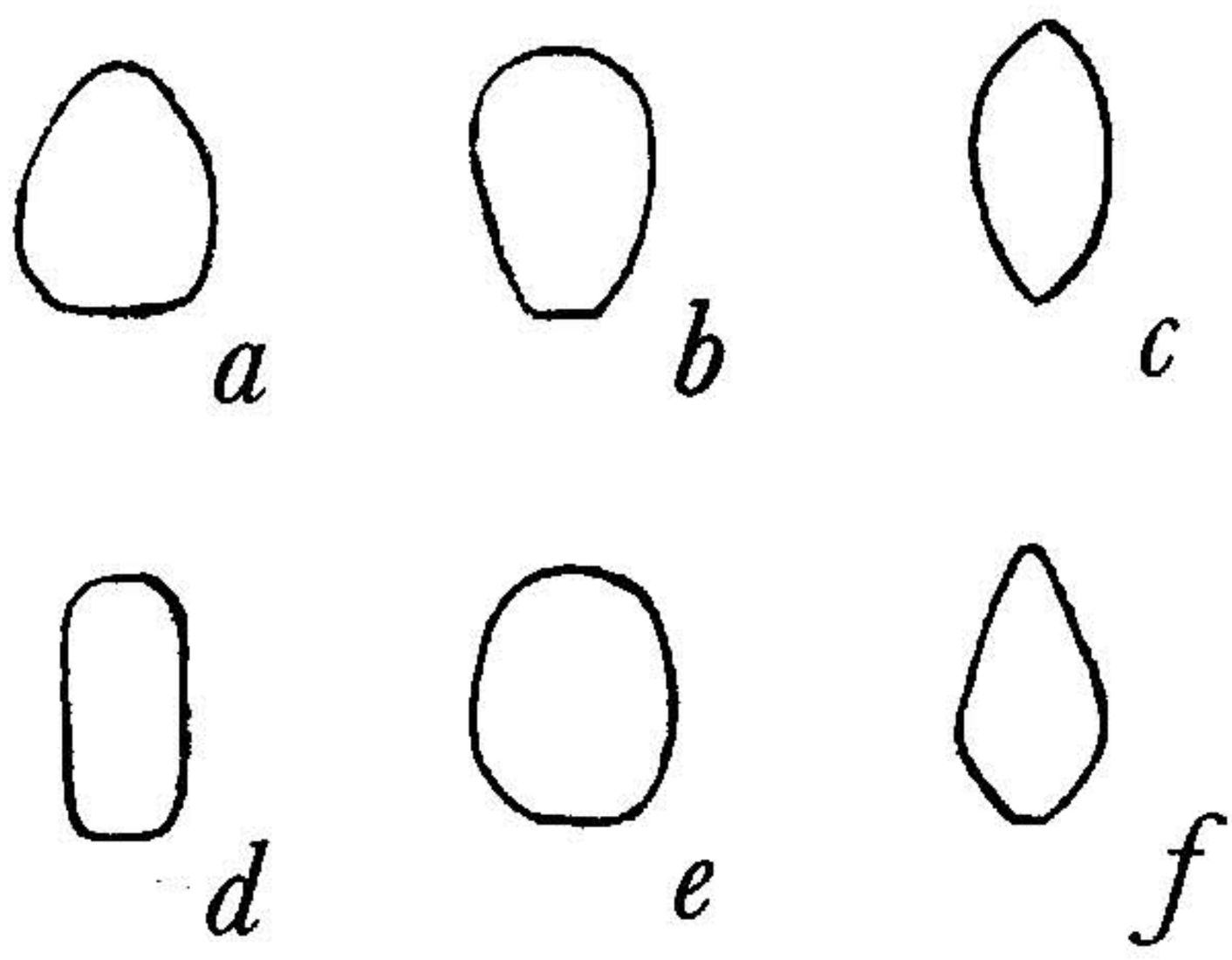



FIGURE 2.—Illustrations of terms used to designate shape: *a*, Ovoid; *b*, obovoid; *c*, ellipsoid; *d*, oblong; *d*, oval; *e*, lanceolate.

name or names; geographic distribution; habit; economic importance; and occurrence in seed samples.

The structure of *Sporobolus* fruits and florets and the terms used to designate shape in the keys and descriptions are illustrated in figures 1 and 2. In plates 1–4 are depicted the fruits and florets for each species.

The range of dimensions are given in the fruit key and both the range and median in the descriptions. The fruit measurements do not include the stylar tip and basal stipe of the pericarp.

## Terminology

Certain terms as used in the keys and descriptions are defined below:

CA: approximately.
CHARTACEOUS: papery in texture.
CORIACEOUS: leathery in texture.
CUCULLATE: hood-shaped.
DORSAL: the embryo side of the fruit.
ECCENTRIC: one-sided.
EMBRYO AREA: the scutellum and the radicle-plumule axis.
INDUMENTUM: any covering, as hairiness or glandularity.
MEMBRANACEOUS: thin, like a membrane.
NARROWLY: (as applied to shape) at least twice as long as wide.
PANDURIFORM: fiddle-shaped, drawn in at the middle.
PITTED: marked with indentations or small hollows.
PLUMBEOUS: lead-colored, or greenish drab.
RETICULATE: netted.
SCABERULOUS: minutely scabrous (covered with short, stiff hairs).
STRAMINEOUS: Straw colored, or pale yellow.
STRIATE: marked by a series of fine parallel lines.
TRANSLUCENT: semitransparent; admitting passage of light but diffusing it so that objects beyond cannot be clearly distinguished.
TRANSPARENT: clear; having the property of transmitting rays of light so that objects beyond can be clearly distinguished.
VENTRAL: the hilum side of the fruit.

## Taxonomic treatment

Certain species of *Sporobolus* separated only by slight inflorescence divergences were found to have equally slight fruit and floret differences. Perhaps the most difficult in which to find diagnostic characteristics for individual species occurred in the *Sporobolus cryptandrus* group. Some specimens of *S. cryptandrus* with enclosed panicles, usually occurring late in the season, are very similar to *S. contractus*. Fruit differences in color, shape, size, and to a certain extent opaqueness and flecking are fairly reliable, although a positive identification might not be possible in all cases. The only significant floret difference is size.

*Sporobolus contractus* and *S. giganteus* are very similar. There is a definite overlap between size and thickness of panicles, size of florets and size of fruits on some specimens. Color and shape of fruits are similar, size being the only variable. It would be impossible to identify accurately all fruits of these two species. The type specimen of *S. giganteus* (*Nash* 394) is typical for the description, having dense,

thick panicles and large fruits and florets. The type specimen of *S. cryptandrus* var. *robustus* (*Neally* 746), cited as a synonym for *S. giganteus*, has panicle, fruit, and floret measurements in the overlapping size range between *S. giganteus* and *S. contractus*.

*Sporobolus flexuosus* and *S. nealleyi* have definite individual fruit characteristics as well as vegetative differences in the plants. The florets cannot be distinguished in all cases.

The herbarium specimens of *Sporobolus cryptandrus* were carefully examined and measured for subspecific variation, as indicated by Jones and Fassett (1950). The overlap in the specific diagnostic characteristics is too great for positive allocation of all specimens into the subspccific categories designated by them, although there are certain broad regional differences.

Florets and fruits of the following species intergrade to some extent: *Sporobolus vaginiflorus* with *S. clandestinus*, and *S. airoides* with *S. wrightii;* the fruits have more individual diagnostic characteristics than the florets and can be distinguished in most instances. The similarity of the fruits and florets of *S. vaginiflorus* and *S. clandestinus* to each other, of interest since the former is an annual and the latter a perennial, is the only instance in which plants of unlike habit overlapped in fruit and floret characteristics. *Sporobolus airoides* and *S. wrightii* are both perennials, being separated principally by a slight inflorescence divergence.

While the plants of *Sporobolus vaginiflorus* and *S. neglectus* are very similar, their identification by fruit and floret characteristics was found to be very dependable. The fruits of the latter are variously mottled while those of the former are not, and there are also differences in size and shape. The florets of *S. neglectus* are chartaceous and glabrous while those of *S. vaginiflorus* are coriaceous or indurate (except for very occasional cleistogamous florets) and usually sparingly pubescent.

The published descriptions of the florets of *S. vaginiflorus* do not cover the range of characteristics for the species. The florets are described as sparsely pubescent, sometimes mottled with dark spots. Statements as to the texture of the lemma and palea are not complete. Examination of the National Herbarium specimens revealed that the indumentum of the florets varied from sparsely pubescent to shiny, microscopical, conical glands. This latter type of floret always has a palea which is split between the two nerves, the split so complete as to cause the palea to appear double. The florets are indurate and mottled, with plump, abruptly acute to incurved or cucullate lemma and palea. Specimens with this kind of floret occur in the limestone areas of Arkansas and Missouri. There is a gradual intergrading of this type with the narrower, thinner textured, slightly pubescent floret

occurring in other regions. It was thought that perhaps the characteristic of the palea splitting between the two nerves might be of some significance, but it could not be correlated with any other constant variable in the florets or fruits. In general, specimens from the northeastern and eastern states have paleas that do not split at fruit maturity. Those from the central, south, and southwestern states have either split or nonsplit paleas.

The form of *Sporobolus neglectus* from the Ozark mountains, designated by Fernald (1933) as *S. ozarkanus*, has florets and fruits like the other forms of *S. neglectus* examined. The type which he described as *S. vaginiflorus* var. *inaequalis* intergrades with florets and fruits of *S. vaginiflorus* from other areas.

The varieties of *Sporobolus asper* were not studied due to lack of available mature fruit material.

*Sporobolus patens* was not included, as only one specimen was available for study. This species has a limited distribution in the United States, being reported only from southern Arizona. The fruits are so similar to those of *S. pulvinatus* that it is doubtful whether these two species can be distinguished.

## Key to fruits

A. Pericarp thick, hard, brittle and opaque; fruits subglobose, ca. 1.0–2.0 mm. in diameter . . . . . **1. S. heterolepis** (pl. 1,A)

A. Pericarp thin, mucilaginous when wet, hyaline; striate or reticulate.

B. Embryo as long as seed to slightly shorter; fruits narrowly eccentric obovoid, plump, tapering to base; length 2.1–3.0 mm., width 1.0–1.5 mm. **2. S. interruptus** (pl. 1,B)

B. Embryo not more than ¾ length of seed.

C. Fruits eccentric ovoid, translucent; seeds smooth, not microscopically pitted; pericarp extremely finely striate, scarcely evident.

D. Fruits bulging dorsally above embryo tip; endosperm light yellowish brown or dark orange-brown.

E. Embryo usually less than ½ length of seed; fruits narrowly ovoid; endosperm usually faintly reddish flecked; scutellum brown or reddish; length 2.2–3.6 mm., width 0.6–1.3 mm., thickness 0.4–1.0 mm . . . . . **3. S. clandestinus** (pl. 1,C)

E. Embryo usually more than ½ length of seed (often ¾); fruits narrowly or broadly ovoid; endosperm rarely reddish flecked; scutellum brown, reddish, or blackish; length 1.0–3.0 mm., width 0.4–1.5 mm., thickness 0.3–1.4 mm. **4. S. vaginiflorus** (pl. 1,D)

D. Fruits bulging ventrally toward base; narrowly ovoid; endosperm light yellowish brown or yellowish orange; embryo area reddish brown; length 1.0–1.5 mm., width 0.4–0.7 mm., thickness 0.2–0.5 mm . . . . . **5. S. texanus** (pl. 1,E)

C. Fruits rarely eccentric ovoid (if so, not translucent); seeds either microscopically pitted or pericarp evidently striate or reticulate.

F. Fruits dark shades of red, orange, or brown, or fruits gray, dark reddish brown flecked or mottled; pericarp frequently dark red or black striate.

G. Scutellum edge prominent, dark red or black at seed maturity.

H. Fruits tapering to thin edges dorsally and ventrally, strongly flattened laterally, broad.

I. Fruits ellipsoid; endosperm orange or reddish brown; translucent at maturity; length 1.7–2.6 mm., width 0.8–1.2 mm., thickness 0.4–0.6 mm . . . . **6. S. purpurascens** (pl. 1,F)

I. Fruits broadly obovoid or broadly ovoid; endosperm reddish or reddish brown; opaque or semitranslucent; length 1.5–1.8 mm., width 1.0–1.2 mm., thickness 0.4–0.7 mm.

**7. S. junceus** (pl. 2,A)

H. Fruits not tapering to thin edges dorsally and ventrally.

J. Embryo ¾ length of seed; seeds reddish brown mottled; endosperm usually grayish and semitranslucent; shape suboval or suboblong, plump.

K. Fruits in dorsal view sharply keeled above embryo tip; scutellum edge narrow (ca. 0.1 mm.); radicle-plumule axis broad, twisted; length 0.8–2.5 mm., width 0.4–1.0 mm., thickness 0.3–0.7 mm . . **8. S. neglectus** (pl. 2,B)

K. Fruits in dorsal view convex the entire length; scutellum edge broad (ca. 0.2–0.3 mm.); radicle-plumule axis narrow, almost straight; length 1.1–2.0 mm., width 0.6–1.3 mm., thickness 0.5–1.1 mm . . . . . **9. S. asper** (pl. 2,C)

J. Embryo less than ¾ length of seed; seeds not mottled; endosperm reddish or yellowish orange; shape suboblong, usually strongly compressed laterally; pericarp dark reddish striate, highly mucilaginous at seed maturity, and then frequently forming a dark rim on the edges of the fruits; length 0.8–1.4 mm., width 0.5–0.8 mm., thickness 0.2–0.4 mm . . . . . **10. S. poiretii** (pl. 2,D)

G. Scutellum edge not prominent, about same color as endosperm; pericarp strongly dark red or black striate; fruits plump, length 0.9–1.7 mm., width 0.4–0.9 mm.

L. Stylar tip rounded; fruits suboblong or suboval, dark yellowish brown or light brown; seeds rarely reddish flecked; thickness 0.4–0.7 mm . . . . . **11. S. airoides** (pl. 2,E)

L. Stylar tip usually pointed and strongly laterally compressed; fruits predominantly ovoid, dark reddish brown (occasionally light brown); seeds usually reddish flecked; thickness 0.3–0.7 mm . . . . . **12. S. wrightii** (pl. 2,F)

F. Fruits light shades of red, orange, brown, or gray, never dark reddish brown mottled; pericarp never dark red or black striate, but frequently light red, rusty, or purplish striate.

M. Fruits flattish at base, embryo without a prominent overhang; hilum within a basally prominent black half-rim; fruits suboval or broadly ovoid; uniformly light reddish orange; endosperm faintly light reddish flecked; length 0.7–1.0 mm., width 0.3–0.7 mm . . . . . **13. S. buckleyi** (pl. 3,A)

M. Fruits pointed at base, embryo with a prominent overhang; hilum not within a basally prominent black half-rim.

N. Scutellum in dorsal view pandurate; in lateral view of fruits, inner scutellum reflected in a broad, dark semicircle through the endosperm; radicle-plumule axis broad.

O. Embryo area greenish black; fruits light yellowish gray or yellowish orange; obovoid; length 0.8–1.0 mm., width 0.4–0.7 mm., thickness 0.2–0.5 mm . . **14. S. pulvinatus** (pl. 3,B)

O. Embryo area dark reddish brown; fruits light orange reddish; obovoid, suboval or subelliptic; length 0.7–1.0 mm., width 0.4–0.6 mm., thickness 0.2–0.4 mm.

**15. S. pyramidatus** (pl. 3,C)

N. Scutellum in dorsal view oval; in lateral view of fruit, inner scutellum either not reflected or narrowly and unevenly reflected through the endosperm; radicle-plumule axis narrow.

P. Fruits extremely light yellowish brown or pale orange-yellow, sometimes almost white; endosperm not rusty or light reddish flecked but usually internally "starchy" or granularly mottled.

Q. Fruits not strongly flattened laterally; average length less than 1.0 mm.; pericarp frequently purplish striate, sometimes rusty striate.

R. Fruits broadly obovoid, frequently "pinched" laterally toward the center; embryo area rusty or light reddish brown; length 0.7–0.9 mm., width 0.5–0.8 mm.

**16. S. flexuosus** (pl. 3,D)

R. Fruits narrowly ovoid, not "pinched" laterally toward the center; embryo area rusty or purplish brown; length 0.7–1.0 mm., width 0.3–0.5 mm.

**17. S. nealleyi** (pl. 3,E)

Q. Fruits strongly laterally flattened; average length over 1.0 mm.; pericarp not purple striate, but sometimes rusty striate; fruits broadly elliptic or broadly ovoid.

S. Fruit length 0.8–1.2 mm., width 0.4–0.8 mm.

**18. S. contractus** (pl. 3,F)

S. Fruit length 1.0–1.9 mm., width 0.6–0.9 mm.

**19. S. giganteus** (pl. 4,A)

P. Fruits darker: moderate orange, brownish orange or light reddish brown; endosperm faintly rusty or light reddish flecked, rarely internally "starchy" or granularly mottled; fruits laterally flattened at stylar tip; ovoid or obovoid; pericarp sometimes rusty or light reddish striate; length 0.6–1.3 mm., width 0.3–0.8 mm . . **20. S. cryptandrus** (pl. 4,B)

## Key to florets

A. Florets coriaceous, indurate, or chartaceous.

B. Florets coriaceous or indurate; pubescent or microscopically striate with shiny conical glands; opaque; color gray, tan, or purplish, unevenly splotched with black, purple, or green.

C. Florets 4.5–13.0 mm. long; palea 0.5–6.0 mm. longer than the lemma; palea acuminate (rarely acute), not split between the two nerves; lemma acute or acuminate . . . . . **3. S. clandestinus** (pl. 1,C)

C. Florets 1.6–7.0 mm. long; palea subequal to 2.0 mm. longer than lemma;

lemma and palea acuminate, acute or incurved or cucullate; palea sometimes split between the two nerves . . **4. S. vaginiflorus** (pl. 1,D)

B. Florets chartaceous; glabrous; smooth; opaque or semiopaque; color white, greenish or purplish tinged, or purplish; length 1.1–3.0 mm.
**8. S. neglectus** (pl. 2,B)

A. Florets membranaceous; essentially glabrous (some species sparingly microscopically scaberulous); opaque, semiopaque, or transparent.

D. Length of florets 3.0 mm. or over.

E. Florets 1.0 mm. thick or over.

F. Lemma and palea acute; florets ca. 1.1 mm. thick, 1.1 mm. wide, and 6.0 mm. long. . . . . **2. S. interruptus** (pl. 1,B)

F. Lemma and palea subacute; florets distended by the globose fruits; ca. 2.0 mm. thick, 2.0 mm. wide, and 4.0 mm. long.
**1. S. heterolepis** (pl. 1,A)

E. Florets less than 1.0 mm. thick (*S. asper* occasionally 1.1 mm. thick).

G. Florets bronze; 3.0–4.0 mm. long and ca. 1.0 mm. wide; lemma acute; fruits often sticking to the edges of the palea.

H. Palea acute. . . . . **6. S. purpurascens** (pl. 1,F)

H. Palea obtuse or subacute. . . . . **7. S. junceus** (pl. 2,A)

G. Florets not bronze.

I. Floret length 4.0–7.0 mm., two to three times as long as the fruit; lemma and palea subacute; color pale yellowish gray, light green or purplish tinged. . . . . **9. S. asper** (pl. 2,C)

I. Floret length 2.2–3.5 mm., not more than twice as long as the fruit; lemma and palea acute or acuminate; color stramineous or plumbeous. . . . . **19. S. giganteus** (pl. 4,A)

D. Length of florets under 3.0 mm.

J. Florets bronze tinged. . . . . **11. S. airoides** (pl. 2,E)
**12. S. wrightii** (pl. 2,F)

J. Florets not bronze tinged.

K. Palea obtuse, usually erose and dentate; lemma acute (sometimes subobtuse).

L. Florets frequently smutted; fruits usually sticking to the outside or tips of the florets; length 1.5–2.0 mm.
**10. S. poiretii** (pl. 2,D)

L. Florets not smutted; length ca. 1.0–2.0 mm.
**13. S. buckleyi** (pl. 3,A)
**14. S. pulvinatus** (pl. 3,B)
**15. S. pyramidatus** (pl. 3,C)

K. Palea acute; lemma acute.

M. Florets usually opaque or semiopaque.

N. Floret length 2.1–2.7 mm.; fruits frequently sticking to the outside or tips of the florets. . . . . **5. S. texanus** (pl. 1,E)

N. Floret length 1.5–2.0 mm.; florets usually dark purplish tinged.
**17. S. nealleyi** (pl. 3,E)

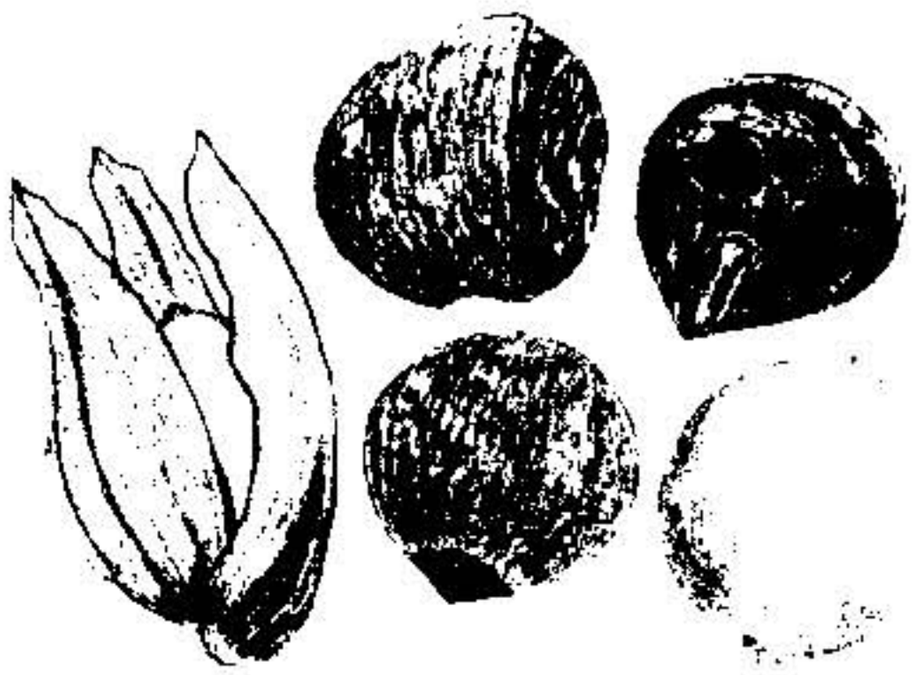
M. Florets usually transparent or semiopaque (rarely opaque).

O. Floret length (1.4)–1.8–(2.0) mm. . . **20. S. cryptandrus** (pl. 4,B)

O. Floret length (1.5)–2.1–(2.7) mm. . . **16. S. flexuosus** (pl. 3,D)

O. Floret length (1.5)–2.4–(2.9) mm. . . **18. S. contractus** (pl. 3,F)

O. Floret length (2.2)–2.9–(3.5) mm. . . **19. S. giganteus** (pl. 4,A)



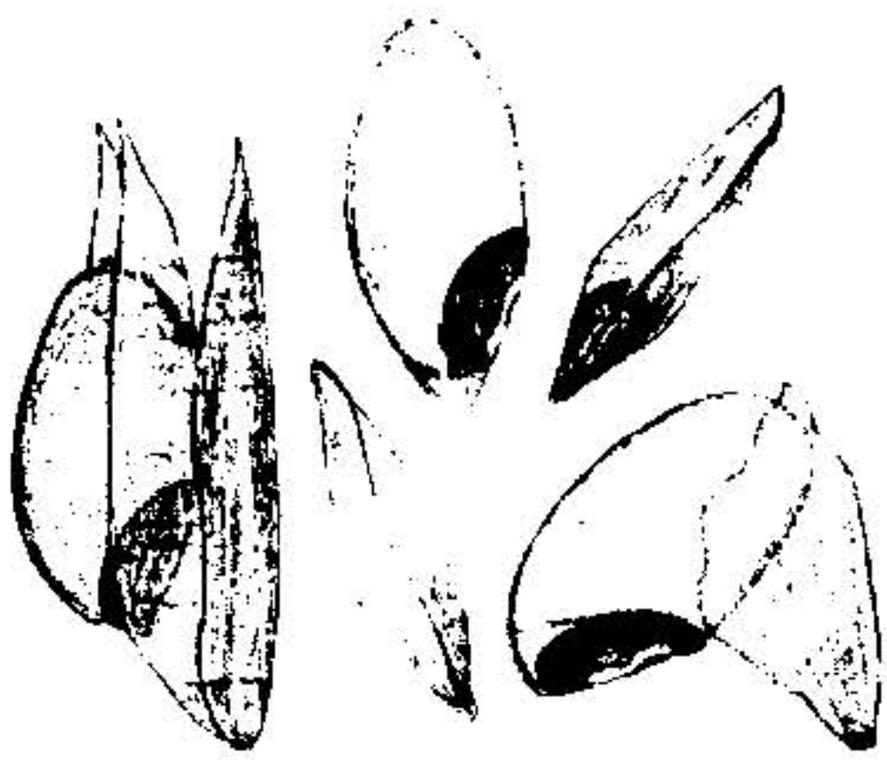
A, *S. heterolepis*, X 6.3

B. *S. interruptus*, X 6.3

C, *S. clandestinus*, X 6.3

D, *S. vaginiflorus*, X 6.3

E, *S. texanus*, X 11.3



F, *S. purpurascens*, X 9.4

SPOROBOLUS FRUITS, SEEDS, AND FLORETS.

A, *S. junceus*, X 9.4

B, *S. neglectus*, X 10.7

C, *S. asper*, X 10.7

D, *S. poiretti*, X 11.3

E, *S. airoides*, X 11.3

F, *S. wrightii*, X 11.3

SPOROBOLUS FRUITS, SEEDS, AND FLORETS.

A. *S. buckleyi*. X 11.3

B. *S. pulvinatus*. X 11.3

C, *S. pyramidatus*. X 11.3

D, *S. flexuosus*. X 11.3

E, *S. nealleyi*. X 11.3

F, *S. contractus*. X 11.3

SPOROBOLUS FRUITS, SEEDS, AND FLORETS.

A, *S. giganteus*, X 11.3



B, *S. cryptandrus*, X 11.3

SPOROBOLUS FRUITS SEEDS, AND FLORETS.

## Descriptions

1. **Sporobolus heterolepis** (A. Gray) A. Gray, Man. 567. 1848. Based on *Vilfa heterolepis* A. Gray. PLATE 1,A
*Vilfa heterolepis* A. Gray, Ann. Lyc. N.Y. 3:233. 1835. Watertown, New York, *Crawe*.

Fruits: Length, width and thickness ca. the same: (1.0)–1.5–(2.0) mm.; opaque; shape subglobose, eccentric in lateral view; color grayish yellow, frequently greenish gray or purplish splotched; pericarp thick, brittle, indehiscent and minutely longitudinally reticulate.

Seeds: These were removed from the pericarp with extreme difficulty. Although reported as being free from the pericarp, they are partially adherent at the stylar tip.

Length, width, and thickness ca. the same as for the fruits; opaque; longitudinally blackish or reddish striate or reticulate, and glandular shiny; shape irregularly obovoid or skull-like, flattened dorsally; color of endosperm variable (yellow, yellowish gray, light brown, grayish greenish yellow, or grayish reddish brown); embryo strikingly darker, sometimes almost black; embryo large, prominent, almost completely covering the dorsal side of the seed; scutellum very broad; radicle-plumule axis short and narrow.

Florets: Length (3.0)–4.0–(4.9) mm.; width and thickness ca. the same as for the fruits; membranaceous; glabrous; color plumbeous or stramineous, frequently purplish or greenish tinged; palea slightly longer and wider than the lemma; nerves of the lemma and palea glabrous or slightly scaberulous toward the tips; palea at fruit maturity splits completely between the 2 nerves, the 2 apices subacute; lemma subacute, at maturity distended at the base by the subglobose fruit.

Specimen illustrated: *C. O. Johnston*, December 1920, in meadow, Manhattan, Kansas.

Common name: Prairie dropseed.

Geographic distribution: Quebec to Saskatchewan, south to Connecticut, eastern Texas, and Colorado; prairies.

Habit: Perennial, in dense tufts.

Economic importance: A true prairie species, disappearing under moderate to heavy grazing; common in hay meadows; common in eastern Kansas, but seed has never been produced or collected in quantity for seeding.

Occurrence in seed samples: Not reported.

**2. Sporobolus interruptus** Vasey, Bull. Torrey Bot. Club 15:8. 1888. Arizona, *Coues* and *Palmer* 66 in 1886; San Francisco Forest, *Rusby* 15 in 1883 (the Rusby specimen, distributed as No. 885, the type). PLATE 1,B

Fruits: Length (2.1)–2.6–(3.0) mm.; width (1.0)–1.1–(1.5) mm.; thickness (1.0)–1.1–(1.3) mm.; opaque or semitranslucent; shape narrowly eccentric obovoid; convex ventrally, plump, tapering to the base; embryo large, prominent, almost completely covering the dorsal side of the seed; color of endosperm yellowish reddish brown, grayish tinged; embryo darker; pericarp brownish black striate or reticulate, the ridges and interspaces grayish mucilaginous.

Florets: Length ca. 6.0 mm.; width and thickness ca. the same as for the fruits; opaque; membranaceous; glabrous; color plumbeous or stramineous; lemma and palea about the same length, the tips acute; nerves of palea glabrous; nerve of lemma glabrous to minutely scaberulous toward the tip; palea splits at fruit maturity.

Specimen illustrated: *Joe A. Downs* 951, Soil Conservation Service "seed" sample, Arizona.

Common name: Black dropseed.

Geographic distribution: Arizona, grassy plains and hills.

Habit: Perennial, densely tufted.

Economic importance: Good forage grass, but doubtful if it will ever be used in revegetation.

Occurrence in seed samples: Not reported.

**3. Sporobolus clandestinus** (Biehler) Hitchc., Contr. U. S. Nat. Herb. 12:150. 1908. Based on *Agrostis clandestina* Biehler. PLATE 1,C

*Agrostis clandestina* Biehler, Pl. Nov. Herb. Spreng. Cont. 8. 1807. Pennsylvania, *Muhlenberg.*

Fruits: Length (2.2)–2.9–(3.6) mm.; width (0.6)–0.9–(1.3) mm.; thickness (0.4)–0.6–(1.0) mm.; translucent; shape narrowly eccentric ovoid, bulging dorsally above the embryo tip; embryo usually less than ½ the length of the seed; color of endosperm and radicle-plumule axis light yellowish brown or dark orange brown; endosperm usually faintly reddish flecked; scutellum edge broad, flat, bandlike, darker than the endosperm and the radicle-plumule axis; pericarp almost smooth, sometimes faintly reddish striate.

Florets: Length (4.5)–7.2–(13.0) mm.; width and thickness ca. the same as for the fruits; opaque; coriaceous; sparingly long-pubescent; microscopically striate with shiny conical glands; color gray, tan, or purplish, unevenly splotched with black, purple, or green; palea (0.5)–1.6–(6.0) mm. longer than the lemma; lemma acute or acuminate; palea usually acuminate, rarely acute; palea does not split at fruit maturity.

Specimen illustrated: *Jason R. Swallen* 5625; Nov. 16, 1938; dry sandy ground east of Gainesville, Florida.

Common name: Hidden dropseed.

Geographic distribution: Connecticut to Wisconsin and Kansas, south to Florida and Texas; sandy fields, pine barrens, hills and prairies.

Habit: Perennial.

Economic importance: Palatable; especially valuable in winter when stock seem to prefer it to other warm-season grasses.

Occurrence in seed samples: Reported in native grass and legume seed samples, in samples of *S. cryptandrus*, and in lespedeza (*Lespedeza* spp.) samples.

**4. Sporobolus vaginiflorus** (Torr.) Wood, Class-book ed. 1861. 775. 1861.
Based on *Vilfa vaginiflora* Torr. PLATE 1,D
*Vilfa vaginiflora* Torr. ex. Gray, N. Amer. Gram. and Cyp. 1: No. 3. 1834; Trin., Mém. Acad. St. Pétersb. VI. Sci. Nat. 4[1]:56. 1840. New Jersey.

Fruits: Length (1.0)–2.0–(3.0) mm.; width (0.4)–0.7–(1.5) mm.; thickness (0.3)–0.5–(1.4) mm.; translucent; shape narrowly or broadly eccentric ovoid, bulging dorsally above the embryo tip; embryo usually more than half length of seed, frequently three-quarters; color of endosperm and radicle-plumule axis light yellowish brown or dark orange brown; endosperm rarely reddish flecked; scutellum edge broad, flat, bandlike, at full maturity strikingly darker than the endosperm and the radicle-plumule axis (sometimes almost black); pericarp almost smooth, rarely faintly reddish striate.

Florets: Length (1.6)–3.3–(7.0) mm.; width and thickness ca. the same as for the fruits; opaque; coriaceous or indurate; usually sparingly pubescent; microscopically striate with shiny, conical glands (6 specimens observed in which the indumentum consisted of these shiny, conical glands alone); color gray, tan or purplish, unevenly splotched with black, purple, or green; length of palea in relation to the lemma variable, but never more than 2.0 mm. longer than the lemma; lemma and palea tips acuminate, acute or incurved to cucullate; palea usually does not split at fruit maturity (only 10 specimens were observed with split paleas); cleistogamous florets like the others or rarely membranaceous, whitish.

Specimen illustrated: *Vera L. Colbry* 17; Oct. 24, 1954; low clay ground, near stream; Prince Georges County, Maryland.

Common name: Poverty dropseed.

Geographic distribution: Maine and Ontario to Minnesota and Nebraska, south to Georgia, Texas, and Arizona; sandy soil or open waste ground.

Habit: Annual.

Economic importance: Considered a weed; no value except for erosion control when it invades abandoned fields.

Occurrence in seed samples: Has been found in native grass and legume seed samples, in *S. cryptandrus* samples, and in lespedeza (*Lespedeza* spp.) samples from the southeastern states.

**5. Sporobolus texanus** Vasey, Contr. U. S. Nat. Herb. 1:57. 1890. Screw Bean, Presidio County, Texas, *Nealley* (755). PLATE 1,E

Fruits: Length (1.0)–1.3–(1.5) mm.; width (0.4)–0.5–(0.7) mm.; thickness (0.2)–0.4–(0.5) mm.; translucent; shape narrowly eccentric ovoid, bulging ventrally toward the base; color of endosperm light yellowish brown or yellowish orange; embryo area reddish brown; scutellum edge narrow, the inner part slightly sunken around the elevated, twisted radicle-plumule axis; pericarp very finely striate or reticulate, frequently partially slipped off mature fruits, causing them to adhere to the florets.

Florets: Length (2.1)–2.3–(2.7) mm.; width and thickness ca. the same as for the fruits; opaque or semiopaque; membranaceous; essentially glabrous, sometimes sparingly scaberulous toward the tips; color plumbeous or stramineous, frequently greenish or purplish tinged; palea slightly shorter than the lemma; lemma and palea tips acute, the nerves minutely scaberulous toward the tips; palea splits at fruit maturity; fruits with the pericarp partially slipped off frequently adhering to the tips or sides of the florets.

Specimen illustrated: *S. M. Tracy* 8197; Oct. 6, 1902; Carlsbad, New Mexico.

Common name: Texas dropseed.

Geographic distribution: Kansas and Colorado to Texas and Arizona; mesas, valleys, and salt marshes.

Habit: Perennial, in close, hemispherical tufts.

Economic importance: Palatable, but no place in a seeding program; one of the first grasses to come into alkaline flats in river bottom succession; eventually crowded out by climax forms.

Occurrence in seed samples: Not reported.

**6. Sporobolus purpurascens** (Swartz) Hamilt., Prodr. Pl. Ind. Occ. 5. 1825. Based on *Agrostis purpurascens* Swartz. PLATE 1,F

*Agrostis purpurascens* Swartz, Prodr. Veg. Ind. Occ. 25. 1788. Jamaica, *Swartz.*

Fruits: Length (1.7)–2.1–(2.6) mm.; width (0.8)–1.0–(1.2) mm.; thickness (0.4)–0.5–(0.6) mm.; translucent at maturity; shape ellipsoid; strongly laterally flattened; convex laterally, and tapering to thin, sharp edges dorsally and ventrally; slightly bulging ventrally and laterally toward the base; color of endosperm orange or reddish brown; scutellum edge broad (ca. 0.2 mm. wide toward the lower edge and 0.1 mm. wide at the upper edge), the outer rim elevated; scutellum dark, black at full seed maturity; radicle-plumule axis elevated and strongly keeled, the same color as the endosperm; pericarp dull,

minutely striate, the striations often reddish; pericarp readily slipping off mature fruits.

Florets: Length 3.0 to 4.0 mm.; width and thickness ca. the same as the fruits; palea transparent; lemma semiopaque, membranaceous, glabrous; color bronze, sometimes purplish tinged; lemma and palea tips acute, usually spread apart at the tips, exposing the fruits; palea splits at fruit maturity; fruits with the pericarp partially slipped off often sticking to the lemma and palea.

Specimen illustrated: *C. L. Lundell & Amelia A. Lundell* 8846; May 10, 1940; in sand along railroad; live-oak belt; north of Encino, Brooks County, Texas.

Common name: Purple dropseed.

Geographic distribution: Southern Texas and eastern Mexico; West Indies to Brazil; sandy prairies.

Habit: Perennial, in dense bunches.

Economic importance: Not reported.

Occurrence in seed samples: Not reported.

**7. Sporobolus junceus** (Michx.) Kunth, Rév. Gram. 1:68. 1829. Based on *Agrostis juncea* Michx. PLATE 2,A

*Agrostis juncea* Michx. Fl. Bor. Amer. 1:52. 1803, not *A. juncea* Lam., 1783. Carolina, *Michaux.*

Fruits: Length (1.5)–1.7–(1.8) mm.; width (1.0)–1.0–(1.2) mm.; thickness (0.4)–1.6–(0.7) mm.; opaque or semitranslucent; shape broadly obovoid or broadly ovoid; strongly laterally flattened; convex laterally and tapering to fairly thin edges dorsally and ventrally; slightly bulging ventrally and laterally toward the base; color of endosperm reddish or reddish brown; scutellum, radicle-plumule axis and pericarp the same as for *S. purpurascens.*

Florets: Palea tips obtuse or subacute; otherwise the same as for *S. purpurascens.*

Specimen illustrated: *Albert Ruth* 91; July 1898; dry sandy soil, Lookout Mountain; DeSoto Falls, Alabama.

Common name: Pineywoods dropseed.

Habit: Perennial, in dense bunches.

Economic importance: Not reported.

Occurrence in seed samples: Not reported.

**8. Sporobolus neglectus** Nash, Bull. Torrey Bot. Club 22:464. 1895. Massachusetts to Kentucky, Tennessee, and Kansas (type, Woodruff Gap, New Jersey, *Britton* in 1887). PLATE 2,B

Fruits: Length (0.8)–1.4–(2.5) mm.; width (0.4)–0.7–(1.0) mm.; thickness (0.3)–0.5–(0.7) mm.; semitranslucent; shape suboval or suboblong; plump; keeled dorsally above the embryo tip; compressed laterally toward the stylar tip; in ventral and dorsal views lanceolate; embryo three-quarters length of seed; color of endosperm

grayish yellowish brown or brownish orange; endosperm strongly reddish brown mottled and usually pitted; scutellum edge narrow (ca. 0.1 mm. broad), bandlike, at full maturity almost black; radicle-plumule axis broad, elevated, twisted, and lighter in color than the scutellum edge; pericarp finely striate.

Florets: Length (1.1)–2.2–(3.0) mm.; width and thickness slightly more than for the fruits; opaque or semiopaque; chartaceous; glabrous; color white, variously greenish or purplish streaked, or purplish; florets wide toward the center; lemma and palea tips acute (palea frequently abruptly acute); palea glabrous on the nerves; lemma scaberulous on the nerve near the tip; palea splits at fruit maturity.

Specimen illustrated: *H. L. Bolley* 867; Aug. 27, 1891; Fargo, North Dakota.

Common name: Puffsheath dropseed.

Geographic distribution: Quebec and Maine to Montana, south to Virginia, Tennessee, and Texas; also Washington and Arizona; dry open ground and sandy fields.

Habit: Annual.

Economic importance: No value except for erosion control when it invades abandoned fields or other bare areas.

Occurrence in seed samples: Reported as occurring in native grass and legume samples and in *S. cryptandrus* samples.

**9. Sporobolus asper** (Michx.) Kunth, Rév. Gram. 1:68. 1829. Based on PLATE 2,C

*Agrostis aspera* Michx.

*Agrostis aspera* Michx., Fl. Bor. Amer. 1:52. 1803. Illinois, *Michaux*.

Fruits: Length (1.1)–1.6–(2.0) mm.; width (0.6)–1.0–(1.3) mm; thickness (0.5)–0.8–(1.1) mm.; semitranslucent; shape suboval or suboblong; plump; in dorsal view convex the entire length, in ventral and dorsal views suboblong; embryo three-quarters length of seed; color of endosperm grayish reddish orange or brownish orange; endosperm reddish brown mottled and usually pitted; scutellum edge broad (ca. 0.2–0.3 mm.), bandlike, at full maturity almost black; radicle-plumule axis narrow, elevated, almost straight, and lighter in color than the scutellum edge; pericarp coarsely striate or reticulate.

Florets: Length (4.0)–6.0–(7.0) mm.; width 1.25 to 2.0 mm.; thickness ca. the same as the fruits; opaque or semiopaque; membranaceous; glabrous; color pale yellowish gray, light green or purplish tinged; florets 2 to 3 times as long as the fruits, completely enclosing them; lemma and palea tips subacute; nerves of the palea glabrous; the nerve of the lemma scabrous toward the tip; palea splits at fruit maturity.

Specimen illustrated: *H. W. Clark* 22; Nov. 22, 1904; east of depot grounds; Lake Maxinkuckee, Indiana.

Common name: Tall dropseed.

Geographic distribution: Vermont to Montana, south to Louisiana, Arizona and Texas; eastern Washington; prairies and sandy meadows.

Habit: Perennial.

Economic importance: Valuable for forage and erosion control; fairly palatable and a rapid grower; seldom planted intentionally but is usually present in the commercial mixed bluestem (*Andropogon* spp.) used for seeding purposes.

Occurrence in seed samples: Reported in bluestem (*Andropogon* spp.) and other native grasses and legumes, and in lespedeza (*Lespedeza* spp.) from Kentucky.

**10. Sporobolus poiretii** (Roem. and Schult.) Hitchc., Bartonia 14:32. 1932.
Based on *Axonopus poiretii* Roem. and Schult. PLATE 2,D

*Axonopus poiretii* Roem. and Schult., Syst. Veg. 2:318. 1817. Based on *Agrostis compressa* Poir., "n. 78", not *A. compressa* Willd., 1790, nor Poir. (op. cit.) No. 82, on the following page.

*Agrostis compressa* Poir. in Lam., Encycl. Suppl. 1:258. 1810, not *A. compressa* Willd., 1790, nor Poir. (op. cit.) 1:259. 1810, nor *Sporobolus compressus* Kunth, 1933. Carolina, *Bosc.*

Fruits: Length (0.8)–1.1–(1.4) mm.; width (0.5)–0.6–(0.8) mm.; thickness (0.2)–0.3–(0.4) mm.; translucent or opaque; shape oblongish, tapering to the base; usually strongly laterally compressed, the edges often reddish black rimmed from the mucilaginous pericarp; color of the endosperm and radicle-plumule axis reddish or yellowish orange; embryo less than half the length of the seed; scutellum edge elevated, about 0.1 mm. wide, and reddish black at maturity; pericarp minutely striate, the striations often dark reddish; pericarp becoming mucilaginous at seed maturity, causing the fruits to adhere to the florets.

Florets: Length 1.5–2.0 mm.; width and thickness ca. the same as for the fruits; semiopaque; membranaceous; essentially glabrous, but microscopically sparingly scaberulous; color stramineous or pale plumbeous; lemma acute; palea obtuse, erose; palea splits at fruit maturity; fruits with the pericarp partially slipped off often sticking to the lemma and palea; florets often affected with a black fungus.

Specimen illustrated: *A. S. Hitchcock* 523; March 1903; Miami, Florida.

Common names: Smutgrass; rattail smutgrass.

Geographic distribution: Virginia to Tennessee and Oklahoma, south to Florida, Texas, and the warmer parts of America to Argentina; on ballast in Oregon and New Jersey; tropical Asia, apparently introduced in America; open ground and waste places.

Habit: Perennial.

Economic importance: None reported in the United States; utilized for forage in arid regions in southern Europe, according to Fiori (1923).

Occurrence in seed samples: Reported as occurring in Dallis grass (*Paspalum dilatatum*) and in bluestem (*Andropogon* spp.) seed samples.

**11. Sporobolus airoides** (Torr.) U. S. Rep. Expl. Miss. Pacif. 7: 21. 1856. Based on *Agrostis airoides* Torr. PLATE 2,E

*Agrostis airoides* Torr., Ann. Lyc. N. Y. 1: 151. 1824. Branches of the Arkansas River near the Rocky Mountains, *James.*

Fruits: Length (0.9)–1.1–(1.7) mm.; width (0.5)–0.7–(0.9) mm.; thickness (0.4)–0.5–(0.7) mm.; opaque; shape irregularly suboblong or suboval; plump; the stylar tip rounded and not much laterally compressed; color of endosperm and embryo area about the same: a dull, dark, yellowish brown or light brown; endosperm rarely reddish flecked; embryo frequently over half the length of the seed; pericarp strongly dark reddish or blackish striate or reticulate, rarely slipped off mature fruits.

Florets: Length (1.5)–1.9–(2.5) mm.; width and thickness ca. the same as for the fruits; opaque or semitransparent; membranaceous; essentially glabrous but at high magnifications minutely scaberulous; color plumbeous, stramineous or purplish, often bronze tinged; lemma and palea acute or subacute, the nerves scaberulous toward the tips; florets spread apart at maturity, exposing the tips of the fruits; palea splits at fruit maturity.

Specimen illustrated: *Edgar A. Mearns* 2303; Sept. 11, 1893; near White Water, on Mexican boundary line; New Mexico.

Common name: Alkali sacaton; bunchgrass.

Geographic distribution: South Dakota and Missouri to eastern Washington, south to Texas and southern California; Mexico; meadows and valleys, especially in moderately alkaline soil.

Habit: Perennial, in large, tough bunches.

Economic importance: Excellent results from seeding in alkaline lowlands; valuable forage and erosion control plant.

Occurrence in seed samples: Occasionally part of native grass or legume seed samples or received as pure seed samples.

**12. Sporobolus wrightii** Munro ex. Scribn., Bull. Torrey Bot. Club 9:103. 1882. Pantano, Arizona, *Pringle.* PLATE 2,F

Fruits: Length (0.9)–1.3–(1.7) mm.; width (0.4)–0.7–(0.9) mm.; thickness (0.3)–0.5–(0.7) mm.; opaque (occasionally semitranslucent); plump; shape predominantly ovoid, plumper toward the base (rarely suboval or obovoid); stylar tip usually pointed and strongly laterally compressed; color of endosperm and embryo area about the same: a dull, dark reddish brown or occasionally light brown; endosperm usually faintly reddish flecked; embryo frequently less than half the length of the seed; pericarp strongly dark reddish or blackish striate or reticulate, frequently slipped off mature fruits.

Florets: Essentially the same as for *S. airoides.*

Specimen illustrated: *Edgar A. Mearns* 2345; Sept. 16, 1893; Dog Spring, Dog Mountains, New Mexico.

Common name: Sacaton.

Geographic distribution: Southern and western Texas and Oklahoma to southern California and central Mexico; mesas and valleys.

Habit: Perennial, in large dense tufts.

Economic importance: Excellent results from seeding in southern New Mexico; useful for grazing when young; also furnishes hay and and makes good winter range.

Occurrence in seed samples: Occasionally part of native grass seed mixtures; received as pure seed samples in U. S. Department of Agriculture Soil Conservation Service seed laboratories.

**13. Sporobolus buckleyi** Vasey, Bull. Torrey Bot. Club 10:128. 1883. Texas, *Buckley*. PLATE 3,A

Fruits: Length (0.7)–0.8–(1.0) mm.; width (0.3)–0.5–(0.7) mm.; thickness (0.2)–0.3–(0.4) mm.; translucent or opaque; shape suboval or broadly ovoid; plump and flattish at the base, the embryo without a prominent overhang; laterally compressed at stylar tip; color of endosperm and embryo light orange reddish, the embryo sometimes slightly darker; endosperm faintly light reddish flecked and pitted; embryo area inconspicuous, usually less than half the length of the seed; hilum within a basally prominent, black half-rim; pericarp usually minutely reddish striate.

Florets: Length 1.2 to 1.7 mm. long; width and thickness ca. the same as for the fruits; opaque; membranaccous; essentially glabrous, but microscopically slightly scaberulous, especially on the nerves; color plumbeous, purplish or stramineous; lemma acute, longer than the palea, which is subacute or obtuse; palea splits at fruit maturity; fruits with the pericarp partially slipped off often sticking to the florets.

Specimen illustrated: *Jason R. Swallen* 1492; Apr. 10, 1931; deep shade, in Rabb Palm Grove; Brownsville, Texas.

Common name: Buckley dropseed.

Geographic distribution: Texas and eastern Mexico.

Habit: Perennial.

Economic importance: Not reported.

Occurrence in seed samples: Not reported.

**14. Sporobolus pulvinatus** Swallen, Journ. Washington Acad. Sci. 31:351. f. 4. 1941. Adamana, Arizona, *Griffiths* 5107. PLATE 3,B

Fruits: Length (0.8)–0.9–(1.0) mm.; (0.4)–0.6–(0.7) mm.; thickness (0.2)–0.4–(0.5) mm.; semitranslucent; shape obovoid; obtuse at stylar tip and pointed at the base from the overhanging embryo; ventral surface frequently longitudinally grooved; color of the endo-

sperm yellowish gray or yellowish orange; endosperm often microscopically pitted; embryo area conspicuous, greenish black at maturity; scutellum in dorsal view panduriform; in lateral view of the fruit the inner scutellum reflected in a broad, dark semicircle through the semitranslucent endosperm; radicle-plumule axis broad in relation to the scutellum edge; pericarp finely striate.

Florets: Length (1.4)–1.5–(1.7) mm.; width and thickness ca. the same as for the fruits; semiopaque or opaque; membranaceous; essentially glabrous, but microscopically sparingly scaberulous; color stramineous or plumbeous, sometimes purplish tinged; lemma acute or subobtuse; palea the same length or slightly shorter than the lemma, obtuse, slightly dentate; palea splits at fruit maturity; fruits with the pericarp partially slipped off often sticking to the florets.

Specimen illustrated: *A. S. Hitchcock* 7820; Oct. 15, 1910; along street; El Paso, Texas.

Common name: None given.

Geographic distribution: Texas, New Mexico and Arizona; northern Mexico; sandy land.

Habit: Annual.

Economic importance: Not reported.

Occurrence in seed samples: Not reported.

**15. Sporobolus pyramidatus** (Lam.) Hitchc., U. S. Dep. Agr. Misc. Pub. 243:84. 1936. Based on *Agrostis pyramidata* Lam. PLATE 3,c

*Agrostis pyramidata* Lam., Tabl. Encycl. 1:161. 1791. South America.

Fruits: Length (0.7)–0.8–(1.0) mm.; width (0.4)–0.5–(0.6) mm.; thickness (0.2)–0.3–(0.4) mm.; usually translucent; shape obovoid, suboval, or subelliptic; obtuse at stylar tip and pointed at the base from the overhanging embryo; ventral surface occasionally longitudinally grooved; color of the endosperm light orange reddish; endosperm often microscopically pitted; embryo area conspicuous, dark reddish brown at maturity; scutellum in dorsal view panduriform; in lateral view of the fruit the inner scutellum reflected in a broad, dark semicircle through the translucent endosperm; pericarp finely striate.

Florets: Length (1.2)–1.5–(1.9) mm.; width and thickness ca. the same as for the fruits; semiopaque or opaque; membranaceous; essentially glabrous, but microscopically sparingly scaberulous; color stramineous or plumbeous; lemma acute, usually slightly longer than the palea; palea subacute or obtuse; palea splits at fruit maturity; fruits with the pericarp partially slipped off often sticking to the florets.

Specimen illustrated: *A. S. Hitchcock* 5343; June 27, 1910; sand, along railway near bay; Corpus Christi, Texas.

Common name: Whorled dropseed.

Geographic distribution: Kansas and Colorado to Louisiana and

Texas; southern Florida; tropical America; sandy or gravelly soil, especially along streets and along the seashore and in the interior in alkaline soil.

Habit: Perennial, in spreading or prostrate tufts.

Economic importance: Too short to be a productive grass; reported by Parodi (1928) as good in saline soils of the pampas, Argentina, where other types of pasture grasses are scarce.

Occurrence in seed samples: Not reported.

**16. Sporobolus flexuosus** (Thurb.) Rydb., Bull. Torrey Bot. Club 32:601. 1905. Based on *Sporobolus cryptandrus* var. *flexuosus* Thurb.

PLATE 3,D

*Sporobolus cryptandrus* var. *flexuosus* Thurb. in S. Wats., Bot. Calif. 2:269 1880. Based on *Vilfa cryptandra* var. *flexuosa* Thurb.

*Vilfa cryptandra* var. *flexuosa* Thurb. ex. Vasey, in Rothr., in Wheeler U. S. Survey W. 100th Merid. Rept. 6: 282. 1878. Nevada and Arizona, *Wheeler Exped.*

Fruits: Length (0.7)–0.8–(0.9) mm.; width (0.5)–0.6–(0.8) mm.; thickness (0.2)–0.4–(0.5) mm.; opaque, semitranslucent or translucent; shape asymmetrically broadly ovoid; pointed at the base from the overhanging embryo; obtuse and scarcely laterally flattened at stylar tip; in ventral and dorsal views predominantly oblongish, frequently "pinched" laterally toward the center; color of endosperm light yellowish brown or pale orange yellow, sometimes almost white; endosperm usually microscopically pitted and internally strongly "starchy" or granularly mottled; embryo area conspicuous, rusty or light reddish brown; radicle-plumule axis narrow, elevated, almost straight; in lateral view the scutellum edges usually unevenly reflected through the endosperm; pericarp frequently purplish or rusty striate.

Florets: Length (1.5)–2.1–(2.7) mm.; otherwise like *S. cryptandrus*.

Specimen illustrated: *Starr* 171A; Oct. 4, 1935; New Mexico.

Common name: Mesa dropseed.

Geographic distribution: Western Texas to southern Utah, Nevada, southern California, and northern Mexico; mesas.

Habit: Perennial.

Economic importance: Fair palatability; invader; occurs in lower Sonoran Zone on medium or light textured soils; at the present time the only species available for seeding around Las Cruces, Deming, and Lardsburg, New Mexico, on light-textured soils.

Occurrence in seed samples: Occasional pure seed samples in U. S. Department of Agriculture Soil Conservation Service seed laboratories.

**17. Sporobolus nealleyi** Vasey, Bull. Torrey Bot. Club 15:49. 1888, name only; Contr. U. S. Nat. Herb. 1:57. 1890. Brazos Santiago, Tex., *Nealley.*

PLATE 3,E

Fruits: Length (0.7)–0.8–(1.0) mm.; width (0.3)–0.4–(0.5) mm.; thickness (0.2)–0.2–(0.3) mm.; opaque or semitranslucent; shape

narrowly ovoid or narrowly obtuse at stylar tip; pointed at the base from the overhanging embryo; color of endosperm light yellowish brown or pale orange yellow, frequently almost white; endosperm sometimes microscopically pitted and usually internally "starchy" or granularly mottled; embryo area conspicuous, rusty or purplish brown; radicle-plumule axis narrow, elevated, almost straight; in lateral view the scutellum edges usually unevenly reflected through the endosperm; pericarp very finely striate, frequently purplish striate, sometimes rusty striate.

Florets: Length (1.5)–1.7–(2.0) mm.; florets usually opaque and very dark green or purplish tinged; otherwise like *S. cryptandrus*.

Specimen illustrated: *J. D. Schoeller & R. S. Campbell* 462; Forest Service 49290; Nov. 13, 1925; three-quarters of a mile east of Middle Well, in Caliche, Jornada Range Reserve, New Mexico.

Common name: Nealley dropseed.

Geographic distribution: Western Texas, Nevada, New Mexico, and Arizona; gypsum sands.

Habit: Perennial, with rhizomes.

Economic importance: Quite common around Roswell, Carlsbad, and Partalu, New Mexico; thought to have forage value.

Occurrence in seed samples: Not reported.

**18. Sporobolus contractus** Hitchc., Amer. Journ. Bot. 2:303. 1915. Based on *Sporobolus strictus* Merr. PLATE 3,F

*Sporobolus strictus* Merr., U. S. Dep. Agr., Div. Agrost. Cir. 32:6. 1901, not *S. strictus* Franch., 1893. Based on *Sporobolus cryptandrus* var. *strictus* Scribn.

*Sporobolus cryptandrus* var. *strictus* Scribn., Bull. Torrey Bot. Club 9:103. 1882. Camp Lowell, Arizona, *Pringle*.

Fruits: Length (0.8)–1.0–(1.2) mm.; width (0.4)–0.6–(0.8) mm.; thickness (0.2)–0.3–(0.5) mm.; opaque, semitranslucent or translucent; shape broadly ovoid or broadly elliptic; pointed at the base from the overhanging embryo; strongly laterally flattened; obtuse or pointed at stylar tip; color of endosperm light yellowish brown or pale orange yellow, sometimes almost white; endosperm usually microscopically pitted and internally strongly "starchy" or granularly mottled; embryo area conspicuous, rusty or light reddish brown; embryo area usually less than half the length of seed; radicle-plumule axis narrow, elevated, almost straight; in lateral view the scutellum edges usually unevenly reflected through the endosperm; pericarp frequently rusty striate, sometimes greenish striate.

Florets: Length (1.5)–2.4–(2.9) mm.; specimens with stramineous or pale plumbeous florets exceeding those with darker florets; otherwise like *S. cryptandrus*.

Specimen illustrated: *O. B. Metcalfe* 780; Sept. 22, 1903; Gila River bottom near cliff; Grant County, New Mexico.

Common name: Spike dropseed.

Geographic distribution: Arkansas, Colorado to Nevada, south to western Texas, southeastern California, and Sonora; adventive in Maine; mesas, dry bluffs, and sandy fields.

Habit: Perennial.

Economic importance: Not used much in reseeding; fits in where *S. cryptandrus* and *S. flexuosus* overlap.

Occurrence in seed samples: Occasionally in native grass seed mixtures or in U. S. Department of Agriculture Soil Conservation Service seed laboratories, received as pure seed samples.

**19. Sporobolus giganteus** Nash, Bull. Torrey Bot. Club 25:88. 1898. Dona Ana County, N. Mex., *Wooton* 394. PLATE 4,A

Fruits: Length (1.0)–1.3–(1.9) mm.; width (0.6)–0.8–(0.9) mm.; thickness (0.3)–0.4–(0.5) mm.; otherwise essentially the same as for *S. contractus*.

Florets: Length (2.2)–2.9–(3.5) mm.; otherwise essentially the same as for *S. contractus*.

Specimen illustrated: *Paul C. Standley;* Oct. 13, 1906; sand hills, southwest of Mesilla, New Mexico.

Common name: Giant dropseed.

Geographic distribution: Oklahoma and western Texas to Colorado and Arizona; mesas and sandhills.

Habit: Perennial.

Economic importance: Minor forage and erosion control value; used on sand dunes in New Mexico with fair results; palatable plant on dunes and blow-out areas in Oklahoma.

Occurrence in seed samples: Occasionally in native grass seed mixtures or in U. S. Department of Agriculture Soil Conservation Service seed laboratories as pure seed samples.

**20. Sporobolus cryptandrus** (Torr.) A. Gray, Man. 576. 1848. Based on *Vilfa cryptandra* Torr. PLATE 4,B

*Vilfa cryptandra* Torr. ex. Trin., Mém. Acad. St. Pétersb. VI. Sci. Nat. 4[1]:69. 1840. Based on *Agrostis cryptandra* Torr.

*Agrostis cryptandra* Torr., Ann. Lyc. N. Y. 1: 151. 1824. Canadian River (Texas or Oklahoma), *James*.

Fruits: Length (0.6)–0.8–(1.3) mm.; width (0.3)–0.5–(0.8) mm.; thickness (0.2)–0.3–(0.5) mm.; translucent, semitranslucent, or opaque; shape ovoid or obovoid (rarely suboval); pointed at the base from the overhanging embryo; laterally compressed toward the stylar tip; bulging toward the base; in ventral and dorsal views predominantly lance-shaped; color of endosperm moderate orange, brownish orange or light reddish brown; endosperm faintly light reddish or rusty flecked and usually pitted; endosperm internally clear or "starchy" or granularly mottled; embryo area usually inconspicuous, the same

color or a slighly deeper shade than the endosperm (rarely very much darker); radicle-plumule axis narrow, elevated, almost straight; in lateral view the scutellum edges evenly or unevenly reflected through the endosperm; pericarp very finely striate, sometimes faintly rusty or reddish striate (rarely with purplish striations).

Florets: Length (1.4)–1.8–(2.0) mm.; width and thickness ca. the same as for the fruits; opaque, transparent or semitransparent; membranaceous; glabrous to minutely microscopically scaberulous, especially toward the tips of the florets and the nerves; color variable, from plumbeous, frequently purple tinged, to stramineous; lemma and palea acute or acuminate; palea splits at fruit maturity.

Specimen illustrated: *Eula Whitehouse* 17190; Sept. 25, 1946; sandy prairie; 4 miles southeast of Farwell on highway 84; Parmer County, Texas.

Common name: Sand dropseed.

Geographic distribution: Maine and Ontario to Alberta and Washington, south to North Carolina, Indiana, Louisiana, southern California, and northern Mexico; sandy, open ground.

Habit: Perennial, usually in rather small tufts.

Economic importance: An invading species in many types of soils; more valuable for erosion control and seeding on problem spots than for forage; not as palatable as most other range grasses.

Occurrence in seed samples: Reported in native grass and legume seed samples or received as pure seed samples.

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