

THE NORTH AMERICAN SPECIES OF ECHINOCHLOA.

By A. S. HITCHCOCK.

INTRODUCTION.

In earlier works this group of grasses was usually included as a section in the great genus *Panicum*. The species form a compact group which according to the modern concept is assigned to generic rank.

There are seven species of *Echinochloa* in North America, two of them introduced from the Old World and a third introduced as well as native. Besides these species there are at least three in the Old World. Although the genus itself is well marked, some of the species are exceedingly variable and not easily distinguished from each other.

A variety of one species, *Echinochloa crusgalli edulis*, is occasionally cultivated in the United States for forage under the name of Japanese barnyard millet, and at one time was advertised by seedsmen as billion dollar grass.

The text figures are natural size.

DESCRIPTION OF THE GENUS AND SPECIES.

ECHINOCHLOA Beauv.

Echinochloa Beauv. Ess. Agrost. 53. pl. 11. f. 11. 1812. The type species is *Panicum crusgalli*, the one figured. Beauvois mentions several species in the text under *Panicum* and lists them under *Echinochloa* in the index.

DESCRIPTION.

Annual or perennial, coarse, often succulent grasses with linear flat blades and usually narrow panicles consisting of several spikelike racemes along a main axis. Spikelets plano-convex, often spiny-hispid, sessile, in pairs or in irregular clusters crowded on one side of the panicle branches. First glume about half as long as the spikelet, pointed. Second glume and sterile lemma equal, stiffly hispidulous on the nerves, usually scabrous on the internerves, pointed, mucronate, or the glume short-awned, the lemma mucronate or awned, sometimes conspicuously so, inclosing a membranaceous palea and sometimes a staminate flower. Fruit plano-convex, the lemma and palea smooth and shining, abruptly acuminate-pointed, the lemma margins inrolled below, flat above, the apex of the palea not inclosed.

The genus differs from *Panicum* in the awned glumes (the first awnless in some species) and sterile lemma and the pointed fertile lemma. The awns are reduced to mucros or points in *E. colonum*, but the habit of the plant and the structure of the inflorescence show the species to be closely allied to the others.

KEY TO THE SPECIES.

Ligule a dense line of stiff yellowish hairs; plants perennial.

Fruit about 2.5 mm. long. Awn of sterile lemma less than 2 mm. long.

1. *E. pyramidalis*.

Fruit about 4 mm. long.

Awn of sterile lemma generally 5 to 10 mm. long; sterile floret staminate.

2. *E. polystachya*.

Awn of sterile lemma generally 4 to 5 cm. long; sterile floret neuter.

4. *E. holciformis*.

Ligule wanting, the ligular area sometimes pubescent; plants annual.

Racemes simple, rather distant, 1 to 2 cm. long; spikelets crowded in about 4 rows, the awn of the sterile lemma reduced to a short point; blades 3 to 6 mm. wide.

7. *E. colonum*.

Racemes more or less branched, usually more than 2 cm. long; spikelets irregularly crowded and fascicled, usually not arranged in rows, the awn of the sterile lemma variable; blades usually more than 5 mm. wide.

Fruit about 4 mm. long.....3. *E. oplismenoides*.

Fruit 2.5 to 3 mm. long.

Sheaths smooth; awns variable, but the panicle not a dense mass of long-awned spikelets.....6. *E. crusgalli*.

Sheaths, at least the lower, hispid or scabrous; panicle dense, the spikelets long-awned.....5. *E. walteri*.

1. *Echinochloa pyramidalis* (Lam.) Hitchc. & Chase.

Panicum pyramidale Lam. Tabl. Encycl. 1:171. 1791. "E Senegal. D. Rousillon."



FIG. 25.—*Echinochloa pyramidalis*. From Duss 3175, Guadeloupe.

Panicum spectabile var. *guadeloupense* Hack. Notizbl. Bot. Gart. Berlin 1: 328. 1897. "Habitat in Guadeloupe in fossis et locis aquaticis prope faubourgs de la Pointe à Pitre: Duss n. 3176."

Echinochloa pyramidalis Hitchc & Chase, Contr. U. S. Nat. Herb. 18: 345. 1917. Based on *Panicum pyramidale* Lam.

DESCRIPTION.

Plants perennial; stems erect, rather fleshy, 1.5 to 2.5 meters tall, glabrous; sheaths glabrous; ligule a dense row of stiff yellowish hairs 1 to 2 mm. long; blades 40 to 60 cm. long, 5 to 10 mm. wide, glabrous above, scabrous on the margins and on the nerves beneath; panicle 20 to 40 cm. long, the axis scabrous; racemes numerous, ascending, 2 to 7 cm. long, single or somewhat fascicled, distant below but overlapping, stiffly pilose at base and

sparingly so along the scabrous or hispidulous rachis; spikelets about 3 mm. long, rather loosely arranged along the rachis, scabrous or slightly hispidulous on the

nerves, glabrous or nearly so on the internerves; sterile lemma mucronate or with an awn 1 to 2 mm. long; fruit about 2.5 cm. long, mucronate.

DISTRIBUTION.

In ditches, Guadeloupe, introduced from Africa.

LEEWARD ISLANDS: Guadeloupe, *Duss* 3175, 3176, 3920; *Hitchcock* 16412.

2. *Echinochloa polystachya* (H. B. K.) Hitchc.

Oplismenus polystachyus H. B. K. *Nov. Gen. & Sp.* 1: 107. 1816. "Crescit in sylvis opacatis Orinocensibus prope Maypure et in radicibus montis Cumadamenari." The Humboldt collections have not been examined. The description applies well to glabrous specimens of *Echinochloa polystachya*. The ligule is described as "margo pilosus." This leaves little doubt as to the identity of the species.

Panicum spectabile Nees, *Agrost. Bras.* 262. 1829. "Habitat, uti videtur, in regno Angola Africae, a Lusitanis ob eximium, quod praebet, pabulum inde in Brasilium allatum, et variis per omne imperium locis cultum, e. g. ad Sebastianopolin, Soteropolin, Maragnanum, Pará." Nees further states, in regard to its introduction from Angola, "Capim de Angola, incolis, de cujus cultura conferatur: *Observações á cerca do Capim de Angola, ultimamente trazido e cultivado aqui. Rio de Janeiro. 1818.*" A specimen in the Munich Herbarium marked, "Capim de Angola. Martius. Iter Brasiliensis," is taken as the type. Dr. Otto Stapf informs me that he has no evidence that this species grows in Africa and that the statement by Nees that it was introduced from Angola appears to be an error.



FIG. 26.—*Echinochloa polystachya*. From Pittier 4383, Panama.

Echinochloa spectabilis Link, *Hort. Berol.* 2: 209. 1833. Based on *Panicum spectabile* Nees.

Orthopogon hirsutus Spreng.; *Steud. Nom. Bot. ed. 2.* 2: 234. 1841. A name only, given as synonym of *Panicum spectabile*.

Panicum phyllanthum Steud. *Syn. Pl. Glum.* 1: 47. 1854. "Ex. hrbo. Deloche, lectum in Montevideo." The type has not been examined.

Panicum bonplandianum Steud. *Syn. Pl. Glum.* 1: 48. 1854. Based on "*Oplismenus polystachyus* H. B."

DESCRIPTION.

Plants perennial, usually in colonies; culms coarse, 1 to 2 meters tall, from a long creeping rooting base, glabrous, the nodes densely hispid with appressed yellowish hairs; sheaths glabrous or papillose-hispid; ligule a dense line of stiff yellowish hairs as much as 4 mm. long; blades as much as 2.5 cm. wide, scabrous on the margins and upper surface; panicle 10 to 30 cm. long, rather dense, the axis angled, very scabrous; racemes ascending, the lower mostly 3 to 6 cm. long, densely hispid at base, the rachis very scabrous and more or less papillose-hispid; spikelets rather closely set, nearly sessile, about 5 mm. long; sterile floret staminate, the awn 2 to 10 mm. long; fruit rather soft, about 4 mm. long, extending into a point about 0.5 mm. long.

DISTRIBUTION.

Swamps and ditches near the coast, Mexico and the West Indies to Argentina.
 SAN LUIS POTOSÍ: Cárdenas, *Hitchcock* 5737.
 TABASCO: Laguna de Peralta, *Rovirosa* 315, González, *Rovirosa* 703.
 PANAMA: Ormila, *Pittier* 4383.
 CUBA: Habana, *Léon* 4168.
 JAMAICA: Savanna-la-Mar, *Hitchcock* 9868.
 SANTO DOMINGO: Sánchez, *Taylor* 66. Rincón, *Fuertes* 1419.
 PORTO RICO: Mayaguez, *Chase* 6290, 6319. Caguas, *Sintenis* 2543. Bayamon, *Hioram* 324 in part. Lares, *Chase* 6583.
 LEEWARD ISLANDS: Antigua, *Wullschlaegel* 635.
 WINDWARD ISLANDS: Martinique, *Duss* 542.
 TOBAGO: *Hitchcock* 10284; *Broadway* 4896.
 COLOMBIA: Santa Marta, *Smith* 108.
 DUTCH GUIANA: Paramaribo, *Kuyper* in 1913.
 BRAZIL: Paraná, *Dusen* 11461. Without locality, *Capanema* 5398.
 PARAGUAY: Pilcomayo River, *Rojas* 76; *Morong* 1070.
 URUGUAY: San José, *Arechavaleta* 227.
 ARGENTINA: Buenos Aires, *Venturi* 6419.

3. *Echinochloa oplismenoides* (Fourn.) Hitchc.

Berchtoldia oplismenoides Fourn. Mex. Pl. 2: 41. 1886. "Toluca, Lerma (BERL. n. 1140)." Berlandier's no. 1140 from Toluca, in the Paris Herbarium, is the type. Fournier has written the name upon the sheet. The specimen consists of three fragmentary culms with a few racemes of characteristic spikelets.

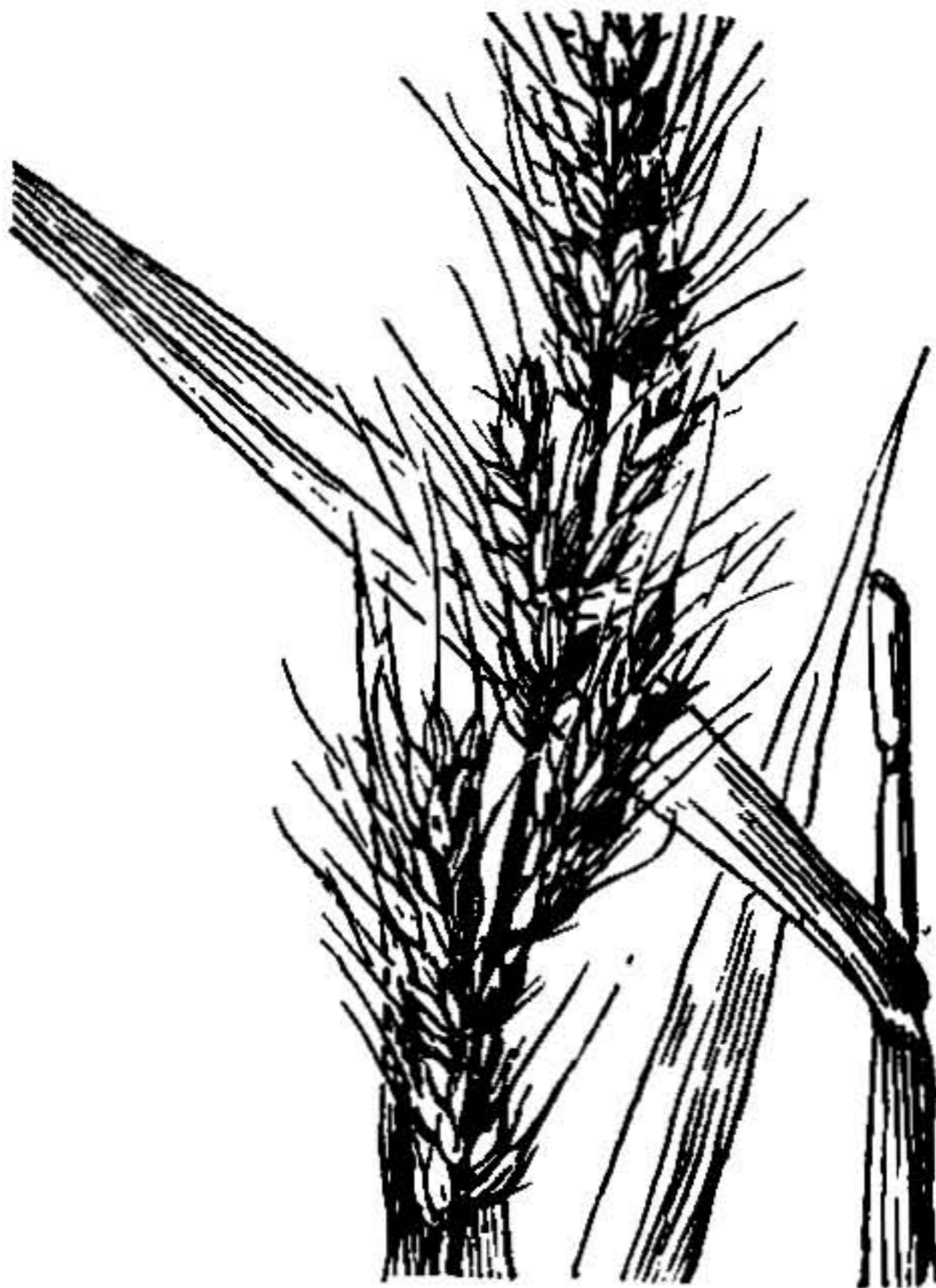


FIG. 27.—*Echinochloa oplismenoides*. From *Hitchcock* 7527 Mexico.

DESCRIPTION.

Plants annual; culms erect, as much as 1 meter tall, glabrous, the nodes glabrous or rarely appressed-hispidulous; sheaths glabrous; ligule wanting, or rarely a line of short hairs; blades mostly less than 1 cm. wide, scaberulous on the margins and upper surface; panicles narrow, usually not over 15 cm. long, the axis angled, scabrous; racemes appressed, the lower mostly 3 to 6 cm. long, the rachis angled, scabrous and more or less stiffly pilose, not hispid at base; spikelets rather densely set, 4 to 5 mm. long; first glume acutish, glabrous; second glume hispidulous on the nerves, acuminate; sterile lemma empty or with palea only, the awn usually about 1 cm. long, rarely as much as 3 cm. long; fruit about 4 mm. long, mucronate.

DISTRIBUTION.

Moist places, central Mexico.
 SONORA: Cananea, *Ricketts* 2.
 CHIHUAHUA: Sierra Madre, *Pringle* 1404. Sánchez, *Hitchcock* 7696. Miñaca, *Hitchcock* 7758.
 DURANGO: Durango, *Palmer* 253 in 1896; *Hitchcock* 7616. Otinapa, *Palmer* 333 in 1906.

ZACATECAS: Zacatecas, *Hitchcock* 7527.

AGUASCALIENTES: Aguascalientes, *Hitchcock* 7441, 7489.

MEXICO: Toluca, *Hitchcock* 6914.

MICHOACÁN: Zamora, *Pringle* 8480. Morelia, *Nicolás* in 1909.

PUEBLA: Puebla, *Arsène* 5444.

4. *Echinochloa holciformis* (H. B. K.) Chase.

Oplismenus holciformis H. B. K. Nov. Gen. & Sp. 1: 107. 1816. "Crescit in humidis montanis prope Ciuapecuaro, alt. 970 hexap. (Regno Mexicano.)" A specimen from the type collection has been examined in the Willdenow Herbarium at Berlin. The label reads, "*Panicum holciforme*. Amer. merid. *Humboldt*."

Orthopogon holciformis Spreng. Syst. Veg. 1: 307. 1825. Based on *Oplismenus holciformis* H. B. K.

Panicum holciforme Steud. Syn. Pl. Glum. 1: 48. 1854. Based on *Oplismenus holciformis* H. B. K.

Berchtoldia holciformis Fourn. Mex. Pl. 2: 41. 1886. Based on *Oplismenus holciformis* H. B. K.

Echinochloa holciformis Chase, Proc. Biol. Soc. Washington 24: 155. 1911. Based on *Oplismenus holciformis* H. B. K.

DESCRIPTION.

Plants perennial; culms erect, sometimes with a decumbent rooting base, stout, succulent, as much as 2 meters tall and 1.5 cm. thick at base, glabrous; sheaths

glabrous; ligule a dense line of stiff hairs, long on the lower leaves, short on the upper leaves; blades mostly 8 to 15 mm. wide, scabrous on the margins and upper surface; panicle dense, or interrupted below, nodding, as much as 40 cm. long, the axis scabrous, densely hispid around the base of the branches; racemes appressed, single or fascicled, the lower as much as 10 cm. long, the rachis scabrous and hispid; spikelets rather closely arranged, nearly sessile, about 5 mm. long, fusiform, green or purple, only slightly convex on the rounded side; first glume acute or obtuse; second glume short-awned; sterile lemma empty, the awn as much as 5 cm. long; fruit elliptic, about 5 mm. long including the point, this about 1 mm. long.

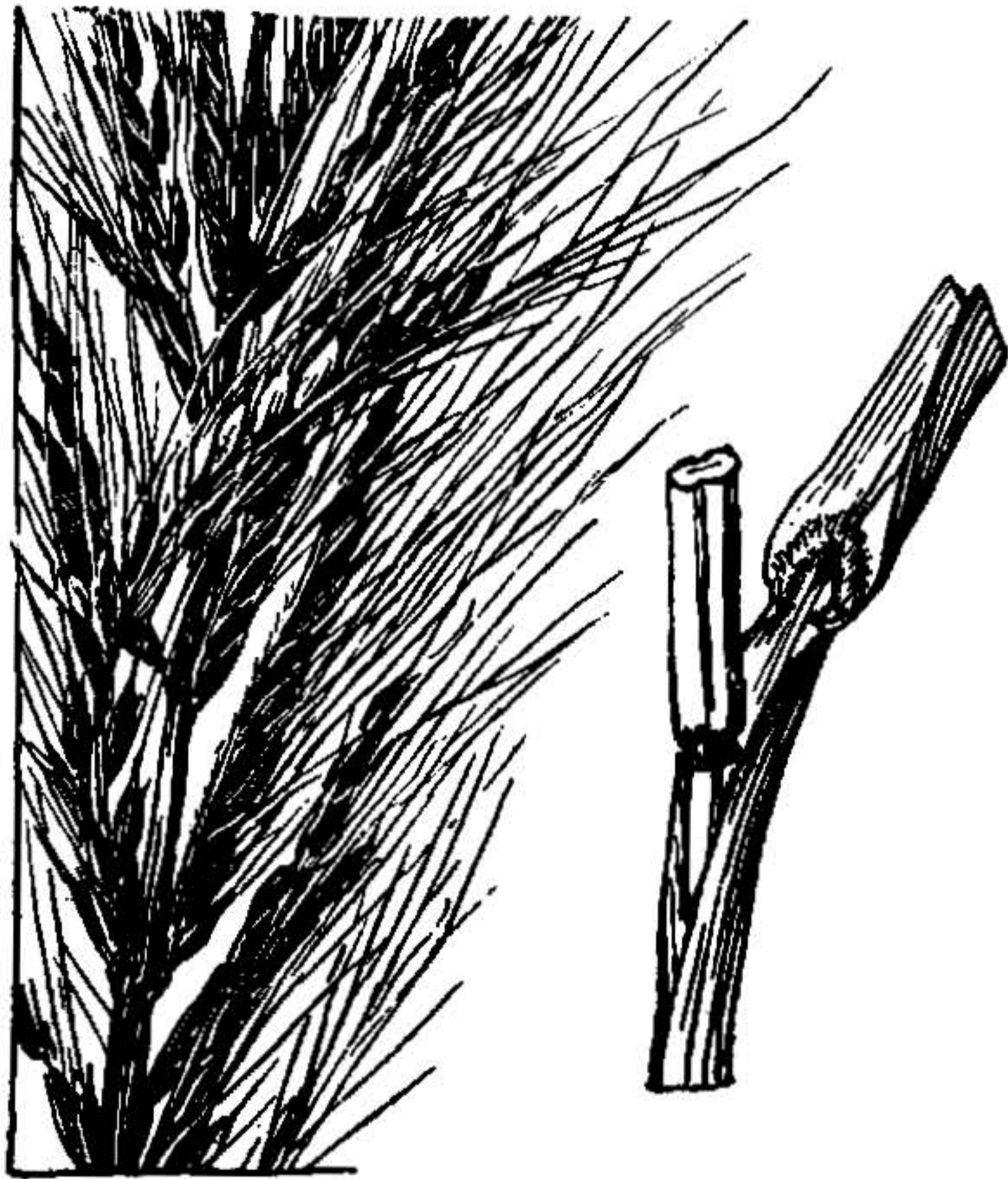


FIG. 28.—*Echinochloa holciformis*. From *Arsène* in 1909, Mexico.

DISTRIBUTION.

Moist places, often covering large areas in shallow water, central Mexico to Guatemala.

DURANGO: Durango, *Hitchcock* 7611; *Palmer* 253 in 1896.

JALISCO: Oroasco, *Hitchcock* 7375.

GUANAJUATO: Acámbaro, *Hitchcock* 6946. Irapuato, *Hitchcock* 7393.

MICHOACÁN: Morelia, *Arsène* in 1909.

MEXICO: Valley of Mexico, *Pringle* 8622; *Berlandier* 730; *Karwinsky* in 1807. Tulu, *Holway* 9.

GUATEMALA: Estanzuela, *Heyde & Lux* 3911.

5. *Echinochloa walteri* (Pursh) Heller.

Panicum hirtellum Walt. Fl. Carol. 72. 1788. Not *Panicum hirtellum* L. 1759. Type locality, South Carolina, no definite station given. There are three specimens in Walter's herbarium at the British Museum.¹ One of these is the species described below under *Echinochloa walteri*. This specimen may be taken as the type, as this preserves the name in its usual application.

Panicum walteri Pursh, Fl. Amer. Sept. 66. 1814. The range is given as "Near the salt-water: Canada and New York." The species is described as having hispid sheaths. The name is founded on *P. hirtellum* Walt.



FIG. 29.—*Echinochloa walteri*. From Chase 1428, Illinois.

Panicum crusgalli var. *hispidum* Ell. Bot. S. C. & Ga. 1: 114. 1816. Based on *P. hispidum* Muhl., in manuscript.

Panicum hispidum Muhl. Descr. Gram. 107. 1817. Not *Panicum hispidum* Forst. 1786. "Habitat in Carolina, Delaware, et Nov. Ebor." *Panicum hirtellum* Walt. is cited as a synonym.

Panicum longisetum Torr. Amer. Journ. Sci. 4: 58. 1822. Not *Panicum longisetum* Poir. 1816. "On the banks of the Fox River," Wisconsin. The type, labeled "Cass's Exped. Capt. Douglass," is in the Torrey Herbarium. The sheaths are glabrous, but only the upper part of the plant is shown.

Orthopogon hispidus Spreng. Syst. Veg. 1: 307. 1825. Based on *Panicum hispidum* Muhl.

Oplismenus longisetus Kunth, Rév. Gram. 1: 45. 1829. Based on "*Panicum longisetum* Torrey."

Echinochloa walteri Heller, Cat. N. Amer. Pl. ed. 2. 21. 1900. Based on *Panicum walteri* Pursh.

Echinochloa longiaristata Nash in Small, Fl. Southeast. U. S. 84. 1903. "In wet ground, South Carolina to Louisiana." The type in the Torrey Herbarium was collected in Louisiana by Hale. The sheaths are glabrous, but only the upper part of the plant is shown.

DESCRIPTION.

Plants annual; stems erect, often succulent, often rooting at the lower nodes when growing in mud or water, 1 to 2 meters high, as much as 2.5 cm. thick at base, glabrous; sheaths papillose-hispid, or papillose only, sometimes only the lower sheaths hispid or the hairs confined to the marginal region, or sometimes scabrous only, or rarely glabrous, the collar more or less pubescent; ligule wanting, the ligular area often pubescent; blades usually 10 to 15 mm. wide, sometimes as much as 3 cm. wide, mostly scabrous on both surfaces; panicle large and dense, as much as 30 cm. long,

¹ See Hitchcock, The Identification of Walter's grasses. Rep. Mo. Bot. Gard. 16: 34. 1905.

erect or nodding, the axis very scabrous, more or less papillose-hispid on the angles; racemes appressed or ascending, single or, in the larger plants, usually fascicled, approximate or the lower somewhat distant, sometimes branched, as much as 10 cm. long, the rachis hispidulous and more or less papillose-hispid, especially at base; spikelets closely arranged, several on short branches of the raceme, mostly long-awned, often purple, about 3 mm. long; sterile floret with a palea, neuter, the awn usually 1 to 2 cm. long, sometimes longer, more rarely reduced to a short point; fruit about 3 mm. long, fusiform, about 1 mm. wide, narrower and more fusiform than in *E. crusgalli*.

DISTRIBUTION.

Coastal Plain, Massachusetts to Florida and Texas; also Michigan to Illinois; Cuba.
 MASSACHUSETTS: West Barnstable, *Knowlton* in 1911.

NEW JERSEY: Point Pleasant, *Pollard* in 1897. Little Silver, *Scribner* in 1891.

Atlantic City, *Scribner* in 1895. Clifton, *Nash* in 1889. Port Norris, *Holmes* 399.

PENNSYLVANIA: Philadelphia, *Smith*.

OHIO: St. Marys, *Wetzstein* 6905; *Kneuck. Gram. Exs.* 75. Sandusky, *Moseley* in 1898.

INDIANA: Little Chapman Lake, *Deam* 21975. Blue Lake, *Deam* 21700. Wilson, *Hill* in 1898.

ILLINOIS: Peoria, *Brendel*. St. Clair County, *Eggert* 232. Chicago, *Chase* 1426.

MICHIGAN: Port Huron, *Dodge* 145. Detroit, *Farwell* in 1901.

WISCONSIN: Sauk City, *Luders* in 1884.

DELAWARE: Collins Beach, *Commons* in 1865. Wilmington, *Commons* in 1897.

MARYLAND: Chesapeake Beach, *Hitchcock* 2388. Little Gunpowder River, *Shull* 308.

VIRGINIA: Virginia Beach, *Williams* 3101; *Hitchcock* in 1902.

NORTH CAROLINA: Wilmington, *Amer. Gr. Nat. Herb.* 431. Elizabeth City, *Boettcher* 290.

SOUTH CAROLINA: Aiken, *Ravenel* in 1869. Georgetown, *Alexander* 167. Orangeburg, *Hitchcock* in 1905.

GEORGIA: Americus, *Harper* 539.

FLORIDA: Orange County, *Fredholm* 5420, 5455. Cedar Key, *Combs* 787, 797. Tallahassee, *Kearney* 72. Duval County, *Fredholm* 245. Jacksonville, *Hitchcock* in 1900; *Combs* 21; *Curtiss* 5023, 5091. Gainesville, *Combs* 747; *Chase* 4233. Sanibel Island, *Hitchcock* in 1900. Hillsborough County, *Fredholm* 6342. Pablo Beach, *Combs* 48. Homosassa, *Combs* 962. Bartow, *Combs* 1199. Apalachicola, *Kearney* 100; *Biltmore Herb.* 809b. Lake City, *Combs* 143; *Hitchcock* 2550. Grasmere, *Combs* 1060. Citrus County, *Hitchcock* 2549. Marion County, *Hitchcock* 2548. Miami, *Hitchcock* in 1903. St. Vincent Island, *McAtee* 1689B. Palma Sola, *Tracy* 7036. Monticello, *Combs* 311.

KENTUCKY: Reelfoot Lake, *Alexander* 307.

MISSISSIPPI: Cat Island, *Tracy & Lloyd* 442.

LOUISIANA: Alexandria, *Hale* in 1840. Houma, *Wurzlów* in 1913. Marksville, *McAtee* 2210. Pointe a la Hache, *Langlois* in 1885. New Orleans, *Waite* in 1885. Lake Charles, *Allison* 101.

TEXAS: Houston, *Thurrow* in 1898. Galveston, *Hitchcock* in 1903. Western Texas, *Wright* 795. Uvalde, *Palmer* 1340 in 1880.

CUBA: Hanábana, *Wright* 3879 in part.

6. *Echinochloa crusgalli* (L.) Beauv.

Panicum crusgalli L. Sp. Pl. 56. 1753. "Habitat in Europae, Virginiae cultis." The type of *Panicum crusgalli* was discussed in an earlier paper.¹ The only specimen in the Linnaean Herbarium upon which Linnæus has written the name is a sheet

¹ Hitchcock, Types of American grasses. Contr. U. S. Nat. Herb. 12: 117. 1908.

from Kalm collected in Canada. This specimen was, in the paper mentioned, considered to be the type. A reconsideration of the subject leads me to the conclusion that the name was applied to a concept rather than to a specimen or specimens and that the basis of this concept was the species as generally known in Europe. The Kalm specimen is about the same form as the type of *Panicum muricatum* Michx. The application of the name *crusgalli* is not altered by the elimination of this Kalm specimen as a type. In the first edition of the *Species Plantarum* Linnaeus describes *Panicum crusgalli* and also a variety β , and gives as the habitat "in Europae, Virginiae cultis." This treatment is followed in the second edition, where he states that "Varietas β . aristis decies glumis longioribus manifeste a communi planta cui vix sesquilingiores aristae, differt." In my remarks on types of American grasses,¹ I showed that the basis of variety β was a specimen of *Echinochloa walteri* from Gronovius (*Clayton* 579). From Linnaeus's note concerning variety β , quoted above, it would appear that the common form, as understood by Linnaeus, had awns about 5 mm. long.

Panicum cruscervi L. *Syst. Nat.* ed. 10. 2: 870. 1759. No locality is given. In a later work² the habitat is given as "in Indiis." This is usually referred to *Panicum crusgalli*, in works on the Asiatic flora.

Milium crusgalli Moench, *Meth. Pl.* 202. 1794. Based on *Panicum crusgalli* L.

Panicum grossum Salisb. *Prodr. Stirp.* 18. 1796. Based on *Panicum crusgalli* L. The text of the *Prodromus* is a mere list. This species appears as follows: "Grossum. 6. P. [*Panicum*] *Crus Galli* Linn. *Sp. Pl.* ed. 2. p. 83."

Panicum muricatum Michx. *Fl. Bor. Amer.* 1: 47. 1803. Not *Panicum muricatum* Retz. 1786. "Hab. in Canada ad ripas lacus Champlain et ad lacum Ontario." The type, labeled "Lac. Champlain," was examined at the Paris Herbarium.³ This form is maintained as a distinct species by Fernald, as indicated below under *Echinochloa muricata*. The trichomes on the second glume and sterile lemma are coarse and arise from large papillae.

Echinochloa crusgalli Beauv. *Ess. Agrost.* 53, 161. 1812. Based on *Panicum crusgalli* L.

Panicum crusgalli var. *aristatum* Pursh, *Fl. Amer. Sept.* 66. 1814. No locality given, but probably from eastern United States. The long awned form.

Panicum pungens Poir. in *Lam. Encycl. Suppl.* 4: 273. 1816. Based on *Panicum muricatum* Michx. "non *Lam. Dict.*"

Setaria muricata Roem. & Schult. *Syst. Veg.* 2: 495. 1817. Based on *Panicum muricatum* Michx.

Echinochloa crusgalli var. *aristata* S. F. Gray, *Nat. Arr. Brit. Pl.* 2: 158. 1821. Described from Great Britain, no definite locality given. The long-awned form.

Oplismenus crusgalli Dum. *Obs. Gram. Belg.* 138. 1823. Based on *Panicum crusgalli* L.

Orthopogon crusgalli Spreng. *Syst. Veg.* 1: 307. 1825. Based on *Panicum crusgalli* L.

Oplismenus muricatus Kunth, *Rév. Gram.* 1: 44. 1829. Based on "*Panicum muricatum* Michx."

Echinochloa muricata Fernald, *Rhodora* 17: 106. 1915. Based on *Panicum muricatum* Michx. Fernald distinguishes *Echinochloa muricata* from *E. crusgalli* by the stiff hairs arising from papillae upon the spikelets and maintains that the former is a native of the United States while the latter, in which the hairs lack the papillose base, is introduced in this country. I have been unable to distinguish *E. muricata* on this basis, as both forms occur in Europe and the two appear to me to intergrade.

There are other synonyms in works on the floras of the Old World.

¹ *Contr. U. S. Nat. Herb.* 12: 117. 1908.

² *Sp. Pl.* ed. 2. 84. 1762.

Contr. U. S. Nat. Herb. 12: 146. 1908.



FIG. 30.—*Echinochloa crusgalli*. From *Somes 3725*, Iowa.

DESCRIPTION.

Plants annual; culms erect or sometimes decumbent at base, as much as 1 meter or even 1.5 meters tall, glabrous; sheaths glabrous; ligule wanting, the ligular area sometimes slightly pubescent; blades 5 to 15 mm. wide, scabrous on the margins, sometimes on the upper surface; panicles erect (or nodding), 10 to 20 cm. long, the axis scabrous; racemes spreading, ascending, or appressed, the lower somewhat distant, as much as 10 cm. long, sometimes branched, the upper approximate, shorter, the rachis scabrous, hispid, especially at the base; spikelets crowded, about 3 mm. long, excluding the awns, strongly hispid or papillose-hispid on the nerves, hispidulous on the internerves; sterile lemma with a well-developed palea, neuter, the awn variable in length, mostly 5 to 10 mm. long on at least a part of the spikelets, sometimes as much as 3 cm. long; fruit elliptic, turgid, narrowed into a cusp or point, 2.5 to 3 mm. long, whitish or brownish.

In America the species may be divided into three geographical races. These are fairly distinct over a certain range, but overlap and intergrade to such an extent that they can not be recognized as distinct species. The three races were originally described as *Panicum crusgalli* L., *Oplismenus crus-pavonis* H. B. K., and *O. zelayensis* H. B. K., respectively. The first is a native of the Old World and also of the eastern United States. The second is found in Brazil and extends north into Mexico and the West Indies. The third has its center of distribution on the Mexican plateau and extends into the southwestern United States. However, there are many specimens in our herbaria that can not be definitely assigned to any one of these forms. Hence in the distribution given under each race the placing of some of the specimens under a given subspecies is arbitrary.

European botanists generally distinguish two forms of the first race, *Panicum crusgalli*, a long-awned and a short-awned, and recent works generally apply the varietal names, *longiaristata* to the first, and *breviaristata* to the second. Ascherson and Graebner,¹ whose recent work is representative for Europe, include the two forms under *Panicum* as *P. crusgalli longiaristatum* Doell² and *P. crusgalli breviaristatum* Doell.²

Pursh³ first distinguished the forms in America as *Panicum crusgalli* var. *aristatum* and *P. crusgalli* var. *mitis*.

The robust form with large compound panicle of short-awned or merely pointed spikelets may look very distinct, but the intergrades are so numerous that it can scarcely receive recognition as a variety. For the sake of convenience it is here segregated as a variety and the specimens of *Echinochloa crusgalli* are more or less arbitrarily assigned to the two forms, the awned under *Echinochloa crusgalli*, the nearly awnless under *E. crusgalli mitis*.

A third form of the first race, originally described as *Panicum frumentaceum* Roxb., is rather more distinct because, being cultivated, the slight differences are perpetuated.

DISTRIBUTION.

Moist open ground, ditches, cultivated fields, and waste places, New Brunswick to Washington, south to Florida and California; warmer parts of the Eastern Hemisphere. The following specimens are referred to the typical or awned form; some of them, however, approach variety *mitis*, but at least a part of the spikelets have awns as much as 3 mm. long. Commonly known as barnyard grass.

NEW BRUNSWICK: Shediac Cape, Hubbard 755, 763.

QUEBEC: Oka, Victorin 3022.

ONTARIO: Amherstburgh, Macoun 26319. Kingston, Fowler in 1897 and 1905. Galt, Herriot in 1908. Iarna, Dodge 129.

MANITOBA: Branchon, Macoun 13226.

¹ Syn. Mitteleur. Fl. 2: 69. 1898.

³ Fl. Amer. Sept. 66. 1814.

² Fl. Bad. 1: 232. 1857.

- MAINE: Orono, *Briggs* 6; *Harvey* 1200. Manchester, *Scribner* in 1873. Cumberland, *Chamberlain* 153. Westbrook, *Ricker* 679.
- NEW HAMPSHIRE: Shelburne, *Deane* in 1915.
- VERMONT: Manchester, *Day* 272. Rutland, *Kirk* 1024.
- MASSACHUSETTS: Nantucket, *F. N. Vasey* in 1897. Winchendon, *Pollard* in 1895. Stoughton, *Blake* 4639. Dennis, *Weatherby* 3827.
- CONNECTICUT: Stratford, *Eames* in 1894. South Glastonbury, *Wilson* 1259.
- RHODE ISLAND: Providence, *Battey*.
- NEW YORK: Oxford, *Coville* in 1884. Clove, *Standley & Bollman* 12166, 12189. Oneida Lake, *Haberer* 1259a. Greenport, *Latham* 318.
- NEW JERSEY: New Durham, *Kearney* in 1894. Camden, *Parker*. Califon, *Fisher* in 1901. Atlantic City, *Scribner* in 1895.
- PENNSYLVANIA: Easton, *Porter* in 1895. Harrisburg, *Small* in 1888.
- OHIO: Olena, *Jennings* 6759. Albion, *Ashcroft* in 1897.
- INDIANA: Lafayette, *Dorner* 51. Pennville, *Deam* 23815. Middlebury, *Deam* 23967. Spencer, *Deam* 23878. Pimento, *Deam* 22195.
- ILLINOIS: Chicago, *Nelson* in 1898; *Umbach* in 1898. Emington, *Wilcox* 120. Wady Petra, *V. H. Chase* 95, 1163.
- MICHIGAN: Alma, *Davis* in 1895. Detroit, *Farwell* in 1902. Port Huron, *Dodge* 110.
- WISCONSIN: Camp Douglas, *Mearns* 772. Madison, *Churchill* in 1893. Milwaukee, *Chase* 1954.
- MINNESOTA: Duluth, *Hitchcock* 5087.
- NORTH DAKOTA: Fargo, *Waldron & Manns* in 1901. Churchs Ferry, *Brannon* 56. Leeds, *Lunell* in 1901.
- SOUTH DAKOTA: Grindstone Buttes, *Griffiths* 750. Frankfort, *Griffiths* 58b. Deep Creek, *Griffiths* 315.
- IOWA: Moscow, *Somes* 3471. Manchester, *Ball* 1006. Ledyard, *Pammel* 886. Mid River, *Somes* 3725. Ames, *Ball* 31. Mount Pleasant, *Ball* 19. Fayette County, *Fink* 327.
- NEBRASKA: Rat Lake, *Thomson* 60. Weeping Water, *Williams* 3011, 3012. Ewing, *Bates* 1124, 1125.
- MISSOURI: Clarksville, *Davis* 1119. Aberdeen, *Davis* 945. La Grange, *Davis* 1060. Hannibal, *Davis* 1043. Springfield, *Standley* 8485. St. Louis, *Eggert* 231.
- KANSAS: Osborne City, *Shear* 229. Riley County, *Norton* 574, 884, 884b; *Kellerman* 51.
- DELAWARE: Mount Cuba, *Commons* 221.
- MARYLAND: Mattawoman Creek, *Tidestrom* 7210. Chesapeake Beach, *Chase* 6995. Patuxent River, *Shull* 277. Takoma Park, *Chase* 7532.
- DISTRICT OF COLUMBIA: *Pollard* 520, 683; *Topping* in 1895; *Ward* in 1876; *Steele* in 1896.
- VIRGINIA: Four-mile Run, *Chase* 2670. Marion, *Small* in 1892. Princess Anne County, *Kearney* 2187. Portsmouth, *Noyes* 71. Glen Carlyn, *Dewey* 322. Arlington, *Amer. Gr. Nat. Herb.* 427.
- WEST VIRGINIA: Sweet Springs, *Steele* 210.
- NORTH CAROLINA: Biltmore, *Biltmore Herb.* 809a. Waynesville, *Standley* 5593. Swayney, *Mooney* in 1913.
- SOUTH CAROLINA: Oconee County, *Anderson* 1533. Jacksonboro, *Metcalf* in 1905.
- GEORGIA: Lafayette, *Harper* 343.
- FLORIDA: Fort Myers, *J. P. Standley* 357a; *Standley* 12960; *Hitchcock* 476. Manatee, *Tracy* 7754. Orange County, *Fredholm* 5455. Lake City, *Bitting* 15, 804, 1031, 1036. Eustis, *Nash* 979. Miami, *Hitchcock* 638, 698, 716; *Pollard & Collins* 249. Jensen, *Hitchcock* 746. New Smyrna, *Curtiss* 5823. Bartow, *Combs* 1236. Homosassa, *Combs* 923. Grasmere, *Combs* 1167. Dunnellon, *Combs* 913. Palm Beach, *Hitchcock* 2561. Hillsborough County, *Fredholm* 6342, 6390. Orange County, *Fredholm* 5455.

- TENNESSEE: Knoxville, *Ruth* 62. Wolf Creek Station, *Kearney* in 1897.
- MISSISSIPPI: Starkville, *Tracy* in 1889. Waynesboro, *Kearney* 197.
- LOUISIANA: Houma, *Wurzlów*. Crowley, *Webb* in 1913. Breton Island, *Tracy & Lloyd* 480. Calhoun, *Ball* 72. Cameron, *McAtee* 1902.
- TEXAS: Guadalupe River, *Groth* 179. Houston, *Fisher* 199. Del Rio, *Hitchcock* 13632. Big Spring, *Hitchcock* 13399. Madison County, *Dixon* 443. Clarksville, *Plank* 12. El Paso, *Hitchcock* 13340. San Antonio, *Amer. Gr. Nat. Herb.* 428. Brownsville, *Hitchcock* in 1904. Western Texas, *Wright* 974.
- OKLAHOMA: False Ouachita, *Palmer* 378, 379a. Lincoln County, *Blankinship* in 1895.
- MONTANA: Ulm, *Williams* 591.
- WYOMING: Little Missouri Buttes, *Griffiths* 599. Newcastle, *Griffiths* 679.
- IDAHO: Boise, *Clark* 308. St. Anthony, *Merrill* 55. Pocatello, *Hitchcock* 1841. New Plymouth, *Macbride* 713. Salmon, *Henderson* 3937. Forest, *Brown* 20.
- WASHINGTON: Waitsburg, *Horner* 527. Alma, *Elmer* 530. Prosser, *Cotton* 641, 892. Klickitat County, *Suksdorf* 2329. Bingen, *Suksdorf* 2639.
- OREGON: Portland, *Suksdorf* 1742. Paisley, *Elder* 22. Wasco County, *Leiberg* 866. Clarks Creek, *Sheldon* 8863. Klamath Falls, *Hitchcock* 2961. Hood River, *Hitchcock* in 1903. Southeastern Oregon, *Griffiths & Morris* 867, 892, 894.
- COLORADO: Grand Junction, *Hitchcock* 2197. Canon City, *Shear* 962. Meadow Park. *Shear* 602. Durango, *Tweedy* 377. Alamosa, *Shear* 863.
- UTAH: Ephraim, *Tidestrom* 2483.
- NEVADA: Battle Mountain, *Hitchcock* 10598. Leonard Creek Ranch, *Griffiths & Morris* 352. Wadsworth, *Griffiths & Hunter* 549. Big Creek, *Griffiths & Morris*, 186.
- NEW MEXICO: Cedar Hill, *Standley* 7937. Without locality, *Wright* 2089.
- ARIZONA: Winslow, *Griffiths* 5018. Walnut Canyon, *MacDougal* 353. Prescott, *Hitchcock* 13192, 13193; *Amer. Gr. Nat. Herb.* 429.
- CALIFORNIA: Biggs, *Johnson* 149. Van Sickle Island, *Kennedy* in 1914. Wrights, *Elmer* 5008. Oroville, *Brown* 114. Visalia, *Coville & Funston* 1277. Sutler Creek, *Braunton* 1130. Stockton, *Davy* 1180. Guerneville, *Davy* in 1896. Napa County, *Bolander* 2419. Amador, *Hansen* 820. Stuarts, *Yates* 515. Yreka, *Butler* 865. Eureka, *Tracy* 4634.
- URUGUAY: Montevideo, *Arechavaleta*.

***Echinochloa crusgalli mitis* (Pursh) Peterm.**

Panicum crusgalli var. *mite* Pursh, Fl. Amer. Sept. 66. 1814. Described from eastern United States, no definite locality given. The short-awned or awnless form.

Panicum crusgalli var. *purpureum* Pursh, Fl. Amer. Sept. 66. 1814. A form of the last with purple spikelets.

Panicum crusgalli var. *muticum* Ell. Bot. S. C. & Ga. 1: 114. 1816. Described from South Carolina or Georgia, but no definite locality given. Spikelets acuminate. The awnless form common in the eastern states.

Echinochloa crusgalli var. *mitis* Peterm. Fl. Lips. 82. 1838. Based on *Panicum crusgalli* var. *mite* Pursh.

Panicum scindens Nees; Steud. Syn. Pl. Glum. 1: 47. 1854. "St. Louis." The type, in the Berlin Herbarium, was collected by Drummond in 1831. It is the nearly awnless form with rather small panicles, the lower racemes spreading.

DESCRIPTION.

Differs from the typical form in having the spikelets awnless or nearly so, the awns being less than 3 mm. long. In the Southwest this form passes into *E. crusgalli zelayensis*. A specimen from San Antonio, Texas, has scabrous sheaths (*Hitchcock* 5141).

DISTRIBUTION.

Moist places, Massachusetts to British Columbia, south to Florida, California, and northern Mexico.

ONTARIO: Toronto, *Macoun* 26318. Galt, *Herriot* 73, 82.

BRITISH COLUMBIA: Agassiz, *Macoun* 4.

MASSACHUSETTS: Pittsfield, *Harrison* 21.

NEW YORK: South Bay, *Haberer* 3303. Staten Island, *Kearney* in 1894.

PENNSYLVANIA: Philadelphia, *Smith*.

OHIO: Oberlin, *Ricksecker* in 1894.

MICHIGAN: Detroit, *Farwell* in 1902. Marquette, *Farwell* in 1902.

MINNESOTA: Fort Snelling, *Mearns* 39.

NORTH DAKOTA: Fargo, *Wright* 1864. Leeds, *Lunell* in 1915.

SOUTH DAKOTA: Huron, *Griffiths* 14, 771, 773. Bellefourche, *Griffiths* 373. Frankfort, *Griffiths* 58a. Aberdeen, *Griffiths* 108. Pierre, *Griffiths* 763. Jamesville, *Bruce* 5. Sonoma, *Griffiths* 351. Hot Springs, *Rydberg* 1101.

IOWA: Kossuth County, *Pammel & Cratty* 791.

NEBRASKA: Whitman, *Rydberg* 1643. Rat Lake, *Thomson* 159. Blue Lake, *Thomson* 310. South Cody Lake, *Thomson* 249. Chelsea, *Clements* 2984. Mullen, *Rydberg* 1590. Forest Station, *Hitchcock* 11067.

MISSOURI: Springfield, *Standley* 1557, 9047, 9764.

KANSAS: Hutchinson, *Smyth* 8. Riley County, *Norton* 884a. Osborne, *Shear* 169. Grant County, *Hitchcock* 573. Syracuse, *Thompson* 131.

DELAWARE: Slaughter Beach, *Commons* 222.

DISTRICT OF COLUMBIA: *Sudworth* in 1890.

NORTH CAROLINA: Magnetic City, *Wetherby* 20.

GEORGIA: Macon, *McCarthy* in 1888.

FLORIDA: Palm Beach, *Hitchcock* 2562.

MISSISSIPPI: Woodville, *Phares* in 1878. Starkville, *Kearney* 7. Panola County, *Eggers* 124.

LOUISIANA: Burnside, *Combs* 1418. Alexandria, *Ball* 176; *Hale*. Marksville, *McAtee* 2186.

TEXAS: San Antonio, *Hitchcock* 5323. El Paso, *Hitchcock* 13331; *Barlow* in 1911. Del Rio, *Hitchcock* 13644. Brownsville, *Hitchcock* 5422. Bastrop, *Plank* 36. Rio-grande, *Griffiths* 6470. College Station, *Hitchcock* in 1903. Western Texas, *Wright* 796.

WYOMING: Ten Sleep, *Williams* 2816. Cumins, *Nelson* 1500. Newcastle, *Griffiths* 679. Platte Canyon, *Nelson* 2748. Buffalo, *Chase* 5266. Devils Tower, *Griffiths* 520. Uva, *Nelson* 8567.

WASHINGTON: Bingen, *Suksdorf* 2639, 2826.

OREGON: John Day Ferry, *Leiberg* 872. Portland, *Suksdorf* 1682. Southeastern Oregon, *Griffiths & Morris* 657.

COLORADO: Rocky Ford, *Griffiths* 3310. Golden, *Rydberg* 2503. Durango, *Shear* 1255. Dry Creek, *Nelson* 8207.



FIG. 31.—*Echinochloa crusgalli mitis*. From *Pammel & Cratty* 791, Iowa.

UTAH: Ephraim, *Hitchcock* 10968. Provo, *Tidestrom* 1740. Cainville, *Jones* 5696. Vermilion, *Jones* 5845. Gunnison, *Tidestrom* 2952; *Ward* 678.

NEVADA: Truckee Valley, *Bailey* 1351.

NEW MEXICO: Dog Spring, *Mearns* 2409. Strauss, *Stearns* 402. Roswell, *Griffiths* 5729. Shiprock Agency, *Standley* 7218. Mesilla, *Wooton* 36; *Standley* 422; *Hitchcock* 3817. White Mountains, *Wooton & Standley* 3578. Mangas Springs, *Metcalf* 728. Albuquerque, *Harward* 2, 3. Artesia, *Hitchcock* 13440. Kingston, *Metcalf* 1351. Deming, *Hitchcock* 3759. Carlsbad, *Hitchcock* 13491.

ARIZONA: Fort Huachuca, *Wilcox* 2547. Moki Reservation, *Hough* 108. Prescott, *Fernow* in 1896. Chiricahua Mountains, *Blumer* 1782. Horseshoe Bend, *Palmer* 749. Tucson, *Toumey* 780. Patagonia, *Hitchcock* 3666.

CALIFORNIA: Oro Fino, *Butler* 490. Piedmont, *Davy* in 1897. Pine Grove, *Hansen* 601. Redding, *Smith* 745. San Bernardino, *Parish* in 1890.

SONORA: Hermosillo, *Hitchcock* 3599.

CHIHUAHUA: Pacheco, *Nelson* 6244. Southwestern Chihuahua, *Palmer* 18 in 1885.

DURANGO: Durango, *Palmer* 466 in 1896.

COAHUILA: Saltillo, *Hitchcock* 5606.



FIG. 32.—*Echinochloa crusgalli edulis*. From *Piper* in 1912 Texas.

***Echinochloa crusgalli edulis*
Hitche.**

Panicum frumentaceum Roxb. Fl Ind. 1: 307. 1820. Not *Panicum frumentaceum* Salisb. 1796. "This I have only found in a state of cultivation." Described from India, but no definite locality given.

Echinochloa frumentacea Link, Hort. Berol. 1: 204. 1827. Based on *Panicum frumentaceum* Roxb.

Oplismenus frumentaceus Kunth, Rév. Gram. 1: 415. 1829. Based on *Panicum frumentaceum* Roxb.

Echinochloa crusgalli frumentacea W. F. Wight, Suppl. Cent. Dict. 810.

1909. Without description, but presumably based on *Panicum frumentaceum* Roxb. *Echinochloa crusgalli edulis* Hitche., U. S. Dept. Agr. Bull. 772: 238. 1920.

DESCRIPTION.

Differs from the typical form in having dense panicles, the racemes thick, appressed, incurved; spikelets awnless, mostly purple; fruits pale, usually exposed before maturity, contrasting with the purple glumes.

In the United States this is sometimes cultivated as a forage grass under the name Japanese barnyard millet. For a time it was exploited under the name billion-dollar grass. In India the seed is used for human food.

DISTRIBUTION.

Escaped from cultivation in several localities in the eastern United States.

NEW HAMPSHIRE: Shelburne, *Amer. Gr. Nat. Herb.* 430.

VERMONT: Burlington, *Hitchcock* 16028.

CONNECTICUT: Salisbury, *Bissell* in 1906.

NEW JERSEY: Califon, *Fisher* in 1901.

ILLINOIS: Catlin, *Lansing* 3507.

MICHIGAN: Cass County, *Darlington* in 1917.

DISTRICT OF COLUMBIA: *Ball* in 1900.

NORTH CAROLINA: West Raleigh, *Coit* 1294.

ALABAMA: Tuskegee, *Hitchcock* in 1904.

TEXAS: Eastern Texas, *Piper* in 1910.

Echinochloa crusgalli zelayensis (H. B. K.) Hitchc.

Oplismenus zelayensis H. B. K. Nov. Gen. & Sp. 1: 108. 1816. "Crescit in alta planitie montana regni Mexicani, prope Zelaya, Queretaro et Patzcuaro, in humidis." The specimen from Pátzcuaro is in the Paris Herbarium. This is the form, common in Mexico and southwestern United States, in which the panicle is erect and simple, the racemes short and appressed, and the spikelets nearly awnless.

Echinochloa zelayensis Schult. Mant. 2: 269. 1824. Based on *Oplismenus zelayensis* H. B. K.

Panicum zelayense Steud. Nom. Bot. ed. 2. 2: 265. 1841. Based on *Oplismenus zelayensis* H. B. K.

Panicum crus-pici Willd.; Doell in Mart. Fl. Bras. 2²: 143. 1877. A herbarium name mentioned as a form of *Panicum crusgalli*. There are two sheets so named in the Willdenow Herbarium, one with short-awned and one with long-awned spikelets. The former is the specimen referred to by Doell.

Echinochloa crusgalli zelayensis Hitchc. U. S. Dept. Agr. Bull. 772: 238. 1920.

DESCRIPTION.

Differs from *E. crusgalli mitis* in having mostly simple, more or less appressed racemes, the spikelets less strongly hispid, not papillose, usually green.

DISTRIBUTION.

Moist, often alkaline places, Oklahoma to Oregon, south through Mexico to Colombia and Argentina.

TEXAS: El Paso, *Chase* 5888; *Havard* in 1882;

Hitchcock 13329, 13330. Big Spring, *Tracy* 8291. Houston, *Hall* 836. Hockley, *Thurrow* in 1898. Cypress, *Thurrow* in 1898. Bastrop, *Plank* 38. Richmond, *Plank* 9. Chillicothe, *Ball* 973. Seguin, *Plank* 98. Eagle Pass, *Havard* 82.

OKLAHOMA: Without locality, *Stevens* 1178.

OREGON: Southeastern Oregon, *Griffiths & Morris* 893. Portland, *Sheldon* 10929.

COLORADO: Golden, *Shear* 753, 2502.

UTAH: Ogden, *Hitchcock* 10879. Salt Lake City, *Jones* in 1879. Green River, *Tracy* in 1887.

NEW MEXICO: Mesilla, *Hitchcock* 3828. Cloudcroft, *Hitchcock* 13298. Carlsbad, *Hitchcock* 13492. Grant County, *Blumer* 132. Pecos, *Standley* 5016. Ojo Caliente, *Wooton* 2968. Las Cruces, *Wooton* 1072; *Hitchcock* in 1903. Albuquerque, *Jones* 4125. Farmington, *Standley* 7030. Cimarron Canyon, *Griffiths* 5552. Cedar Hill, *Standley* 7936. Without locality, *Wright* 2088.



FIG. 33.—*Echinochloa crusgalli zelayensis*. From *Mearns* 744, Mexico.

- ARIZONA: San Bernardino Ranch, *Mearns* 744. San Pedro River, *Mearns* 1120. Carrizo Mountains, *Standley* 7494. Winslow, *Griffiths* 5035. Fort Verde, *MacDougal* 614. Opposite Black Point (California), *Jepson* in 1912. Prescott, *Hitchcock* 13180. Benson, *Griffiths* 1993. Papago Reservation, *Griffiths* 1651. Fairbank, *Griffiths* 1970. Tucson, *Griffiths* 1616.
- CALIFORNIA: Ione, *Braunton* 1241. Lake Tahoe, *Hitchcock* in 1901. Threerivers, *Jepson* 4717. Rockwood, *Parish* 8340. Fort Yuma, *Parish* 8233. Imperial Valley, *Parish* 8085; *Wales* 13. Kern County, *Hilgard* in 1895. Merced, *Hitchcock* 3212. Death Valley, *Coville & Funston* 242.
- SONORA: Colorado River, *Palmer* 950 and 951 in 1889.
- CHIHUAHUA: Casas Grandes, *Townsend & Barber* 353.
- DURANGO: Torreón, *Hitchcock* 7725. Durango, *Hitchcock* 7565, 7566; *Palmer* 252 in 1896.
- COAHUILA: Saltillo, *Palmer* 380 in 1898; *Hitchcock* 5600, 5607, 5612.
- ZACATECAS: Zacatecas, *Hitchcock* 7526.
- AGUASCALIENTES: Aguascalientes, *Hitchcock* 7442, 7486.
- SAN LUIS POTOSÍ: San Luis Potosí, *Hitchcock* 5655.
- JALISCO: Oroasco, *Hitchcock* 7385. Guadalajara, *Hitchcock* 7310, 7314; *Palmer* 430 in 1886. Colotlán, *Rose* 3606.
- GUANAJUATO: Acámbaro, *Hitchcock* 6935. Irapuato, *Hitchcock* 7387, 7398, 7399; 7421. Guanajuato, *Duges* in 1897.
- QUERÉTARO: Querétaro, *Hitchcock* 5820, 5835, 5850, 5851, 5867; *Arsène* 10264; *Basile* 36, 54.
- MICHOACÁN: Morelia, *Arsène* in 1910.
- MEXICO: Mexico, *Bourgeau* 236, 680; *Pringle* 9585; *Orcutt* 4105; *Hitchcock* 5894.
- PUEBLA: Cholula, *Nicolás* in 1910. Tehuacán, *Hitchcock* 6061.
- VERACRUZ: Orizaba, *Hitchcock* 6326; *Müller* 2049. Pital, *Liebmann* 377.
- OAXACA: Oaxaca, *Hitchcock* 6175, 6181.
- MEXICO (Republic of): Without locality, *Liebmann* 386.
- GUATEMALA: Guatemala City, *Hitchcock* 9098.
- COSTA RICA: San José, *Jiménez* 926; *Cooper* 5992; *Tonduz* 3016; *Pittier* 229. Cartago, *Cooper* 144; *Tonduz* 10754. San Marcos, *Tonduz* 7530. Alajuelita, *Tonduz* 8825.
- COLOMBIA: Palmira, *Pittier* 817.
- BOLIVIA: Coripati, *Bang* 2108.
- ARGENTINA: General Roca, *Fischer* 274.

Echinochloa crusgalli crus-pavonis (H. B. K.) Hitchc.

Oplismenus crus pavonis H. B. K. Nov. Gen. & Sp. 1: 108. 1816. "Crescit in apricis calidissimis Provinciae Cumanensis prope Bordones." The type, in the Paris Herbarium, has awns mostly 5 to 10 mm. long. The specific name is written as two words.

Panicum sabulicolum Nees, Agrost. Bras. 258. 1829. "Habitat in arenosis Parae (Sieber). Vidi in Herb. Willd.—In Monte Video, et in confinibus Regni Paraguayani legit Sellow. (Herb. Reg. Berol.)." The Sieber specimen (the name in a slightly different form) has been examined in the Willdenow Herbarium. The Sellow specimen has been examined at the Berlin Herbarium. This is the same form as *Oplismenus crus-pavonis*.

Panicum crus-pavonis Nees, Agrost. Bras. 259. 1829. Based on *Oplismenus crus-pavonis* H. B. K. Nees describes a variety α with short awns as in *Oplismenus crus-pavonis*, and a variety β , with long awns. The type of the latter, from the Rio Negro, has awns 15 to 20 mm. long.

Echinochloa composita Presl; Nees, Agrost. Bras. 259. 1829, as synonym of *Panicum crus-pavonis*. It was not published by Presl. The specimen, in the German University at Prague, was collected at Acapulco by Haenke. It is about the same form

as the type of *Oplismenus crus-pavonis*, but the racemes are not so compact; the awns are 2 to 5 mm. long.

Panicum aristatum Macfad. Bot. Misc. Hook. 2: 115. 1831. This was described in a footnote to an article entitled, "Sketch of a short botanical excursion in Jamaica." The grass was found in the vicinity of Spanish Town. The type specimen, in the Kew Herbarium, is the form described under *Oplismenus crus-pavonis*.

Oplismenus jamaicensis Kunth, Enum. Pl. 1: 147. 1833. Based upon *Panicum aristatum* Macfad. and referred to *Oplismenus* with a query.

Panicum jamaicense Steud. Nom. Bot. ed. 2. 2: 257. 1841. Based upon *Oplismenus jamaicensis* Kunth.

Panicum horridum Salzm.; Steud. Syn. Pl. Glum. 1: 47. 1854. A herbarium name of a Salzmann specimen from Bahia, Brazil, given as synonym of *Panicum crusgalli* L. Since *Echinochloa crusgalli* itself is rare in South America and the subspecies *crus-pavonis* is common, the plant is probably the subspecies.

Panicum crusgalli var. *sabulicola* Doell in Mart. Fl. Bras. 2²: 142. 1877. Based on *Panicum sabulicola* Nees.

Oplismenus angustifolius Fourn. Mex. Pl. 2: 40. 1886. "Vera Cruz (GOUIN n. 54)." The type specimen, in the Paris Herbarium, is the form with awns 1 to 2 cm. long.

Echinochloa sabulicola Hitchc. Contr. U. S. Nat. Herb. 17: 257. 1913. Based on *Panicum sabulicola* Nees.

DESCRIPTION.

Differs from the typical form in having nodding, rather soft panicles, the spikelets averaging smaller, less strongly hispid, the awn variable in length, but usually not over 1 cm. long.

DISTRIBUTION.

Marshes and wet places, often in the water, Texas and the West Indies south to Bolivia and Argentina. Apparently native in tropical America.

TEXAS: Pierce, Tracy 7743.

LOWER CALIFORNIA: La Paz, Palmer 130 in 1890.

CHIHUAHUA: Casas Grandes, Nelson 6355a.

SINALOA: Culiacán, Palmer 1790 in 1891.

DURANGO: Durango, Palmer 730 in 1896.

COAHUILA: Jaral, Schumann 1738. Saltillo, Palmer 418 in 1898.

JALISCO: Guadalajara, Palmer 430 and 430a in 1886; Hitchcock 7351. Orosco, Hitchcock 7373.

GUANAJUATO: Acámbaro, Hitchcock 6949. Irapuato, Hitchcock 7420.

QUERÉTARO: Querétaro, Basile 30, 31; Arséns 10280; Hitchcock 5810, 5852, 5866.



FIG. 34.—*Echinochloa crusgalli crus-pavonis*. From Sintenis 1889, Porto Rico.

- MICHOACÁN: Zamora, *Pringle* 8480. Morelia, *Holway* 3591. Maravalio, *Hitchcock* 6923.
- MEXICO: Valley of Mexico, *Pringle* 8572, 9606; *Hitchcock* 5879; *Bourgeau* 530.
- VERACRUZ: Córdoba, *Hitchcock* 6452. Monte Pacha, *Liebmann* 385. Veracruz, *Smith* 1329. Orizaba, *Botteri* 161, 718; *Hitchcock* 6344.
- MORELOS: Cuernavaca, *Hitchcock* 6849.
- GUATEMALA: Cobán, *Türckheim* 1287, 3827.
- COSTA RICA: Nuestro Amo, *Jiménez* 527. San José, *Hitchcock* 8453; *Pittier* 382.
- PANAMA: Chagres, *Fendler* 365. Ancón, *Celestine* 18. Balboa, *Hitchcock* 7999. Pedro Miguel, *Hitchcock* 7958; *Pittier* 2508.
- BERMUDA: *Brown, Britton & Russell* 1961; *Collins* 343.
- CUBA: Yumurí Mountains, *Rugel* 884. Habana, *Léon* 747, 2785. Without locality, *Wright* in 1865; *Rugel* 889; *Liebmann* 378.
- JAMAICA: Savanna-la-Mar, *Hitchcock* 9862. Black River, *Hitchcock* 9650. Grosmond Marsh, *Harris* 11751. Meylersfield, *Harris* 11824.
- PORTO RICO: Lares, *Chase* 6596. Humacao, *Sintenis* 1889. San Juan, *Chase* 6352, 6396. Canovanas, *Stevenson* 5388. Rio Piedras, *Stevenson & Rose* 6428. Without locality, *Eggers* 685.
- LEEWARD ISLANDS: Guadeloupe, *Duss* 3161.
- TRINIDAD: *Bot. Gard. Herb.* 1678.
- BRITISH GUIANA: Without locality, *Jenman* 5991; *Schomburgk* 151.
- BRAZIL: Minas Geraes, *Regnell* 1374. Campinas, *Campos Novaes* 1250, 1251. São Paulo, *Löfgren* 1539, 2787. Paraná, *Dusen* 7910. Without locality, *Capanema* 5398½; *Jard. Bot.* 145; *Glaziou* 16616.
- PARAGUAY: Pilcomayo River, *Morong* 963; *Rojas* 55, 55a. Central Paraguay, *Morong* 539, 743.
- URUGUAY: Without locality, *Arechavaleta*.
- BOLIVIA: Tarija, *Fries* 1102. Coripati, *Bang* 2108.
- ARGENTINA: Misiones, *Ekman* 606, 606a, 607. Catamarca, *Jorgensen* 1399, 1651. Without locality, *Stuckert* 13872.

7. *Echinochloa colonum* (L.) Link.

Panicum colonum L. Syst. Nat. ed. 10. 2: 870. 1759. No locality is mentioned. In a later work¹ the locality is given as, "Habitat in Indiae cultis." The type specimen in the Linnaean Herbarium² was sent from Jamaica by Patrick Browne. The word "colonum" appears to be a genitive plural.³

Milium colonum Moench, Meth. Pl. 202. 1794. Based on *Panicum colonum* L.

Oplismenus colonus H. B. K. Nov. Gen. & Sp. 1: 108. 1816. Based on *Panicum colonum* L.

Panicum zonale Guss. Fl. Sic. Prodr. 1: 62. 1827. This citation has not been verified. The description refers to the form of *Echinochloa colonum* with zonate leaves.

Oplismenus repens Presl, Rel. Haenk. 1: 321. 1830. "Hab. in Mexico." A part of the type, sent to Trinius from Prague, has been examined in the Trinius Herbarium at Petrograd.

Echinochloa colona Link, Hort. Berol. 2: 209. 1833. Based on *Panicum colonum* L.

Panicum incertum Bosc; Steud. Nom. Bot. ed. 2. 2: 258. 1841. A name only, as synonym of *Panicum colonum* L.

Panicum prorepens Steud. Syn. Pl. Glum. 1: 46. 1854. Based on *Oplismenus repens* Presl.

¹ Sp. Pl. ed. 2. 84. 1762.

² See Hitchcock, Contr. U. S. Nat. Herb. 12: 119. 1908.

³ See Hitchcock, Contr. U. S. Nat. Herb. 17: 256. 1913.

Panicum colonum zonale L. H. Dewey, Contr. U. S. Nat. Herb. 2: 502. 1894. Based on *Panicum zonale* Guss.

Echinochloa colona zonalis Woot. & Standl. N. Mex. Coll. Agr. Bull. 81: 45. 1912. Presumably based on *Panicum zonale* Guss., though no synonym is cited.

Several other synonyms are given in works on European floras.

DESCRIPTION.

Plants annual, the larger ones usually much branched at base; culms prostrate-spreading, ascending, or erect, usually 20 to 40 cm. long, glabrous, compressed; sheaths glabrous, compressed; ligule wanting; blades rather lax, 5 to 10 cm. long, rarely longer, 3 to 6 mm. or rarely as much as 1 cm. wide, somewhat scabrous on the margins, occasionally bearing transverse purple bands (zonate); panicles 5 to 10 or even 15 cm. long, the axis smooth or slightly scabrous; racemes several, 1 to 2 cm. long or rarely longer, appressed or ascending, single or occasionally two approximate, the lower usually distant as much as 1 cm., the rachis triangular-flattened, scabrous; spikelets about 3 mm. long, crowded, nearly sessile, in about 4 rows; second glume and sterile lemma short-pointed but not awned; fruit about 2.5 mm. long, short-pointed.

In this species the spikelets are merely pointed and not awned, but in all other respects it agrees with the concept of the genus.

DISTRIBUTION.

Ditches and moist places in the warmer parts of both hemispheres; introduced in America, where it is a common weed.

NEW JERSEY: On ballast, Camden, *Martindale* in 1879.

PENNSYLVANIA: On ballast, Girard Point, Philadelphia, *Martindale* in 1879.

MISSOURI: Carruthersville, *Hitchcock* in 1904.

VIRGINIA: Virginia Beach, *Kearney* 2049.

NORTH CAROLINA: Eastern North Carolina, *McCarthy* in 1885.

SOUTH CAROLINA: Santee Canal, *Curtiss* 3611. Aiken, *Ravenel* in 1869. Orangeburg, *Amer. Gr. Nat. Herb.* 425.

GEORGIA: Athens, *Harper* 113. Camilla, *Tracy* 4571. Stone Mountain, *Hitchcock* in 1905.

FLORIDA: Marco, *Hitchcock* 475. Alachua County, *Combs* 691, 729. Little River, *Eaton* 472. Monticello, *Combs* 315. Tallahassee, *Kearney* 84; *Nash* 2337; *Combs* 389. Quincy, *Combs* 410. Chipley, *Combs* 539c. Apalachicola, *Biltmore Herb.* 794b. Chattahoochee, *Curtiss* 5999. Milton, *Chase* 4315. Hillsborough County, *Fredholm* 6358.

TENNESSEE: La Vergne, *Eggert* 73. Knoxville, *Ruth* in 1895; *Scribner* in 1889. Nashville, *Gattinger* in 1878; in *Curtiss N. Amer. Pl.* 3583*.

ALABAMA: Birmingham, *Hitchcock* in 1898. Mobile, *Mohr* in 1879; *Kearney* 66. Tuskegee, *Carver* 85. Selina, *McCarthy* in 1888.



FIG. 35.—*Echinochloa colonum*. From *Bentley* in 1899, Texas.

- MISSISSIPPI: Starkville, *Kearney* 17. Agricultural College, *Pollard* 1281.
- ARKANSAS: Pine Bluff, *Eggert* 111. Texarkana, *Heller* in 1898. Northwest Arkansas, *Harvey* 20.
- LOUISIANA: New Orleans, *Waite* in 1885. Shreveport, *Ball* 106. Rayville, *Ball* 6. Alexandria, *Ball* 178. Mount Lebanon, *Ball* 87. Pointe a la Hache, *Langlois* in 1885.
- TEXAS: Corpus Christi, *Heller* 1501; *Hitchcock* 5354. Ennis, *Smith* 18. Kerrville, *Heller* 1923; *Hitchcock* 5319. Laredo, *Sauvignet* in 1892; *Hitchcock* 5511. Fort Worth, *Ruth* 164. San Antonio, *Ball* 950; *Amer. Gr. Nat. Herb.* 426. Brownsville, *Hitchcock* 5423. New Braunfels, *Hitchcock* 5200, 5199. El Paso, *Hitchcock* 7808. Rio Grande, *Griffiths* 6465. Pierce, *Tracy* 7393. Texarkana, *Letterman* in 1894. Comal County, *Groth* 97. Houston, *Hall* 826. Barstow, *Tracy* 8285. Beaumont, *Plank* 21. Abilene, *Bentley* in 1899. Without locality, *Reverchon* 1091.
- WASHINGTON: On ballast, *Linnton*, *Suksdorf* 7401.
- NEW MEXICO: Organ Mountains, *Wooton & Standley* in 1906. Deming, *Hitchcock* 3755. Las Cruces, *Vasey* in 1881.
- ARIZONA: Tucson, *Thorner* 283; *Griffiths* 1518, 1534, 3344. Paradise, *Blumer* 1764, 2268. Patagonia, *Hitchcock* 3683. Santa Rita Mountains, *Griffiths* 7007, 7291. Papago Reservation, *Griffiths* 1655. San Bernardino Ranch, *Mearns* 719, 795. La Noria, *Mearns* 1207.
- CALIFORNIA: Mecca, *Parish* 8101. Imperial, *Parish* 824.
- LOWER CALIFORNIA: 80 miles southeast of San Diego, California, *Palmer* 419 in 1875. Mulejé, *Palmer* 202 in 1887. Santa Agueda, *Palmer* 223 in 1890. San José del Cabo, *Brandegge* 26, 38.
- SONORA: La Colorada, *Clokey* 1916, 1917. Guaymas, *Palmer* 51 in 1887, 202 in 1887; *Hitchcock* 3560. Hermosillo, *Hitchcock* 3580, 3620. Alamos, *Rose* 12984. Yaqui River, *Palmer* 13 and 14 in 1869. Cocospora Ranch, *Griffiths* 6832. Oputo, *Hartman* 189.
- CHIHUAHUA: Santa Eulalia, *Wilkinson* in 1885. Chihuahua, *Hitchcock* 7780. Sánchez, *Hitchcock* 7690.
- SINALOA: Mazatlán, *Rose* 14039. Topolobampo, *Rose* 13265. Rosario, *Rose* 1544, 14574. Culiacán, *Palmer* 1542 in 1891. San Blas, *Rose* 13424.
- DURANGO: Tlahualilo, *Pittier* 478. Durango, *Hitchcock* 7655. Torreón, *Hitchcock* 7552.
- COAHUILA: Saltillo, *Hitchcock* 5592, 5599.
- NUEVO LEÓN: Monterrey, *Hitchcock* 5548.
- TEPIC: Acaponeta, *Rose* 1923, 14250.
- SAN LUIS POTOSÍ: Cárdenas, *Hitchcock* 5750.
- JALISCO: San Nicolás, *Hitchcock* 7224. Río Blanco, *Palmer* 193 in 1886.
- GUANAJUATO: Acámbaro, *Hitchcock* 6941. Irapuato, *Hitchcock* 7413.
- QUERÉTARO: Querétaro, *Hitchcock* 5831.
- COLIMA: Caldras, *Hitchcock* 7020. Colima, *Palmer* 169 in 1897.
- MICHOACÁN: Morelia, *Arsène* in 1909.
- PUEBLA: Tehuacán, *Hitchcock* 6052.
- VERACRUZ: Orizaba, *Bourgeau* 2593; *Hitchcock* 6325. Guitepec, *Liebmann* 383. Veracruz, *Hitchcock* 6569.
- MORELOS: Cuernavaca, *Hitchcock* 6836.
- GUERRERO: Balsas, *Hitchcock* 6802. Iguala, *Rose* 9386.
- OAXACA: Oaxaca, *Hitchcock* 6125. Tomellín, *Hitchcock* 6228; *Rose* 10048.
- YUCATÁN: Izamal, *Gaumer* 2484.
- GUATEMALA: Gualán, *Deam* 6322.
- SALVADOR: La Unión, *Hitchcock* 8793.
- NICARAGUA: Corinto, *Hitchcock* 8741.

- COSTA RICA: Puntarenas, *Hitchcock* 8531. Salinas, *Pittier* 2704. Alajuelita, *Tonduz* 8827. San José, *Pittier* 2830; *Jiménez* 928.
- PANAMA: Corozal, *Pittier* 2184, 6770. New Frijoles, *Pittier* 6837. Empire, *Pittier* 3720, 3723. Culebra, *Hitchcock* 7922. Balboa, *Celestine* 14. Miraflores, *Pittier* 2505.
- BERMUDA: *Brown, Britton & Bisset* 2147; *Collins* 154.
- CUBA: Cienfuegos, *Pringle* 45. Cabañas, *Palmer & Riley* 756. Habana, *Palmer & Riley* 1137; *Léon* 752, 844. Santa María, *Linden* 1814. Manacas, *Léon* 5904. Regla, *Liebmann* 376. Buenaventura, *Wilson* 9320. Guane, *Shafer* 10392. Paso Estancia, *Shafer* 1561. Sierra Guayaba, *Shafer* 13852. Sancti Spiritus, *Shafer* 12152. Santiago de las Vegas, *Baker* 502, 4765; *Hitchcock* 490. Isle of Pines, *Curtiss* 427. Guines, *Léon* 425. Arroyo Apolo, *Léon* 303. Without locality, *Wright* 752.
- JAMAICA: Savoy, *Harris* 11612. Hope Grounds, *Harris* 11241. Halls Delight, *Harris* 11419. Gordon Town, *Hart* 825. Ipswich, *Hitchcock* 9594. Bog Walk, *Hitchcock* 9288. Savanna-la-Mar, *Hitchcock* 9867. Montpellier, *Harris* 11806.
- SANTO DOMINGO: Rincón, *Fuertes* 1274. San Pedro de Macoris, *Rose* 4438. Azua, *Rose* 3950, 4421.
- PORTO RICO: Rio Piedras, *Barrett* 64; *Cowgill* 694. Guanica, *Millspaugh* 732; *Chase* 6530. Mayaguez, *Heller* 4409; *Chase* 6252. Puente Fluco, *Goll* 878. San Antonio, *Goll* 186. Caguas, *Millspaugh* 214. Catano, *Heller* 108. Coamo Springs *Goll* 660. Cabo Rojo, *Sintenis* 845. San Juan, *Chase* 6381. Vieques, *Chase* 6689; *Shafer* 2483. Culebra, *Britton & Wheeler* 145; *Millspaugh* 569.
- VIRGIN ISLANDS: St. Thomas, *Eggers* 291; *Millspaugh* 335. Tortola, *Fishlock* 65, 108. St. Croix, *Ricksecker* 31, 106.
- LEEWARD ISLANDS: St. Kitts, *Britton & Cowell* 282. Antigua, *Wullschlaegel* 612. Montserrat, *Shafer* 704. Guadeloupe, *Duss* 2684. Dominica, *Jones* 32.
- WINDWARD ISLANDS: Martinique, *Duss* 1322. Barbados, *Bot. Sta. Herb.* 240.
- TRINIDAD: *Broadway* 4936; *Bot. Gard. Herb.* 2285; *Hitchcock* 10026.
- TOBAGO: *Broadway* 4648; *Hitchcock* 10211.
- COLOMBIA: Cartagena, *Hitchcock* 9904. Santa Marta, *Smith* 150.
- BRAZIL: Bahia, *Löfgren* 3766. Without locality, *Capanema* 5393.
- PARAGUAY: Sierra de Amambay, *Rojas* 10785, 10785a. Apa River, *Hussler* 11929.
- ECUADOR: Without locality, *Jameson* 346. Galápagos Islands, *Stewart* 1300.
- URUGUAY: Without locality, *Arechavaleta*.
- ARGENTINA: Estancia San Teodoro, *Kneucker Gram. Exs.* 185.
- CHILE: Santiago, *Philippi* in 1888.

DOUBTFUL SPECIES.

Panicum echinatum Willd. Enum. Pl. 1032. 1809. "*Panicum muricatum* Hornem. Cat. hort. haf. p. 28 * * * Non est *P. muricatum* Retzii." "Habitat in America meridionali." The type has not been examined, and the brief diagnosis is insufficient for identification. In Hornemann's catalogue the name is ascribed to Retzius, and there is no description.

Oplismenus echinatus Kunth, Rév. Gram. 1: 45. 1829. Based on "*Panicum echinatum* Willd."