

Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

Circular No. 747

July 1946 • Washington, D. C.



UNITED STATES DEPARTMENT OF AGRICULTURE

Distinguishing Characteristics of Some Forage-Grass Diseases Prevalent in the North Central States¹

By J. LEWIS ALLISON, *associate pathologist, Division of Forage Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, United States Department of Agriculture, and assistant professor of plant pathology, University of Wisconsin*, and DONALD W. CHAMBERLAIN,² *formerly research assistant, Department of Plant Pathology, University of Wisconsin*

CONTENTS

	Page		Page
Diseases of perennial grasses.....	2	Diseases of perennial grasses—	
Kentucky bluegrass.....	2	Continued.	
Powdery mildew.....	2	Other grasses—Continued.	
Rusts.....	3	Net blotch.....	11
Stripe smut.....	4	Diseases of annual grasses.....	12
Leaf spot.....	5	Sudan grass.....	12
Smooth bromegrass.....	6	Bacterial spot.....	12
Bacterial blight (chocolate spot).....	6	Bacterial stripe.....	12
Brown spot.....	7	Leaf blight.....	13
Leaf spot.....	7	Anthracnose.....	14
Scald.....	8	Nonparasitic foliage disorders.....	14
Ergot.....	9	Control measures.....	15
Other grasses.....	10	Literature cited.....	16
Brown stripe.....	10		

PASTURE and forage grasses have become increasingly important in the grassland agriculture of the United States, but for years little other than mycological attention has been given to the diseases known to attack grasses. The advent of grass-improvement investigations, however, brought recognition that grasses, like most economic

¹ Cooperative investigations of the Division of Forage Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, U. S. Department of Agriculture, and the Wisconsin Agricultural Experiment Station.

² Now assistant in forage-crop investigations, Kentucky Agricultural Experiment Station, Lexington.

crop plants, are hosts to many diseases, some of which are very destructive.

This circular brings together the information available on the more important diseases of pasture and forage grasses in the north-central region of the United States. Emphasis is placed on the distinguishing characteristics of each disease, and no attempt is made to include all the hosts or all the diseases known to occur in the region. No attempt is made to rank the diseases in the order of their economic importance. Grass diseases occur to a greater or less degree each year, with varying damage, depending upon environmental conditions and the manner in which the grasses are grown.

DISEASES OF PERENNIAL GRASSES

KENTUCKY BLUEGRASS

Powdery Mildew

Powdery mildew, a fungus disease caused by *Erysiphe graminis* DC., attacks many grasses and is very common on Kentucky bluegrass (*Poa pratensis* L.). It is a conspicuous disease. The white powdery growth visible on the surface of leaves is the vegetative and sporulating portion of the fungus (fig. 1). Later, dried blotched areas develop at the points where the fungus has penetrated into the leaves. Severely infected plants become weakened and retarded in growth. Mildew is omnipresent and is seasonal in its development. It first appears late in spring, diminishes during the dry, hot period of summer, and builds up again during the fall months. Physiologic races of this fungus occur in nature.

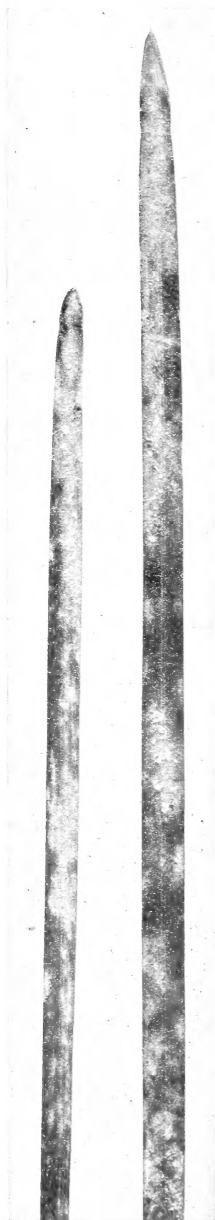


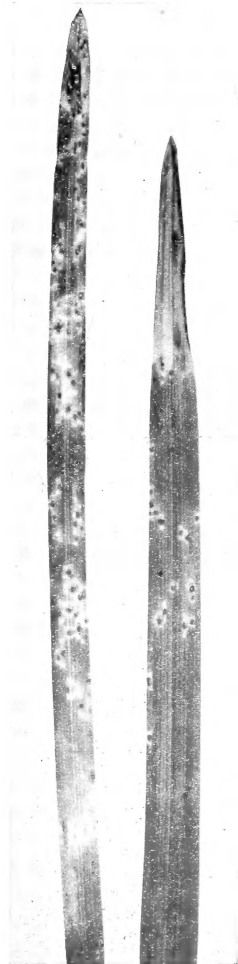
FIGURE 1.—Powdery mildew on Kentucky bluegrass.

Rusts

Leaf rust, a fungus disease caused by *Puccinia poae-sudeticae* (West.) Jorstad, attacks bluegrass. Initial symptoms first appear on the leaf blades as small chlorotic spots. These soon develop into typical rust pustules (fig. 2). Orange-colored spores are produced in large numbers in each pustule and are liberated when the pustules rupture. Leaf rust is prevalent each year but, like mildew, it is seasonal in its development. It first appears late in spring, diminishes somewhat during the dry, hot period of summer, and becomes very abundant early in fall. Leaf-rust development is favored by periods of warm, humid weather.

Stem rust, caused by *Puccinia graminis* Pers., the destructive rust common on cereal crops, attacks several grasses, including bluegrass. On bluegrass it can be distinguished from leaf rust only by microscopic examination of the pustule and spores. Stem rust is not so prevalent on bluegrass as leaf rust; it occurs in abundance only late in summer and in fall. Physiologic races of stem rust occur commonly in nature.

FIGURE 2.—Leaf rust on Kentucky bluegrass.



Stripe Smut



FIGURE 3.—Stripe smut on Kentucky bluegrass.

Stripe smut, a fungus disease caused by *Ustilago striaeformis* (West.) Niessl, attacks many grasses and is common on bluegrass. Initial symptoms appear as chlorotic stripes on the blades. Later the stripes become grayish-black (fig. 3). Masses of smut spores are released when the stripes mature and rupture. Spores are brown, spherical to oval, and are covered with short spines. Severely infected plants are stunted and dwarfed. Stripe smut develops systemically within its host. Thus it is not seasonal in its development and can be found to a greater or less degree any time during the growing season.

A second stripe smut, caused by *Urocystis agropyri* (Preuss) Schroet., attacks several grasses, including bluegrass, and can be distinguished from the first only by microscopic examination of its spores, which are formed in balls with one to three fertile spores surrounded by a single layer of empty cells. This smut is not so common on bluegrass as *Ustilago striaeformis*.

Leaf Spot

The leaf spot disease caused by *Helminthosporium vagans* Drechsl., occurs only on bluegrass. Initial infections appear as chlorotic specks on the blades. These rapidly develop into ovate, straw-colored lesions with reddish margins (fig. 4). A single lesion may cover the entire width of a blade, and severely infected leaves wither and die. Conidia of the fungus are borne on the lesions or on withered leaf tips. Conidia are characteristically dark olivaceous, cylindrical, or slightly tapered, with five to eight septations. The disease occurs from late in spring until fall and attains its greatest severity during midsummer. Leaf spot development is favored by periods of humid, hot weather.

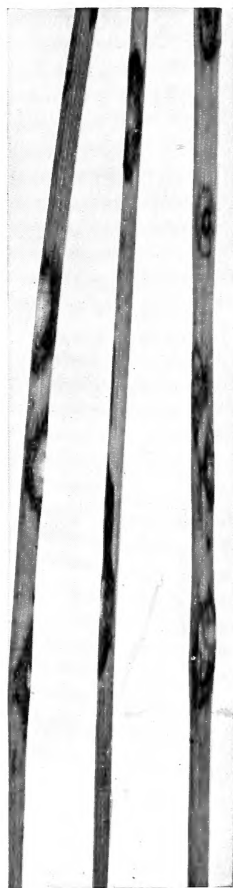


FIGURE 4.—Leaf spot on Kentucky bluegrass.



SMOOTH BROMEGRASS

Bacterial Blight (Chocolate Spot)

Bacterial blight, caused by *Pseudomonas coronafaciens* (Elliot) Stapp var. *atropurpurea* (Reddy and Godkin) Stapp, attacks several grasses and is a serious disease of smooth brome-grass (*Bromus inermis* (Leyss.)). Initial symptoms appear as circular to elliptical water-soaked areas of uniform size on the leaf blades. These soon turn purplish black, and it is from this stage that the common name chocolate spot originates. This is a misnomer, however, as lesions more frequently coalesce to form typically blighted areas involving the entire blade and sheath (fig. 5). As blighted leaves wither and die, the lesions fade to a rusty brown, and occasionally a dry exudate is present. Bacterial blight often attains epiphytotic proportions by mid-June. Its development is favored by periods of humid, hot weather. The causal organism is readily cultured and produces a green-fluorescent, pigmented type of colony on artificial media.

FIGURE 5.—Bacterial blight on smooth brome-grass.

Brown Spot

Brown spot, caused by *Pyrenophora (Helminthosporium) bromi* (Died.) Drechsl., is a fungus disease that attacks smooth bromegrass. Initial symptoms appear as small, dark spots on the first blades formed early in spring. As lesions enlarge, a yellow halo forms around each spot (fig. 6). Severely infected leaves yellow and wither. Conidia of the fungus develop either on the lesions or on the withered blades. The conidia are light yellowish, with 1 to 10 septations. Ordinarily this stage is rarely found. At this time, however, small black bodies can be discerned embedded in the dry, diseased leaves. These bodies are the initials of the perfect or perithecial stage of the fungus and carry it through the rest of the growing season and through the winter. They do not mature and release the perfect spore stage until very early in the spring of the following year. Ascospores are light brown, with commonly 3 transverse septations, which are further divided by a longitudinal septation. Brown spot develops during periods of wet, cool weather and is most prevalent very early in spring.

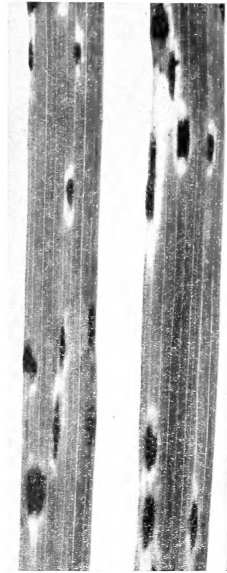


FIGURE 6.—Brown spot on smooth bromegrass.

Leaf Spot

Leaf spot, a fungus disease caused by *Selenophoma bromigena* (Sacc.) Sprague and A. G. Johnson, attacks smooth bromegrass. Initial infections appear as small, brown specks on the leaves early in spring. As lesions enlarge they become irregular in shape and size. Mature lesions are translucent in appearance, and black fruiting bodies develop at random in them (fig. 7). These are the pycnidia of the fungus, and in them masses of conidia are produced. The conidia are small, hyaline, slightly sickle-shaped, and are nonseptate. Mature pycnidia often drop out of the lesions, leaving pinhole perforations. The disease is favored by periods of moist, cool weather and diminishes in severity as the season progresses, all but disappearing during the hot, dry period of midsummer.

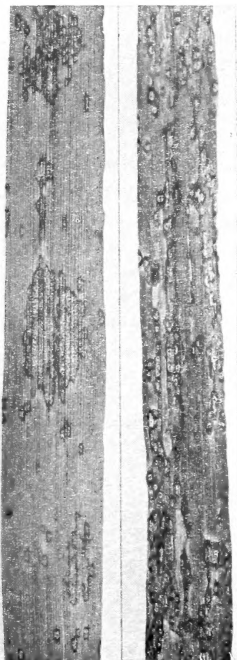


FIGURE 7.—Leaf spot on smooth bromegrass.



Scald

Scald, caused by *Rhynchosporium secalis* (Oud.) J. J. Davis, is a fungus disease common on smooth bromegrass. Specialized races of the parasite attack several grasses. Initial symptoms appear on the leaf blades as irregular water-soaked areas, which within a few days dry, and each lesion takes on a characteristic scalded appearance (fig. 8). Dried lesions are typically grayish green, and conidia are borne on them in concentric rings. Conidia are hyaline, short-cylindric, with one septation, and have a short oblique beak. Severely infected leaves wither and die. Scald appears late in spring and early in summer, and its development is favored by periods of humid, warm weather.

FIGURE 8.—Scald on smooth bromegrass.

Ergot

Ergot, a fungus disease caused by *Claviceps purpurea* (Fr.) Tul., attacks many grasses and is common on smooth bromegrass. It attacks only the flower and seed parts of its host and is of economic importance only when grasses are grown for a seed crop or are allowed to flower and set seed prior to grazing or cutting for hay. The initial symptoms appear at flowering time, when a sticky exudate, called the honeydew stage, is noticeable. This exudate, containing the conidial stage of the fungus, attracts flies and other insects, and much secondary infection results from insect transmission. As the disease progresses, black horny bodies called sclerotia develop in place of seeds (fig. 9). When mature, the sclerotia fall to the ground or are harvested with the seed crop. In either case, they carry the fungus over winter. When planted with the seed or carried over on the ground by natural means, they develop the perfect spore stage of the fungus the following summer, and the spores released cause the initial infection each year. Ergot development is favored by periods of warm,



FIGURE 9.—Ergot on smooth bromegrass, showing typical sclerotia.

moist weather. Livestock injury may result if severely infected grasses are grazed or fed for hay. Substances in the sclerotia cause abortion and if fed over long periods cause break-down of the capillaries, particularly in hoofs and ears.

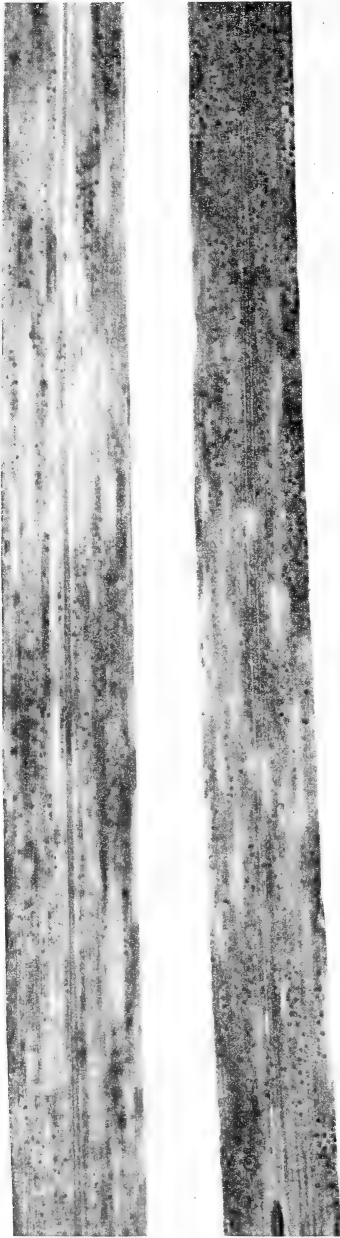


FIGURE 10.—Brown stripe on orchard grass.

OTHER GRASSES

Among other perennial grasses subject to disease are timothy (*Phleum pratense* L.), redtop (*Agrostis gigantea* Roth), orchard grass (*Dactylis glomerata* L.), meadow fescue (*Festuca elatior* L.), and Canada bluegrass (*Poa compressa* L.).

Brown Stripe

Brown stripe, caused by *Scolecotrichum graminis* Fckl., is a fungus disease that attacks many grasses, including all those listed above. Symptoms on all grasses are much the same and start with a browning of the leaf blades from the tips downward until the leaves wither and die. In the browned areas, black structures, arranged linearly between the leaf veins, are clearly visible (fig. 10). Each structure represents a dense cluster of conidiophores and conidia. The latter are borne on unbranched, irregular conidiophores and are elongated, slightly tapered, and typically uniseptate. They are readily disseminated by wind and rain. Brown stripe is omnipresent and is not at all seasonal in development. It appears early in spring and is present to a greater or less degree throughout the entire growing season.

Net Blotch

Net blotch, a fungus disease caused by *Helminthosporium dictyoides* Drechsl., attacks only meadow fescue. Early symptoms appear as irregular brownish areas on the leaves (fig. 11). Lesions are marked with a delicate netted pattern, and it is from this characteristic marking that the disease gets its common name. In the later stages of infection leaves wither and die from the tip toward the base. Conidia of the fungus are borne on the lesions or on the withered leaf tips. Conidia are subhyaline to yellow and are typically straight, with three to five septations. Net blotch occurs from late in spring until fall, attaining its greatest severity during midsummer. The disease is favored by periods of humid, hot weather.

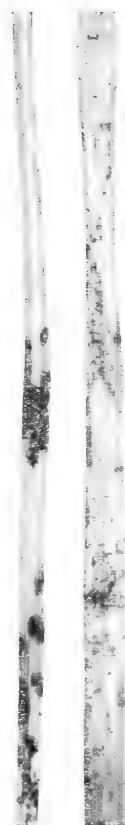


FIGURE 11.—Net blotch on meadow fescue.

DISEASES OF ANNUAL GRASSES

SUDAN GRASS

Bacterial Spot

Bacterial spot, caused by *Pseudomonas syringae* Van Hall (*Bacterium holci* Kendr.), attacks several grasses and is common on Sudan grass (*Sorghum vulgare* Pers., var. *sudanensis* Piper and Hitchc.). Initial infections appear as circular to elliptical water-soaked spots on the lower leaves. These spots soon become dry and papery and are light-colored (fig. 12). The disease appears soon after seedlings emerge in spring and progresses with plant development throughout the entire growing period, gradually spreading from the lower leaves over all the others. Disease development is favored by periods of warm, moist weather.



FIGURE 12.—Bacterial spot on Sudan grass.

Bacterial Stripe

Bacterial stripe, caused by *Pseudomonas andropogoni* (E. F. Sm.) Stapp, attacks several grasses and is common on Sudan grass. Initial infections appear on the leaves as long, narrow, irregular stripes (fig. 13). These soon dry, become pigmented, and are covered with an abundance of dry exudate. Severely infected leaves dry and wither. Stripe first appears about midsummer and continues until plant maturity. Disease development is favored by periods of warm, moist weather.



FIGURE 13.—Bacterial stripe on Sudan grass.

Leaf Blight

Leaf blight, caused by *Helminthosporium turcicum* Pass., is a serious fungus disease of corn and sorghum in some areas of the United States and is destructive on Sudan grass in the North Central region. As its name implies, symptoms are a conspicuous blighted or scalded appearance of the foliage (fig. 14). Within a period of a few days an entire field of Sudan grass may develop extreme blighting and appear characteristically burned or frosted. Conidia of the fungus are produced in abundance on the lesions. Conidia are dark, slightly thickened, with one to eight septations, and have a distinctly protruding hilum at the basal end. Blight first appears about midsummer and continues until plant maturity. Disease development is favored by periods of warm, moist weather.

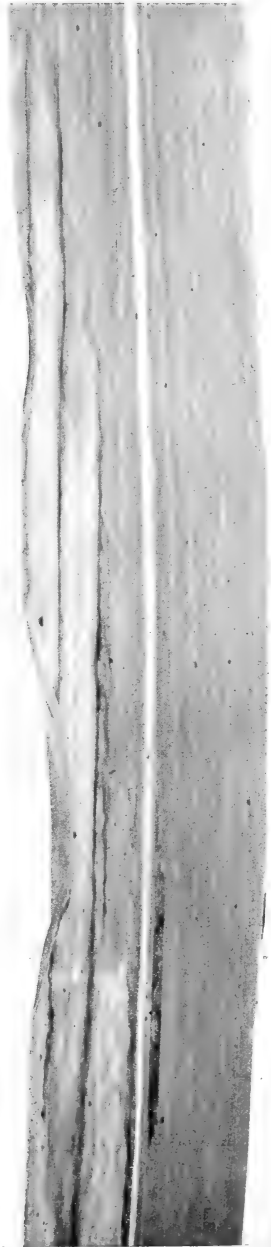
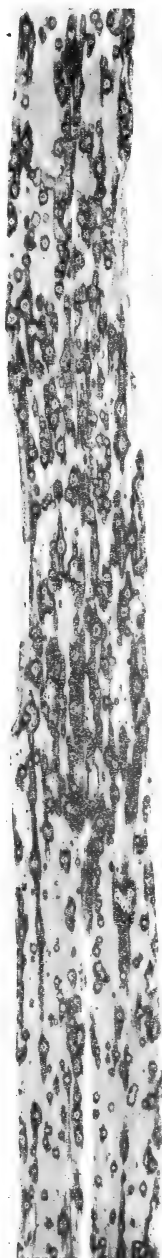


FIGURE 14.—Leaf blight on Sudan grass.



Anthracnose

Anthracnose, caused by *Colletotrichum graminicolum* (Ces.) G. W. Wils., is a fungus disease that attacks several grasses and is common on Sudan grass. Initial symptoms appear on the basal leaves as small necrotic eye spots with visible black bodies in the center of each (fig. 15). These open structures are filled with large numbers of conidia, which, being readily washed and splashed about by rain and dew, account for much secondary infection. Conidia are hyaline, slightly curved, tapered, and nonseptate. As the disease progresses, all leaves often become infected. Individual lesions frequently coalesce, and entire leaves wither and die. Anthracnose appears about midsummer and develops rapidly from that time on until plant maturity. The disease is favored by periods of humid, hot weather.

Nonparasitic Foliage Disorders

Nonparasitic foliage disorders caused by hereditary factors occur on several grasses, especially Sudan grass. The symptoms are commonly confused with those caused by parasitic organisms. Several such disorders on Sudan grass are shown in figure 16.

FIGURE 15.—Anthracnose
on Sudan grass.

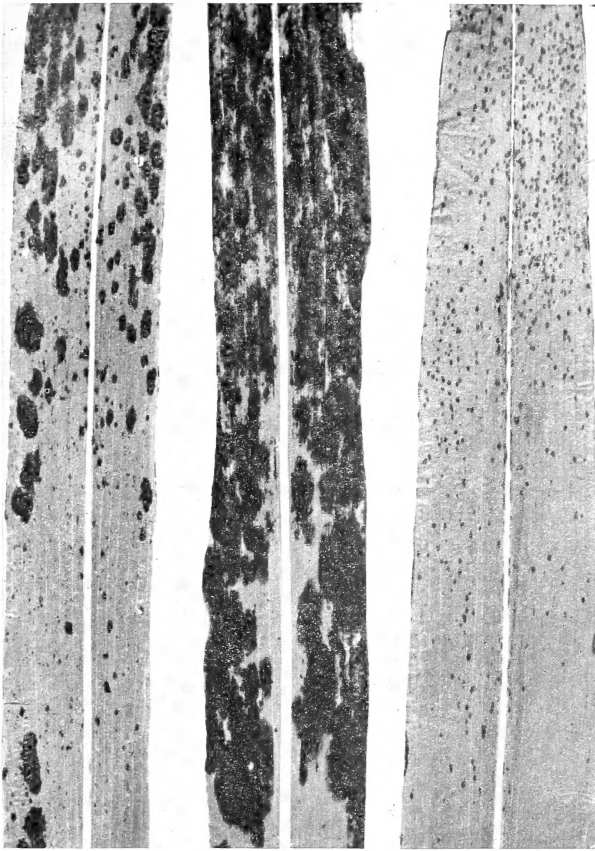


FIGURE 16.—Nonparasitic foliage disorders on Sudan grass.

CONTROL MEASURES

The grass diseases reviewed in this circular are not effectively controlled by the accepted regular control methods of sanitation, crop rotation, or use of chemicals. Sanitation and crop rotation are both impractical because most of the diseases attack more than one species, many of which are noneconomic ones growing and harboring the diseases in locations inaccessible for such control programs. Spraying or dusting with fungicides, invaluable in the case of many crop diseases, is obviously impractical with grasses. Seed treatment is of value only for those diseases known to be seed- or soil-borne and can arrest only that phase of a disease that attacks the plant in the seedling stage of development.

The development of disease-resistant strains of grasses offers the only practical control measure. Resistance to many of the diseases reviewed has been demonstrated (1, 2, 4, and 9).³ The presence of physiological races in certain of the fungi discussed has been recognized (2, 5, and 6).⁴ Such knowledge will aid greatly in the development of grass improvement programs. Improvement programs are in progress with all the major grass species reviewed (1, 3, 7, and 8).

LITERATURE CITED

- (1) AHLGREN, H. L., SMITH, D. C., and NIELSEN, E. L.
1945. BEHAVIOR OF VARIOUS SELECTIONS OF KENTUCKY BLUEGRASS, *POA PRATENSIS* L., WHEN GROWN AS SPACED PLANTS AND IN MASS SEEDINGS. *Amer. Soc. Agron. Jour.* 37: 268-281.
- (2) ALLISON, J. L.
1945. SELENOPHOMA BROMIGENA LEAF SPOT ON BROMUS INERMIS. *Phytopathology* 35: 233-240, illus.
- (3) BURTON, G. W.
1942. TIFT SUDAN, A UTOPIA GRASS FOR [THE] SOUTHEAST. *South. Seedsman* 5 (1): 7, 31, 35, illus.
- (4) CHAMBERLAIN, D. W., and ALLISON, J. L.
1945. THE BROWN LEAF SPOT ON BROMUS INERMIS CAUSED BY PYRENOPHORA BROMI. *Phytopathology* 35: 241-248, illus.
- (5) DAVIS, W. H.
1930. TWO PHYSIOLOGIC FORMS OF USTILAGO STRIAEFORMIS (WESTD.) NIESSL. *Phytopathology* 20: 65-74.
- (6) HARDISON, J. R.
1944. SPECIALIZATION OF PATHOGENICITY IN ERYSIPE GRAMINIS ON WILD AND CULTIVATED GRASSES. *Phytopathology* 34: 1-20.
- (7) HAYES, H. K., and SCHMID, A. R.
1943. SELECTION IN SELF-POLLINATED LINES OF BROMUS INERMIS LEYSS., FESTUCA ELATIOR L., AND DACTYLIS GLOMERATA L. *Amer. Soc. Agron. Jour.* 35: 934-943.
- (8) KARPER, R. E.
1940. SWEET SORGHUM CROSS IMPROVES SUDAN GRASS. *South. Seedsman* 3 (12): 8, 18, 19, 23.
- (9) TSIANG, Y. S.
1944. VARIATION AND INHERITANCE OF CERTAIN CHARACTERS OF BROME GRASS, BROMUS INERMIS LEYSS. *Amer. Soc. Agron. Jour.* 36: 508-522.

³ Italic numbers in parentheses refer to Literature Cited.

⁴ See also FISCHER, G. W., and LEVINE, M. N. SUMMARY OF THE RECORDED DATA ON THE REACTION OF WILD AND CULTIVATED GRASSES TO STEM RUST (*PUCCINIA GRAMINIS*), LEAF RUST (*P. RUBIGOVERA*), STRIPE RUST (*P. GLUMARUM*), AND CROWN RUST (*P. CORONATA*) IN THE UNITED STATES AND CANADA. *U. S. Bur. Plant Indus., Plant Dis. Rptr. Sup.* 130, 30 pp. 1941. [Processed.]



