The Influence of Environment on the Development of Two Foliar Diseases of Bromus inermis Leyss

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Dickson (7) has observed that foliar diseases of smooth bromegrass tend to be more important in nurseries or seed fields than in meadows. Studies of some of these diseases have been or are being inaugurated at various experiment stations. The development of the two foliar diseases; brown leafspot, incited by *Pyrenophora bromi* Died., and bacterial blight incited by *Pseudomonas coronafaciens* var. *atropurpurea* (Reddy and Godkin) Stapp., were studied under different management. It was the purpose of this study to determine the influence of environment on disease development, differential host reaction, and new facts about the causal organisms.

Reddy and Godkin (14) first collected lesions of bacterial blight on smooth bromegrass in North Dakota and Wisconsin in 1916 and 1921, respectively. Bacterial blight appears to be present in Wisconsin every year and has been reported in smooth bromegrass from Kansas to Manitoba (6, 13). Reddy and Godkin (14) and Lefebvre (13) have found many species of *Bromus* and *Agropyron repens* susceptible to the disease. Allison and Chamberlain (2) stated that bacterial blight may become a serious disease of smooth bromegrass as it reaches epiphytic proportions by mid-June in Wisconsin. The incitant of bacterial blight was described first by Reddy and Godkin (14) to be a variant of *Pseudomonas coronafaciens* and to differ slightly morphologically and physiologically as well as in pathogenicity from this organism. However, Breed et al. (4) in Bergey's Manual, 1948, described *P. coronafaciens* var. *atropurpurea* as differing from *Pseudomonas coronafaciens* only in its pathogenicity and symptoms on smooth bromegrass.

The symptoms of bacterial blight are essentially as described by Reddy and Godkin (14), Allison and Chamberlain (1), and Dickson (7). Reddy and Godkin (14) stated that this bacterium penetrated the susceptible wounds and stomata and good infection was obtained by spraying followed by incubation in a moist chamber for 48 hours. This organism probably overwinters on dead or living plant tissue and is disseminated locally by splashing rain and wounds caused by insects, livestock, and farm implements.

Diedicke (8) in 1902 first described the causal organism of brown leafspot of bromegrass in Germany and gave it specific rank (*Helminthosporium bromi*) in 1903 (9). Drechsler (10) made an extensive study of the organism in 1923 and transferred the asciogenous stage from *Pleospora* to *Pyrenophora*. These workers and Chamberlain and Allison (5) have described adequately the symptoms of brown leafspot of smooth bromegrass.

Most commercial varieties of bromegrass differ in susceptibility to these diseases although plant breeders have selected plants relatively resistant which probably will prove valuable in the development of new commercial varieties of smooth bromegrass.

**MATERIALS AND METHODS**

Field Studies

Foliar diseases of the grasses were investigated by means of a comparative study of disease reaction of various lines of smooth bromegrass. The first set of plants for this experiment were grown in the greenhouse beginning January, 1947, and ending November, 1948. They were of wide variety and geographical origin, but none was known to be representative of any specific commercial variety. Ten of these plants had been resistant while ten others were susceptible to *Pyrenophora bromi* but resistant to brown leafspot. The symptoms of *P. bromi* were examined, and the results were corroborated withgerminal conidia of *P. coronafaciens* var. *atropurpurea* isolated from the field during the autumn of 1947.

Clonal lines of these plants were transplanted to the field plots on August 26, 1947. A replicate consisted of (16 feet by 20 feet) each containing clones of 10 plants and 10 susceptible lines. Two of the units were weeded with a hoe so that there was no interplant spreading of the clones. By late fall of 1947, the clones were approximately 15-18 inches in diameter, and a complete cover of bromegrass occurred on all of the plots.

In the experiment with brown leafspot, disease was induced by maintaining perithecia of *P. bromi* over the experimental area in the fall of 1947 and 1948, and in early 1949. Also the foliage was sprayed in May with a conidial suspension of *P. bromi* during a period favorable for infection. Natural inoculum also was available from overhead irrigation used for 4 days in the spring to increase infection.

A suspension of two pathogenic cultures of *P. atropurpurea* grown in large volumes of nutrient broth with water was sprayed on the clones in the greenhouse experiment with a 3-gallon pressure sprayer or with a power sprayer. In 1948 inoculum was applied between sundown and midnight after a rain and with the temperatures usually above 28°C. It is possible, while in 1949 four of the inoculations were made with the power sprayer on hot humid days, after rain, and when many of the leaf stomata on the bromegrass were open.

Data on leaf lesions as disease indices were obtained in the spring and fall of 1948 and 1949 for both diseases. Data on recovery after clipping were taken in August and September of 1949.

**Greenhouse Studies**

Eight plants of smooth bromegrass, two of which were susceptible and two resistant to each disease on the basis of field ratings, were selected for study in the greenhouse. Each plant was potted in a peat and sod (2 inches square and 3 inches in depth) and planted in the field in November 1948, planted in 5-inch clay pots, and grown in cold frames until used. These were moved to the greenhouse maintained at 22°C, and the new foliage was inoculated with water. Eight clones of each clone were moved to each of four greenhouses maintained at 20°C and 28°C for a period of 1 week before and after inoculation. *P. coronafaciens* var. *atropurpurea* was inoculated in nutrient broth in shaker flasks or a suspension of conidia was used. The symptoms of bacterial blight were examined, and the results were corroborated with conidia of *P. bromi* isolated from the field during the autumn of 1947.

**RESULTS AND DISCUSSION**

Data from the greenhouse studies confirm the earlier findings that the diseases are not only common but occur during the growing season in the field. The symptoms of bacterial blight are essentially as described by Reddy and Godkin (14), Allison and Chamberlain (1), and Dickson (7). Reddy and Godkin (14) stated that this bacterium penetrated the susceptible wounds and stomata and good infection was obtained by spraying followed by incubation. The symptoms of brown leafspot are essentially as described by Reddy and Godkin (14), Allison and Chamberlain (1), and Dickson (7). Reddy and Godkin (14) stated that this bacterium penetrated the susceptible wounds and stomata and good infection was obtained by spraying followed by incubation. The symptoms of brown leafspot are essentially as described by Reddy and Godkin (14), Allison and Chamberlain (1), and Dickson (7). Reddy and Godkin (14) stated that this bacterium penetrated the susceptible wounds and stomata and good infection was obtained by spraying followed by incubation.