BROMEGRASS LEAF SPOTS IN SASKATCHEWAN, ALBERTA AND THE PEACE RIVER REGION OF BRITISH COLUMBIA IN 1967[1]

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In 1967 the incidence of foliage diseases of smooth bromegrass, Bromus inermis Leyss, was estimated in commercial fields and test plots at several locations. In addition, the reaction of varieties and synthetics of B. inermis and of Bromus spp. was determined with particular reference to brown leaf spot, Pyrenophora bromi (Died.) Drechsl.

Disease survey

Surveys for leaf spots of smooth bromegrass caused by P. bromi, Selenophoma bromigena (Sacc.) Sprague & Johnson, and Rhynchosporium secalis (Oud.) J. J. Davis were made in Alberta and the Peace River region of British Columbia in the first two weeks of July. In Saskalchewan, the severity of these diseases was noted from early June to late August. The association of disease with soil zones previously recorded for Saskatchewan (4, 5) prompted a similar classification for the fields in the present survey (Table 1).

Table 1. Severity of Selenophoma, Pyrenophora, and Rhynchosporium leaf spots of bromegrass in soil zones in Saskatchewan and Alberta and the Peace River region of British Columbia in 1967

Region	Soil zones	Number of locations surveyed	Leaf spot pathogen	Number of locations in each severity class* 4	3	2	1	0
Saskatchewan	Black and gray	49	S. bromigena	0	0	0	10	39
			P. bromi	0	8	11	18	12
			R. secalis	0	0	2	7	40
	Brown and dark brown	33	S. bromigena	0	0	5	23	5
			P. bromi	0	0	0	17	16
			R. secalis	0	0	0	7	26
Alberta and Peace River region of British Columbia	Black and gray	73	S. bromigena	0	0	6	30	37
			P. bromi	0	10	26	26	11
			R. secalis	0	0	5	19	49
	Brown and dark brown	25	S. bromigena	0	0	3	22	0
			P. bromi	0	0	3	3	19
			R. secalis	0	0	0	3	22

* Where 4 represents severe disease and 0 no symptoms seen.

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In Saskatchewan in 1967 few leaf spots were seen on bromegrass before the first week in June, which is two to three weeks later than in 1966. Throughout the growing season, infections were light in the brown and dark brown soil zones and on drought-affected areas on the thin-black and black soils. P. bromi caused slight to moderately severe damage in late July and August in hay and seed crops in some northern areas on black and gray soils.

P. bromi was the dominant leaf spot pathogen of B. inermis on black and gray soils in Alberta and the Peace River region of British Columbia. This was previously found to be the case in Saskatchewan (4, 5). S. bromigena was widely distributed over all soil zones; R. secalis was of sporadic distribution.

Varietal resistance to leaf spot diseases

Bromegrass strains and registered varieties were sown at six centers in different soil zones in Saskatchewan in the spring of 1966. At each center there were four randomized blocks of 16 strains and varieties. Each bromegrass was sown in three rows 3.3 m long and 0.15 m apart. An infector strip 1 m wide of 'Carlton 19611, susceptible to P. bromi and S. bromigena, was sown round each block.

When leaf spot infection appeared to be at its maximum in July or August 1967, at each center, 25 tillers were plucked at random from the middle row of each bromegrass and rated for infection. A 0 to 4 infection scale, in which 0 represents no disease and 4 very severe disease (6), was used. Where more than one disease was present in significant amounts, separate ratings were used for each.

Strains. and varieties of bromegrass in hay and seed tests at Beaverlodge and Lacombe, Alberta, were rated for leaf spot infection in early July following sampling for hay yield. These six replicate tests had been sown in 1965.

Table 2. Disease ratings for three leaf spot pathogens of smooth bromegrass grown at six locations in 1967

Bromegrass		Pyrenophora bromi						Rhynchosporium secalis			Selenophoma bromigena
		Saskatchewan				Alberta					
Variety or strain	Type[a]	Big River	Nipawin	Loon Lake	Av.[b]	Beaver-lodge	Lacombe	Nipawin	Loon Lake	Av.[c]	Unity, Sask.
Carlton 1961	N	1.99[d]	1.67	1.48	1.71	1.47	1.59	0.19	0.35	0.27	1.33
Common	N	1.81	1.44	1.58	1.61	1.17	1.36	0.28	0.36	0.32	1.47
Brandon 1000	NS	1.55	1.67	1.25	1.49		1.33	0.25	0.61	0.43	1.30
Manchar	N	1.66	1.41	1.21	1.43			0.17	0.33	0.25	1.39
Brandon 988	NS	1.56	1.52	1.09	1.39		1.43	0.18	0.32	0.25	1.20
S-6733 Syn 1	NS	1.66	1.29	1.21	1.38			0.27	0.20	0.24	1.05
Brandon 1065	NS	1.61	1.44	1.02	1.36		1.47	0.26	0.32	0.29	1.24
S-6733 Syn 2	NS	1.64	1.33	1.05	1.34			0.27	0.20	0.24	1.23
S-6324 Syn 2	N	1.74	1.32	0.97	1.34	1.01	1.28	0.24	0.21	0.23	1.16
Redpatch	S	1.49	1.28	1.11	1.29	0.67	1.31	0.33	0.44	0.39	1.14
S-6363 Syn 2	S	1.37	1.41	1.00	1.26		1.20	0.10	0.21	0.16	1.14
B.S. G. 1	S	1.49	1.28	0.99	1.25			0.31	0.31	0.31	1.19
Saratoga	S	1.29	1.46	0.97	1.24		1.17	0.10	0.44	0.27	1.27
Magna	S	1.27	1.47	0.97	1.24	0.54	1.46	0.17	0.12	0.15	1.16
Brandon 987	S	1.36	1.25	0.90	1.17		1.32	0.22	0.28	0.25	1.25
Lincoln	S	1.09	1.23	1.07	1.14	0.55	1.31	0.18	0.16	0.17	1.09
Average		1.54	1.40	1.12		0.90	1.35	0.22	0.30		1.23
L.S.D. 5%		0.05	0.05	0.06		0.04	0.05	0.20	0.28		0.05
1%		0.06	0.06	0.08		0.05	0.07	0.27	0.37		0.06

[a] N = northern type: S = southern type

[b] r = +0.711

[c] r = +0.029

[d] Average disease severity rating of 100 (25 per replicate) plants where 4 represents very severe disease and 0 no disease.

There was insufficient disease at Saskatoon and Melfort for reliable ratings to be made.

At the Saskatchewan centers, southern strains had generally lower ratings for P. bromi than northern strains (Table 2). Northern-southern hybrids occupied an intermediate position in disease rating. Although there was good correlation (r= 0.711) between variety ratings for P. bromi at the three Saskatchewan centers, there was some variation in response of varieties at each center. This variation may have been due to either interference from R. secalis, which was present in rateable amounts at Nipawin and Loon Lake, or to different physiological races of P. bromi at each center. The levels of infection by P. bromi in the tests at Big River and Nipawin were higher than those at Loon Lake; the greater incidence was probably due to abundant external inoculum from adjacent large fields of infected common and 'Carlton' bromegrass. There were no bromegrass fields close to the Loon Lake test. The test at Big River, where there was the most infection, and the test at Loon Lake, with the least infection, were on gray woodland podzol. The test at Nipawin, which showed an intermediate amount of infection, was on a dark gray soil in the parkland-forest transition.

Although present in rateable amounts in the Nipawin and Loon Lake tests, infection by R. secalis was light on most varieties. There was no consistent varietal response to infection with R. secalis in the tests. This was confirmed by the lack of significant differences in each test and by the very low correlation (r= 0.029) between ratings at the centers (Table 2).

Ratings for P. bromi on bromegrass varieties at Beaverlodge and Lacombe, Alberta, are not directly comparable with those at the three Saskatchewan centers because of differences in the age of stand, time of rating, and trial layout. At Beaverlodge there was significantly more P. bromi on the northern 'Carlton' than on the southern bromegrasses. At Lacombe 'Saratoga' showed the lowest incidence of P. bromi. 'Lincoln' did not excel at this center as it had done at others (Table 2).

At Unity, Saskatchewan, on dark brown soil, where S. bromigena was the only pathogen present in sufficient amount for reliable rating, S-6733 Syn 1, 'Lincoln', 'Redpatch', S-6363 Syn 2, and S-6324 showed significantly less spotting than northern common bromegrass, 'Manchar', and 'Carlton 1961' The former strains were reported by Smith and Knowles (6) to be resistant to this pathogen at Saskatoon (Table 2).

Resistance of four synthetics of B. inermis and of five Bromus species to P. bromi

Four greenhouse synthetics of smooth bromegrass were made in the winter of 1966-67:

S-7222 44 plants, previously shown in greenhouse infection studies to be resistant to S. bromigena, from the northern type S-6342 Syn 2.

S-7269 25 plants from the northern-southern hybrid S-6733 Syn 2 with high resistance to S. bromigena in greenhouse and field tests.

S-7270 33 plants of northern common, with a low incidence of P. bromi, from heavily infected bromegrass fields at Big River, Saskatchewan.

S-7271 57 plants of northern and southern strains of bromegrass, with low P. bromi ratings, from Indian Head, Saskatchewan.

Plants from these synthetics were put out in rows of 20 at 0.92 m spacing. There were three replications of each strain with three interplanted check rows of 'Carlton 1961' and S-6733 Syn 2 bromegrass. Planting was done in May 1967 at Big River, Saskatchewan, in a half-acre test plot in a field of common bromegrass which later showed heavy natural infection with P. bromi.

Average ratings for the four synthetics and two check varieties in early September ranged from 1.10 (S-7269) to 1.52 (S-7270). Although differences between ratings were not significant, seven plants of S-7269 showed no apparent infection with P. bromi. All other plants were infected.

Twenty plants of each of five introduced Bromus spp. were planted in single rows in the same location as the test of synthetics. In early September, average ratings for P. bromi infection for these were: B. variegatus (OT 1927-9845), 0.10; B. syriacus (OT 1927-9840), 0.33; B. erectus (S-1172), 0.38; B. erectus (OT 1927-8651), 0.44; B. macrantherus (OT 1927-9833), 2.0. Sixteen plants of B. variegatus showed no infection with P. bromi; all plants of B. macrantherus were Infected.

With the exception of B. macrantherus all introduced Bromus spp. showed considerably less infection than the B. inermis strains. B. erectus (S-1172) showed useful agronomic characters. B. variegatus (OT 1927-9845), with the lowest disease rating, was a small low-growing perennial. B. erectus (OT 1927-8651) was less robust in growth habit than B. erectus (S-1172). The former, introduced from Minsk, USSR, and B. syriacus (OT 1927-9840) fall taxonomically into the B. tyttholepis complex of species of Nath and Nielsen (4). Introgression between B. tyttholepis and *g.* inermis has been reported (3) and hybrids between *g.* erectus and *g.* inermis have been produced (1). The wide range in chromosome number and meiotic behavior in material distributed in North America as "B. erectus"

was considered by Hanna (2) as perhaps due to interspecific hybridization in nurseries in which Bromus spp. were grown.

It may be possible to combine in hybrids the superior resistance to P. bromi of "B. erectus" or of members of the B. tyttholepis complex with the best agronomic features of selected strains of B. inermis. B. macrantherus, being very susceptible to P. bromi, may be a useful indicator of inoculum potential in field test areas.

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