

## Response of Kentucky Bluegrass Cultivars and Blends to a Natural Stem Rust Population

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### ABSTRACT

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*Poa pratensis* cultivars, experimental lines, and blends were evaluated for stem rust reaction under field conditions. A complete range of stem rust reaction was found. Galaxy, Bonnieblue, Nugget, Sydsport, Glade, Majestic, and Fanfare were among the most resistant cultivars, and Vantage was among the most susceptible. Half of all cultivars evaluated showed less than 20% prevalence. Rust prevalence in polystands approximated the average prevalence of the respective cultivars when grown as a pure line.

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Release of the Kentucky bluegrass (*Poa pratensis* L.) cultivar Merion in 1950 was a significant step in turfgrass culture. Merion is superior to common Kentucky bluegrasses (1), but extreme susceptibility to stem rust (*Puccinia graminis* Pers.) limited its desirability as a turf in many areas (6-8). A severe outbreak of stem rust on Merion

bluegrass in Lincoln, NE, in 1953 (6) was attributed to cool nights with heavy dews and warm sunny days coupled with frequent irrigation of the Merion turf.

In 1965, Britton and Butler (2) observed that stem rust infection on seven Kentucky bluegrass cultivars ranged from immune to susceptible. Elliott (4) screened 131 Kentucky bluegrass selections for stem rust reaction and found 46 to be resistant. Pflieger (5) also noted a range of stem rust reaction in Kentucky bluegrasses.

This report summarizes field observations on the response of Kentucky

bluegrass cultivars, experimental lines, and blends to the natural stem rust population in Mead, NE.

### MATERIALS AND METHODS

Sixty Kentucky bluegrass cultivars and 24 blends were established in August 1976 in 1.0 × 2.0 m plots at a seedling rate of 10 g/m<sup>2</sup>. Plots were established in a randomized complete block design with four replicates. Each week turfs were irrigated with 3.8 cm of water and mowed at 5.0 cm with clippings returned to the plot. Plots were fertilized in late October, May, June, and September with 15 g of N per square meter. Dimethyl tetrachloroterephthalate at 13.6 kg/ha and 2,4-dichlorophenoxyacetic acid at 1.1 kg/ha were applied for weed control; no other pesticides were used. Host blends were one-third by weight on three-way blends and one-half by weight on two-way blends.

Stem rust was rated in September 1978 and October 1979 on a 1-9 scale in which 1 = 0-10% of leaves infected and 9 = 90-100% of leaves infected per plot.

An analysis of variance was made of

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**Table 1.** Prevalence ratings of stem rust (*Puccinia graminis* Pers.) on 60 Kentucky bluegrass (*Poa pratensis* L.) cultivars and selections at Mead, NE

Cultivar or selection	Rust rating <sup>z</sup>	
	1978	1979
	(September)	(October)
N-135-P-154	1.0 a	1.0 a
P-59	1.0 a	1.2 ab
Park	1.0 a	1.2 ab
Banff	1.0 a	1.2 ab
NuDwarf	1.0 a	1.2 ab
K1-154	1.0 a	1.3 ab
Delta	1.1 ab	1.3 ab
Baron	1.1 ab	1.3 ab
S-21	1.2 abc	1.3 ab
South Dakota	1.2 abc	1.3 ab
Adelphi	1.2 abc	1.3 ab
N-408	1.2 abc	1.3 ab
Aquila	1.3 abcd	1.5 ab
Parade	1.3 abcd	1.5 ab
Geary	1.3 abcd	1.5 ab
K109eg × Anh	1.5 abcde	1.5 ab
K1-157	1.5 abcde	1.5 ab
A-20-6	1.5 abcde	1.5 ab
Enita	1.6 abcdef	1.5 ab
EVB-2461	1.6 abcdef	1.5 ab
Rugby	1.6 abcdef	1.6 ab
WWAg-463	1.6 abcdef	1.6 ab
EVB-3702	1.8 abcdef	1.6 ab
Galaxy	1.8 abcdef	1.6 ab
Bonnieblue	1.9 abcdef	1.6 ab
Nugget	1.9 abcdef	1.6 ab
Sydsport	1.9 abcdef	1.8 abc
Glade	1.9 abcdef	1.8 abc
Majestic	1.9 abcdef	1.8 abc
K1-103 × Anh	1.9 abcdef	1.8 abc
A-20	2.0 abcdef	2.0 abcd
Fanfare	2.0 abcdef	2.0 abcd
Newport	2.3 bcdef	2.2 abcd
Fylking	2.5 bcdef	2.3 abcd
Bristol	2.6 efg	2.3 abcd
Enmundi	2.8 efg	2.5 abcd
Cougar	3.7 fgh	2.6 abcd
Enoble	3.7 fgh	2.6 abcd
Victa	3.7 fgh	2.6 abcd
Pennstar	3.8 fgh	2.6 abcd
K1-150	3.8 fgh	2.8 bcde
FFR-9030	4.0 gh	2.8 bcde
Touchdown	4.0 gh	3.3 cdef
WWAg-436	4.0 gh	3.3 cdef
K3-160	4.0 gh	3.3 cdef
Birka	4.7 hi	3.5 defg
Cheri	4.7 hi	3.5 defg
P-1925 ×		
War. Shade	4.8 hij	4.3 efgh
Plush	5.3 ij	4.5 fghi
P-104	5.5 ijk	4.8 fghij
Bono	5.5 ijk	5.0 fghijk
P-3N	5.5 ijk	5.3 ghijkl
Bensun	5.7 ijk	5.6 hijkl
Enprima	6.0 jk	6.0 hijkl
Entopper	6.6 kl	6.5 ijklm
Merion	6.7 klm	6.6 jklmn
WWAg-436	7.6 lmn	6.8 klmn
EVB-3965	7.8 mno	7.6 mno
Vantage	8.3 no	7.8 mno
TPE-523 ×		
P148	8.8 o	8.3 o
Mean	3.1	2.8

<sup>z</sup>Stem rust was rated on a 0–9 scale: 1 = 0–10% of leaves infected and 9 = 90–100% of leaves infected per plot. Means followed by the same letter are not significantly different. Means are averages of two readings per plot with four replicates.

**Table 2.** Stem rust (*Puccinia graminis* Pers.) prevalence rating of 24 Kentucky bluegrass (*Poa pratensis* L.) blends

Blend	Rust rating <sup>z</sup>			
	1978	1979	Overall mean	
	Blend	Blend	Blend	Cultivars in pure stand
Fylking, South Dakota, Park	1.0 a	1.0 a	1.0	1.6
Parade, Aquila	1.0 a	1.0 a	1.0	1.4
Fylking, Pennstar, Nugget	1.0 a	1.2 a	1.1	2.5
Park, South Dakota, Newport	1.0 a	1.3 a	1.15	1.6
Victa, Baron, Nugget	1.0 a	1.5 a	1.25	2.0
Glade, Adelphi, Baron	1.0 a	1.5 a	1.25	1.5
Parade, Aquila, Adelphi	1.0 a	1.5 a	1.25	1.4
Fylking, Pennstar, Baron	1.8 ab	1.5 a	1.65	2.3
Fylking, Pennstar, Park	1.9 ab	1.5 a	1.7	2.2
Victa, Adelphi, Baron	1.9 ab	1.5 a	1.7	1.9
Glade, Fylking, S-21	2.0 ab	1.8 a	1.9	1.9
Victa, Baron	2.0 ab	1.8 a	1.9	2.2
Bonnieblue, Baron, Majestic	2.0 ab	1.8 a	1.9	1.6
Bonnieblue, Baron, Adelphi	2.2 abc	2.0 ab	2.1	1.4
Fylking, Pennstar, Sydsport	2.5 bc	2.0 ab	2.25	2.5
Enmundi, Enoble	2.8 bcd	2.2 abc	2.5	2.9
Baron, Bonnieblue, Birka	2.9 bcd	2.3 abc	2.75	2.4
Fylking, Nugget, Sydsport	3.3 cd	2.5 abc	2.9	2.0
Fylking, Park, Merion	3.3 cd	2.5 abc	2.9	3.4
Fylking, Pennstar, Merion	3.3 cd	2.8 bc	3.0	4.1
Merion, Park	3.8 de	3.0 bc	3.4	3.9
Bonnieblue, Birka, Majestic	3.8 de	3.0 bc	3.4	2.6
Enmundi, Enoble, Enprima	4.7 e	3.8 bc	4.25	4.0
Victa, Vantage, Bristol	4.8 e	4.8 c	4.8	4.6
Mean	2.3	2.1	2.2	3.0

<sup>z</sup>Stem rust was rated on a 0–9 scale: 1 = 0–10% of leaves infected and 9 = 90–100% infected per plot. Means followed by the same letter are not significantly different. Means are averages of two readings per plot with four replicates.

stem rust ratings. Significant differences among treatment means were determined by Duncan's multiple range test.

## RESULTS AND DISCUSSION

Stem rust was slightly less prevalent in 1979 than in 1978. A complete range of stem rust prevalence was found and differences among rust ratings of cultivars and experimental lines were significant (Table 1). The experimental line N-135-P-154 was free of stem rust both years. The mean rust prevalence rating on 30 of the 60 cultivars and experimental lines evaluated was less than two, indicating that a high degree of stem rust resistance exists in commercially available cultivars and breeder lines. Previous stem rust studies (2,5) evaluated a few common Kentucky bluegrass cultivars and experimental lines, whereas our study included many improved and common cultivars. Less than 7% of the cultivars and experimental lines had a mean rust prevalence rating above seven. The response of a cultivar or experimental line to the natural stem rust population was very consistent between years.

The range of stem rust prevalence on blends was narrower than that for individual cultivars; however, differences were significant (Table 2). Stem rust prevalence in blends usually approximated the mean rust severity of the respective cultivars when grown as a pure line. Some exceptions were noted. When comparing rust ratings of blends to the mean of the

respective cultivars grown as a pure line, the blends of Fylking, Pennstar, and Nugget and of Fylking, Pennstar, and Merion differed by an amount greater than one on the 1–9 rating scale in both years. Blends containing Fylking, Pennstar, Baron and Fylking, Nugget, Sydsport differed by this margin in only 1978. The differences for all remaining blends were less than one.

When establishing new plantings or when overseeding or renovating bluegrass turfs, we recommend blending at least three improved Kentucky bluegrass cultivars. Since stem rust of Kentucky bluegrass probably exists as several races (3), blending resistant cultivars should provide a greater genetic base of stem rust resistance to a turf. Unfortunately, the genetic basis of pathogen races and host resistance in Kentucky bluegrass is lacking, compared with stem rust of wheat (3).

Races of the pathogen undoubtedly exist, but until host differentials are developed, the number of *P. graminis* races on Kentucky bluegrass will remain unknown. Thus, degree of stem rust susceptibility of cultivars or lines may differ in different geographic areas. Britton and Butler (2) and Pfleger (5) rated Newport as more resistant to stem rust than Park or Delta, but in our study Park and Delta were more resistant.

Disease control was obtained by using blends in these studies, but blends approximate the resistance of the

cultivars in the blend. Thus, blends should consist only of resistant cultivars. Incorporation of susceptible cultivars reduces the resistance level of the blend.

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