Effects of Wheat Streak Mosaic Virus Infection on Fifteen Hard Red Spring Wheat Cultivars

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Wheat streak mosaic has always been a significant problem in areas where winter wheat is grown. Spring wheats are also commonly susceptible, however, and the recent trend toward increased plantings of winter wheat in eastern North Dakota could increase the incidence of wheat streak mosaic in spring wheats.

Knowledge of the effects of wheat streak mosaic virus (WSMV) on hard red spring wheat cultivars may help in cultivar selection for planting in areas where wheat streak mosaic is a problem. In this study, 15 hard red spring wheat cultivars were evaluated under field conditions for their responses to early infection with WSMV. This study emphasized newer cultivars, while more commonly grown cultivars have been tested previously (1,2,3).

MATERIALS AND METHODS

Hard red spring wheat cultivars Butte, Butte 86, Challenger, Cutless, Eagle/ND5865sib, Glenman, HY 320, Katepwa, Lancer, Leif, Norak, Norseman, Olaf, Oslo, and Success were grown in field plots at Fargo. All were planted May 16, 1986 in paired four-row plots with four replications. On June 9 (three to four leaf stage), the two center rows of one of each of the paired plots were inoculated by spraying the plants with a mixture of carborundum and diluted sap from WSMV-infected wheat plants.

Typical yellowing and streak mosaic symptoms were observed approximately two weeks after inoculation. Mild to severe stunting became evident as the growing season progressed.

The two center rows (20 feet total per plot) of every plot, inoculated and noninoculated, were harvested for relative yield comparisons. Thousand kernel weights were determined by counting and weighing 1000-kernel samples from each plot.

RESULTS AND DISCUSSION

Spray inoculation of field plots resulted in excellent uniformity of infection. Efficiency of inoculation was as good as in previous years or better, even though different spray equipment was used. Unfortunately, 1986 conditions were very conducive to the development of other diseases as well. Yields of all entries, including checks, probably suffered as a result.

Average yields and 1000-kernel weights of all cultivars were significantly less in inoculated plots than in noninoculated plots (Table 1). Yields for virus-infected plants ranged from essentially zero bushels per acre (Olaf) to 19.4 bushels per acre (Butte 86). The cultivars with the least reduction in yield were Butte, Butte 86, Cutless, and Challenger (Fig. 1). While Butte actually suffered the least yield reduction, Butte 86, Cutless, Challenger, and Oslo produced the highest yields. The most yield reduction was suffered by Olaf, with Norak, Katepwa, and Success almost as severely affected. Except for Norak, these results are consistent with those of previous years (Table 2) (1,2,3).

Thousand-kernel weight was most reduced by virus infection in Norak, Success, Katepwa, and Oslo, while seed weights of Leif and Lancer were least affected (Fig. 2). Still, Butte 86 had the heaviest grain and HY 320 the lightest.

From these results it appears that Butte, Butte 86, Cutless, and Challenger should perform best where WSMV is present. Growers who are planting hard red spring wheats in areas where WSMV infection has been a problem in the past should consider the use of these varieties if alternative controls are not feasible.

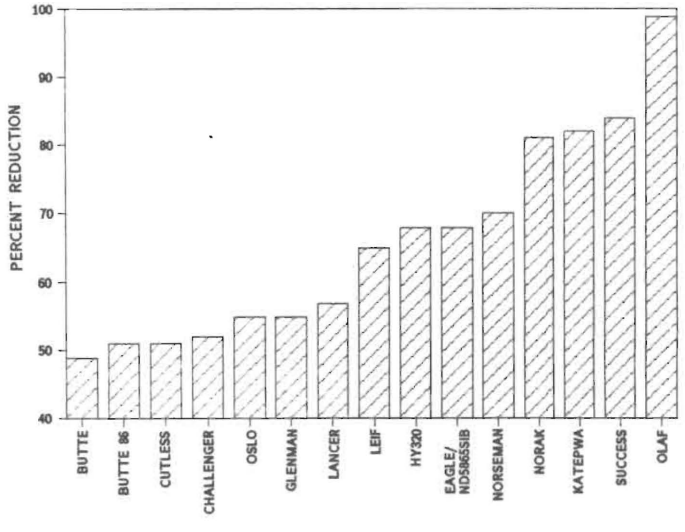

Figure 1. Reduction in yields of 15 hard red spring wheats as a result of infection with wheat streak mosaic virus.

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Table 1. Effect of WSMV infection on yield and thousand kernel weight of fifteen hard red spring wheat cultivars in field trials at Fargo, 1986.

Cultivar	Yield (Bu/A)[a] Control	Yield (Bu/A)[a] WSMV Inf.	% Yield Reduction[b]	1000 Kernel Wt. (g)[a] Control	1000 Kernel Wt. (g)[a] WSMV Inf.	% Weight Reduction[b]
Butte	27.4	14.1	49 g	23.2	17.6	24 def
Butte 86	39.9	19.4	51 g	27.4	20.5	25 cdef
Challenger	38.3	18.4	52 fg	22.3	16.3	27 bcdef
Cutless	38.2	18.7	51 g	24.1	16.8	30 bcde
Eagle/ND5865sib	24.8	7.9	68 de	22.1	15.7	29 bcde
Glenman	25.1	11.2	55 fg	22.7	17.3	24 ef
HY 320	23.4	7.6	68 de	18.8	13.1	30 bcde
Katepwa	38.3	6.8	82 b	26.8	17.5	35 abc
Lancer	29.0	12.4	57 efg	23.9	19.2	20 f
Leif	26.3	9.3	65 def	22.3	18.3	18 f
Norak	38.2	7.4	81 bc	23.6	13.6	42 a
Norseman	40.2	11.9	70 cd	24.6	19.0	23 ef
Olaf	30.4	0.4	99 a	24.9	18.6[c]	25 cdef
Oslo	38.5	17.5	55 fg	22.8	15.1	34 abcd
Success	25.8	4.1	84 b	21.0	13.3	37 ab

[a]differences between healthy and infected plant yields are all significant at the 0.1% level (paired t-test).
[b]values followed by the same letter are not significantly different at the .05% level (Duncan's test).
[c]thousand kernel weight data for WSMV-infected Olaf is only estimated due to insufficient seed production.

Table 2. Yield reductions due to WSMV infection for selected cultivars in 1986 versus previous years. (Data from past years was derived from references 1-3).

Cultivar	% Yield Reduction 1979	1980	1984	1985	1986	Average % Reduction Over All Years
Butte	41	26	32	54	49	40
Olaf	89	69	47	98	99	80
Oslo	—	—	34	33	55	41
Katepwa	—	—	—	62	82	72
Norak	—	—	—	37	81	59
Success	—	—	—	69	84	77

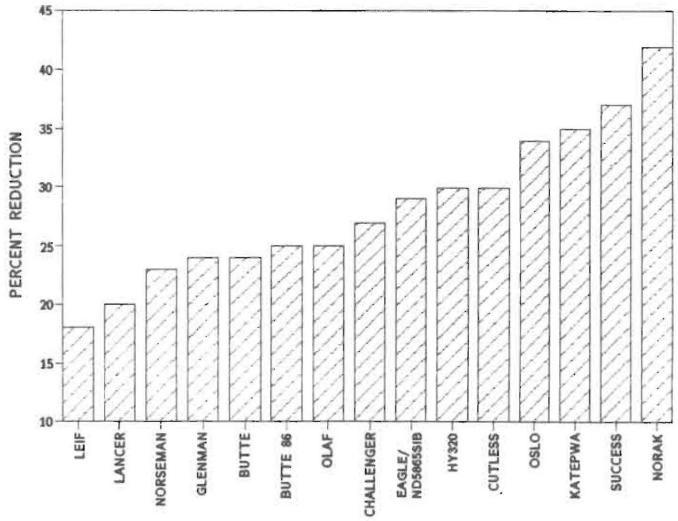

Figure 2. Reduction in thousand kernel weights of 15 hard red spring wheats as a result of infection with wheat streak mosaic virus.

Literature Cited:

1. Jons, V.L., R.G. Timian, and H.A. Lamey. 1981. Effect of wheat streak mosaic virus on twelve hard red spring wheat cultivars. North Dakota Farm Research 39:17-18.
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