

EFFECT OF WHEAT STREAK MOSAIC VIRUS ON TWELVE HARD RED SPRING WHEAT CULTIVARS

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Grain yields and growing season symptoms were recorded for 12 hard red spring wheat cultivars that were infected in the seedling stage with wheat streak mosaic virus. Significant yield differences among the cultivars were noted. Yields were higher in those cultivars with mild symptoms of WSMV.

INTRODUCTION

Wheat streak mosaic (WSM) incited by wheat streak mosaic virus and vectored by the wheat curl mite (*Eriophyes tulipae* Kiefer) is a widely occurring, important wheat disease, especially in the winter wheat growing regions of central and western North America. Annual losses in Kansas alone have exceeded \$30 million. Diseased areas can be large, covering hundreds of acres, or be confined to a few fields, or localized along the border of a single field (5).

WSM was first reported in North Dakota in winter wheat in 1964 (4). WSM also occurs on barley, corn, rye, oats, many annual and perennial grasses and spring wheats. Hard red spring and winter wheats are grown in adjacent fields in several locations in western North Dakota, or spring wheat is overseeded on winter-killed winter wheat. Severe yield losses due to WSM were observed in spring wheat grown in these western North Dakota areas in the early 70's. Losses of 100% in certain fields were observed in 1978. Entire fields were plowed under because severe infection had completely inhibited heading of the wheat plants. Our study was prompted by the apparent susceptibility of the two most popular spring wheat cultivars, Olaf and Waldron, grown in western North Dakota. Differences among spring wheat cultivars in susceptibility to WSM were observed in earlier studies (2, 3), but presently grown cultivars were not included.

MATERIALS AND METHODS

The commercial hard red spring wheat cultivars Olaf, Waldron, Eureka, Len, Coteau, Sinton, James, Butte and Prodx¹ were inoculated with WSMV under field

conditions in 1979. The wheat cultivars Olaf, Solar, Sinton, Benito, Coteau, Prodx, Pro Brand 711, Butte and James were inoculated with WSMV in 1980. Both of these trials were conducted at Fargo, North Dakota.

WSMV inoculum was prepared by grinding leaves of greenhouse infected 'Mindum' durum, straining the sap through cheese cloth, diluting it 1:10 with water, and adding 10g of 400 grit carborundum/100 ml liquid. Three- to four-leaf stage wheat seedlings were mechanically inoculated by spraying plants with a De Vilbiss type EGA paint spray gun with a type G nozzle at 40-60 lbs/in² nozzle pressure. The nozzle was held 3-4 centimeters from the leaf surface.

Nine cultivars were planted in paired four-row plots. The two center rows of one of the plots were inoculated with WSMV, and the other corresponding check plot was not inoculated. The paired treatments were randomized within each of four replications. Yield was measured by harvesting the two infected rows and the two center rows from the noninfected check, respectively. Symptoms, mainly yellowing, mosaic and stunting, were observed during the growing season (Fig. 1).

RESULTS AND DISCUSSION

Significant differences in susceptibility to WSMV, based on grain yield, were noted among spring wheat cultivars (table 1). Yield losses in 1979 ranged from 35% for Prodx to 89% for Olaf, the least and most affected of the cultivars, respectively. In 1980 the reduction in yield was least in Butte at 26% and most in Olaf at 69%. Severe stunting, yellowing, and mosaic, and lack of head development were characteristic of the infected susceptible cultivars, Waldron, Olaf, Len, Eureka and Solar. Symptoms were milder in Butte, James, Coteau, and Prodx and yields of these cultivars were less affected by the virus. Olaf and Waldron, two of the more

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widely grown spring wheat cultivars in western North Dakota were the most susceptible to WSMV.

Better choices of spring wheat cultivars, if conditions are favorable for WSM, are Butte, James, Coteau, and Prodax. Spring wheat overseeded onto partially winter-killed winter wheat, spring wheat planted adjacent to winter wheat or wheat grasses and spring wheat planted into fallow land containing volunteer winter wheat are conditions favoring the presence of WSMV (1)



Figure 1-A. Severe stunting and severe yellowing in Olaf spring wheat infected with WSMV.

Choosing less susceptible spring wheat cultivars along with cultural practices that break the cycle of the WSMV vector (the wheat curl mite) would lessen the losses caused by WSM. Destroying all volunteer wheat plants two weeks before planting will help break the mite cycle. It is impossible to predict the occurrence of WSM, but good practices along with growing tolerant cultivars will reduce losses.



Figure 1-B. Slight stunting and moderate yellowing in Butte spring wheat infected with WSMV.

LITERATURE CITED

1. Lamey, H. A. and R. G. Timian. 1979. *Wheat streak mosaic*. North Dakota Agric. Exp. Station Circ. pp-646.
2. McNeal, F. H. and T. W. Carroll. 1968. *Wheat streak mosaic in twelve varieties of spring wheat*. Plant Dis. Repr. 52(3):201-203.
3. Ralman, F., J. G. Ross and W. S. Gardner. 1974. *Tolerance to wheat streak mosaic virus in spring and winter wheat cultivars*. Crop Sci. 14:178-180.
4. Timian, R. G. and H. L. Bissonnette. 1964. *Wheat streak mosaic virus in North Dakota*. Plant Dis. Repr. 48(9):703.
5. Wiese, M. V. 1977. *Compendium of wheat diseases*. The American Phytopathological Society. St. Paul, MN. 106 p.

TABLE 1. The yield of virus free and WSMV infected spring wheat cultivars and the per cent reduction in yield in field trials in 1979 and 1980.

1979				1980			
Cultivar	Yield bu/A Virus free control	WSMV inoculated	Yield reduction %	Cultivar	Yield bu/A Virus free control	WSMV inoculated	Yield reduction %
Prodax	40	26a ¹	35	James	40	25a ¹	38**
Butte	27	16b	41	Butte	34	25a	26*
James	32	13bc	49*	Probrand711	42	24a	41**
Sinton	22	11c	55*	Prodax	33	24a	27**
Coteau	23	10c	60*	Coteau	37	24a	34*
Len	28	5d	82*	Benito	36	22ab	36**
Olaf	35	4d	89**	Sinton	29	20ab	31**
Eureka ²	-	-		Solar	35	17bc	51**
Waldron ²	-	-		Olaf	41	12c	69**
LSD 5%		3.9				5.8	

¹ Means separated by a different letter differ significantly (P = .05).

² Waldron and Eureka were not harvested due to extensive bird damage, but yields were estimated to be in the range of Olaf and Len.

*,** Significant at the .05 and .01 level, respectively, as indicated by the paired t test.