

Wheat Striate Mosaic Virus in the Dakotas and Minnesota

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ABSTRACT

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Wheat striate mosaic virus was detected in several corn plants at the South Dakota State University Southeast Experiment Farm near Beresford, South Dakota, in 1979. The virus was prevalent in hard red spring and durum wheats throughout North Dakota and northeastern South Dakota and was detected at one location in west central Minnesota the same year.

Wheat striate mosaic (WStM), caused by American wheat striate mosaic virus (WStMV), was first detected in wheat in

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South Dakota in 1950 and occurs frequently in the north central United States and adjacent Canadian provinces (3-6). WStMV is transmitted mainly by the painted leafhopper *Endria inimica* Say, and incidence is usually correlated with heavy infestations of this insect. Yield losses in wheat are usually light because the disease occurs sporadically. However, as many as 25% of the plants in durum fields in eastern North Dakota in 1959 showed symptoms (6).

WStM symptoms were observed in 38% of 65 durum wheat fields and 7% of 191 hard red spring wheat fields surveyed in North and South Dakota in 1979. Less than 3% (usually 1% or less) of the plants in any commercial field showed symptoms; but up to 20% of the durum plants in

some experimental plots at Fargo, ND, had symptoms typical of WStM.

Scattered plants of corn inbred N28Ht (*Zea mays* L.) in the Animal and Plant Health Inspection Service disease monitoring plot and N28 border rows on the South Dakota State University Southeast Experiment Farm showed symptoms that were atypical of maize dwarf mosaic (1). The upper leaves of these corn plants had very distinct, long, thin, white, chlorotic streaks (Fig. 1), resembling the symptoms caused by WStMV on durum wheat (*Triticum turgidum* L.) (2-4). Symptomatic corn leaves were collected for disease identification.

MATERIALS AND METHODS

Sap from diseased N28Ht corn leaves was used to mechanically inoculate Golden Cross Bantam sweet corn (*Z. mays* var. *saccharata*), N28 corn, johnsongrass (*Sorghum halepense* (L.) Pers.), and Olaf and Kitt hard red spring wheats (*Triticum aestivum* (L.)).

Leafhoppers (*E. inimica*) and greenbugs (*Schizaphis graminum* Rond.) were fed on other symptomatic N28Ht leaves for



Fig. 1. Wheat striate mosaic symptoms on leaves of corn inbred N28Ht.

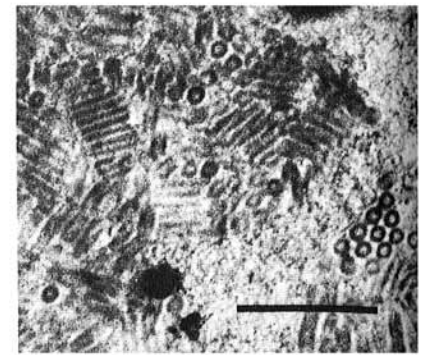


Fig. 2. Bacilliform particles in a thin section preparation from a corn leaf with wheat striate mosaic symptoms. Bar represents 500 nm.

The N28Ht field corn isolate was serologically indistinguishable from the stock culture of WStMV. Bacilliform particles (Fig. 2) like those described for WStMV (2) were observed in preparations from N28Ht corn and striated wheat from Morris, MN, but not in preparations from symptomless Golden Cross Bantam.

Evidence from transmission studies, serology, and electron microscopy indicated that WStMV was present in and contributed to the symptoms noted on N28Ht corn grown in the experimental plots. This is the first known report of WStMV infecting dent corn under natural conditions in the field and the first confirmed report of WStMV infecting wheat in Minnesota. Earlier reports of host range studies include greenhouse infections of Gaspe flint corn (2,4); and, based on characteristic symptoms, the virus reportedly occurred on wheat in Minnesota (6).

The importance of WStMV in corn is not known. N28Ht was very susceptible and Golden Cross Bantam appeared immune in our studies. Testing other inbred lines and corn hybrids for susceptibility to WStMV is warranted.

LITERATURE CITED

1. Jons, V. L., Timian, R. G., and Gardner, W. S. 1981. Wheat striate mosaic virus found in corn in South Dakota. (Abstr.) *Phytopathology* 71:229.
2. Sinha, R. C., and Benki, R. M. 1972. American wheat striate mosaic virus. *Descriptions of Plant Viruses*, No. 99. Commonw. Mycol. Inst./Assoc. Appl. Biol., Kew, Surrey, England.
3. Slykhuis, J. T. 1953. Striate mosaic, a new disease of wheat in South Dakota. *Phytopathology* 43:537-540.
4. Slykhuis, J. T. 1962. Wheat striate mosaic, a virus disease to watch on the prairies. *Can. Plant Dis. Surv.* 42:135-142.
5. Slykhuis, J. T. 1963. Vector and host relations of North American wheat striate mosaic virus. *Can. J. Bot.* 41:1171-1185.
6. Timian, R. G. 1960. A virus of durum wheat in North Dakota transmitted by leafhoppers. *Plant Dis. Rep.* 44:771-773.
7. Timian, R. G., Jons, V. L., and Lamey, H. A. 1978. Maize dwarf mosaic virus in North Dakota. *Plant Dis. Rep.* 62:674-675.

24 hr. The greenbugs were then transferred to N28 and Golden Cross Bantam corn, and the leafhoppers were transferred to Mindum durum wheat. After a 12-day incubation period, equal numbers of leafhoppers were transferred to Mindum durum wheat; Olaf spring wheat; and N28, N28Ht, and Golden Cross Bantam corn.

Ouchterlony double-diffusion tests were conducted to compare the N28Ht field corn isolate with a stock culture of WStMV. WStMV antiserum was obtained from the American Type Culture Collection.

N28Ht corn infected with the corn isolate, symptomless Golden Cross Bantam on which WStMV-infective leafhoppers had fed, and striated wheat leaves collected from the University of Minnesota's west central experiment station, Morris, MN, were examined for the presence of virus particles. All tissues were fixed in 2.5% glutaraldehyde in 0.01 M phosphate buffer (pH 7.0) and postfixed in osmium tetroxide. Thin sections were stained with lead citrate followed by uranyl acetate and were viewed with a Philips 300 electron microscope.

RESULTS AND DISCUSSION

Mechanical inoculation with sap from symptomatic corn leaves caused foliar symptoms similar to those induced by maize dwarf mosaic virus (MDMV) (7) on Golden Cross Bantam and N28 corn but not on johnsongrass or Olaf or Kitt wheats. Symptoms typical of MDMV infection also developed on Golden Cross Bantam and N28 plants on which infective greenbugs had fed.

Symptoms similar to those caused by WStMV (2-4) were evident on Mindum and Olaf wheats approximately 2 wk after infective leafhoppers had fed on them. Symptoms developed on N28 and N28Ht but not on Golden Cross Bantam corn 3 wk after leafhopper feeding. Symptoms produced by the field corn isolate on Mindum wheat and N28Ht corn were similar to those caused by the stock culture of WStMV in greenhouse studies. Although all N28Ht plants collected in the field were infected with both MDMV and WStMV, prior infection with MDMV was not necessary for infection with WStMV in the greenhouse. In all studies, virus-free controls did not develop symptoms.