Wheat Streak Mosaic Virus in Wild Rice

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ABSTRACT

Berger, P. H., Percich, J. A., and Ransom, J. K. 1981. Wheat streak mosaic virus in wild rice. Plant Disease 65:695-696.

Several wild rice plants (*Zizania aquatica*) in experimental paddies on the Minnesota Agricultural Experiment Station in St. Paul were observed to have streak symptoms, suggesting a viral infection. Electron microscopy, host range, and serology confirmed wheat streak mosaic virus as the causal agent.

Wild rice (*Zizania aquatica* L.) is becoming an increasingly important commercial crop in Minnesota and Canada. Although several fungal and bacterial pathogens are known to attack *Z. aquatica* (3,5), this is the first report of a mechanically transmitted viral pathogen isolated from wild rice.

Many of the fungal and bacterial diseases of wild rice are similar or identical to those of rice (*Oryza sativa* L.). However, most of the major viral diseases of rice are not found in North America. Rice is susceptible to sugarcane mosaic virus and maize dwarf mosaic virus (MDV) (2), but attempts to infect *Z. aquatica* with either MDMV-A or MDMV-B were unsuccessful (Berger and Zeyen, *unpublished data*).

During the summer of 1979, several *Z. aquatica* plants in experimental paddies on the Minnesota Agricultural Experiment Station in St. Paul were observed to have streak symptoms, which suggests viral infection. Other wild rice plants were systemically infected by mechanical inoculation using sap expressed from infected plants found in the paddies. This inoculation was difficult, probably because the wild rice leaf surface is hydrophobic.

Infected plants showed typical streak symptoms, but as the disease progressed the chlorotic areas on the lower leaves became necrotic after 10 days (Fig. 1). The necrotic areas eventually coalesced, resulting in the death of the leaf. Attempts to isolate fungal or bacterial pathogens from these necrotic lesions were unsuccessful.

Thin sections of systemically infected wild rice examined with the electron microscope contained inclusion bodies and "pinwheel" inclusions (Fig. 2). Sap from naturally infected wild rice negatively stained and examined by the electron microscope contained flexuous, rod-shaped particles measuring 700 × 13 μm (Fig. 3).

Twenty plants of several grass species, oats, wheat, barley, and some cultivars of maize were systemically infected by mechanical inoculation from wild rice. However, quack grass (*Agropyron repens* (L.) Beauv.), barnyard grass (*Echinochloa crus-galli* (L.) Beauv.), barley (*Hordeum jubatum* L.), and Trudan-5 (Sudangrass, Northrup King Corp.) were not susceptible. Regardless of the systemically infected host used as an inoculum source, attempts to transmit the virus by several hundred green peach aphids (*Myzus persicae* Sulzer) and oat bird cherry aphids (*Rhopalosiphum padi*

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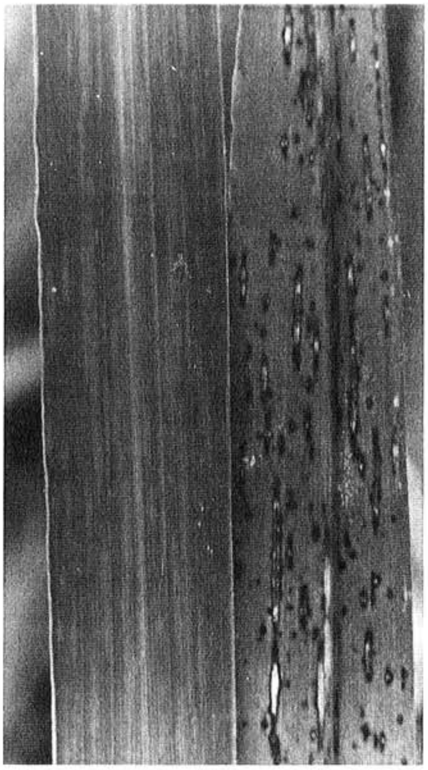

Fig. 1. Symptoms in wild rice following manual inoculation with wheat streak mosaic virus. The leaf on the right was infected longer than that on the left. Necrotic areas eventually coalesced.

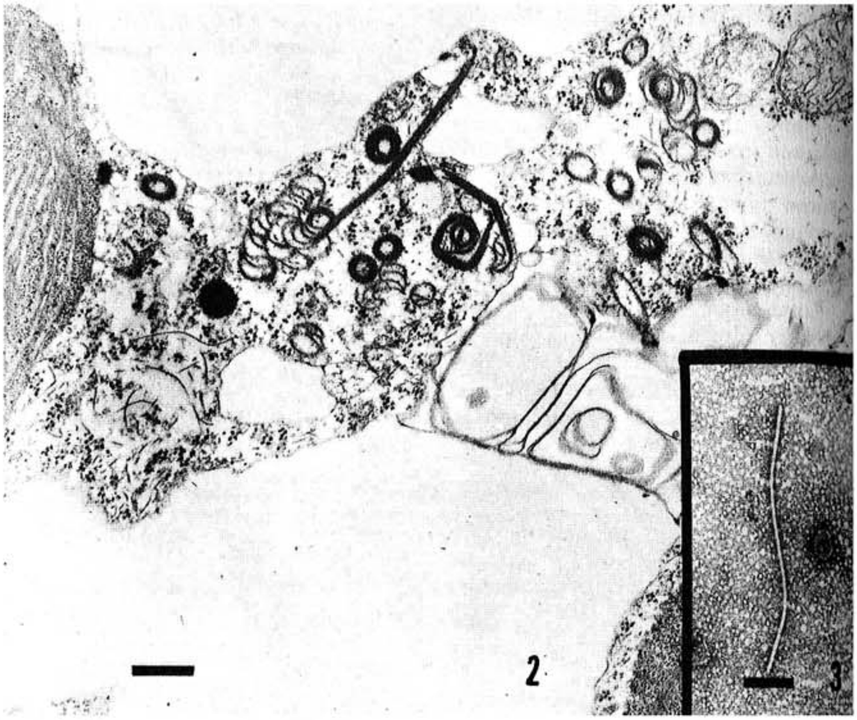

Fig. 2. Mesophyll cell of wild rice leaf containing circular and pinwheel inclusions associated with viral infection. Bar = 20 μm. **Fig. 3.** Negatively stained, flexuous, rod-shaped particles associated with infected wild rice. Bar = 100 μm.

L.) to either barley or wild rice were unsuccessful.

We performed agar double diffusion tests using antisera to MDMV-A, agropyron mosaic virus (AMV; supplied by W. G. Langenberg), and wheat streak mosaic virus (WSMV, source unknown). Strong precipitin bands were evident in reaction to AMV and WSMV but not to MDMV-A or healthy controls. Although the serologic dilution endpoints for AMV and WSMV were the same (1:16), WSMV appeared to be the causal agent on the basis of the host range (1).

Slykhuis and Bell (6), however, indicated that barnyard grass (*E. crus-galli*) is susceptible to WSMV but not to AMV. Differences in antisera quality may account for the inability to differentiate WSMV from AMV serologically, because Slykhuis and Bell (6) considered the serologic relationship to be distant. The slight difference in host range and the serology suggest that the wild rice isolate of WSMV (WSMV-WR) may be more closely related to AMV than the strains used by Slykhuis and Bell (6) and McKinney (4). Work is continuing on the relationship of WSMV-WR to type cultures of WSMV and AMV.

Although very few plants were found to be naturally infected with WSMV-WR, crop losses may occur in the future. WSMV has caused significant yield losses in other Gramineae (7). The eriophyid mite vector, *Aceria tulipae* Keif., which is commonly found on wild rice, retains WSMV for several days and is transported long distances by wind. It is thus likely that this disease will be observed again in wild rice. Monitoring for WSMV in wild rice is continuing.

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