PURPLE-TOP WILT OF POTATOES CAUSED BY THE
ASTER YELLOWS VIRUS

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Despite the fact that purple-top wilt of potatoes has been known since 1915 (Muncie, 1940), the etiology of this disease has remained obscure. It was suggested by Muncie (1932), Long (1935), Orton and Hill (1938) and Leach and Decker (1938) that the disease was caused by some insect injury. Severin and Haasis (1934), Leach (1939) and Epps (1942) have shown that both eastern and western strains of the aster yellows virus may induce symptoms on potatoes closely resembling those characterizing purple-top wilt in the field. Severin (1940) transmitted the western aster yellows virus from a naturally infected, volunteer potato plant to asters by means of a long-winged strain of the aster leafhopper. This is apparently the only report of successful transmission of a virus, which resembles the aster yellows virus, from naturally infected potatoes. The western strain of the aster yellows virus is not known to occur outside of California, Oregon, Washington, Wyoming, Colorado, and Utah (Severin, 1942). For this reason it is probably not associated with the potato purple-top wilt disease as known in New York, Pennsylvania, West Virginia, North Dakota, Minnesota, Wisconsin, and Michigan. Epps (1942) reported that out of 193 trials, he obtained 28 cases of successful transmission to potatoes of the eastern aster yellows virus. He was unable to transmit the virus from potatoes to asters by means of *Macroteles divisus* (Uhl.), but obtained transmission of the virus by means of grafts from potato to *Nicotiana rustica* L., and subsequently from *N. rustica* to asters by means of *M. divisus*.

The present studies were made in an attempt to determine more precisely the relationship between the eastern strain of the aster yellows virus and the purple-top wilt disease.

**Materials and Methods**

A strain of the eastern aster yellows virus was secured from naturally infected ragweed (*Ambrosia artemisifolia* L.) found near a field of potatoes showing purple-top wilt symptoms at Gainesville, New York. Throughout these studies the virus has been maintained on asters

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and has been transferred by means of a colony of *Macrosteles divisus* collected in the same locality.

Non-infective insects were reared on barley. When the nymphs were in the third or fourth instar they were moved to diseased asters and fed on these plants continuously for 20 to 30 days. The infective insects were then transferred to caged potato plants 1 to 1 1/2 inches in height. At the end of the feeding period on potatoes, the cages and surviving insects were removed and the plants fumigated at 10-day intervals.

**Transmission of the Eastern Aster Yellows Virus to Potatoes**

During the course of these studies 475 potato plants, comprising 11 different varieties, have been inoculated with the aster yellows virus. A total of 208 or 43.8 per cent of these plants showed typical symptoms of purple-top wilt. Symptoms displayed by the varieties Rural, Katahdin, Sebago, and Mesaba are characterized by the appearance of a purple color at the base of the leaflets. Leaflets on infected plants of the varieties Warba, Earline No. 2, Chippewa, and Russet Burbank display a faint purpling, while symptomatic leaflets of Green Mountain, Houma and Sequoia become yellow rather than purple. The purple color appears to be accentuated by intense light in those varieties where pigmentation is characteristic. Aside from the degree and type of coloration, the symptoms on all varieties are similar. Infected plants are dwarfed, the youngest leaflets are rolled upward, and tend to be more narrow than normal leaflets. The magnitude of the angles at the leaf axils is greatly increased and shoots are produced from all but the uppermost leaf axils. During the short day seasons aerial tubers are formed in the axils of the lower leaves. From ten days to six weeks after the appearance of the symptoms the plants wilt. The roots of wilted plants are completely necrotic and the necrosis may extend a short distance upward from the base of the stem. A few tubers have been found showing a limited net necrosis at the stem end.

Attempts to transfer the aster yellows virus directly from potatoes to asters by means of *Macrosteles divisus* have been unsuccessful. Cleft grafts on *Nicotiana rustica* using scions from infected potatoes have resulted in virus transmission in less than 10 per cent of the trials. Inarch grafts have been more successful and a maximum of 50 per cent of such unions have resulted in virus transmission. Successfully inoculated *N. rustica* plants become symptomatic within 4 to 10 days and