Feathery mottle virus of sweet potato in Ontario

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The occurrence of a virus similar to feathery mottle virus in certain transmission characteristics, particle morphology, and size is reported in sweet potato ***(Ipomoea batata)*** for the first time in Canada. The virus was found in both experimental and commercial plantings in Norfolk County, Ontario, and is widespread in the cultivars Jewel, Nemagold, Baker, Puerto Rico, and Redmar.

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La frequence d'un virus semblable a celui de la marbrure duveteuse, en ce qui concerne certaines caracteristiques de transmission, la morphologie et la taille, est signalée pour la premiere fois au Canada chez la patate douce ***(Ipomoea batata).*** Le virus a ete observe dans certaines plantations experimentales et commerciales du comté de Norfolk (Ontario) et est largement repandu dans les cultivars Jewel, Nemagold, Baker, Puerto Rico et Redmar.

Research to improve the quality and yields of sweet potato ***(Ipomoea batata*** **(L.)** Poir), a crop of limited acreage but of high dollar value per acre in Ontario, was initiated in 1972 by the Horticultural Research Institute of Ontario at Simcoe, Ontario. One of the principal problems encountered was an apparent virus disease in all the experimental plantings that often reached an incidence of 100%. The disease was equally prevalent on farms in the Simcoe region. Our concern was that material produced as selected seed roots from affected cultivars in the experimental plots and later released to the Ontario grower might further spread the disease and affect marketable yield and quality in subsequent crops. This paper briefly reports experiments conducted to determine the transmissibility, the viral nature, and the identity of the virus associated with this disease condition.

Symptoms

Primary symptoms of the disease in most of the sweet potato cultivars observed in the field consist of small faintly chlorotic spots and sometimes rings randomly scattered over the younger leaves. These spots gradually enlarge and later become diffuse. Vein-clearing and vein-banding may develop subsequently and as the affected leaves age they may become mildly chlorotic and mottled. Under summer conditions the foliage symptoms are usually masked; definite symptoms can only be distinguished on the lower, shaded leaves (Fig. 1**A).** The cultivar Nemagold, however, frequently exhibits purple rings on the lower, older leaves.

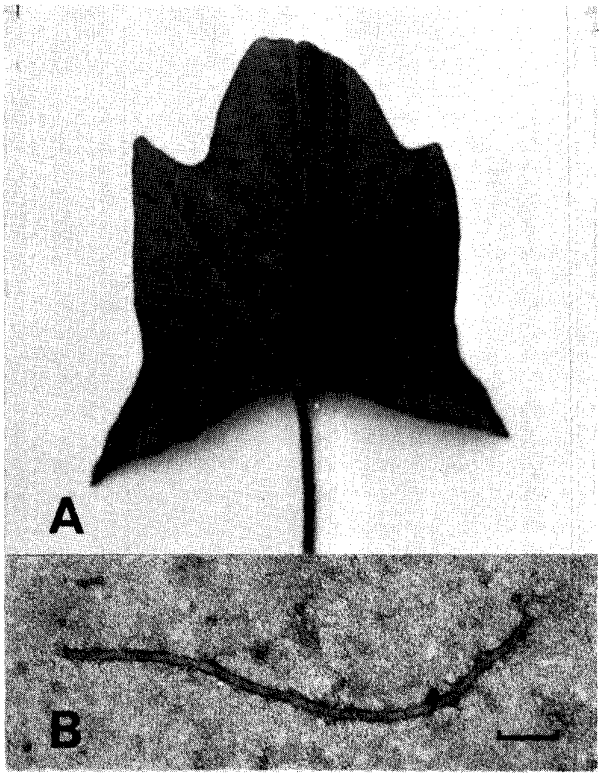

Figure 1, A) Sweet potato leaf (cv. Nemagold) naturally infected with feathery mottle virus. B) Flexuous rod-shaped virus particle (ca. 850 nm) in negatively stained leaf dip from infected Nemagold sweet potato. Bar length, 0.1 mμ.

Experimental and discussion

When inoculum was prepared with 0.1M **DIECA,** symptoms appeared on the first true leaves of the test plants ***(Ipomoea nil*** cv. Scarlet O'Hara) as early as **14** days after mechanical inoculation. In this test, all 35 inoculations resulted in visible symptoms within **4**

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weeks. Moreover, symptoms induced in the Scarlet O'Hara seedlings after inoculation with sap in 0.1M DIECA from infected leaves of the sweet potato cultivars Jewel, Nemagold, Baker, Puerto Rico, Redmar, and B18 were indistinguishable from each other.

No virus-like symptoms were produced on the cultivar Scarlet O'Hara mechanically inoculated at the cotyledonary stage with inoculum prepared in tap water or in 0.1M cysteine hydrochloride at ca. 2 ml/g infected leaf. Twenty-five seedlings inoculated with sap prepared either way failed to develop symptoms after a 4–6 week period.

All 19 healthy 14-day-old Scarlet O'Hara seedlings were successfully infected when young apical shoots from *I. batata* cv. B18 and Redmar with pronounced symptoms were grafted onto their stems and bound with latex rubber strips. The incubation period of the virus in this plant varied from 14 to 28 days, with most of the plant showing definite symptoms within 18 days. The first symptoms consisted either of small yellow spots or vein-clearing on leaves that had not yet reached full size. Three of the 19 grafts failed to unite and the scions wilted and died within 3 days; however in each case the receptor seedling became infected. This suggested that contact only was required to transmit the virus from scion to stock. The symptoms induced on Scarlet O'Hara seedlings after mechanical inoculation with sap and by grafting were indistinguishable.

The possibility that the virus was transmitted by aphids was also investigated. On 3 occasions, summer populations of the aphid (*Myzus persicae* [Sulz]), collected from infected sweet potatoes in the field, failed to transmit the virus to Scarlet O'Hara when 10 aphids were caged on each healthy seedling immediately after collection. In two greenhouse experiments *M. persicae* raised on healthy cabbage seedlings were used in aphid transmission tests. The aphids were removed from the seedlings, starved by holding on moist filter paper for 3 to 4 hours, and then placed on detached leaves of infected sweet potatoes. After feeding for 1 to 2 minutes they were transferred in groups of 5 to 10 seedlings of *I. nil.* About 15 hours later, the aphids were either killed with a malathion spray or removed by hand. None of the plants exposed to feeding aphids developed visible virus symptoms. Neither was virus detected in the test plants when they were indexed by mehcanical inoculation to *I. nil* seedlings.

Attempts to determine the thermal inactivation, dilution end-point and longevity of the virus in sweet potato sap expressed in 0.1M DIECA were unsuccessful.

Crude extracts from sweet potato leaves with chlorotic spots, rings, and vein-banding symptoms were examined under a Phillips 201 electron microscope. With both the epidermal-strip and leaf dip techniques (2), involving negative staining with 2% phosphotungstate, only long, flexuous rods (ca. 850 nm) were observed (Fig. 1B). No virus-like particles were observed in preparations from symptomless, apparently healthy plants of the same cultivar.

The data presented here indicate that the disease in sweet potato in Ontario is virus induced. Similarities in symptomatology, certain transmission characteristics, and particle morphology and size strongly suggest that the chlorotic spotting, vein-banding, and, in some instances, the purple ring symptoms on sweet potato were caused by feathery mottle virus (FMV) previously described in the USA (1); however our failure to achieve virus transmission by aphids is at variance with that report. While there is no previous report that this virus occurs in Canada, our observations indicate that FMV may be widely distributed in all commercial sweet potato cultivars in Ontario. Moreover, the disease appears to be of economic importance in the successful production of this crop.

Literature cited

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