CURLY-TOP, A VIRUS DISEASE OF FLORISTS' GERANIUM IN ONTARIO[1]

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Abstract

Evidence is presented to prove that the pronounced yellow veinbanding and curling, observed on the foliage of Pelargonium hortoruim var. "George Tassel" at Dunnville, Ontario, is of virus origin.

Introduction

In December, 1958, peculiar symptoms suggestive of virus infection were observed in two three-year old stock plants of Pelargonium hortorum Bailey var. "George Tassel" in a greenhouse at Dunnville, Ontario. The syndrome in this variety was unlike that of any of the virus diseases of geranium hitherto reported in Canada, This report describes the disease and presents some experimental evidence concerning its nature.

Symptoms

Affected plants of the variety George Tassel develop a pronounced yellowing of the entire network of veins of many of the leaves under conditions of low temperature and low light. Some of the foliage on three-year-old plants appears mildly chlorotic. The younger, vein-cleared leaves are cupped and frequently curled downward (Fig. 1). On the older, woody parts of the plant, extremely small, curled, vein-cleared leaves develop from many of the nodes. By March, 1959, both of the affected plants and their progeny lost the marked vein-clearing. Though this feature of the disease was still faintly discernible at that time, most new growth showed only moderate chlorosis with no cupping or curling. Conspicuous symptoms reappeared during January, 1960, under greenhouse conditions.

Transmission

Scions from healthy seedlings of Pelargonium aonale Ait. were top grafted to affected George Tassel plants to determine whether the symptom complex was graft-transmissible.

Eighteen such graft combinations were made during the first week of December, 1959. The grafted plants were kept under constant surveillance for four months. Three scions showed mild but distinct veinal chlorosis but no curling of the leaves in 21 days. Two weeks later, an additional seven scions exhibited these mild symptoms. Not until two months after grafting was pro-

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Fig. 1. Symptoms of curly-top on the geranium variety George Tassel.

nounced yellow vein-clearing observed. These more severe symptoms appeared on only three leaves of a single scion. Definite cupping of the foliage was found, however, on three previously healthy scions. As summer approached, the symptoms became less and less apparent. They recurred in January, 1960, and again in January, 1961, on a few plants maintained in the greenhouse.

During January, 1960, three symptomless, presumably healthy, George Tassel scions were top-grafted to affected plants. Marked vein-banding and some downward cupping was noted on one of the scions in January 1961. No definite symptoms were apparent before this time.

In the first year following grafting, none of the scions exhibited the severe curly top symptom that seems to be associated with the advanced stage of infection in older plants. More pronounced symptoms that approached those found on the naturally affected George Tassel appeared, however, in the latter part of the second year,

Mechanical inoculations by conventional methods, using affected leaves of George Tassel as inoculum, failed to infect Pelargonium zonale Ait., Nicotiana glutinosa L., N. tabacum L., N. rustica L., Datura stramonium L., Chenopodium amaranticolor Coste and Reign., Cucumis sativa L., and Gomphrena globosa L.

Neither a bacterial nor a fungous pathogen was isolated from stem tissue of geraniums affected by curly-top.

Discussion and Conclusions

The experimental evidence indicates that the disease syndrome observed in plants of the variety George Tassel is of virus origin. The results do not exclude the possibility that curly-top in Ontario is a composite disease caused by multiple virus infection. However, the affected plants, as originally observed, have never shown the characteristic symptoms of leaf curl (2) and mosaic (4, 5), the only virus diseases of geranium reported in Canada. Nevertheless, the viruses responsible for these diseases might be masked in George Tassel under the environmental conditions in our greenhouses. Moreover, other latent, undetected viruses might be present and could account in part for the symptoms noted. Since the common geranium viruses are not usually mechanically transmissible and infect few plant species, the separation of component viruses in any complex in this host is prevented.

The identity of curly-top and its relationship to other virus diseases described elsewhere in geranium has of necessity been based on symptoms alone. In some characteristics, the Ontario disease resembles and could be similar to the curly-top of geranium that occurs in California. Severin and Freitag (7) described this disease in 1934 and showed that it was caused by Beta virus 1, which is transmitted by the beet leafhopper, Circulifer tenellus (Baker) (=Euttetix tenellus (Baker) of Severin and Freitag). However, no protuberances such as they described were observed on the veins of the undersides of the leaves of affected George Tassel. McWhorter (6) described a geranium disease that he called leaf cupping. There appeared to be some question in his mind as to whether curly-top and leaf cupping should be considered the same, though he felt that Severin and Freitag had clearly showed that the curly-top virus caused a leaf cupping disease of Pelargonium. Moreover, he believed that they confused other troubles with accepted curly-top symptoms. The protuberances described by them have been shown to be the direct result of insect feeding, not a virus. This fact might account for my failure to find this symptom on my infected plants. Insects have never been observed on the naturally infected plants, nor have they been seen on the graft-inoculated scions.

Kivilaan and Scheffer (3) also described a leaf cupping disease of geranium that they attributed to the curly-top virus. Their illustration showing leaf cupping in a seedling plant grafted with a scion from a symptomless plant does not resemble the Ontario disease as observed in naturally infected George Tassel, graft-inoculated, presumably healthy, George Tassel, or grafted seedlings of P. zonale.

Inasmuch as the symptoms of the Ontario disease do not agree in all respects with those reported for curly-top in California and leaf-cupping in Michigan, it seems best at present not to identify the Ontario disease with either of the two until their relationships have been further investigated.

Should this disease in fact be caused by Beta virus 1, concern about its natural spread in Ontario can be dismissed because the only insect vector of Beta virus 1, the beet leafhopper, has not been reported in Canada (1). Moreover, the virus has not been mechanically transferred,

Curly-top of geranium is of no economic importance in Ontario at the present time and no cases of this disease have been brought to my attention since the original one in 1958.

Literature Cited

1, BEIRNE, B. P. 1956. Leafhoppers (Homoptera:Cicadellidae) of Canada and Alaska. Can. Ent. 88, Supplement 2.

2. BERKELEY, G.H. 1938. Leaf curl of geranium. Can. Hort. Home Mag. April 1938: 1-4.

3. KIVILAAN, A. and R.P. SCHEFFER, 1959. Detection, prevalence, and significance of latent viruses in Pelargonium. Phytopathology 49 (5): 282-286

4, MACLACHLAN, J.D. 1949. in Can. Plant Dis, Survey. 29th Ann. Rept. 109.

5, MACLEOD, D. J. 1949. in Can. Plant Dis. Survey. 29th Ann, Rept. 109.

6. MCWHORTER, F.P, 1957. Virus diseases of geranium in the Pacific Northwest. Plant Dis. Reptr. 41 *(2):* 83-88.

7. SEVERIN, H.P. and J.H. FREITAG. 1934. Ornamental flowering plants naturally infected with curly-top and aster-yellows viruses. Hilgardia 8: 233-260.

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