LEAFROLL RESISTANCE IN SOME TUBEROUS SOLANI UNDER CONTROLLED APHID INOCULATIONS

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INTRODUCTION

Resistant varieties constitute the best means of controlling virus diseases of plants. Commercial varieties of potato highly resistant to the potato leafroll virus have not yet been obtained. Nor has an effective control other than resistance been developed for the leafroll disease. Since no immunity to this virus had been found among the various varieties and seedlings of Solanum tuberosum L. (11), the search was extended to other members of the genus Solanum (2, 3, 10, 12).

In 1933, Dykstra (3) transmitted the leafroll virus to these Solanaceous plants: Datura stramonium L., D. tatula L. and Lycopersicon esculentum Mill, with the aphid, Myzus persicae Sulzer, now known to be the major vector of the virus.


Webb and Hougas (12) evaluated 164 selections of 33 Solanum spp. and 57 selections of species hybrids for leafroll susceptibility. At least one plant of every selection included became infected with the leafroll virus. Nonetheless, 57 selections showed greater resistance than the field resistant Katahdin. Disease reaction was based on a five-hill field test and five plant greenhouse inoculation trial using the green peach aphid as vector.

In 1950, Ross and Baerecke (10) indicated that S. chacoense Bitt., S. catarthrum Juz. and S. andigenum Juz. et Buk. might have immune individuals among them. No later reports confirming this have been noted.

In 1952, Webb, Larson and Walker (13) reported that the leafroll virus could not be recovered from eggplant, Solanum melongena L.

Other investigators (1, 2, 4, 5, 6, 7, 8, 11) have tested various potato varieties and their progenies for field resistance to leafroll. To date, no seedling or variety immune to the leafroll virus is known. Even the seedling


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F 4896 (Southesk X Katahdin parentage), which remained healthy after six years of aphid transmission tests in the field and greenhouse, was susceptible to graft inoculation with the leafroll virus (7). Stevenson, Folsom and Dykstra (11) also obtained lines which withstood the disease for five years in the field.

Thus, practically all Solanum spp. which have been tested contain susceptible individuals. S. melongena, not a member of the section Tuberosum, appears to be an exception. This study was begun in order to locate additional sources of resistance to leafroll which would be useful in plant breeding programs. It was hoped that some of these would provide true immunity to the virus.

**Materials and Methods**

Production of experimental plants: The accessions tested were obtained from the Inter-regional Potato Introduction Station at Sturgeon Bay, Wisconsin, and were started in flats (if true seed) or in 4-inch pots (if tubers). The seedlings were transplanted to 4-inch pots in the three- to four-leaf stage. Plants for field exposure were grown in the greenhouse at 70°F under natural light conditions until shifted to the field.

Exposure to infection: Field exposures were commenced in late June with plants two months old. Plants were 18 inches apart in rows three feet apart. The rows ran north and south, the prevailing winds coming from the west. The plants were exposed for approximately three months to the natural spread of the leafroll virus. Netted Gem variety under these conditions exhibited 64% current season leafroll in 1958.

Plants were inoculated in the five- to six-leaf stage for greenhouse tests so that symptoms would develop rapidly. Five, six, or ten green peach aphids (Myzus persicae) were put on each of the test plants, depending on their size and the number of aphids available when the inoculations were made. Graft inoculations were not used because they would prevent the expression of resistance to the vector.

Viruliferous aphids were confined to the test plants by 4-inch long cardboard cylinders, three inches in diameter, covered on one end with fine nylon screen. For confining non-viruliferous aphids on plants suspected of harboring the virus, a small clamp-on leaf cage was used. This restricted the movement of the aphids placed on the suspected plant, so that they could be easily transferred later to a plant of Solanum villosum, the species selected as an indicator of leafroll.

Non-viruliferous aphids were caged on leafroll-infected source plants for at least one week before being moved to the plants to be inoculated. After a three-day inoculation period, the aphids were killed by a malathion spray. Fourteen days later, ten non-viruliferous aphids were put on a leaflet of the test plant within a leaf cage. After a three- to five-day acquisition period, the vectors were transferred to an indicator plant and allowed to feed for approximately one week.

Rearing and maintaining the vectors: Non-viruliferous colonies of M. persicae were maintained on caged virus-free potato plants of the variety Katahdin. Viruliferous colonies were similarly maintained on caged stocks of leafroll-infected Katahdin.