IV. POTATO APHID VECTORS IN NEW BRUNSWICK

by

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The role of the insects called aphids, in the transmission of potato virus diseases is a complex one. Not only are there several species of aphids found on potato foliage in New Brunswick, but the effectiveness of these species as vectors (disease inoculators) varies widely with the species, and with the virus concerned.

During the summer season, roughly June 20 to September 10, aphids may be found on potato foliage in New Brunswick. Four species of these insects are found, Macrosiphum solanifolii Ashmead (the gei of Koch), Aphis abbreviata Patch (Aphis rhamni Boyer), Myzus persicae Sulzer and Myzus pseudosolani Theobald.

Macrosiphum solanifolii Ashmead is a large, active aphid, which overwinters in the egg stage on various species of Rosa, wild and cultivated. This aphid is the most apparent on potato foliage due to its larger size, its restlessness and its characteristic habit of feeding on the more terminal growth. Both Myzus persicae and Aphis abbreviata feed on the lower two thirds of the plant, and confine themselves largely to the under sides of the foliage. In addition to this fact, these species are much shorter legged, comparatively smaller and sedentary in habit. In this way such species often escape ready detection. This in all probability explains why a rose bush eradication program was instituted in the State of Maine in the twenties. Macrosiphum solanifolii was very evident, so also was disease spread. The entire field of knowledge at that time was limited and the most obvious conclusions were accepted - the spread of disease was connected with the abundance of M. solanifolii. An eradication of its winter host should control the aphid. Unfortunately, rose bush eradication was difficult and even where it was undertaken with some degree of success, disease transmission continued. Further search began to reveal the role of Myzus persicae and so the program was dropped.

Aphis abbreviata overwinters in the egg stage on Rhamnus cathartica L. and possibly on other species of Rhamnus. Myzus pseudosolanii Theobald is largely confined to the environs of garden plots, since it overwinters on Digitalis sp. in this province

Myzus persicae Sulzer, by far the most efficient vector of virus diseases of the potato, has become generally abundant in southwestern New Brunswick, and during the past few years has been anually recorded in limited numbers from other parts of the province. Considerable difficulty has been encountered in determining its overwintering host. On two occasions fall migrants and on one occasion, sexuales, have been taken from Prunus virginiana L. and P. pennsylvanica L.f. During 1941, (1) numerous forms were collected in the very early spring from Prunus nigra Ait. and in the autumn of 1941, migrant forms were also collected from wild plum. This suggests strongly that wild plum may be one of the major factors in the distribution of Myzus persicae Sulzer in New Brunswick.

1/ Gorham, R.P., Ann. Rep. Ent. Soc. Ont., No. 72, 1942.

The comparative effectiveness of the four species in regard to virus transmission has been examined carefully by numerous research workers in North America and Europe. References are numerous which establish the fact that Myzus persicae is by far the most effective vector, particularly in the case of leafroll transmission. Davies in collaboration with Whitehead and Currie in 1932 (Ann. Appl. Biol. 19:539) made these following statements: "In samples taken from leafroll plants, transmission only occurred when they included Myzus persicae.....", and "Cases of transmission occurred when only one specimen of Myzus persicae from a leafroll plant was used....." "In the case of 20 Macrosiphum solanifoli no transmission occurred until Myzus persicae were among them....."

In 1934, (Ann. Appl. Biol. 21:283) Davies discusses the merit of aphid species in their roles as disease vectors. He states, "There is now general agreement that Myzus persicae Sulzer is the species of aphis which is most generally responsible for the dissemination of the leafroll disease of potatoes. Smith has shown that one or two individuals only of Myzus persicae are sufficient to transmit leafroll from an infected to a healthy plant."

The role of Aphis abbreviata Patch as a vector of leafroll has been studied at the Maine State Experiment Station in more recent years. Although the viruses of potato diseases may occasionally be carried by Macrosiphum solanifolii Ashmead, and Aphis abbreviata Patch, the effectiveness of Myzus persicae Sulzer so far surpasses that of the other two as to make studies of these species secondary.

In the case of Myzus pseudosolani Theobald, its relative lack of abundance makes it a negligible factor of disease transmission in New Brunswick.

During the past ten years, Myzus persicae Sulzer has been used by the laboratory here in studies on virus resistance in potaotes. The bulk of the studies to date has been in regard to the resistance of horticultural hybrids to Solanum Virus 3 (A). The efficiency of Myzus persicae can be noted when it is realized that an original total of over 12,000 seedlings has been reduced by greenhouse inoculations via M. persicae to slightly more than 200 survivors in 1941. These 200 plants have been tested repeatedly and seem to be escaping because of a true virus resistance.

More recently this species is being used in similar tests using Solanum Virus 14 (leafroll) instead of Solanum Virus 3 (A). Its effectiveness has been noteworthy and its use quite satisfactory.