

## CONTROL OF POTATO LEAF ROLL VIRUS BY MANAGING APHID POPULATION

by  
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### INTRODUCTION

Potato Leaf Roll Virus is a persistent virus transmitted by several aphid species of which the Green Peach Aphid, *Myzus persicae* (Sulzer) is the predominant transmitter.

Systemic or foliar pesticide applications are the commonly used control methods for aphids. However, wide-spread pesticides usage not only in aphid control are becoming increasingly unacceptable due to development of insect resistance, environmental impact and the ever increasing purchasing and application costs.

In aphid control, judicious uses of pesticides could help in reducing the costs and negative effects accompanied with chemical treatment. In order to achieve this, accurate and consistent monitoring of aphid populations, that is the initial and peak flight degree days are necessary. This information would help in predicting flight patterns and consequently reducing chemical applications and costs.

### MATERIALS AND METHODS

#### Aphid Sampling In Potato Plots.

Three plots were planted with four varieties of potatoes. They were Ranger, Norkotah, Russet Burbank and Shepody. Each of the three plots had a different planting date (1st March, 15 March, and 29 March). Depending on which was planted first, the plots were designated as first, second or third plantings. One 400 foot row of each variety was chosen at random for every planting time as a sample. Sampling site at northern, middle and southern portions of the rows were marked with distinct flag colors.

Samples were obtained using a black 21" by 21" beating sheet and stick by gently tapping potato plants eight times. Aphids were either aspirated, picked with a camel hair brush or sucked using a portable vacuum cleaner modified by placing a nylon mesh cloth for trapping the aphids. The latter method was used when aphid populations increased because it was efficient in preventing insects from escaping. Specimen, both winged and wingless, were preserved in 95% alcohol for laboratory identification. Samples were taken on weekly basis.

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This Presentation is part of the Proceedings of the 1994 Washington State Potato Conference & Trade Fair.

### Commercial Fields.

Four fields under commercial management were sampled for aphids as above. Pesticide application dates were recorded.

### Virus Free Plots.

Potted potato plants propagated from commercially available seed and tested to be virus free by the PCR and ELISA technique were planted in an isolated part of the research station. The first plants were exposed to virus transmission by immigrating aphids on 20th May for one month after which they were transferred to a greenhouse. The second lot of plants were put out on the 23rd June and the third on 29th July, both exposed for the same duration of one month. Using the ELISA, roots and tubers were tested for PLRV.

## RESULTS

### Alates:

In all the three plantings, a general pattern in aphid numbers was apparent. Peak flight occurred on 22nd July which corresponded to (1282.14) degree days. No significant differences in winged aphid counts were found between varieties within and between plantings. After the 4th of August (1495.3) degree days when the first and second plantings were not registering any aphids, the third planting still supported a small population of alate aphids.

### Apterae:

As in alates, there was a similar trend in wingless aphid counts. That is, there were no differences in counts within plantings. Maximum population was reached at a date corresponding to peak flight of the immigrating alates. However, the third planting exhibited a significantly higher wingless aphid counts in comparison to the other two plantings. None but one nymph with wing pads was observed from all the specimen.

### Virus Free Plot:

The second planting exposed to possible virus transmission tested positive for Potato Leaf Roll Virus had a few plants which tested positive. The third planting had not been tested yet, but the appearance of visual symptoms suggest that the rate of transmission had increased.

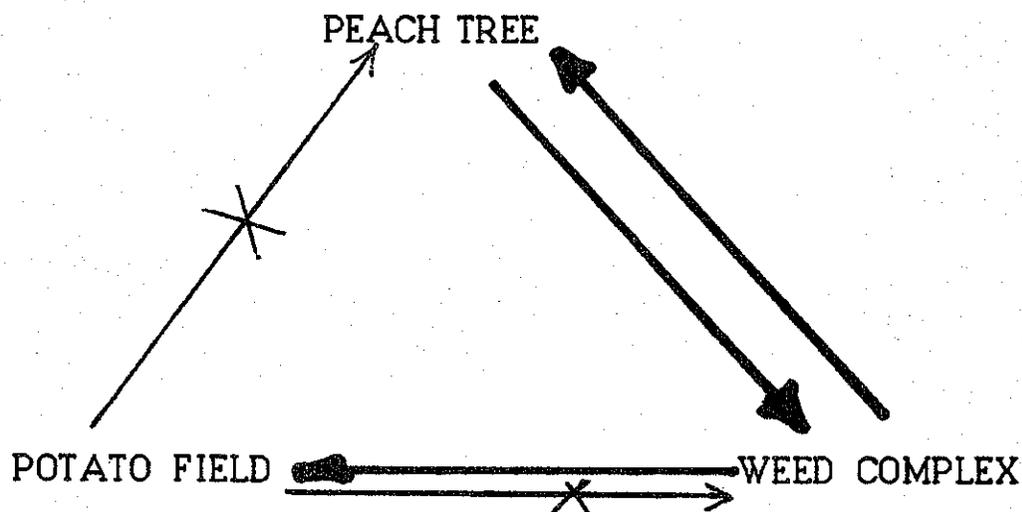
### Commercial Fields:

The commercial field with center pivot irrigation was treated with 17.5 lbs per acre of Thimet 20-G at planting. Additional applications of Monitor occurred on 25 June and 23 July. The Shepody field under rill irrigation received no aphicides.

## DISCUSSION

The insignificant differences for alate aphids between and within plantings suggest that landings in potato fields occurs at random with no preferences for neither potato variety nor planting time. The first aphids to arrive did not colonize potato and therefore could not transmit the virus. The first colonizing Green Peach Aphids arrived on the 2nd of July while peak immigration did not occur until 22nd July. As the number of immigrants increased so did that of apterea aphids implying that most of the wingless forms were being produced by the colonists.

The fact that only one aphid with wing pads was noticed suggests that under conditions of photoperiod more than eight hours and no crowding effects no emigrating alate aphids will be produced. A possible path that is most likely taken is shown below.



For both the alate and apterous aphid, the third planting supported their population when none were found in the other two plots. This can be attributed to the freshness hence enough nutrients in to support a small population.

Virus-free potatoes exposed to immigrating aphids did not become infected with PLRV until after 22nd July when most GPA were wingless offspring of the colonists. These results show that in commercial systems, PLRV is most likely transmitted from plant infested as seed to uninfected plants by wingless aphids. The heavy flight of immigrating aphids may occur over a period of 3 weeks or more and need not be controlled until most colonizers have landed. Use of certified seed which was grown with a systemic insecticide could help reduce the spread of PLRV. Early planting could help reduce aphid colonists from establishing a population as the wilting plants would be in no condition of supporting the pest at peak flight.