
Green Peach Aphid Apterous


Green Peach Aphid Alate


Symptoms of Leafroll

GREEN PEACH APHID/PLRV POPULATION DYNAMICS

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NOT FOR PUBLICATION

A significant change in population and seasonal occurrence of the green peach aphid (GPA) has occurred in Pacific Northwest potato production fields. Though this change is documented only for the lower Columbia Basin, discussions with growers, processors and entomologists throughout North America indicate a similar change. Inspection of data from as early as 1996 shows evidence of this change. Its significance, however, was not fully appreciated until massive populations of winged aphids were monitored in potato research plots in 1999.

Not only did populations of winged aphids increase dramatically, their distribution extended over a much longer period than observed from 1990 to 1994. Before the withdrawl of aldicarb in 1989, winged aphids would migrate into potato fields beginning in May, with a substantial peak occurring in late June. Populations would then decline during early July (Figure 1). At that time, aldicarb was applied at cracking, or last field cultivation. Aldicarb would effectively control winged aphids until about the end of the first full week of July. Control of wingless aphids would last even longer. Generally, there would be no further migration of winged aphids into the crop and the only observation of winged aphids would occur during late August as aphids began to migrate back to winter hosts. When further migrations of winged aphids into the field occurred, it was caused by harvest of nearby fresh market potato where aphids had been inadequately controlled. This happened infrequently and could be controlled in most cases by a single application of methamidophos (Monitor). After reinstatement of the aldicarb registration, the product can only be applied at planting time. While still one of the better insecticides in the arsenal for control of aphids, it no longer provides control into July, making control of aphids in July dependent on multiple foliar applications.

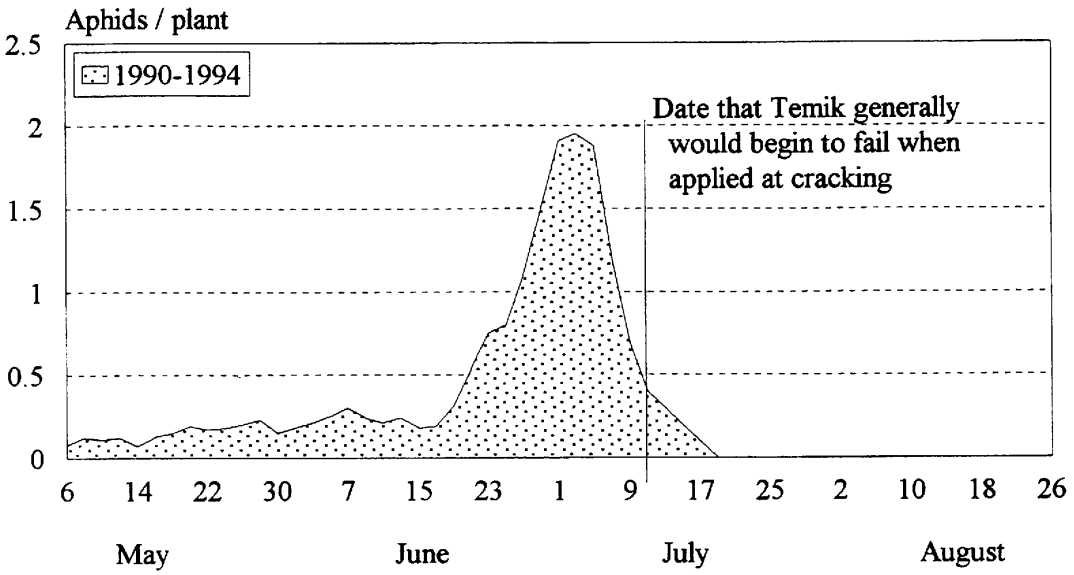

Figure 1. Number of winged aphids per plant (beating cloth samples), Hermiston, OR. 1990-1994.

During 1999, tremendous numbers of alate aphids were observed on beat cloth counts in insecticide trials (Figure 2). Numbers of winged aphids per plant approached 45, and for the period between July 15 and August 5, exceeded 20 per plant daily. These winged immigrants were entering the fields daily and were eventually controlled by the insecticide treatment. However, control takes substantial time (more than 24 hours), allowing these winged migrants to infect plants with potato leafroll virus (PLRV). Applying a foliar insecticide to control these winged aphids is very difficult due to the presence of an extremely dense and compacted plant canopy. Since GPA prefer to inhabit the underside of the lower leaves in the canopy, once they penetrate the upper portion of the canopy, foliage applications will not reach them. Examination of winged aphid populations from 1996 and 1998 insecticide research projects, indicated that the trend for winged migrants to infest potato, during mid-July through early August, was present in those years.

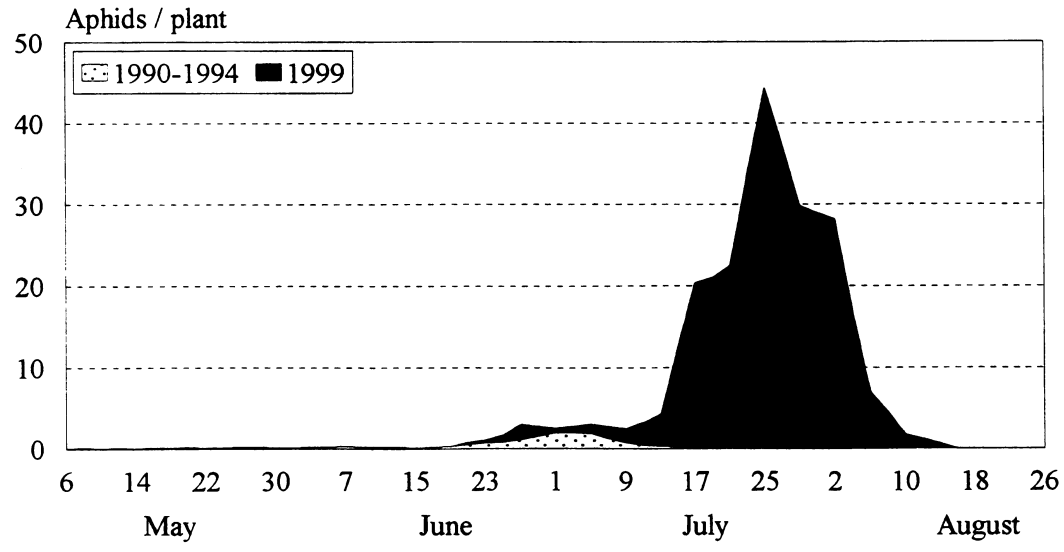

Figure 2. Number of winged aphids per plant (beating cloth samples), Hermiston, OR. 1990-1994 and 1999.

Aphid control in commercial fields is done to suppress the transmission of PLRV. These migrants further complicate efforts to suppress the virus because they appear to be coming from early and mid-season potato fields where control was inadequate to prevent aphid population development. These fields often receive applications of a pyrethroid insecticide to control Colorado potato beetle. The pyrethroid removes the predator complex resulting in outbreak populations of GPA. Prior to harvest, the irrigation is removed from the fields, creating stress on developing aphids, resulting in large winged populations, which migrate from the field. Though these fields are planted with certified seed, often that seed has a low level of PLRV.

The combination of beetle control, predator removal, and poor, if any, aphid control results in: (1) the spread of PLRV in these fields and: (2) large numbers of outward migrating aphids that are viruliferous. These viruliferous aphids not only are carrying PLRV, they often have been feeding on plants with a very high titre of the virus, have already passed through the incubation period of the virus (in the aphids' bodies), and are carrying large amount of the virus in their salivary glands. These aphids then migrate from the field to be harvested, a portion of them landing in Russet Burbank potato fields, which are being grown for winter storage. Once there, they can transmit the virus to healthy potato plants in less than an hour. This is causing a trend for an increased incidence of PLRV in potato tubers destined for winter storage. The trend is visible from winter grow-outs of eyes from tubers from insecticide trials. The best insecticide, for a number of years, has been Admire 2FS applied at 20 oz/acre in a 7-inch sub-seed piece band. When the previous five years of data are observed, this trend can be seen (Figure 3 - no 1997 grow-out). Visual observation of these plots in 1999 showed the highest percentage of PLRV infected plants that has been observed in the insecticide trials in the past 14 years.

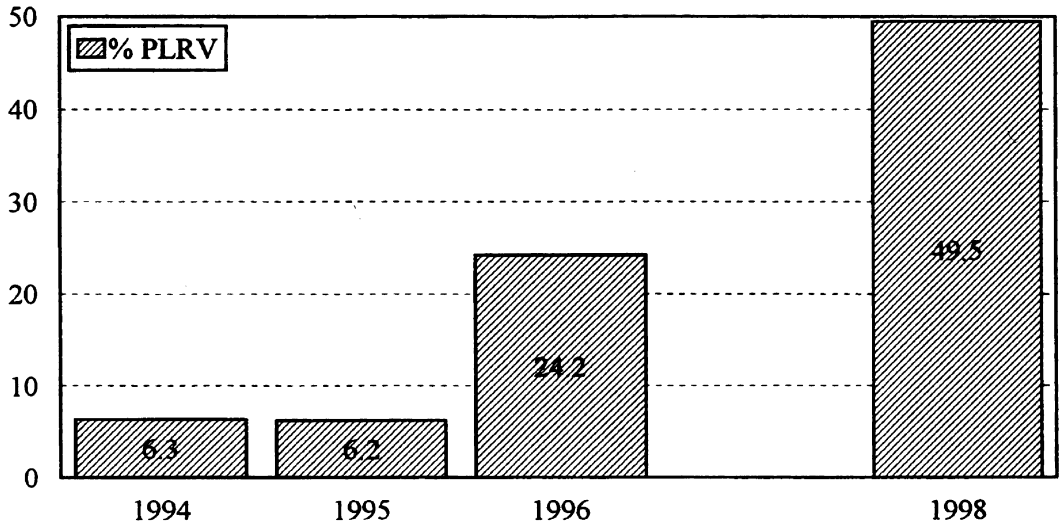

Figure 3. Incidence of potato leafroll virus (PLRV) from a grow-out of eyes from Admire treated tubers (the best insecticide treatment), Hermiston, OR, 1994-1998 (no grow-out in 1997).

Protection for potatoes other than Russet Burbank intended for storage or seed production remains as in the past. If control measures were applied to these fields, the aphid load in Russet Burbank storage and seed crops would be manageable. In the likelihood that this does not happen, growers will benefit from a calendar approach to aphid control. Growers of these crops generally initiate control with a planting time or cracking time application of a systemic insecticide. Results of tuber grow-outs from insecticide trials over a number of years, indicate that Admire, at 20 oz/acre, and Temik, tend to be superior to shorter duration control measures. Figure 4 shows the periods of control that were achieved, before wingless aphid populations reached a threshold of 1 per plant, for different systemic insecticides tested in 1999. The threshold of 1 aphid per plant

from beating sheet samples, is an arbitrary threshold and is, probably, too high for Russet Burbank storage and seed crops. However, that level will generally be reached before a resident population is sampled using leaf counts. Based on days from date of application, a foliar program should be started before the systemic loses efficacy, and maintained until winged aphid flights are not longer entering the field. Sampling for winged aphids should be done with a beating cloth, or a tray small enough to be inserted under the foliage closely, and positioned against a stem.

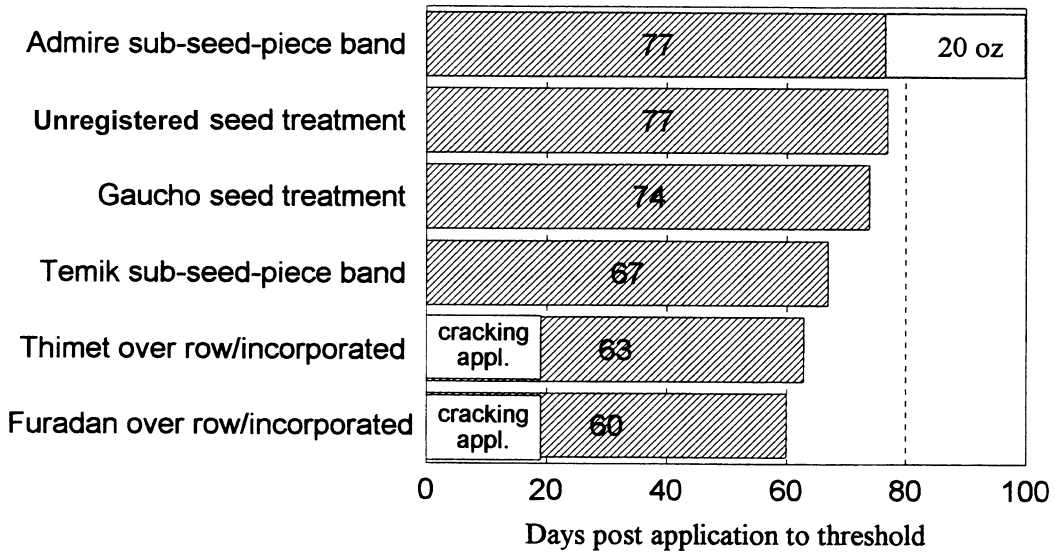

Figure 4. Days effective control before reaching a threshold of 1 wingless aphid per plant, Hermiston, OR, 1999.

Unfortunately, foliar insecticides are not as effective in controlling winged aphids as they are for wingless aphids. To make these insecticides more effective, a vigorous scouting program needs to be followed. Fields where measurable numbers of winged aphids have been observed should be scouted at least twice weekly and numerous sites in the field checked.

The lack of aphid control for the early and mid-season processing chipping and fresh pack crops is based on an assumption that: (1) these varieties rarely express "net-necrosis"; (2) that PLRV infestations in this crop do not reduce yield and; (3) that aphid populations do not cause yield reductions. Figure 5 shows a comparison between Adage 5FS seed treatment, Temik, Admire (a single pre-plant application), the unprotected check, and plots treated with permethrin. A substantial yield loss occurred on these Russet Burbank potatoes in the permethrin plots where aphids, PLRV, and mites were not controlled. Whether is occurs with Shepody, Russet Ranger, and Russet Norkotah remains to be evaluated. These evaluations will be conducted in 2000.

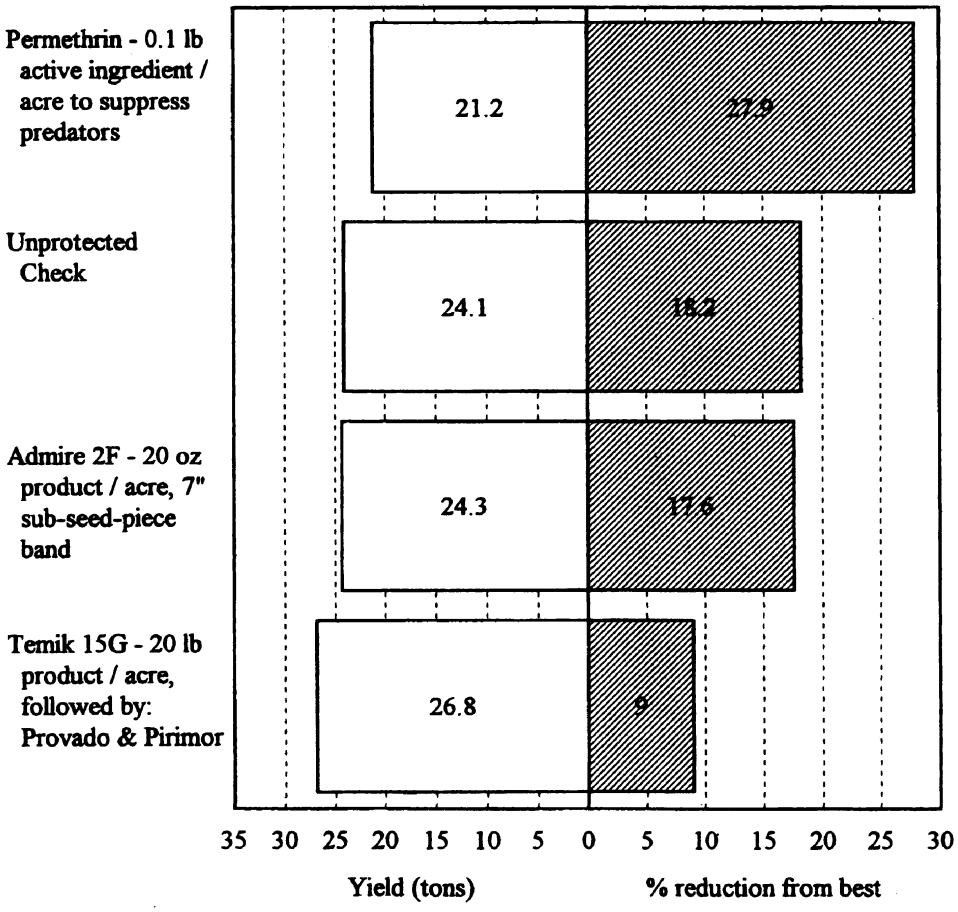

Figure 5. Potato yield and reduction of yield caused by aphid, potato leafroll virus and mites, selected treatments. Hermiston, OR. 1999.

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