

Section I
Mites and Sap-Sucking Insects

PERIODICITY OF APHIDS AND TRANSMISSION OF POTATO VIRUSES

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Though extensive research has demonstrated the vector-disease relationship between green peach aphid, Myzus persicae, and potato leaf roll virus (PLRV) the seasonal distribution of this transmission needed to be documented for Oregon. In addition little was known about seasonal vectoring of potato virus Y (PVY). This research was conducted to determine seasonality of PLRV, PVY and alate aphids occurring in potato fields.

METHODS AND MATERIALS

Virus free potato, cv. "Russet Burbank", were planted at HAREC (Hermiston), NWES (Aurora), and COES (Madras) and covered with row cover prior to crop emergence. A single row of virus infected potato (100% PVY, 100% PVS, 60% PLRV, and 10% PVX) was planted between research treatments. At weekly intervals, beginning with crop emergence, covers were sequentially removed for periods of one week to monitor season-long transmission of virus. The treatments were arranged in a replicated complete block design. Virus was transmitted by naturally occurring aphid populations that migrated as alatae through the plots. In order to stop virus transmission at the end of the exposure period, residual aphid populations were eliminated by insecticide treatment. Aphid populations were monitored on the same weekly time interval using yellow pan traps. At harvest, 20 tubers from separate hills were harvested and placed in storage at HAREC. During December - February, the tubers were eye-indexed to determine frequencies of PLRV and PVY. Identification of PLRV and PVY was visual with limited verification using ELIZA.

RESULTS AND DISCUSSION

Over 70 species of aphids were collected in potato plots at HAREC and COES during 1988 and 1989. Aphid collections at NWES have not been completely identified at this time. However, several additional species have been collected. Of the 70+ species at HAREC and COES, four species make up 65% of all aphids trapped and an additional 6 species made up an additional 30%. The four most common species were:

Myzus persicae - complex
Acyrtosiphon lactucae
Aphis sp. - (keys to fabae but is not)
Acyrtosiphon pisum

The other six common aphid species were:

Capitophorus sp.
Brevicoryne brassicae
 Unidentified #4

Aphis sp.
Chromaphis juglandicola
Lipaphis erysimi

Virus transmission occurred at all sites much earlier than expected and at greater frequency than expected. The frequency of virus expression is a measure of aphid populations vectoring virus, not actual virus in the region, since the source of virus came from the highly infected adjacent rows. These data however, explain observations by growers in the Columbia Basin that early season virus transmission often occurs prior to significant flight by green peach aphid (GPA). Transmission during 1989 developed much earlier than GPA populations at HAREC (Figure 1). Though aphid collections were not made at NWES in 1988, seasonal virus development was similar to that at HAREC. Seasonal virus development was much less as would be expected from the production region at COES with very few GPA in 1988.

Aphid populations at HAREC were lower and developed later in 1989 than in 1988. We expect the eye-indexing to show lower frequencies of virus infection and to occur later than in 1988 also.

Based on this data, it is important in at least some years for insecticide programs aimed at preventing virus transmission to be effective as soon as potato emergence occurs. It also indicates that though GPA might be the most effective vector of PLRV and PVY, it certainly is not the only vector of the diseases.

Hermiston, Oregon 1988

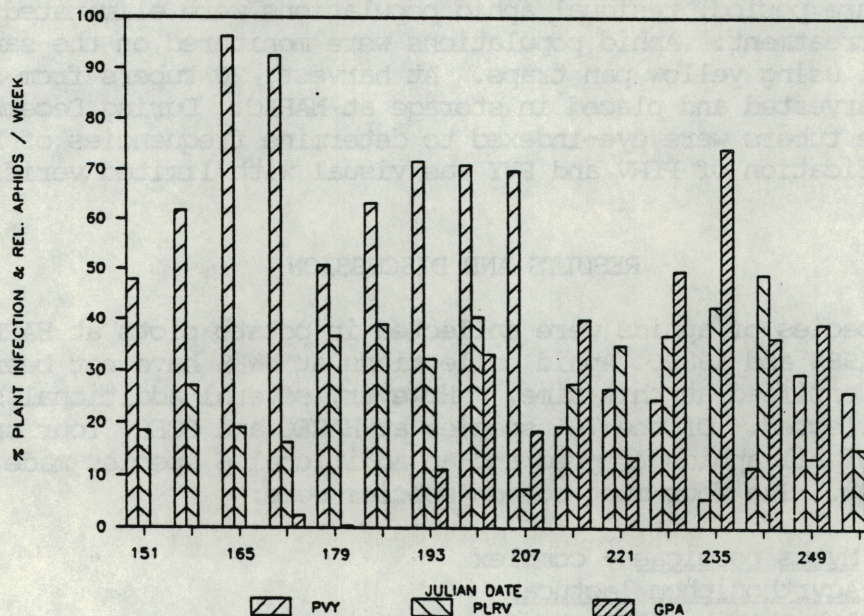


Figure 1. Seasonal occurrence of green peach aphid (GPA), potato leaf roll virus (PLRV) and potato virus Y (PVY) at HAREC 1988. 2