# AN UPDATE ON PLUM POX

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## *Introduction*

Plum pox (PPV) is a virus disease that is causing much interest in North America since it was discovered in PA in 1999. It is a disease that was first discovered in the Balkans around 1915. By 1984 it had spread to many places in Europe and to India. By 1922 it had been eradicated in a few places but had also spread to Chile. In the fall of 1999 it was identified in one localized area of Adams County, Pennsylvania. Unfortunately, fruit symptoms had been seen for two years prior to that but local experts were unable to identify this disorder.

## *PPV Strains, Symptoms and Spread*

PPV has several strains including M, D, E, A and C. These strains can be quite variable in the species that they attack and in the symptoms that are produced in the susceptible plants. In addition, symptoms can vary from cultivar to cultivar, some having distinct flower coloration, some having distinct fruit symptoms, but others having no symptoms at all. Strain D of PPV was originally found in southern France in apricots. It is the only strain that is found in the U. S., Canada, and Chile and it is not seed transmitted. It can infect peaches, plums, apricots, and nectarines, but not cherries. Fortunately, this strain is not very aggressive. In contrast, the M (Marcus) strain is the most aggressive strain in peaches and was originally found in northern Greece. It is the strain that is most easily vectored and it is believed to be seed transmitted although that information is controversial. Plum pox can be spread by mechanical means through propagation materials or by natural spread since several aphids vector this virus. Some strains are seed borne. Aphid transmission is possible when an aphid acquires the virus during feeding probes. The aphid can then transmit the virus for up to one hour but since the virus is not systemic in the aphid the virus dies after about one hour. It is thought that aphids can travel from 100 to 120 meters before the virus dies. Most aphids that transmit viruses do not have peach or *Prunus* as a preferred host so these aphids often skip many trees before landing and making another feeding probe. This tends to limit the spread of the virus and makes control easier.

## *Control Strategies*

Plum pox control strategies can be prevention, eradication or management as noted below:

Prevention
- Rigorous inspection at all ports of entry
- Public education for those in industry
- Some surveillance
- Nursery certification programs

Eradication
- Index and destroy infected material
- Establish quarantine zone
- Establish moratorium for planting *Prunus*
- Certify quality propagative materials
- Perform regular surveys of orchards and nurseries

Management

Certify quality propagative materials
Develop cultivars resistant to the virus
Survey regularly to detect plants in earliest stages of infection
Immediately destroy infected plants
Control vector populations

In eradication it is hoped that, once found, the virus can be eradicated so that the area will then be PPV free. In the management mode, PPV is common in many plants in a locale and it is thought to be impossible to eradicate. In those situations growers must remove all plant identified as having the viruses and only PPV free material may be planted.

### *1999 Pennsylvania Survey*

A survey for PPV was begun in PA in the fall of 1999 once it was identified here. Since the virus was not identified until late August and since leaves are the primary plant material used for detection, not much time was available to locate this disease. A quick survey system was set up which involved an X pattern across all orchards near the site of initial detection. Blocks were identified in the locale where PPV had been found and ELISA procedures were used once suitable standards could be identified. In addition to the X pattern of sampling more intensive samples of 20 X 20 tree segments in positive orchards were taken in order to aid in the epidemiological studies. These studies were conducted to develop a more refined sampling method that would be the most efficient means for detecting the virus based on the number of samples collected, the amount of dollars expended and the available manpower. All participating federal, state and local agencies cooperated in an admirable manner to make detection likely. Early on, eradication was the only option talked about. In addition, affected growers cooperated fully even though they knew that their orchards would need to be destroyed if found to be positive for PPV. Several positive orchards were identified in the fall of 1999 and a quarantine area was established. The quarantine area established included Latimore and Huntington Townships in the northeast corner of Adams County. After leaf fall a conference was held in Gettysburg, PA with invited foreign speakers who were experts in the detection and management of PPV. In addition, USDA, Agricultural Research Service (ARS), and Animal and Plant Health Inspection Service (APHIS) personnel were actively involved.

### *2000 Pennsylvania Survey*

In 2000 the revised survey methods were utilized that had been developed based on the intensive epidemiological studies that were conducted in 1999. Extensive sampling was conducted in all areas of Pennsylvania. A listing of the 2000 results is given below:

| | Total | PPV Negative | PPV Positive |
|---|---|---|---|
| No. of Samples | 65,022 | 64,623 | 399 |
| No. of Blocks | 1654 | 1614 | 40 |

Although the area of quarantine was enlarged it should be remembered that it is one small geographical area. The quarantine area now includes Latimore, Huntington and part of Menallen Townships in Adams County and a very small part of Middleton and Dickinson Townships in Cumberland County. The Pennsylvania Department of Agriculture (PDA) and USDA APHIS worked together in detecting and surveying orchards and in establishing quarantine parameters. After the 2000 PPV survey, 875 acres of orchards were destroyed. This was about 1/8 of the Pennsylvania susceptible stone fruit acreage. In addition, a 3-year moratorium was placed on planting in the quarantine area and serious consideration is now being given to the removal of all

susceptible *Prunus* species within 200 meters of any positive orchard. The results of the 2000 survey showed that PPV has been found in one small pocket of Pennsylvania orchards and that Pennsylvania fruit tree nurseries are PPV free. The spread of PPV in Pennsylvania may be explained by one introduction with subsequent spread by aphids. The path of entry into Pennsylvania is not known. The USDA and PDA developed a plan to reimburse growers for peach orchards that needed to be destroyed. The value of these orchards was calculated based on average yield per acre and on the average value per bushel. The gross margin for each year was calculated and the net present value of an orchard of ages 1 to 25 was calculated. The maximum reimbursement rate was approximately $14,000 per acre for an orchard of 7 years of age. Reimbursement for younger and older orchards was less than this.

### *Weed and Aphid Surveys*

Additional work was done in Pennsylvania to determine if there was either *Prunus* or non-*Prunus* plant materials (weeds and trees) in areas surrounding PPV infected orchards. This research was essential to conduct if eradication was to be successful. Fortunately, no positive samples were detected. In this survey, 7,000 samples were run involving 245 total species. In addition, there were many surveys done for aphids trying to determine which species of aphids were present and which aphids might play a role in dispersal of this disease.

### *2000 Canadian Survey*

In the fall of 1999, Canada placed an embargo on the importation of all *Prunus* material from the US. In the spring of 2000, Canadian authorities began a trace back of peach trees that were purchased in Canada from nurseries located in south central Pennsylvania. Plum pox was confirmed in some peach trees that had originally been purchased in Pennsylvania but this did not confirm that the infection originated in Pennsylvania. In other words, there was no proof that the trees were infected when they entered Canada. Subsequent surveys of fruit tree nurseries in Pennsylvania indicated that all nurseries were negative and clean of PPV and that the positive trees found in Canada in all likelihood had been infected in Canada after arrival. In addition, the USDA, APHIS conducted intensive trace backs of peach trees grown by nurseries located in south central Pennsylvania. The trees that were suspected of carrying the virus to Canada were actually grown in Tennessee and were propagated from virus-free budwood collected in California. Subsequent surveys in Canada indicate that PPV was widespread in Ontario. The results of the Ontario survey up to Nov. 14, 2000 are:

| | Total | PPV Positive | Growers Positive |
|---|---|---|---|
| No. of Samples | 100,913 | 947 | 81 |
| No. of Blocks | 5,099 | 240 | 240 |

These results could be compared to the Pennsylvania survey where only 40 blocks were positive compared to the 240 positive in Ontario. In Ontario, one propagator was positive for PPV. The main area where PPV was found in Ontario was near St. Catherine although positive samples were also detected near Simcoe and Harrow. The percentage of total positive samples detected in Ontario by varieties varies from 21% for Veecling, 19% for Baby Gold 7, to an intermediate level of about 3% for Redhaven, and 2.5% for Garnet Beauty. Low percentages of samples were detected in plums and in Cresthaven and Vivid peaches. The wide distribution of PPV in Canada can be explained by a possible propagation link. It is thought that the wide distribution of PPV came about by the distribution of inspected budwood of a highly desirable clingstone peach variety. The selection of a new clingstone peach was made in 1981 and the selections were planted in the experiment station in 1983. Budwood was sent to a nursery in 1988 and finished trees were planted at Site 13 in 1990. Since this peach variety was highly desirable and many growers wanted trees, budwood was distributed from Site 13 in 1992. Finished trees from this propagation were sold in 1994. No budwood was collected from Site 13

after 1996. Site 13 and surrounding orchards were determined to be highly infected with PPV in 2000.

### *Summary*

The status of Pennsylvania PPV is that it was detected in 40 blocks of trees and all 875 acres of infected orchards have been removed. In addition, a 3-year moratorium was placed on planting in the quarantine area and serious consideration is now being given to the removal of all susceptible *Prunus* species within 200 meters of any positive orchard. There are two medium size nurseries in Adams County, Pennsylvania, and both are PPV free. In addition, trace backs have been intensively carried out on most *Prunus* trees sold by the nursery that is located closest to the PPV infected area. Thus, PA nurseries have been more intensively investigated than nurseries from other states so you should feel confident in buying peach, nectarine and plum trees from PA nurseries. Pennsylvania has had a Fruit Tree Improvement Program since the 1960's that involves personnel from PDA, Penn State University, and participating nurserymen. This program has helped the nurserymen maintain the high quality of trees produced in Pennsylvania and has developed plans to deal with PPV. It is anticipated that there may be a national plan for nursery certification in order to deal with PPV on a national basis.

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