

Growing Profits in New *Prunus* Orchards

Penn State Cooperative Extension and the Pennsylvania Department of Agriculture

Replanting Stone Fruit in Sites Previously Affected by Plum Pox

A Devastating and Economically Important Disease of Stone Fruit



Plum Pox or “Sharka” is one of the most devastating and economically important diseases of stone fruit worldwide. The disease is caused by the Plum Pox Virus (PPV) which is spread by aphids and by the use of infected propagation material.

PPV was discovered for the first time in North America in 1999 in a peach orchard in Adams County, Pennsylvania. In Pennsylvania, peach, plum, nectarine and apricot are the four commercial stone fruit susceptible to PPV, Strain D. In addition, certain native and ornamental *Prunus* and even some perennial weeds may become infected by PPV.

Results of surveys indicated that within the United States the virus was confined to a relatively small geographic area of Pennsylvania although recently the virus has also been discovered in New York and Michigan. In Pennsylvania, mandatory destruction orders were given for all PPV infected orchards as well as for stone fruit grown within a 500 meter buffer zone of infected sites. The virus affected regions were placed under a quarantine that prohibited new plantings of susceptible stone fruit.

The criterion for rescinding a quarantine boundary is three consecutive years of PPV negative survey data. In November 2006 an analysis of survey data showed

that a large portion of the quarantined area met the three-year requirement of no new positives including all of Franklin, Latimore, Huntington and Dickinson Townships (Refer to Penn State PPV educational web site: <http://sharka.cas.psu.edu/>). Lifting the quarantine in these areas opens many acres for replanting *Prunus*. It is anticipated that a significant number of new stone fruit orchards will be established in this region within the next few years.

Considerations for Replanting *Prunus*— A Chance to Do Everything Right!

All new orchards offer the opportunity for a “fresh start” and growers must plan carefully to get the most from their investment. Key points to consider include:



- Evaluate the location for any site related problems such as air drainage, slope orientation or soil moisture issues.
- Evaluate the replant site for potential nematode / soil-borne disease problems.
- Evaluate the replant site for potential pH / fertility problems.
- Review the site cropping history for indicators of previous production problems.

Identify Potential Soil-Borne Problems

A soil test and a nematode assay are essential first steps in identifying potential soil-borne problems. The nematode assay will determine if damaging levels of plant-parasitic nematodes are present. If nematodes are a problem the grower needs to choose a management option that fits into the renovation plan. Nematode control options are typically soil fumigation, nematicides or some combination of rotation / green manure crop. The choice of nematode control will be influenced by the specific nematodes that need to be managed, the future crop to be planted, the time frame for site renovation, efficacy and cost.



Biofumigation: Penn State field trials of rotation crops / green manures for control of nematodes and other soil-borne problems.

A soil test report will provide recommendations to correct any nutrient imbalances or pH problems. These corrective measures need to be started before the new orchard is planted so that fertilizers and lime can be incorporated into the soil for maximum benefit. This is particularly important for P, K, Mg and Ca fertilizers as well as Zn, Cu, Mn, Fe and lime that move very slowly down the soil profile.

Prepare a Replant Time Table

Once potential replant problems have been identified and corrective measures decided upon, it is beneficial to prepare a time table that includes each major step in the renovation process. Among other things, the time table helps to ensure that an adequate amount of time is allocated to accomplish each task.

Special Considerations for Replanting *Prunus* with Regard to PPV and other Virus and Virus-like Diseases

Plum Pox and other plant viruses are difficult or impossible to control once they are in a field setting since the only way to eliminate the virus is to destroy the host. Therefore, disease prevention is the only practical management strategy to avoid virus problems.

Endemic virus diseases such as Tomato Ring Spot Virus (ToRSV) are widespread and have many alternate hosts that can serve as reservoirs. It would be impossible to eradicate ToRSV from the landscape and therefore prophylactic measures to prevent virus spread are the only option for growers. However the PPV that was introduced into Pennsylvania offers a unique opportunity for eradication because of its limited distribution and limited host range. Eradication can only be accomplished if all PPV reservoirs are identified and destroyed.

The restriction on planting *Prunus* within the quarantine zone limits virus access to susceptible hosts and is an invaluable tool in the eradication process. The decision to rescind the quarantine and allow replanting is made based on the results of several years of intensive surveys that indicate the area is free of PPV. Thus replanted orchards on previously quarantined sites should be at no greater risk of contracting PPV than sites that had never been under quarantine. Nevertheless, the possibility that some reservoir plant escaped detection can not be completely dismissed and PPV surveys will continue even though the land is no longer under quarantine.

Purchase Certified Virus-Free Trees

Whether the goal is to prevent PPV or another common virus such as ToRSV, there are several precautions that growers can take to avoid infection and prevent spread. Perhaps the single most important consideration is to purchase certified virus-free trees from a reputable nursery. It is important to inquire which viruses are included in the virus certification since each virus requires its own test. Any virus that is not included can escape detection. Plum Pox and common viruses such as Prune Dwarf (PDV), and *Prunus* Necrotic Ring Spot (PNRSV and ToRSV) can easily be spread in the nursery by propagating infected tissue. Infected nursery plants

have been responsible for the introduction of virus diseases into new countries and regions.

Control Potential Reservoir Hosts

Another virus management consideration is the control of potential reservoir hosts. The natural host range and the role of weeds in PPV survival and spread are not fully known especially in locations where the virus has recently been introduced such as Pennsylvania. However in Europe wild *Prunus* can function as a symptomless PPV reservoir making eradication of the virus impossible in many areas. There have also been reports of PPV infections in herbaceous plants. Although no PPV infected weeds have been detected in the field in Pennsylvania, successful aphid transmission has occurred under experimental conditions and the possibility of weed reservoirs can not be ruled out. Broad-leaf weed management is known to be beneficial in the control of certain plant viruses such as ToRSV. Therefore, while the destruction of potential reservoir hosts is not a proven strategy, the elimination of wild *Prunus* and broad-leaf weeds in and near *Prunus* orchards may be of some value in preventing the reintroduction of PPV to previously quarantined areas.

SEASON	ACTION
↪ Summer/Fall	<ul style="list-style-type: none"> ➤ Sample for nematodes / fertility / pH ➤ Remove trees, roots, trash; Herbicide ➤ Cultivate; Plant winter cover crop
↪ Spring	<ul style="list-style-type: none"> ➤ Lime; Incorporate green manure
↪ Spring/Summer	<ul style="list-style-type: none"> ➤ Establish summer cover crop
↪ Late Summer	<ul style="list-style-type: none"> ➤ Incorporate green manure
↪ Early Fall	<ul style="list-style-type: none"> ➤ Deep till
↪ Late Fall	<ul style="list-style-type: none"> ➤ Fumigate, if needed (Sept.-Oct.) ➤ Lime, fertilize / compost ➤ Plant permanent sod or cover crop
↪ Spring	<ul style="list-style-type: none"> ➤ Plant fruit trees early for optimum early growth

Lessons Learned About Preventing the Introduction of Exotic Pests

The appearance of PPV in Pennsylvania highlights the ever-present risks posed by virus diseases and serves to raise the level of awareness that all growers need to possess. Orchard sanitation and good cultural practices are key issues in the prevention of virus problems. Start with a clean orchard site, purchase clean planting material and be conscientious about keeping virus reservoirs and vectors under control.

State and federal agencies have initiated clean plant programs to prevent the introduction and spread of foreign pathogens. However, as our experience with PPV illustrates, pathogens sometimes are introduced to new regions either by illegal or unwitting use of infected propagation material or by natural means. Good management practices require growers to be familiar with common disease problems and their control. It is also important for growers to remain vigilant for anything unusual and bring it to the attention of experts who can identify the problem.

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A replant site should remain out of tree fruit for at least two years. Rotation crops increase organic matter and provide an excellent opportunity to incorporate fertilizer and lime, get weeds under control and eliminate virus reservoirs.

Manage Vectors

Another tool for virus control is vector management. This strategy works best for virus vectors that are not highly mobile such as nematodes. Aphid management for the prevention of PPV is problematic. This approach is probably only of limited value in some situations. Horticultural spray oil is known to inhibit virus transmission by aphids and could be used to protect young, non-bearing trees but since oil can have a negative effect on fruit production this may not be practical on older trees.

A Chance to Do Everything Right!

Horticultural Considerations for Replant Success

Get Advice on Cultivars from your Fruit Marketers

There are an increasing number of stone fruit variety options, including white or yellow flesh, standard or sub-acid flavor, regular or donut shape, melting or firm flesh texture. Also, there are an ever expanding range of maturity dates and even inter-specific hybrids to consider. Some of these options will gain increasing popularity in the marketplace, and some will decline in popularity. Fruit marketers can give you valuable advice about market trends.

Consider the Planting Density and Training System that is Best for You

Traditionally, peaches and nectarines have been planted at low density with low, spreading canopy training, such as the open vase system. The open vase has low establishment cost, and permits most tasks to be accomplished without the use of ladders, but is relatively low yielding during the early years and slower to come into production than higher density systems. High density systems, such as the perpendicular V come into production earlier and produce more fruit per acre than low density blocks until the latter finally fill their space in the orchard. After *Prunus* trees have filled their space the yield of either tree density is similar.

High density systems may lend themselves to less complex pruning and simplify the adjustment of crop load through pruning methods. Ladders or labor platforms are required to perform pruning, thinning and harvest tasks in high density systems. The important considerations are: a) the differences in establishment (tree numbers) and labor (ladders vs. pedestrian) costs and b) the

difference in establishment time between high and low density systems. How important to your business are the advantages of quick entry into new market opportunities and a quicker return on investment, and what is the anticipated economical life of the orchard? Generally speaking, the more valuable the crop the greater is the value of increased tree density.

Consider Pre-Ordering Trees

Prunus nursery stock of intermediate size and vigor is usually preferable to large caliper trees. This is due to the need for viable buds near the base of the tree that can grow out to form the new canopy following low heading at planting. The best cultivars and grades of trees are likely to be in high demand for the near future. The best way to assure that you will get the trees that you want is to plan ahead with a growing contract for trees. This requires planning and making a deposit on trees this summer for trees to be planted two years later, but it eliminates the risk of being forced to wait an extra year or to have to plant varieties or nursery stock that is in low demand. Pre-ordering should also permit you to save on the price compared to trees ordered in the year of planting.

Provide for Irrigation

To get the new orchard into production quickly, the trees must grow rapidly to fill their allotted spaces. Buyers pay more for large fruit than for small fruit. The importance of water to our industry could hardly be overstated. The ability to provide supplemental water to maintain growth of young trees, maintain functional foliage and sustain fruit growth through periods of drought is an important way to reduce risk.

Consider Orchard Array and Row Placement

We want to design blocks that are optimal for implementing new pest management techniques such as mating

disruption and pest monitoring. Entomology studies have shown that square shaped blocks of five acres or larger are ideal. It may be easier to implement mating disruption in sites that are sheltered from wind or that have windbreaks installed. We speculate that selection of fairly level sites will also come into play as our industry investigates the feasibility of mechanically-assisted harvest. These are additional site factors to consider for enhancing the future performance of new plantings.

Fruit trees perform better in the drive rows of the previous planting than in the old tree rows. Replant problems can be reduced by the use of GPS mapping to record the physical location of the tree rows in the old orchard, so that planting new trees in the same rows can be avoided.

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