



Plum Pox: Plum Pox Virus

Introduction

Plum Pox is a viral disease of stone fruit trees such as plums, peaches, and apricots. Plum Pox Virus (PPV) has been a devastating disease in Europe since the early 1900s. It was first reported in Bulgaria and spread throughout Europe. In 1992, PPV was reported for the first time in the Americas in Chile. It was then found in Adams County, Pennsylvania in 1999, in Ontario and Nova Scotia, Canada in 2000, and in Argentina in 2004.

In the continental United States, the disease remained localized, and it was hoped that it was contained before it had a chance to spread to the other parts of the North American continent. However, in July 2006, the virus was identified in 2 plum trees in Niagara County, New York, and a short time later, in August 2006, it was identified on peach, also from Niagara County. This site was in close proximity to a confirmed positive site in Ontario, Canada. Also in August 2006, Michigan reported a positive find.

At this time, four races of the pathogen have been identified. Race "D" is the only race that has thus far been identified in North America. Aphids are believed to be the primary vectors, spreading the virus from tree to tree. Race "D" is not believed to spread to cherry or to be spread through the movement of any stone fruit.

Symptoms and Signs

Plum Pox symptoms vary according to cultivar, age, and nutritional status of the host and may also vary

with environmental factors, such as temperature. Severity of symptoms may differ according to the specific strain of PPV. PPV reduces the quality of stone fruit and, over a period of time, renders the tree useless for fruit production. Often symptoms of the virus occur sporadically. The virus may be detected at the bottom of a branch but not at the tip or it may be detected on some fruit and leaves but not others. Symptoms of PPV often appear 3 years following initial infection. However, serological tests performed in the laboratory can detect the virus before visible symptoms occur.



Figure 1: Foliar symptoms (provided by Dr. Ralph Scorza, USDA, Kerneysville)

Diagnostic symptoms occur on leaves and fruits of most stone fruit trees and on flowers of certain varieties of peaches. Symptoms in leaves may be subtle; they include yellowing veins and/or yellow to light green rings (**Fig. 1**) on the surface of the leaf. The skin of the fruit may develop lightly pigmented rings (**Fig.2**) or line patterns resulting from the

convergence of several rings. Necrotic or brown areas may appear and the fruit may become deformed and irregular. Some fruits, like apricots, have rings that appear on the surface of the seed, but these rings are not visible on the external skin of the fruit. Plums are a good indicator species of PPV because they tend to develop severe, visible symptoms.



Figure 2: Ring spot symptoms on peach fruit (provided by Dr. Ken Hickey, Pennsylvania)

Disease Cycle

PPV is spread over short distances by aphids. The mechanism by which aphids spread disease is called non-persistent transmission; the virus is infectious and can be transmitted by the aphid only for a short period of time. Aphids transmit the virus through a piercing-sucking mouthpart (stylet) that probes into the vascular tissue of plants while feeding. The virus sticks to the lining of the food canal and can be injected back into a healthy plant cell as the aphid moves from plant to plant. In order for the virus to successfully spread to a new host the aphid must:

- 1) feed on an infected plant,
- 2) acquire a sufficient amount of virus and,
- 3) fly immediately to a new host plant for transmission.

The virus does not persist or increase inside the aphid's circulatory system. The virus carried by an

aphid is lost in the next plant cell on which they feed. Also, the efficiency of transmission may vary if the host plant from which the aphid acquired the virus is different from the newly infected host.

Physical movement of infected plants or plant parts causes long distance spread of PPV. PPV was introduced into several European countries via infected nursery stock or infected buds grafted onto healthy trees. This is the only known method of long-distance transmission. Long-distance spread of the virus via aphids is not likely as the lifespan of the virus within the aphid is usually less than an hour.

Management Strategies

Exclusion and Quarantine

The best method for controlling PPV is to prevent the introduction of the virus into new fruit-growing areas of the United States by carefully regulating and inspecting all imported plant material. To achieve this goal, imported fruit plants should be tested for plant pathogens, especially exotic pathogens not known to occur in this country. Commercial growers and nursery propagators should purchase only certified virus-free planting stock that has been tested for PPV and other viruses.

Eradication

The next strategy is to control spread by eliminating infected trees as quickly as possible. Sampling of trees is difficult since PPV is not distributed evenly and some plant parts may have undetectable concentrations of the virus. For this reason, multiple samples must be obtained for laboratory testing from the suspected tree and trees in the surrounding areas.

Infected trees can be bulldozed or cut with tree removal equipment. It is important to eradicate sucker shoots developing from tree stumps because they are known to be a good source of the virus. Suckers can be treated with herbicides. In Europe, growers are recommended to wait three years before replanting an orchard with stone-fruit trees.

Insect Control

Application of insecticides can reduce the population of aphids but total aphid control is practically impossible. A single aphid may spread the virus to a new host within a few seconds. Careful monitoring of aphids is difficult. Growers tend to encounter numerous aphid species throughout the season; these aphids may have different migratory patterns and host ranges.

Plant breeding and genetic engineering

If preventative measures cannot exclude PPV from a growing area, then plant resistance to the virus may be the only feasible control strategy. There are few naturally occurring resistant genes in fruit trees available to plant breeders. However, genetic engineering may allow scientists to insert genes into trees to enhance resistance. This mechanism is not well understood, but it has been successful with plum trees and apricots.

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