CAPS Datasheets provide pest-specific information to support planning and completing early detection surveys.

Potyvirus Plum Pox Virus

Figure 1. PPV symptoms on a plum leaf and fruit. Photos courtesy of Dr. Laszlo Palkovics, Corvinus University, Budapest, Hungary.

Scientific Name

Potyvirus plumpoxi

Synonym:

Plum pox virus (PPV)

Common Name

Plum pox virus, Plum pox, Sharka

Type of Pest

Virus

Taxonomic Position

Class: Stelpaviricetes
Order: Patatavirales
Family: *Potyviridae*
Genus: *Potyvirus*
Species: *Potyvirus plumpoxi*

Pest Recognition

This section describes characteristics of the organism and symptoms that will help surveyors recognize possible infestations/infections in the field, select survey sites, and collect symptomatic material. For morphological descriptions, see the Identification/Diagnostic resources on the AMPS pest page on the CAPS Resource and Collaboration website.

Pest Description

Plum pox virus (PPV), an RNA virus, is the causal agent of plum pox disease (Byzova et al., 2010; Çelik et al., 2021; García et al., 2014; Schneider et al., 2011). There are many PPV isolates that differ in properties such as aggressiveness, aphid transmissibility and symptomatology (López-Moya et al., 2000). Currently, ten strains are recognized for PPV (Chirkov et al., 2022; Chirkov et al., 2018; García et al., 2014; James et al., 2013; Rodamilans et al., 2020), although research is still ongoing (Chirkov et al., 2022; Gürcan et al., 2020; Hajizadeh et al., 2019; Maejima et al., 2020). The recognized strains (An, C, CR, CV, D, EA, M, Rec, T, and W) have been differentiated based on their biological, serological and molecular properties (Table 1) (Bodin et al., 2003; Chirkov et al., 2022; Chirkov et al., 2018; Crescenzi et al., 1997; García et al., 2014; Glasa et al., 2013; Hajizadeh et al., 2019; James et al., 2013; James et al., 2003; Kerlan et al., 1979 Rodamilans et al., 2020; Serçe et al., 2009; Sihelská et al., 2017). Virus strains cause different symptoms in different hosts, and not all strains or isolates infect the same hosts (Damsteegt et al., 2007; Llácer, 2006). Different strains can infect a number of cultivated stone fruit species including plum, peach, nectarine, apricot, almond, and cherry, as well as wild and ornamental *Prunus* species. Among these, PPV D and M are the most economically important and widespread (García et al., 2014; James et al., 2013). All previous occurrences in the United States had been identified as strain D (PPV-D) (Damsteegt et al., 2001; Schneider et al., 2011); PPV-D is the only strain that remains present in North America (in Canada). Strains W and Rec had been detected in Canada, and they are now considered eradicated (CFIA, 2022; Rochon et al., 2003; Thompson et al., 2009). Strain D naturally infects peach, nectarine, apricot and plum; almond and cherry are not natural hosts, although they can be infected experimentally (Damsteegt et al., 2007).

Table 1: Strains of *Plum pox virus*

Strain	Originally described from	Notes
PPV-M (Marcus)	Greece (peach) (James et al., 2013)	In many European countries but absent from the Americas. It is the most aggressive strain (Pedrelli et al., 2023); it causes rapidly spreading epidemics in peach (López-Moya et al., 2000), but is less frequently found in plums and apricots (Nikbakht Dehkordi et al., 2017; Wang et al., 2006). Efficiently transmitted by aphids (García et al., 2014).
PPV-D (Dideron)	France (apricot) (James et al., 2013)	PPV-D is the most widespread strain of PPV (Pedrelli et al., 2023 García et al., 2014), but less efficiently transmitted by aphids than PPV-M (López-Moya et al., 2000; Rochon et al., 2003). It has been eradicated in the United States (USDA-APHIS, 2019) and in Nova Scotia (CFIA, 2022) since 2019; however, the strain is still present in the Niagara Region of Ontario (CFIA, 2022). It can infect many *Prunus* species, but cherries are not naturally infected and are generally believed to be resistant to this strain (CFIA, 2022).
PPV-Rec (Recombinant)	Serbia (plum) (Glasa et al., 2005)	A group of isolates from a single homologous recombination event between PPV-M and PPV-D (*NIb* gene) (Glasa et al., 2005). It is widespread in several central and eastern European countries (Candresse et al., 2007; Svanella-Dumas et al., 2015). Recently found in Turkey and France (Candresse et al., 2007; Svanella-Dumas et al., 2015). It mainly infects plum and apricot trees. Efficiently transmitted by aphids (García et al., 2014).
PPV-EA (El Amar)	Egypt (apricot) (James et al., 2013)	Not reported outside of Egypt at this time (García et al., 2014).

Strain	Originally described from	Notes
PPV-C (Cherry)	Moldova (sour cherry) (James et al., 2013)	Reported in Moldova in 1980's. Reported and eradicated in Italy (Rizza et al., 2014). Sporadically present in central and eastern European countries. Reported from Belarus, Russia and Croatia (Bodin et al., 2003; García et al., 2014; Glasa et al., 2014).
PPV-CR (Cherry Russian)	Russia (sour cherry) (James et al., 2013)	Unusual PPV isolates recovered from naturally infected sour cherries in several regions of Russia have been characterized and proposed to form a second cherry-adapted strain, PPV-CR (Cherry Russian) (Glasa et al., 2013; Glasa et al., 2014). The epidemiology of this strain is undetermined.
PPV-W (Winona)	Canada (plum) (James et al., 2005)	Reported and eradicated from two infected plum trees in Canada (CFIA, 2022). Recently reported from Kazakhstan, it is also present in Latvia and Ukraine, and widespread in Russia (Dallot et al., 2019).
PPV-T (Turkey)	Turkey (apricot) (Çelik et al., 2021)	Recognized through improved strain typing methods. These isolates have a recombination event in the *HC-Pro* gene (Serçe et al., 2009). This strain occurs in Turkey and was identified also in Albania (Çelik et al., 2021; Palmisano et al., 2015).
PPV-CV (Cherry Volga)	Russia (sour cherry) (Chirkov et al., 2018)	Limited to Russia at this time (Chirkov et al., 2018).
PPV-An (Ancestor) [PPV-AM (Ancestor Marcus)]	Albania (plum) (James et al., 2013)	Very little information is available on this strain (Hajizadeh et al., 2019; Maejima et al., 2020). May be a potential ancestor of the M strain of PPV (James et al., 2013).

Symptoms

Plum pox virus symptoms vary in type and severity with the host, cultivar, environmental and growth conditions, timing of infection, and age of the trees (Clemente-Moreno et al., 2015; Mitrofanova et al., 2015; Morca et al., 2020). The virus can also be unevenly distributed within the tree (Adams et al., 1999; Ferri et al., 2002). Healthy branches can be found on infected trees, and healthy and infected buds can occur on the same branch (Nemeth, 1986). Newly infected trees can be asymptomatic (García et al., 2007) or symptoms can be restricted to only some parts of the tree, while the development of systemic infection can require several years (Barba et al., 2011).

Figure 2: Fruit deformation caused by plum pox virus infection in sensitive plum. Photo courtesy of P. Gentit, CTIFL, France.

Symptoms may appear on leaves, flowers, fruits, stones, and woody tissues. On leaves, symptoms typically appear in springtime, showing mild light green discoloration, chlorotic spots, bands or rings, vein clearing or yellowing, and leaf distortions (Clemente-Moreno et al., 2015; García et al., 2007). Flowers can show petal discolorations and malformations with wrinkled petals (Avramov, 2023; García et al., 2007). Fruits can show chlorotic spots or lightly pigmented yellow rings. They may become deformed and develop necrotic areas (rings), show internal browning and gummosis of the flesh, and can drop prematurely (Clemente-Moreno et al., 2015; García et al., 2007). Generally, the fruits of early maturing cultivars of all susceptible species show stronger symptoms compared to the late maturing cultivars (Nikbakht Dehkordi et al., 2017). In some cultivars, the virus can also cause flattening and cracking on the woody parts of the host (EPPO, 2023b). Those cracks develop into large open cankers and the affected trees may decline over the course of a few years (Barba et al., 2011; Nemeth, 1986).

See below for descriptions of symptoms on some common hosts:

<u>Plum</u>

Symptoms on leaves include chlorotic spots, rings and lines (Mitrofanova et al., 2015). Flowers can show spot necrosis or deformations (Mitrofanova et al., 2015). Fruits show light halos with darker center and sunken lesions and stones can have dark spots (Barba et al., 2011; Mitrofanova et al., 2015; Rodoni et al., 2020) (Fig. 1). They can be deformed (Mitrofanova et al., 2015) (Fig. 2) and some plum cultivars can drop fruits prematurely (García et al., 2014).

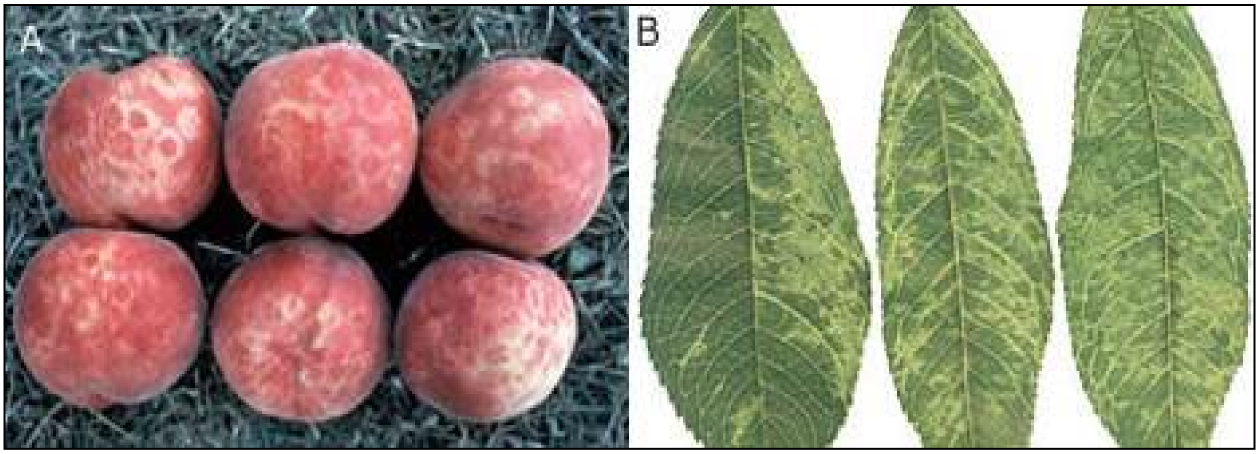

Figure 3: Symptoms of PPV in peach, including **(A)** chlorotic ring patterns in peach fruit and **(B)** chlorotic blotches in peach leaves. Photos courtesy of P. Gentit, CTIFL, France.

Peach

Symptoms on leaves include chlorotic spots, rings, bands, and halos (Fig. 3B). Leaves may be distorted, twisted and banded along the central vein (Mitrofanova et al., 2015). Lines and spots can appear on the petals, and flowers may exhibit color breaking (Barba et al., 2011) (Fig. 4B). Immature fruits can have chlorotic spots and light rings; mature fruits can develop red rings, bright purple-red spots or large halos with a pink center (Levy et al., 2000a; Mitrofanova et al., 2015; Rodoni et al., 2020) (Fig. 3A, 4A).

Figure 4: More symptoms of PPV in peach including **(A)** yellow rings caused by PPV on a yellow-fleshed peach cultivar, and **(B)** color break symptoms induced by PPV in peach flowers. Photos courtesy of European and Mediterranean Plant Protection Organization Archive, www.bugwood.org and P. Gentit, CTIFL, France.

Almond

Infection can be symptomless (Nikbakht Dehkordi et al., 2017), with some varieties showing resistance (Rubio et al., 2003). Leaves in infected trees show few symptoms.

Apricot

Symptoms on leaves include mild, pale green rings and diffuse chlorotic spots (Kollerová et al., 2006; Navratil et al., 2005) (Fig. 5B). Some cultivars show discolored spots with green, red, or violet rings on immature fruits (Levy et al., 2000a; Mitrofanova et al., 2015) (Fig. 5C). Fruits may be misshapen and may have rings on the surface of the seed (Fig. 5A, C) (Levy et al., 2000a; Rodoni et al., 2020).

Figure 5: Symptoms of PPV in apricot, including **(A)** rings on the stone of apricot, **(B)** rings and chlorotic spots on the leaves, and **(C)** misshapen fruit with rings. Photos (A)&(B) courtesy of Miroslav Glasa, (C) courtesy of Dr. Laszlo Palkovics, Corvinus University, Budapest, Hungary

Cherry

Symptoms on leaves include discoloration along veins, light green bands, and leaf distortions (Glasa et al., 2013). Sour cherry fruits can show black ring patterns, depressions, and necrosis, which gradually disappears during ripening (Sheveleva et al., 2021). Some sweet cherry fruits develop chlorotic and necrotic rings, notched marks, and premature fruit drop (Levy et al., 2000a).

Easily Mistaken Species

PPV symptoms are sometimes difficult to distinguish from other diseases. PPV may be confused with *Taphrina deformans* (peach leaf curl), *Apple chlorotic leaf spot* and *Peach mosaic virus* in peach, *Prunus necrotic ringspot* in cherry (Lebas et al., 2003; Nemeth, 1986).These diseases are present in the United States (Alfieri Jr. et al., 1984; French, 1989; USDA-ARS, 1960).

Biology and Ecology

- Short distance spread of PPV is the result of aphid transmission (Gildow et al., 2004; Kimura et al., 2016; Levy et al., 2000a). Aphids test leaf and fruit surfaces by probing them and virus particles can be pulled into their mouthparts (stylet) in probes short as 30 seconds (Levy et al., 2000a; Rimbaud et al., 2015). Once acquired, PPV remains in the aphid for one to three hours (Levy et al., 2000a) and can be transferred to healthy trees during new probes. The virus does not persist in the aphid after it has been expelled into new tissue (Gildow et al., 2004). There is no correlation between the ability to transmit PPV and the ability to colonize *Prunus*: the virus can be spread efficiently by transient aphids as well as by aphids colonizing *Prunus* (Labonne et al., 1995). Aphids can also acquire PPV from harvested infected fruits (Gildow et al., 2004). The efficiency of natural transmission by aphids and the spatial pattern of spread may differ for different PPV isolates and host cultivars (García et al., 2014).

- Spring aphid flights are important for spread within and between orchards. About twenty aphid species can transmit PPV, but only a few of them are considered important vectors in the United States: the black bean aphid (*Aphis fabae*), the spirea aphid (*Aphis spiraecola*), the black peach aphid (*Brachycaudus persicae*), and the green peach aphid (*Myzus persicae*) (Gildow et al., 2004). *Toxoptera citricida* (brown citrus aphid) is also an efficient vector, but does not occur in major stone-fruit growing areas (Gildow et al., 2004). All infected trees, even when not showing symptoms, are sources of possible PPV transmission to healthy trees.
- Aphids' flights distance can vary. Studies have shown that most transmission happens within 650 ft of diseased trees, but could happen as far as 2000-3000 ft or more from diseased trees(Labonne et al., 2006, Dallot et al., 2003; Pleydell et al., 2018). Studies have shown that aphid dissemination occurs through two distinct processes: active flights over short distances below the canopy of *Prunus* orchards, where wind speeds are reduced, and passive flights above the canopy, where air masses carry the aphids over longer distances (Rimbaud et al., 2015).
- Long-distance spread of PPV occurs primarily by movement of infected plants or plant parts. The virus can spread through infected nursery stock or grafting of buds collected from infected trees (Barba et al., 2011; Cambra et al., 2006; Rimbaud et al., 2015).
- The presence of other viruses, such as *Plum dwarf virus*, *Prunus necrotic ringspot virus*, and *Apple chlorotic leaf spot virus* can increase the severity (synergistic effect) of plum pox symptoms (Németh, 1994). Depending on the host cultivar, mixed infections with multiple strains of PPV can occur (Capote et al. 2006).

Known Hosts

Plum pox virus has a wide host range and is known to cause economic damage to commercial cultivars and rootstocks of woody plants in the genus *Prunus* (Rosaceae). It can infect wild, ornamental and cultivated species of *Prunus* (Barba et al., 2011; Damsteegt et al., 2007; García et al., 2014).

The host list below includes cultivated and wild plants that 1) are infected or infested by the pest under natural conditions, 2) are frequently described as major, primary, or preferred hosts, and 3) have primary evidence for feeding and damage documented in the literature. Plants are highlighted in bold if they are commercially produced and the pest causes economically significant damage.

Preferred hosts

Prunus armeniaca (apricot), ***P. cerasifera*** (cherry plum), ***P. cerasus*** (sour cherry), ***P. domestica*** (plum), ***P. salicina*** (Japanese plum) and ***P. persica*** (peach/ nectarine), (Cambra et al., 2006; Chirkov et al., 2022; García et al., 2014; Nemeth, 1986; Zhou et al., 2021) are the preferred host of this virus and are the primary targets for early detection surveys.

Plum pox virus was isolated from ***Prunus avium*** (sweet cherry) (Crescenzi et al., 1994; Kölber et al., 1997) even though in the past it was considered resistant to it (Kamenova et al., 2013).

Other hosts

Prunus dulcis (almond) is a host of PPV and may be symptomless. There is conflicting evidence in the scientific literature on whether it serves as reservoir host (İlbağı et al., 2014; Rodamilans et al., 2020; Rogers et al., 2024; Šafáøová et al., 2016 Rubio et al., 2003).

Detection surveys for this virus should be restricted to *Prunus* hosts. Within this genus, species such as *Prunus americana* (American plum), *P. blireana* (blireana flowering plum), *P. fruticosa* (steppe cherry), *P. glandulosa* (dwarf flowering almond, cherry almond), *P. insititia* (damson plum), *P. japonica* (Korean cherry/ Japanese bush cherry), *P. mume* (Japanese apricot), *P. serotina* (black cherry), *P. spinosa* (blackthorn) could potentially act as reservoir (Chirkov et al., 2016; Chirkov et al., 2022; Collum et al., 2022; Damsteegt et al., 2007; García et al., 2007; James et al., 2006; Maejima et al., 2010; Nemeth, 1986; Polák, 1997; Sebestyen et al., 2008; Stobbs et al., 2005; Zhou et al., 2021).

Many ornamental and herbaceous plants, including those often found in orchards, can serve as hosts for this virus. However, the role of these non-*Prunus* hosts in the survival and spread of the virus is not well understood. While they could potentially be a source of infection, natural transmission between herbaceous plants and *Prunus* species has never been observed (Llácer, 2006; Rimbaud et al., 2015). This is complicated by the fact that different strains of the virus cause different symptoms in various hosts, and not all strains infect the same plants (Damsteegt et al., 2007; Llácer, 2006).

For more information about natural and experimental non-*Prunus* hosts see (Çıtır et al., 2021; Collum et al., 2022; Damsteegt et al., 2007; Hamdorf, 1973; Kil et al., 2021; Labonne et al., 2004; Llácer, 2006; Nemeth, 1986; Pigliónico et al., 2021; Polak, 2000, 2003; Schneider et al., 2011; Wang et al., 2006).

Pest Importance

Plum pox virus is the most widespread and destructive disease of stone fruits in Europe; it causes fruit to be unmarketable, weakens infected trees, and decreases fruit yield and quality (Németh, 1994). Nemeth (1986) estimated that losses due to the disease of some susceptible plum cultivars could be as high as 80-100%. A recent study carried out on sour cherry showed that PPV reduced productivity of the trees 38% to 45%, compared to uninfected trees (Sheveleva et al., 2021) and even symptomless trees produced less fruit. Some studies have recorded that the weight of diseased fruits may decrease by 0.2-4% in tolerant cultivars, and by 22-34% in susceptible cultivars. In other cases, it varied between 12-19%. PPV decreases the sugar and the anthocyanin content and increases the acidity of fruits (Németh, 1994). The virus also shortens the productive lifespan of orchards. It is often isolated with other viruses (Pedrelli et al., 2023), and coinfection can enhance symptoms and damaging effects (Németh, 1994; Salavey et al., 2012).

In addition to production losses, there are also costs associated with PPV management, including eradication, compensation, preventive measures (e.g., quarantines, surveys, inspections, nursery control, diagnostics), and impacts on trade. Cambra et al. (2006) estimated that worldwide costs associated with PPV management in the preceding 30 years exceeded 10 billion euros.

PPV is listed as a harmful organism in 45 countries worldwide, including Canada, China, and numerous other large trading partners (PCIT, 2023). If this virus becomes established in the United States, trade implications with some of these countries are likely. PPV is listed on the EPPO A2 list (EPPO, 2022).

Known Vectors

Plum pox virus has been transmitted by at least 20 aphid species, although only some are considered important vectors (Table 3) (Gildow et al., 2004; Hazır et al., 2021; Levy et al., 2000a). The efficiency of transmission is dependent on the virus isolate, host cultivars, host age, aphid species, and time of year. The most important aphid vectors are *Brachycaudus cardui* (plum-thistle aphid), *B. helichrysi* (leaf-curling plum aphid), *Hyalopterus pruni* (mealy plum aphid), *Myzus persicae* (green peach aphid), and *Phorodon humuli* (hop aphid) (CABI, 2024; Gildow et al., 2004; Hazır et al., 2021; Levy et al., 2000a). These species have been reported as vector in several countries and all are present in the Unites States. Although reports vary from country to country, natural virus spread tends to be high in the spring and fall and low in summer and winter. Spring flights of *B. helichrysi, M. persicae,* and *P. humuli* are most important for spread within and between orchards (Levy et al., 2000a).

Table 3: Aphid vectors of *Plum pox virus*, with important vectors according to Levy et al. (2000a) in **bold**.

Aphid Species	Colonizes *Prunus*	Host
Aphis arbuti	No (transient)	*Arbutus unedo*
A. craccivora	No (transient)	polyphagous
A. fabae	No (transient)	polyphagous
A. gossypii	No (transient)	polyphagous
A. hederae	No (transient)	*Hedera helix*
A. spiraecola	Occasionally	polyphagous
Brachycaudus cardui	Yes	*Prunus;* Compositae
B. helichrysi	Yes	*Prunus;* Compositae
B. persicae	Yes	*Prunus*
Dysaphis plantaginea	No (transient)	Apple; Plantago
D. pyri	No (transient)	Pear; *Gallium*
Hyalopterus pruni	Yes	*Prunus; Fragmites*
Macrosiphum rosae	No (transient)	*Rosa;* Dipsaceae

Aphid Species	Colonizes *Prunus*	Host
Megoura rosae	No (transient)	Leguminoseae
Myzus persicae	Yes	polyphagous
M. varians	Yes	Peach; *Clematis*
Phorodon humuli	Yes	*Prunus; Hop*
Rhopalosiphum padi	No (transient)	*Prunus padus;* Gramineae
Sitobion fragariae	No (transient)	*Rosa;* Gramineae
Ureleucon sonchi	No (transient)	*Lactuca; Sonchus*

Known Distribution

Africa: Egypt and Tunisia. **Asia:** China, India, Iran, Israel, Japan, Jordan, Kazakhstan, Pakistan, South Korea, Syria, Turkey and Uzbekistan. **Europe:** Albania, Austria, Belarus, Belgium, Bosnia-Herzegovina, Bulgaria, Croatia, Crimea, Cyprus, Czech Republic, Denmark, France (including Corsica), Germany, Greece, Hungary, Italy, Latvia, Lithuania, Luxembourg, Macedonia, Moldova, Netherlands, Norway, Poland, Portugal (including Azores), Romania, Russia, Serbia and Montenegro, Slovakia, Slovenia, Spain, Switzerland, Ukraine, and the United Kingdom. **North America:** Canada and Mexico. **South America:** Argentina, and Chile (Boulila et al., 2004; Candresse et al., 2007; CFIA, 2022; Crescenzi et al., 1997; Dallot et al., 2004; Dallot et al., 2020; EPPO, 2014, 2023a; Glasa et al., 2005; Glasa et al., 2013; Gottwald et al., 1995; Kamenova et al., 2019; Kimura et al., 2016; Kollerová et al., 2006; Loera-Muro et al., 2017; Maejima et al., 2010; Mitrofanova et al., 2015; Morca et al., 2020; Mumford, 2006; Navratil et al., 2005; Nemchinov et al., 1997; Nikbakht Dehkordi et al., 2017; Oh et al., 2017; Palmisano et al., 2015; Papayiannis et al., 2007; Polák, 1997; Reyes et al., 2003; Salamon et al., 2002; Salavey et al., 2012; Sattorov et al., 2020; Serçe et al., 2009; Spiegel et al., 2004; Staniulis et al., 1998; Svanella-Dumas et al., 2015; Varveri, 2006; Verhoeven et al., 2006; Wang et al., 2006; Zhou et al., 2021; Zotto et al., 2006).

The disease has been found in Estonia, Georgia and Lebanon, but did not establish or is no longer found in these countries (EPPO, 2023a; Levy et al., 2000a; Roy et al., 1994).

In 2014, a plum tree in Finland was found to be infected with PPV-D. This tree, originally from Russia, was used as a mother tree (Santala et al., 2015). This tree and all six infected progeny trees were destroyed, and PPV is currently considered eradicated (EPPO, 2023a).

In 2014, a symptomatic peach fruit in Brazil was found to contain PPV (strain not reported) (Rezende et al., 2016). This fruit was imported from Chile. There is no evidence of presence of the virus in Brazil (EPPO, 2023a).

<u>**Status of infestation in the United States (January 2024)**</u>

In the United States, the disease was recorded in Pennsylvania in 1999 (Levy et al., 2000b), followed by New York and Michigan in 2006 (Gottwald, 2006; Snover-Clift et al., 2007). Plum pox virus was eradicated from Pennsylvania and Michigan in 2009 and western New York in 2012. In 2019, the disease was declared eradicated from the United States (USDA-APHIS, 2019).

Pathway

Infected *Prunus* spp. are the major source of inoculum (Barba et al., 2011). The main pathway for long distance spread is the movement of infected plants or plant material for grafting (Cambra et al., 2006; Rimbaud et al., 2015; Sihelská et al., 2017). The virus is transmitted from infected trees by grafting and other vegetative propagation (Barba et al., 2011; Kimura et al., 2016). Once a diseased plant has entered an orchard or a nursery, aphid species transmit it locally (Barba et al., 2011).

Despite some reports of Plum pox virus detection in seeds and pollen (Nemeth, 1986; Németh, 1994; Nemeth et al., 1982), there is no consensus among scientists or strong evidence that the virus is pollen or seed transmitted (Barba et al., 2011; Glasa et al., 1999; Milusheva et al., 2008; Pasquini et al., 2006). In some studies, the virus was detected in seed coats and cotyledons (Milusheva et al., 2008), but embryonic tissue and seedlings obtained from germinated seeds never showed symptoms, and they gave negative results with both ELISA and PCR assays (Milusheva et al., 2008; Pasquini et al., 2006).

Use the PPQ Commodity Import and Export manuals listed below to determine 1) if host plants or material are allowed to enter the United States from countries where the organism is present and 2) what phytosanitary measures (e.g., inspections, phytosanitary certificates, post entry quarantines, mandatory treatments) are in use. These manuals are updated regularly.

Agricultural Commodity Import Requirements (ACIR) manual: ACIR provides a single source to search for and retrieve entry requirements for imported commodities.

Potential Distribution within the United States

In the United States, Plum pox virus was first recorded in Pennsylvania in 1999 (Levy et al., 2000b) and in New York and Michigan in 2006 (Gottwald, 2006; Snover-Clift et al., 2007). Since 2019, the virus has been declared eradicated from the United States (USDA-APHIS, 2019). Plum pox virus has the potential to occur wherever susceptible hosts are grown including most of the eastern United States and portions of Washington, Oregon, and California. Based on the known distribution of Plum pox virus and comparing those areas to Global Plant Hardiness Zones (Takeuchi et al., 2018), we expect that *PPV* could establish in plant hardiness zones 6-11.

Survey and Key Diagnostics

Approved Methods for Pest Surveillance*:

For the current approved methods and guidance for survey and identification, see Approved Methods for Pest Surveillance (AMPS) pest page on the CAPS Resource and Collaboration website, at https://approvedmethods.ceris.purdue.edu/.

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Versions

May 2011: Datasheet completed (Version 1)
- Original version written and posted to CAPS Resource and Collaboration site in the Stone Fruit Manual

May 2013: (Version 3)
- Minor updates to host and distribution sections.

April 2014: (Version 4)
- Added Israel and Belarus to distribution. Updated Pest Importance section with PCIT data. Added Pathway section.

July, 2014: (Version 4.1)
- Incorporated comments and corrections from Thierry Candresse. Added the newly identified strain PPV-CR to table 1.

October, 2014: (Version 4.2)
- Incorporated comments from Miroslav Glasa and Delano James.

Updated the Pest Description, Known Hosts, and Key Diagnostics sections. Replaced Figure 6 with a better image.

March, 2015: (Version 5)

- Minor update to distribution section. Rec strain found in France.

August, 2015: (Version 5.1)

- Added Finland to distribution section.

July, 2016: (Version 6)

- Updated mapping data

November, 2016: (Version 6.1)

- Updated distribution list. Strain D found in South Korea, and PPV found in Brazil

June, 2023 version 7

Updated to the new template, Scientific Name, Pest Description, Symptoms, Easily Mistaken Species, Biology and Ecology, Known Hosts, Pest Importance, Known Vectors, Known Distribution, Pathway, Potential Distribution within the United States, Survey and Key Diagnostics sections

Reviewer(s)

Vessela Mavrodieva, Ph.D., PPCDL, USDA APHIS PPQ Science & Technology