

Data Sheets on Quarantine Pests

Xanthomonas arboricola pv. *pruni***IDENTITY**

Name: *Xanthomonas arboricola* pv. *pruni* (Smith) Vauterin *et al.*

Synonyms: *Xanthomonas campestris* pv. *pruni* (Smith) Dye
Xanthomonas pruni (Smith) Dowson

Taxonomic position: Bacteria: Gracilicutes

Common names: Bacterial leaf spot, shot-hole, black spot (English)
Tache bactérienne, bactériose (French)
Fleckenbakteriose (German)

Notes on taxonomy and nomenclature: The genus *Xanthomonas* has recently been extensively revised with a number of pathovars elevated to rank of species and existing species descriptions substantially altered (Vauterin *et al.*, 1995). The new name *Xanthomonas arboricola* pv. *pruni* was proposed as part of this revision.

Bayer computer code: XANTPR

EPPQ A2 list: No. 62

EU Annex designation: II/A2

HOSTS

X. arboricola pv. *pruni* attacks only *Prunus* spp., and particularly the fruit crops almonds, peaches, cherries, plums, apricots and *P. salicina*. Other exotic or ornamental species of *Prunus* attacked include *P. davidiana* and *P. laurocerasus*. Cultivars of the Sino-Japanese group (*P. japonica* and *P. salicina*) are generally more susceptible than European plums (Bazzi & Mazzucchi, 1984; Topp *et al.*, 1989).

GEOGRAPHICAL DISTRIBUTION

X. arboricola pv. *pruni* was first described in North America. It is not clear from the literature whether it has spread from there or naturally has a wider range.

EPPQ region: Found in Austria (unconfirmed), Cyprus (unconfirmed), Lebanon, Moldova, Netherlands (unconfirmed), Switzerland (unconfirmed), Ukraine. Locally established in Bulgaria, Italy, Romania, Russia (European, Far East), Slovakia (unconfirmed) and Slovenia.

Asia: China (widespread), Cyprus (old unconfirmed record, now absent), Hong Kong, India (Himachal Pradesh), Japan, Korea Democratic People's Republic, Korea Republic, Lebanon, Pakistan, Russia (Far East), Saudi Arabia, Taiwan, Tajikistan.

Africa: South Africa, Zimbabwe.

North America: Bermuda, Canada (Manitoba, Nova Scotia, Ontario, Quebec), Mexico, USA (Alabama, Arkansas, Connecticut, Florida, Georgia, Kentucky, Louisiana, Maryland, Michigan, Missouri, Mississippi, New Jersey, North Carolina, South Carolina, Texas).

South America: Argentina, Brazil (Santa Catarina, São Paulo), Uruguay.

Oceania: Australia (New South Wales, Queensland, Victoria, Western Australia), New Zealand.

EU: Present.

Distribution map: See CMI (1987, No. 340).

BIOLOGY

On peach, *X. arboricola* pv. *pruni* overwinters primarily in the intercellular spaces of the cortex, phloem and xylem parenchyma towards the tips of twigs produced during the preceding season. On plum and apricot, summer cankers formed in one season continue developing the following spring, so providing a source of inoculum at this time. Plum buds and fallen leaves have also been reported as overwintering sites.

In the spring, before host division starts, the bacteria in the intercellular spaces multiply and cause the epidermis to rupture, so initiating a visible lesion referred to as a spring canker. Inoculum from these cankers is disseminated in rain and wind and infects new leaf growth via stomata. Lesions developing on the leaf exude bacteria which bring about secondary infections. Du Plessis (1983; 1987) suggests that the bacterium may migrate systemically from twigs to leaves. Pruning operations will also transmit the disease (Goodman & Hattingh, 1988). Insects which damage plum bark, such as *Cicada* spp. in New Zealand, provide points for entry.

Following foliage infection, summer cankers develop in the green tissue of the shoot, but usually become sealed off by a periderm layer and, as cankers tend to dry out during the course of summer, the viability of bacteria therein is largely reduced; thus, except in certain localities, summer cankers in plum and peach are of no importance as overwintering sites for the bacterium, or in initiating infections the following spring. In general, it is the late infections of shoots, occurring during rains just before and during leaf fall in the autumn, when the host resistance mechanism of producing a periderm barrier is reduced, which constitute the primary inoculum source for the following spring.

A warm, moderate season with temperatures of 19-28°C and with light, frequent rains accompanied by fairly heavy winds and heavy dews is most favourable for severe infection. The disease tends to appear and spread in the spring, then makes little progress through the summer, but late infections occur in the autumn. In culture, bacteria have survived ice-box conditions of -2°C to +2°C for 5 months. The disease is not usually found in arid regions.

Strain differences have mostly not been noted in *X. arboricola* pv. *pruni*, but Du Plessis (1988a) has found differential virulence to peach, plum and apricot cultivars.

For more information, see Dunegan (1932), Thornberry & Anderson (1933), Anderson (1956), Hayward & Waterston (1965).

DETECTION AND IDENTIFICATION

Symptoms

On peach leaves

Infection is first apparent on the lower surface as small, pale-green to yellow, circular or irregular areas with a light-tan centre. These spots soon become evident on the upper surface as they enlarge, becoming angular and darkening to deep-purple, brown or black. The immediately surrounding tissue may become yellow. The diseased areas drop out, usually after darkening in colour, but they may drop out prior to the colour change, giving

a shot-hole appearance to the leaf. Often, a dark ring of diseased tissue is left with the formation of the shot hole. Spots are usually concentrated towards the leaf tip, because the bacteria accumulate in this region in droplets of rain or dew. Bacterial ooze may be associated with the spots. Severely infected leaves turn yellow and drop off. Atypical symptoms reported for peach include a grey leaf spot on the upper surface, and a case in which bacteria infiltrated a large area, giving the leaf a greenish-yellow, translucent appearance.

On plum leaves

The shot-hole effect is usually more pronounced.

On peach fruit

Small circular brown spots appear on the surface. They become sunken, the margins are frequently water-soaked, and there are often light-green haloes which impart a mottled appearance to the fruit. As a result of natural enlargement of the fruit, pitting and cracking occur in the vicinity of the spots. These cracks are often very small and difficult to see, but where heavy infection has occurred on young fruit they can be extensive, severely damaging the fruit surface. Gum flow, particularly after rain, may occur from bacterial wounds; this may easily be confused with insect damage.

On plum fruit

Symptoms may be quite different; large, sunken black lesions are common on some cultivars, while, on others, only small pit-like lesions occur.

On peach twigs

Spring cankers occur on the top portion of overwintering twigs and on watersprouts before green shoots are produced; initially small, water-soaked, slightly darkened, superficial blisters, they extend 1-10 cm parallel to the long axis of the twig and may even girdle it. In this case the tip of the twig may die, while the tissue immediately below the dead area, in which the bacteria are present, is characteristically dark; this is the so-called "black tip" injury.

Twig infections later in the season result in summer cankers, which appear as water-soaked, dark-purplish spots surrounding lenticels. These later dry out and become limited, dark, sunken, circular to elliptical lesions with a water-soaked margin.

On plum and apricot twigs

Cankers are perennial, in contrast to peach, and continue developing in twigs of 2 and 3 years old. The inner bark is penetrated, resulting in deep-seated cankers which deform and kill twigs.

On cherries

Leaf symptoms are similar to those on peach, but rarely of importance. Early fruit infection, however, results in distorted fruit, and bacteria may be found from the epidermis to the stone.

For more information, see Dunegan (1932), Anderson (1956), Hayward & Waterston (1965), Moffett (1973).

Morphology

X. arboricola pv. *pruni* is an aerobic, motile, Gram-negative rod, 0.2-0.8 x 0.8-1.7 μm , with a single polar flagellum. Colonies are wet shining, convex, of a slimy mucoid consistency and produce a yellow water-insoluble pigment (Hayward & Waterston, 1965).

Detection and inspection methods

X. arboricola pv. *pruni* can be detected by a detached-leaf bioassay (Randhawa & Civerolo, 1985), and by isolation (Gitaitis *et al.*, 1988). Although serological techniques have been developed for other *X. campestris* pathovars on fruit crops, it seems that none is yet available for *X. arboricola* pv. *pruni*.

MEANS OF MOVEMENT AND DISPERSAL

X. arboricola pv. *pruni* has a limited capacity for local dispersal by rainsplash in orchards. In international trade, it is likely to be carried on plants for planting (except seeds) of host species, including budwood. The bacterium may also be found on fruits.

PEST SIGNIFICANCE

Economic impact

Greatest damage arises from severe defoliation resulting in weakened trees. Heavily infected trees (plum) gradually became uneconomic as leaders die following invasion by *X. arboricola* pv. *pruni*. In addition, fruit is small and often unmarketable. In neglected peach orchards, 25-75% of fruit may be attacked (Dunegan, 1932). In south-eastern Queensland (Australia), peach and plum losses are high in certain years; serious damage also occurs in New Zealand. Infection appeared on peaches and apricots in New Zealand and Australia, where these susceptible crops had been cultivated for many years without leaf spot problems, but in proximity to infected plums (Moffett, 1973). This was possibly due to a strain or race of increased virulence developing. *X. arboricola* pv. *pruni* has attracted increasing attention in South Africa (Du Plessis, 1988b).

Control

Resistant cultivars are available, and *Prunus* breeding programmes in North America attach considerable importance to *X. arboricola* pv. *pruni* resistance. No direct control methods are suggested, but bactericides have been evaluated (Du Plessis, 1983). Care should be taken to ensure that budwood is obtained from disease-free trees, preferably grown in arid regions. Orchard management practices in New Zealand have been reviewed by Young (1987).

Phytosanitary risk

X. arboricola pv. *pruni* is listed as an A2 quarantine pest by EPPO (OEPP/EPPO, 1978) and is of quarantine significance for IAPSC. The disease is rated as of little economic importance by the EPPO countries where it currently occurs, but it is absent from several major countries producing *Prunus*. Its behaviour elsewhere in the world suggests that it would be likely to establish more widely in the EPPO region although, in general, the bacterium would not present a threat to arid regions.

PHYTOSANITARY MEASURES

The EPPO specific quarantine requirements recommend that consignments of plants for planting (except seeds and tissue cultures), and fruits, of *Prunus* should come from a field found free from the disease by growing-season inspection (OEPP/EPPO, 1990).

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