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Susceptibility of some woody plant species, mainly Prunus spp., to sharka (plum pox) virus

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Abstract

Thirty-eight woody plant species and cultivars, mainly *Prunus* spp., were examined for their susceptibility to sharka virus. Seven species belonging to the subgenera *Prunophora* and *Amygdalus* were susceptible. Twenty-eight species, belonging to the subgenera *Amygdalus*, *Cerasus*, *Padus* and *Laurocerasus* proved to be immune. No certainty exist about three species. In *P. amygdalo-persica* grafted on 'Common Mussel' plum rootstock, the virus was detected in the rootstock but not in the species.

Introduction

Sharka (plum pox) virus (*/*; */*; ^{E}/E; ^{S}/Ap) is very harmful to apricots (*Prunus armeniaca*), peaches (*P. persica*) and plums (*P. domestica*) in some parts of the world. Hence, many countries try to keep the virus out. Some *Prunus* spp. are already long known to be susceptible to the virus, but many other species were never investigated in this respect. This was clearly shown by data presented at the International Conference on Sharka Disease in 1967 (Darke, 1968). More recently, Souty (1974) summarized data on the host range of sharka virus.

The present study was started in 1968. Many *Prunus* species and a few woody species of other genera were tested as possible hosts of the virus.

Materials and methods

The trees to be tested were obtained from several Dutch nurseries. They were planted in the spring of 1968 and 1969 on an isolated plot in a forest with mainly oak trees. The soil was sandy and this was probably the cause of a poor growth of several trees.

Three trees per species were inoculated and two trees served as controls. Before inoculation all trees were tested on peach seedlings in the glasshouse for the presence of viruses. Peach seedlings are used as indicator plants for different plum viruses. In some cases *Prunus* ringspot, line pattern and dark green mottle (caused by apple chlorotic leaf spot virus) symptoms were obtained, but sharka virus was absent in all trees.

Inoculations were made by chip-budding 3–4 months after planting, using an infected peach seedling or plum tree ('Czar') as a source of sharka virus. Five chips per tree were used.

Observations for symptoms were made monthly during the growing seasons of 1969 to 1973. Tests for infection were made from the branches that were originally inoculated with the virus (excluding the place of infection). These tests were made by chip-

budding to peach seedling in a glasshouse during the spring of 1971. Three seedlings were used for every plant species and five chips per seedling. They were examined for symptoms twice a week during the first month, were then cut back and examined for another month. The inoculated plants species that were free of sharka virus were inoculated again in 1971 using the same tree as a virus source. The final tests for infection were made in 1973.

The trees of this field trial were grubbed and eradicated in 1973.

Results

Most inoculated plant species did not show symptoms of sharka virus and back transmissions to peach seedlings were negative. The results with these species are summarized in Table 1. Only a few *Prunus* species showed sharka symptoms for one or more seasons (Table 2). These species were arranged into four groups, on the basis of presence or absence of symptoms on the species itself and/or rootstocks and the results of tests for the presence of virus.

The leaves of the inoculated trees of the species and the plum rootstock 'Common Mussel', listed in group 1 showed the symptoms the first year after inoculation. The leaves of inoculated *P. persica* seedlings first had yellow secondary veins and were severely curled, but later the plants were symptomless. *P. cerasifera* 'Trailblazer' had dark red diffuse flecks and lines on the leaves nearly the entire growing season but the symptoms were most distinct in the spring. Both *P. tomentosa* and 'Common Mussel' had distinct yellow diffuse flecks on the leaves during the entire growing season. Symptoms were weak on the leaves of *P. spinosa*. Diffuse light green flecks were seen only for a few weeks in early summer. Back transmissions of the trees of group 1 were positive.

Symptoms on the leaves of *P. mume* and *P. triloba* (group 2) were present only one season. In both species diffuse yellow flecks were seen although symptoms were very weak in *P. mume*, but distinct in *P. triloba*. In this group the species died before back

Table 1. Woody plant species that proved to be non-susceptible to sharka virus.

Prunus species		
Amygdalus	*P. amygdalus*	*P. tenella**
Cerasus	*P. avium*	*P. serrula**
	P. effusa 'Schnee'*	*P. serrulata* 'Amanogawa'*
	P. glandulosa 'Albo-Plena'[1]	*P. serrulata* 'Hizakura'
	*P. incisa**	*P. serrulata* 'Pink Perfection'*
	*P. moacyaca**	*P. serrulata* 'Shidare Sakura'
	*P. nipponica kurilensis**	*P. subhirtella* 'Autumnalis rosea'*
	*P. pilosiuscula**	*P. subhirtella* × *yedoënsis* 'Pandora'
	*P. sargentii**	*P. yedoënsis**
Padus	*P. maacki**	*P. serotina*
	P. padus	*P. virginiana**
Laurocerasus	*P. laurocerasus* 'Zabeliana'*	*P. lusitanica**
Other species	*Crataegus monogyna*	*Ribes nigrum**
	*Evonymus europaeus**	*Viburnum opulus**

[1] On the plum rootstock 'Brompton'. The trees of other species were on own roots or on *P. avium* rootstocks.

* Not tested earlier.

Tabel 1. Houtige plantesoorten, die onvatbaar bleken voor het sharka virus.

Table 2. *Prunus* species with symptoms of sharka virus on the leaves or on the leaves of the rootstock and the result of back transmission.

Group	Subgenus	Species	Symptoms/back transmission	
			species	rootstock
1	*Prunophora*	*P. cerasifera**		○/○
		'Trailblazer'	+/+	
		P. spinosa[1]	+/+	
		'Common Mussel'[1]	+/+	
	Amygdalus	*P. persica*[1]	+/+	
	Cerasus	*P. tomentosa*[1]	+/+	
2	*Prunophora*	*P. mume*	+/○	+/○
	Amygdalus	*P. triloba*	+/○	+/○
3	*Amygdalus*	*P. persica* 'Clara Mayer'*	○/○	+/○
	–	*P. cistena**	○/○	+/○
4	*Amygdalus*	*P. amygdalo-persica**	−/−	+/+

\+ = Symptoms present; back transmissions positive.
− = Symptoms absent; back transmissions negative.
○ = No observations.
[1] On own roots.
* Not tested earlier.

Tabel 2. Prunus-soorten met symptomen van het sharkavirus op de bladeren of op de bladeren van de onderstam, en de resultaten van terugtoetsing.

transmissions could be made. Nevertheless, the suckers of their rootstock ('Brompton') showed clear sharka symptoms.

The *Prunus* species of group 3 (*P. persica* 'Clara Mayer' and *P. cistena*) died during the first year after inoculation, but showed no sharka symptoms. However, the same season the species died, clear sharka symptoms became apparent on the leaves of the suckers of their rootstock ('Brompton' and 'St. Julien A', respectively).

The trees of *P. amygdalo-persica* (group 4) did not show leaf symptoms of sharka. Back transmissions also were negative. One tree, however, had numerous suckers of its rootstock ('Common Mussel') that showed distinct symptoms of sharka. Back transmissions using both the species and the rootstock demonstrated sharka virus in the latter only.

Discussion

Many *Prunus* species and cultivars did not show symptoms of sharka after inoculation and the virus could not be detected by testing on the peach seedling indicator. The back transmissions were always made from the inoculated branches to avoid effects of incomplete systemic infection. Twenty-six out of the thirty-eight species and cultivars tested here had not yet been investigated as possible host before. The present paper adds one cultivar to the list of susceptible and twenty-two species to the list of non-susceptible species. Results with the species also studied by others (Darke, 1968; Hamdorf, 1972; Souty, 1974) agree closely with their data. Only *P. glandulosa* (Németh and Schmelzer, 1972) did not become infected after inoculation.

Most of the known *Prunus* hosts of the virus belong to the subgenus *Prunophora*, but

some can also be found in the subgenus *Amygdalus*. So far, no hosts seem to occur in other subgenera, except in the section *Microcerasus* of the subgenus *Cerasus* (Souty, 1974). The section *Microcerasus* is of interest, since some of its species are graft compatible with plums (*P. domestica*) and can be crossed with *P. domestica* and *P. cerasifera* (Ingram, 1947). In fact, *P. cistena* is a cross between the latter and *P. pumila*. It has been suggested that the species of the section *Microcerasus* are more closely related to plums than to cherries (Ingram, 1947). This may explain the susceptibility to the virus of some species of the section *Microcerasus*. The observations on *P. amygdalo-persica* (subgenus *Amygdalus*) raise the question, why it was impossible to detect the virus in the species. The species may not be susceptible but able to transport the virus to the susceptible rootstock. There may be more of such combinations. Although this is not likely to occur frequently, it might complicate field diagnosis of sharka virus.

Samenvatting

De vatbaarheid van enkele houtige plantesoorten, voornamelijk Prunus-soorten, voor het sharka-(plum pox)virus

Een groot aantal *Prunus*-soorten werd onderzocht op vatbaarheid voor het sharka virus. Tevens werden enige andere houtige plantesoorten bestudeerd. Ze waren alle afkomstig van Nederlandse boomkwekerijen. In 1968 en 1969 werden ze geplant op een door de Plantenziektenkundige Dienst beschikbaar gesteld terrein. Per soort werden 3 bomen geïnoculeerd. De planten werden gedurende de groeiseizoenen van 1969 tot en met 1972 beoordeeld op bladsymptomen. Zowel in het voorjaar van 1971 als van 1973 werden de soorten getoetst op het voorkomen van het virus op perzikzaailing als indicator.

De meeste onderzochte *Prunus*-soorten en de 4 andere soorten bleken onvatbaar (Tabel 1). De *Prunus*-soorten behoren tot de subgenera *Amygdalus*, *Cerasus*, *Padus* en *Laurocerasus*. Een klein aantal *Prunus*-soorten, behorend tot de subgenera *Prunophora* en *Amygdalus*, bleek wel vatbaar (Tabel 2). Ook praktisch alle uit de literatuur bekende waardplanten behoren tot deze subgenera. De enige *Prunus*-waardplanten buiten de subgenera *Prunophora* en *Amygdalus*, behoren tot de sectie *Microcerasus* van het subgenus *Cerasus*.

Opvallend bleek het gedrag van de soort *P. amygdalo-persica* op de pruimeonderstam 'Common Mussel'. De soort werd geïnoculeerd, het virus kon daarin echter niet worden aangetoond, maar wel in de onderstam.

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