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DISTRIBUTION OF *PLUM POX VIRUS* (PPV) IN BOSNIA AND HERZEGOVINA

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Abstract

A large-scale survey for the presence of *Plum pox virus* (PPV) was carried out by ELISA in Bosnia and Herzegovina (BiH). PPV was found in all stone fruit cropping areas surveyed: i.e. Banja Luka, Gradacac, Sarajevo and Mostar. Of the 42 orchards visited, 32 were found to be infected by the virus. The highest infection rate was reported in the central part of the country with 41%, and the most affected *Prunus* spp. was the plum (21%). PPV occurred in commercial orchards, bordering trees and nurseries, with prevalence in private gardens and bordering trees, which were generally old plums. PPV incidence in plum was higher in local cultivars compared to imported cultivars. The study indicated a largely compromised sanitary status of local stone fruit industry due to the endemic presence of PPV.

Key words: stone fruits, orchards, nurseries, PPV, detection, ELISA

Introduction

Sharka is one of the most devastating diseases of stone fruit industry in Europe and the Mediterranean (Roy and Smith 1994). The disease is detrimental primarily for apricot, peach and plum trees, reducing the quality and causing premature dropping of fruits (Dunez and Sutic 1988). It has been reported occasionally in almond and cherry trees (Festic 1978, Crescenzi et al. 1994). The disease is caused by *Plum pox virus* (PPV), a member of the *Potyvirus* genus classified in the *Potyviridae* family (Berger et al. 2000).

Sharka was first described in Yugoslavia in 1937 on plum (Josifovic 1937). Later on, it was reported in other *Prunus* spp., i.e. apricot (Sutic 1964), blackthorn

(Jordovic et al. 1969) and peach (Dulic and Saric 1986). Recently, a large-scale survey on PPV distribution in Bosnia and Herzegovina was undertaken, and the results are presented in this paper.

Material and methods

Field surveys

Field inspection and sample collection were carried out in four stone fruit growing regions: Banja Luka, Gradacac, Sarajevo and Mostar. Randomly collected samples were from European plum (*Prunus domestica* L.), peach (*P. persica* (L.) Batsch), apricot (*P. armeniaca* L.), sweet cherry (*P. avium* L.), sour cherry (*P. cerasus* L.), myrobalan (*P. cerasifera* Ehrh.), blackthorn (*P. spinosa* L.), wild peach (*P. silvestris* L.) and wild cherry (*Prunus* spp.). Inspected trees varied in ages (from young to more than 50-year-old trees), including both native and imported cultivars.

ELISA

All samples collected were tested for PPV by DAS-ELISA (Clark and Adams 1977) using commercial kits (Loewe, Germany). Reactions three times higher than the healthy control after 1 h were considered positive.

Results

Field surveys

Field surveys were carried out in 22 commercial orchards, 16 gardens and/or groups of bordering trees, and four nurseries, inspecting more than 15 000 trees.

Sharka leaf symptoms were found in most of the plantings visited. Symptom appearance and severity varied according to species and cultivar. Obvious PPV infections were frequently observed in plum; i.e. chlorotic rings and bands for cv. 'Čačanska Rodna', uneven chlorotic pattern with yellowish ring spots for cv. 'Stanley', etc. PPV symptoms were encountered in peach, apricot, myrobalan and blackthorn also, but were less frequent. Peach showed chlorosis to yellowing of secondary and tertiary veins, while apricot leaves displayed chlorotic areas and slight blade deformations.

Fruit symptoms were striking in plum cv. 'Pozegaca' showing strong deformations with internal browning and gumming of the flesh, whereas cvs 'Čačanska Rodna' and 'Bjelica' showed slight deformations with colour modification of the affected fruit portion. Symptoms on peach and myrobalan consisted of superficial chlorotic rings or spots affecting mainly the marketable value of fruits.

ELISA

A total of 1080 samples, 592 plums, 244 peaches 149 cherries, 68 apricots and 27 other *Prunus* species (myrobalan and blackthorn) were tested by ELISA. PPV infection was found in 180 samples: 126 plums, 43 peaches, six apricots, four myrobalans and one blackthorn. The average infection level, considering all tested trees, was 17% (Table 1). PPV affected more plum (21%), followed by peach (18%) and apricot (9%), but it was found also in myrobalan and blackthorn. No cherries were found infected by PPV.

Both local and imported cultivars were PPV-infected, though to a varying degree, with higher infection rate in native (21%) than in imported cultivars (9%) (Table 2). Among native cultivars, the most infected were cvs 'Bjelica' (42%) and 'Pozegaca' (36%), probably due to their long cultivation in infected areas. The other native cvs of 'Čačak' origin (i.e. 'Čačanska Rodna', 'Čačanska Lepotica' or 'Čačanska Najbolja') were bred and distributed later, when more attention was paid to PPV in nurseries. The imported cv. 'Stanley' was found less infected (6%), while for the other cultivars only a few trees were tested. The distribution of PPV in peach cultivars was uneven (data not shown), reaching its peak in cv. 'Red Haven' (32%).

The virus was found in all the main areas of stone fruit cultivation visited. The highest infection for plum was in the central part of the country (41%), whereas the lowest rate in the southern areas (8%) (Table 3). For peach, the virus was found in both areas of cultivation: southern (21%) and north-western (15%) (data not shown). The long duration of PPV in the country and the lack of sanitary control for nursery productions and imported propagating material are likely to be responsible for its widespread distribution. Of the 42 orchards visited, 32 had symptoms and ELISA confirmed the presence of the virus (Fig. 1). Of the 10 PPV-negative plantings, eight were plums, one peach and one cherry. Beside the well-known detection limits of ELISA in the presence of low virus titer (the case of poor growing conditions of plum gardens which represented five out of eight), this situation could be due to the isolated mountain conditions of some of the plantings.

Table 1

Virus infection detected by ELISA

Species	No. of samples		Infection rate (%)
	tested	infected	
Plum	592	126	21
Peach	244	43	18
Cherry	149	0	0
Apricot	68	6	9
Myrobalan	17	4	23
Blackthorn	10	1	10
Total	1 080	180	17

Table 2

PPV infection to different plum cultivars

Cultivar	No. of trees		Infection rate (%)
	tested	infected	
'Pozegaca' ^N	92	33	36
'Čačanska Rodna' ^N	80	14	17
'Čačanska Lepotica' ^N	57	4	7
'Čačanska Najbolja' ^N	52	1	2
'Bjelica' ^N	40	17	42
Subtotal native	321	69	21
'Stanley' ^I	86	5	6
'California Blue' ^I	8	2	25
'Althanova Renkloda' ^I	7	–	0
Other imported cvs	10	3	30
Subtotal imported	111	10	9
Unknown cvs	160	47	29
Total	592	126	21

N – native, I – imported.

Table 3

PPV distribution in plum in areas of the country

Areas	No. of trees		Infection rate (%)
	tested	infected	
North-western	277	53	19
Southern	119	9	8
Central	105	43	41
North-eastern	91	21	23
Total	592	126	21

Table 4

PPV in different types of plum planting

Type of planting	No. of trees		Infection rate (%)
	tested	infected	
Commercial orchards	254	51	20
Nurseries	179	12	7
Bordering/garden trees	159	63	40
Total	592	126	21

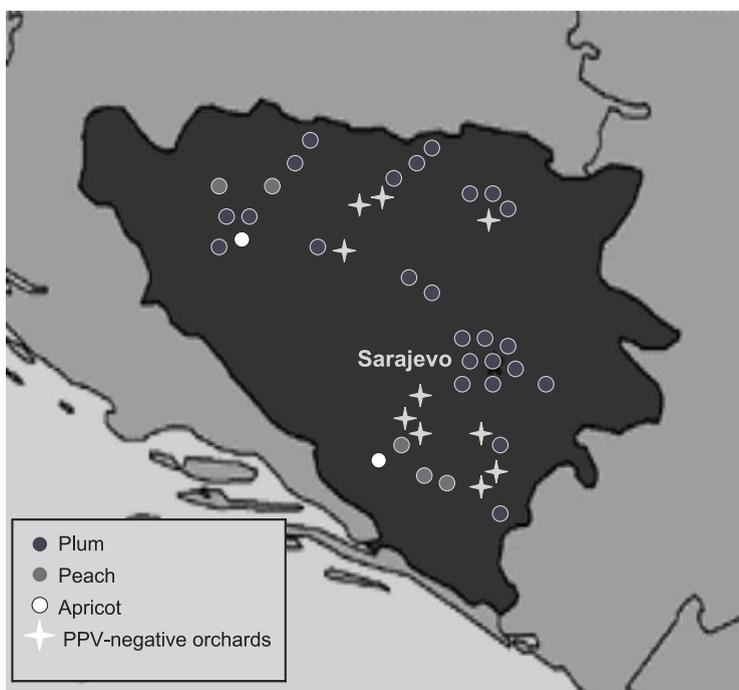


Fig. 1. PPV distribution in Bosnia and Herzegovina

PPV occurred in all types of plantings such as commercial orchards, gardens and bordering trees, and nurseries. Table 4 reports the situation of plum, where the highest infection was reported in bordering trees and private gardens which were generally old trees. Several gardens were totally infected by PPV, possibly the result of severe infestation of aphids observed in the field and the lack of chemical control. Virus infection was lower in commercial orchards, where many of the trees were young. PPV was detected also in two of the four visited nurseries and their mother blocks. PPV presence in peach was as follow: garden trees (28%), commercial orchards (16%), and nurseries (19%). Virus incidence in peach nurseries (19%), was even higher than that of plum (7%) confirming the alarming situation, because these nurseries contribute to the fast and long-distance spread of the virus.

Discussion

The result of this survey showed a largely compromised sanitary status of the stone fruit industry in Bosnia and Herzegovina due to PPV presence. The diffused presence of sharka, specially for plum, is similar to that of neighbouring countries,

as reported in Albania (Myrta et al. 1994), Serbia (Dulic-Markovic 2003) and Bulgaria (Kamenova et al. 2003).

This disease is now wide spread in large areas of the country making difficult its effective control. Efforts should be made to grow resistant cultivars rather than to attempt disease eradication. Avoiding the introduction of infected propagating material from abroad through implementation of a quarantine program and concentration of local stone fruit nursery production in PPV-free areas is desirable.

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Accepted for publication: 19.05.2005

