THE STRATEGY OF THE SHARKA ERADICATION IN POLAND

Jacek ŽANDARSKI[1]
[1] The Main Inspectorate of Plant Protection – The Central Laboratory, Poljska

ABSTRACT

In Poland sharka has been reported since 1961. *Plum pox potyvirus*, the causal agent of the sharka, has a quarantine status in Poland since 1990.
The extend and the prevalence of the sharka occurrence had not been recognized until 1996, when the delimiting survey was carried out. It led to the conclusion that sharka occurred on the whole territory of Poland, also in scions orchards and nurseries, but in various prevalence. Southern regions were the most affected.
It became clear that strict measures were necessary for the containment and the eradication of the sharka in Poland. The official program was developed in 1998 in cooperation with the Institute of Pommology and Horticulturae in Skierniewice. The program includes the eradication of sharka from propagative material used for planting (scions orchards, rootstocks crops and nurseries), and also from commercial orchards as well as other crops of PPV host plants (small orchards attached to a homesteads, allotment gardens and wild sharka hosts). General guidelines were: the increase of the number of crops inspected, the uniform procedures of the inspection conducting and sampling, and strictly observed eradication.
Each infected tree is rooted out. Particular strict measures are taken in the case of scions orchards, rootstocks crops and nurseries. The detection of PPV in those crops means, except removal of infected plants, the prohibition of using plants or their parts for further propagation until the crop is recognized as free from the disease. Additional preventive measures (e.g. spraying against aphids) are applied in each case.
All these measures have resulted in complete eradication of the sharka from scions orchards, the elimination of the commercial movement of the infested plant material originating from scions orchards or nurseries and the reduction of the prevalence of PPV in nurseries and surrounding crops.
Keywords: *Plum pox virus*, sharka, control, eradication, quarantine

IZVLEČEK

STRATEGIJA ZA ERADIKACIJO ŠARKE NA POLJSKEM

Na Poljskem je bila šarka zabeležena leta 1961. *Plum pox potyvirus* (PPV), povzročitelj šarke, je na Poljskem karantenski škodljivi organizem od leta 1990.
Stopnja okužbe in razširjenost šarke ni bila znana do leta 1996, ko je bil narejen pregled razširjenosti te bolezni. Na osnovi tega pregleda so sklenili, da je šarka razširjena na celotnem območju Poljske, tudi v matičnih nasadih in v drevesnicah, vendar v različnem obsegu. Najbolj so prizadeta južna območja.
Postalo je jasno, da so za obvladovanje in izkoreninjenje šarke na Poljskem potrebni strogi ukrepi. Uradni program je bil izdelan leta 1998 v sodelovanju z Inštitutom za pomologijo in hortikulturo v Skierniewicah. Program vključuje izkoreninjenje šarke iz

[1] M.Sc., ul. Zwirki i Wigury 73, 87-100 Torun, Poland, e-mail: klab-tor@pior.gov.pl

razmnoževalnega in sadilnega materiala (matični nasadi cepičev, zarodišča podlag in drevesnice), pridelovalnih nasadov ter drugih rastlin, gostiteljic virusa PPV (mali nasadi na kmečkih gospodarstvih, vrtovi in divji gostitelji). Splošna navodila so bila: povečanje števila pregledanih rastlin, enotna metoda pregledov in vzorčenja in strog nadzor izkoreninjenja.
Vsako okuženo drevo je bilo uničeno. Posebno strogi so kriteriji za matične nasade cepičev, zarodišča podlag in drevesnice. Razen odstranitve okuženih dreves je ob odkritju virusa PPV na teh objektih prepovedana tudi uporaba rastlin ali njihovih delov za nadaljnje razmnoževanje, dokler le-ti niso priznano brez virusov. Dodatne ukrepe (t.j. škropljenje proti ušem) uporabljajo v vsakem primeru.
Rezultat vseh teh ukrepov je popolno izkoreninjenje šarke v matičnih nasadih cepičev, preprečitev trgovine z okuženim materialom iz matičnih nasadov ali drevesnic in zmanjševanje pojava PPV v drevesnicah in na gostiteljih v njihovi okolici.
Ključne besede: Plum pox virus, šarka, zatiranje, karantena

1. INTRODUCTION

The sharka (plum pox) disease, caused by *Plum pox potyvirus* (PPV), is a reason of serious losses in crops of plums, peaches and apricots, mainly. The disease was for the first time reported from Bulgaria (Atanasoff, 1932). The sharka has spread from Balkan countries throughout almost the whole territory of Europe – currently it is not reported from Scandinavia, only (CABI/EPPO, 1997). In spite of strict quarantine measures, *Plum pox potyvirus* has been recently introduced to North America (Carter-Lane and Redding, 1999; Ferguson and Prange, 2000) and to other areas of the world (*inter alia* Chile, Egypt, India, Syria, Turkey).
Plum pox potyvirus affects plants from the genera of *Prunus*, mainly (OEPP/EPPO, 1992; Adams, 1995; CABI/EPPO, 1997). From economical point of view, plums (*Prunus domestica*), peaches (*P. persica*), apricots (*P. armeniaca*) and almonds (*P. amygdalus*) are the most important natural hosts of PPV. First natural occurrence of PPV in sour cherry (*P. cerasus*) was reported from Moldavia (Kalashyan *et al.*, 1994). PPV was also found in walnut trees (*Juglans regia*) located nearly infested plum orchards (Baumgartnerowa, 1996).
Foliar symptoms of the sharka mainly consist of pale green chlorotic spots, rings, and lines that can be visible from early summer onward. The development of symptoms on fruits depends on cultivar mainly, but usually fruit symptoms consist of rings and blotches, which are better visible in fully expanded unripe fruit, as well as sunken rings and spots. Red rings and spots can occur on the stones. Affected fruits are low in sugar and tasteless. They usually drop from the tree prematurely.

2. OCCURRENCE OF THE SHARKA IN POLAND

In Poland the sharka was observed for the first time in 1961 in southern region of the country (Szczygiel, 1962), but it has spread in short time to other regions. The extend and the prevalence of the sharka occurrence had not been recognized until 1996, when the delimiting survey was carried out by The Plant Protection Service. That survey led to the conclusion that sharka occurred on the whole territory of Poland, also in scions orchards and nurseries, but in various prevalence (Zandarski and Chodkowski, 1999). Southern regions were the most affected.
It became clear that strict measures were necessary for the containment and the eradication of the sharka in Poland. General guidelines were: the increase of the number of crops inspected, the uniform procedures of the inspection conducting and sam-

pling, obligatory testing of propagative material for the presence of the latent infection, and strictly observed eradication.
Official eradication program was developed in 1998 by Main Inspectorate of Plant Protection in co-operation with the Institute of Pommology and Floriculturae at Skierniewice. The program includes the eradication of sharka from propagative material used for planting (scions orchards, rootstocks crops and nurseries), and also from commercial orchards as well as other crops of PPV host plants (small orchards attached to homesteads, allotment gardens and wild sharka hosts), especially surrounding crops of propagative material.

3. DESCRIPTION OF THE PROGRAM

Basic measures focused on the detection of the disease foci are:
- visual inspections, carried out at the time when the probability of the symptoms occurrence is the highest;
- laboratory testing conducted in case when sharka symptoms or signs of aphids feeding are visible;
- in case of scions orchards and nurseries – laboratory tests conducted even if the symptoms are not present – in order to detect the possible latent infection.

All scions orchards, rootstock crops as well as nurseries and, in addition, all other crops surrounding those crops are subject to visual inspection. The number of other crops to be inspected depends on the powers. It is assumed that at least 10% of commercial orchards are inspected each year (table 1).

Table 1: Numbers of the sharka host crops inspected by The Plant Protection Service for the presence of *Plum pox virus* during 1996-2000

Years	Nurseries, rootstock crops and scion orchards	Commercial orchards
1996	593	1,016
1997	859	1,077
1998	1,062	1,086
1999	933	1,193
2000	1,260	1,706

Samples are appropriately labeled and packed, and then sent to the laboratory. Over than 30 laboratories of The Plant Protection Service are prepared for the detection and identification of PPV in plant material. ELISA test is the most common routine diagnostic method (Clark *et al.*, 1976; Voller *et al.*, 1976; Adams, 1978; Malinowski and Zawadzka, 1994). In addition, the detection of PPV using PCR is conducted in the Central Laboratory (Korschineck *et al.*, 1991; Wetzel *et al.*, 1991). Mechanical inoculation of *Chenopodium foetidum* is used occasionally.
The appropriate quarantine measures are taken in case of obtaining of positive results. These are in order to eradicate the disease and prevent its further spreading. As there is no way of recovering of the infected plants, rooting out of infected plants is the only way of the virus eradication. Particularly strict additional measures are taken in case of infested scions orchards, rootstocks crops and nurseries. The detection of PPV in those crops means, except removal of infected plants, the prohibition of using of plants or their parts for further propagation until the crop is recognized as free from the disease. Other preventive measures, e.g. spraying against aphids, are usually applied to prevent the disease spread.

Detailed measures applied for various crops are as follows:

a. Scions orchards:
- at least two inspections (the first one - from the end of May to the end of June; the second one - from the middle of August to the end of September);
- sampling and laboratory testing in case of sharka symptoms detection;
- obligatory testing at the time of the first inspection if no symptoms are visible;
- rooting out of each infected tree;
- the prohibition of scions obtaining for grafting in the year of disease detection.

b. Rootstocks crops:
- one inspection during the vegetation period;
- sampling and laboratory testing in case of detection of sharka symptoms or signs of aphids feeding;
- in case of sharka detection in a lot - destroying of all rootstocks.

c. Nurseries:
- at least two inspections (the first one - from the end of May to the end of June; the second one - from the middle of August to the end of September);
- sampling and laboratory testing in case of detection of sharka symptoms or signs of aphids feeding;
- obligatory testing at the time of the second inspection if no symptoms are visible (at least 10% of plants);
- rooting out of each infected tree and two neighbouring trees;
- the prohibition of selling tress until the crop is recognized as free from the disease;
- when rate of infection exceeds 2% - destroying of the whole lot;
- if introduction of PPV with scions is suspected - checking of the scions source.

d. Commercial orchards:
- at least one inspection during the vegetation period;
- sampling and laboratory testing in the case of sharka symptoms detection;
- rooting out of each infected tree and further inspections of the crop.

e. Small orchards, allotment gardens and wild sharka hosts:
- at least one inspection during the vegetation period;
- sampling and laboratory testing in case of sharka symptoms detection;
- rooting out of each infected tree and further inspections.

4. RESULTS OF THE PROGRAM

Although the complete estimation of the program results can be performed after its several years operation only, some of benefits can be seen at the time being. These are:
- the sharka has been almost completely eradicated from scions orchards;
- the movement of the infected plant material as well as those originating from infested scions orchards and nurseries has been eliminated almost completely;
- the prevalence of PPV in nurseries and crops surrounding scions orchards and nurseries has been getting lower;
- in areas of the sharka high prevalence, new commercial orchards usually are not established, or tolerant varieties are used as well as longer distances from other hosts of PPV are usually practiced.

5. REFERENCES

Adams A.N., 1978. The detection of *Plum pox virus* in *Prunus* species by enzyme-linked immunosorbent assay (ELISA). *Annals of Applied Biology*, 90: 215-221.
Adams A.N., 1995. *Plum pox virus*. In: *Compendium of stone fruit diseases*: 69.
Atanasoff D., 1932. Sharka po slivik, edna nova virusova bolest. Jb. Univ. Sofia, Agronom Fak. 11: 49-70.
Baumgartnerova H., 1996. First findings of *Plum pox virus* in walnut trees (*Juglans regia* L.). *Acta virologica*, 40: 59-60.
CABI/EPPO, 1997. Data Sheets on Quarantine Pests - *Plum pox potyvirus*. In: *Quarantine Pests for Europe*: 1287-1293.
Carter-Lane S., Redding J., 1999. Agriculture officials confirm *Plum pox virus* in Pennsylvania orchard. http://www.aphis.usda.gov/lpa/press/1999/10/plumpox.txt.
Clark M.F., Adams A.N., Thresh J.N., Casper R., 1976. The detection of *Plum pox* and other viruses by ELISA. *Acta Horticulturale*, 67: 51-57.
Ferguson B., Prange K., 2000. *Plum pox virus* confirmed in Canada.
http://www.cfia-acia.agr.ca/english/corpaffr/newsrelease/20000623e.shtml.
Kalashyan Y.A., Bilkey N.D., Verderevskaya T.D., Rubina E.V., 1994. *Plum pox potyvirus* on sour cherry in Moldova. *Bulletin OEPP/EPPO*, 24: 645-649.
Korschineck I., Himmler G., Sagl R., Steinkellner H., Katinger H.W.D., 1991. A PCR membrane spot assay for the detection of *Plum pox virus* RNA in bark of infected trees. *Journal of Virological Methods*, 31: 139-146.
Malinowski T., Zawadzka B., 1994. Zastosowanie metody ELISA do wykrywania wirusów drzew owocowych - możliwoœci i ograniczenia. *XXXIII Ogólnopolska Konferencja Sadownicza*, cz. I: 9-14.
OEPP/EPPO, 1992. Quarantine Procedure No. 43. *Plum pox potyvirus* - inspection and test methods. *Biuletyn OEPP/EPPO*, 22: 239-242.
Szczygiel A., 1962. Pojawienie siê w Polsce groŸnej choroby wirusowej szarki *Prunus virus-7*. *Ochrona Roœlin* 1-2: 14-17
Wetzel T., Candresse T., Ravelonandro M., Dunez J., 1991. A polymerase chain reaction assay adapted to *Plum pox potyvirus* detection. *Journal of Virological Methods*, 33: 355-365.
Voller A., Bartlett A., Bidwell D.E., Clark M.F., Adams A.N., 1976. The detection of viruses by enzyme-linked immunosorbent assay (ELISA). *Journal of General Virology*, 33: 165-167.
Zandarski J., Chodkowski A., 1999. Wykrywanie, rejestrowanie i zwalczanie ognisk wirusa ospowatoœci œliwy (*Plum pox virus*, PPV) w Polsce. *Ogólnopolska Naukowa Konferencja Ochrony Roœlin Sadowniczych*: 250-253.