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NATURAL SOURCES OF *PLUM POX VIRUS* AND TYPING OF STRAINS IN THE CZECH REPUBLIC

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SUMMARY - Surveys were carried out in the Czech Republic to type *Plum pox virus* (PPV) isolates from stone fruit orchards and wild trees. Wild trees (plums and myrobalans) or cultivated plums grown along roads, were found to be the main and primary sources of PPV. From 263 tested plums, 119 were PPV-infected. Virus infected trees were found mainly in central, western and eastern Bohemia and north-western and central Moravia. As far as myrobalan was concerned, PPV was detected in 51 of 132 trees. A total of 12 sour and 45 sweet cherry trees tested negative. Some 254 blackthorns were tested and 36 were infected, mainly in lowlands of central, western and eastern Bohemia, central and southern Moravia, i.e. in plum and myrobalan areas with high incidence of PPV. PPV-D was the main strain of the virus in the Czech Republic. PPV-M was found only in a few trees of peach, plums and one damson tree.

Key words: Czech Republic, stone fruits, blackthorn, PPV, virus strain, ELISA

RESUME *- Des prospections ont été réalisées dans la République Tchèque afin de typer les isolats du Plum pox virus (PPV) à partir des vergers fruitiers et des arbres à l'état sauvage. Les arbres sauvages (pruniers et myrobolans) ou les pruniers cultivés le long des routes se sont avérés être les sources naturelles principales et primaires du PPV. Des 263 pruniers testés, 119 étaient infectés par le PPV. L'infection virale a été mise en évidence principalement en Bohême centrale, occidentale et orientale et en Moravie nord-occidentale et centrale. En ce qui concerne le myrobolan, le PPV a été détecté dans 51 des 132 arbres testés. En plus, 12 cerisiers acides et 45 merisiers ont été testés et trouvés négatifs. Environ 254 prunelliers sauvages ont été examinés pour la présence du PPV et 36 buissons se sont révélés infectés, en particulier dans les bas-fonds de la Bohême centrale, occidentale et orientale et de la Moravie centrale et du sud, tout comme dans les régions où sont cultivés les pruniers et les myrobolans et l'incidence du PPV est élevée. Le PPV-D est l'isolat principal du virus dans la République Tchèque. Le PPV-M n'a été observé que sur quelques pêchers, pruniers et pruniers de Damas.*

Mots-clés: *République Tchèque, espèces fruitières à noyau, prunellier sauvage, PPV, souche virale, ELISA*

INTRODUCTION

Plum pox virus (PPV) is the causal agent of Sharka disease inducing serious losses in stone fruit trees. Sharka was first reported in Bulgaria in 1917. The disease has spread from eastern Europe to nearly all European and Mediterranean countries. The disease reached Spain and Portugal in 1984. In the last decade it was reported from Chile, India and Azorean Islands, in 1999 from the USA (Pennsylvania), and in 2000 from Canada (Ontario). Sharka disease was first described to infect plums, but later it became one of the most damaging diseases of *Prunus* species, plums (*P. domestica*, *P. salicina*, P. *insititia*), apricots (*P. armeniaca*), peaches (*P. persica*). Recently it was reported to infect also cherries (*P. avium* and *P. cerasus*). Wild *Prunus* or other host plants can be considered as potential reservoirs of the virus also.

Four distinct serotypes of PPV strains were identified, PPV-D, PPV-M, PPV-C, and PPV-El Amar. PPV-El Amar is reported only in Egypt, infecting mainly apricots; PPV-C infects sweet and sour cherries, and occur in Italy, Moldova, Bulgaria and Hungary. PPV-D and PPV-M strains are the most prevalent, infecting plums, apricots and peaches in most countries where PPV is distributed. PPV-M strain was first described in one isolate originated from Greece (Kerlan and Dunez, 1979) and is more epidemic, especially for peaches and apricots. PPV-M is prevalent in eastern and central Europe. For a successful control of PPV it is necessary to know the distribution of natural sources of the virus and identify its strains in wild hosts.

In the Czech Republic, sharka was first detected in 1952 (Smolák and Novák, 1956). The disease has spread to the major plum-producing areas of the country, mainly in central, western and eastern Bohemia, and in south-western and northern Moravia. PPV causes economic losses in the Czech Republic of plums, apricots and peaches. It affects myrobalan (*Prunus cerasifera* ssp. *myrobalana*) also. The first attempts to characterise PPV isolates in the Czech Republic were recently done (Komínek *et al*., 1998; Navrátil *et al*., 1998; Poncarová and Komínek, 1998). Most PPV isolates were classified as PPV-D and a limited number as PPV-M.

An investigation on diversity and distribution of natural sources of PPV in the Czech Republic began in 1996. Partial results were published by Polák (1997). In 1999 two new wild PPV hosts were found (Polák, 2001). During the period 1999-2001, PPV isolates from wild hosts were typed for their strain. Monitoring of the distribution and diversity of natural sources of PPV around the country have continued.

MATERIALS AND METHODS

Naturally growing plums, myrobalans and blackthorns were evaluated for the presence of PPV infection in different areas of the country. Collections included trees and shrubs, originated from seeds or root suckers, in uncultivated stands. Plums planted along the roads were also rated. Naturally growing sweet and sour cherry trees, as well as trees growing in old uncultivated orchards in central and western Bohemia and southern Moravia, showing diffuse spots or rings in leaves were tested for PPV. Old orchards of apricots and peaches in South Moravian region were also surveyed and trees tested.

Field surveys for PPV symptoms in leaves of plums, myrobalans, blackthorns, sour and sweet cherries were done in May and June from 1996 to 2001. Flowers from inspected trees and/or leaves showing PPV symptoms were sampled for virus detection by DAS-ELISA using polyclonal antibodies prepared at Halle UniversityWittenberg (Germany). DASI-ELISA (Cambra *et al*., 1994) for the detection of PPV strains was carried out with the identified PPV isolates from plums, myrobalans, blackthorns, apricots and peaches, tested against MAbAL (Agritest, Italy), recognised as specific to PPV-M (Boscia *et al*., 1997) and MAbAC (Myrta *et al*., 2000), specific to PPV-C. Selected isolates were mechanically inoculated onto *Nicotiana benthamiana*.

RESULTS AND DISCUSSION

Wild plums and myrobalans or cultivated plum trees grown along roads were found to be the primary natural sources of PPV in the Czech Republic. From 263 tested plums, 119 were PPV-positive. Virus infections were found mainly in central, western and eastern Bohemia and north-western and central Moravia. As far as myrobalan was concerned, PPV was detected in 51 of 132 trees. Area of spread of this spontaneous source of infection corresponds with the dissemination of PPV in plums, even though myrobalans are not common in the countryside.

Sweet and sour cherry trees were sampled in localities of central Bohemia, western Bohemia and southern Moravia. A total of 12 sour and 45 sweet cherry trees tested negative. However, PPV tested trees, showing diffuse spots and rings in leaves, were usually infected with *Prunus necrotic ringspot virus* (PNRSV).

Beside stone fruit trees, 254 blackthorns were tested also. PPV was detected in 36 bushes. PPV-infected blackthorns were found mainly in lowlands of central, western and eastern Bohemia, central and southern Moravia and in areas with severe PPV incidence of plums and myrobalans. Blackthorns growing in marginal areas with low incidence of PPV in plums and myrobalans were negative.

Preliminary investigation on the occurrence of PPV strains in spontaneous hosts, carried out during 1999-2001, revealed a low presence of PPV-M strain and the absence of PPV-C (cherry) strain. Occurrence of PPV-M was investigated in various localities in 78 plum and damson trees, 32 myrobalans and 8 blackthorns. PPV-M was detected only in two plum trees and one damson tree. Until now, PPV-M had not been detected in myrobalan or blackthorns.

PPV-M was found in one old peach orchard in south Moravia, but not in another in central Bohemia (near Slaný). PPV was detected in 8 peach trees of 12 tested, whereas PPV-M was identified in 4 peach trees. This orchard was originated years ago with propagating material imported from abroad. PPV-M was also found in two peach trees of cv. Lesiberian at the orchard of the Faculty of Horticulture, Lednice in

south Moravia. PPV-M in apricot was only in the locality Hrusky, but not in Velké Pavlovice, both in south Moravia. The planting materials for the infected apricot trees in the locality Hrušky were of imported origin (Fig. 1).

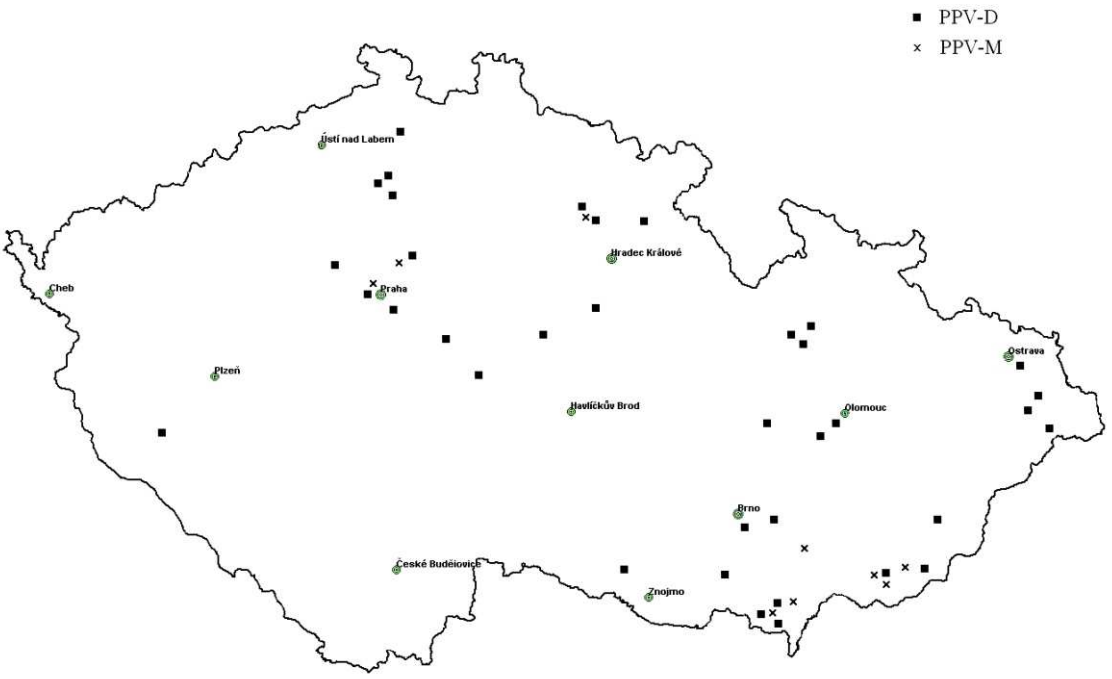

Fig. 1. Distribution of PPV strains in the Czech Republic (data collected by J. Polak, P. Kominek and M. Navrátil)

Very low incidence of PPV-M strain in spontaneous PPV hosts showed that in the Czech territory PPV-D strain is endemic and established awhile, PPV-M strain appears to have been of recent introduction. Occurrence of PPV-M strain in some apricot and peach orchards planted with material imported from abroad confirmed recent introduction of PPV-M.

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