Occurrence of *Prunus necrotic ringspot virus* and *Prune dwarf virus* in wild cherries in the locality velehrad (South Moravia, Czech Republic)

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Abstract

The occurrence and spatial distribution of PDV and PNRSV in a seed wild cherry (*Prunus avium*) orchard were studied during the period 1996 - 1999. Each year any newly infected trees were immediately removed. The cumulative infection rate of PDV-positive trees reached 4.7% and number of new infections per year was 1.2 %, on average. Although the number of centers was found to be decreasing (from 22 in 1996 to 10 in 1999), eradication of PDV was not achieved. Only one case of PNRSV infection was found in 1997.

Keywords: PDV, PNRSV, ELISA, epidemiology

Introduction

Prune dwarf virus (PDV) and *Prunus necrotic ringspot virus* (PNRSV) represent important pathogens, affecting stone fruit trees production. Both viruses are considered as the causal agent of serious viral diseases of both sweet and sour cherries in the Czech Republic. During the period of former Czechoslovakia, the occurrence and distribution of PDV and PNRSV was monitored by Blattný (1958), Králiková (1959, 1960, 1962), and Paulechová and Baumgartnerová (1970). These research papers indicated that the distribution of both viruses was relatively wide. The highest occurrence of these viruses was observed on plums and both sour and sweet cherries. Sporadic occurrences were also noted on peaches and apricots. Recently, Polák (2007) studied the distribution of PDV and PNRSV on road-border trees of plum, myrobalan, sweet and sour cherry, as well as blackthorn in the Czech Republic. The occurrence of both viruses was confirmed in all tested tree species. In this study, we summarize the results of monitoring the incidence of the PDV and PNRSV, as well as their spatial distribution in a wild cherry orchard over a four-year period; plus the probable effects of the eradication of infected trees.

Material and methods

During the period 1996 – 1999, a seed orchard of wild cherry (*Prunus avium* L.) located in Velehrad (South Moravia, Czech Republic) was examined for both the *Prunus necrotic ringspot virus* and *Prune dwarf virus*, and their occurrence and distribution were monitored. This twenty year-old orchard was represented by 930 trees spaced at 7 x 7 meters. Samples of the leaves or flowers from each tree were collected from the beginning of May through the beginning of June. Representative samples, all done in two repetitions, were prepared from 20 leaves or flowers collected around the crown. ELISA detection kits from Bioreba AG were used to detect both viruses, according to the manufacturer's instructions.

The percentage of infected trees was noted and the spatial pattern of diseased trees within the orchard was visualized using contour plotting, implemented in NCSS 2001 software package (Statistical Solution Ltd. Cork, Ireland).

Results and discussion

Twenty-year old wild cherries were visually inspected repeatedly for the presence of virus infections, until 1995. All trees manifesting symptoms of either PDV or PNRSV infections (mosaics on leaves and reduced growth) were immediately eliminated. During this period, a total of 156 trees (16.8%) died or were cut-down. During the subsequent four-year period, the presence of these viruses within the orchard was screened by ELISA. Infection by PDV was detected every year, but only one case of tree infection by PNRSV was noted in 1997. The symptoms of PDV infection on the trees were very weak; with only a few of them showing a mild yellow mosaic or chlorotic-necrotic ringspots on the leaves, sporadically. All trees that tested positive were removed in the same season, in order to reduce the inoculum potential within the plot. The spatial distribution of PDV during the period 1996-1999 is illustrated on the contour map (Fig. 1). The ELISA test confirmed the occurrence of PDV at limited focal points (centres). Newly PDV-infected trees were only found in the vicinity of trees that were previously positive. Although the number of centers of infection steadily decreased, from 22 in 1996 to 10 in 1999, eradication of PDV was not achieved.

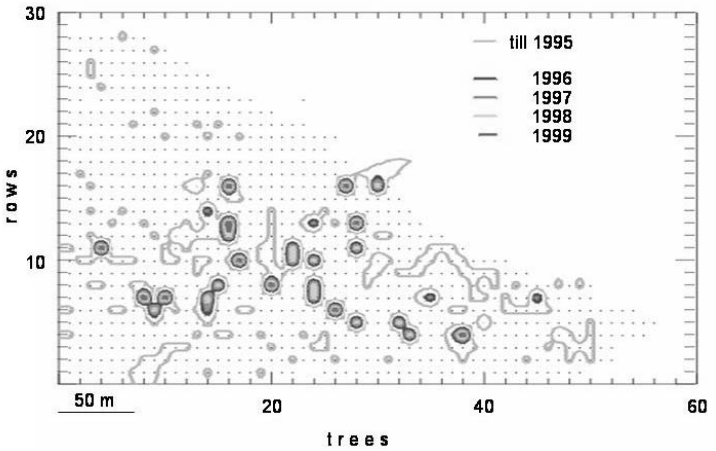

Fig. 1 Distribution of PDV-infected wild cherry trees within the orchard.

The result of repeated viral assays (Fig. 2) clearly indicates that during each vegetative season additional cherry trees had become infected, and/or a latent infection was present. In the seed orchard studied, the cumulative infection rate reached 4.7 % PDV-positive trees within the four-year period. The number of new infections per year was 1.2%, on average. Surprisingly, PNRSV was practically undetected during the monitoring period; which indicates the absence of PNRSV infection resources. Only a few authors have studied the progress of PDV infections within cherry orchards. Gerginova (1981) noted the increasing incidence of PNRSV and PDV (from 8.2% to 68.2% and from 2.1% to 35.3%, respectively) in a cherry orchard during a 7-year period. Andersone et al. (2002) reported 4% PDV and 13% PNRSV naturally infected trees, after two years of growing virus-free trees within their experimental plot. The spread of PDV in our study was lower, and with less intensity. This could be due to the absence of virus resources and thus a decrease of infection pressure, due to the elimination of infected trees.

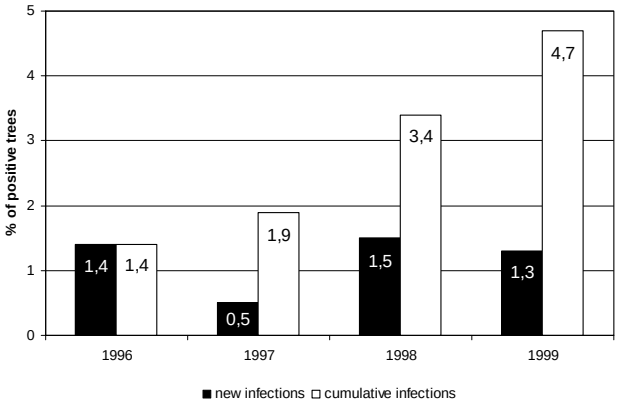

Fig. 2 Percent of infections of PDV in the wild cherry orchard in the period 1996-1999.

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