Asian Journal of Plant Sciences

ISSN 1682-3974

science alert

ANSInet
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Asian Journal of Plant Sciences 4 (6): 660-663, 2005
ISSN 1682-3974

Sanitary Status of Fruit Trees with Implementation of Clean Stocks

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Abstract: The research and experimental plot for peach and nectarine at University of Kahramanmaras Sutcu Imam (KSU) has been established in the growing period of 1998-1999. The severity and distribution of five virus diseases of peach and nectarine trees were determined during the 2004-2005 growing season. A total of 262 samples were individually collected and tested by DAS-ELISA for *Prunus necrotic ringspot virus* (PNRSV), *Prune dwarf virus* (PDV), *Plum pox virus* (PPV), *Apple chlorotic leafspot virus* (ACLSV) and *Apple mosaic virus* (ApMV). A total of 22.9% of ELISA-tested samples (60 out of 262) were infected by one (22.5 %) or two (0.4%) viruses. PPV was the most widespread virus (11.45%), followed by PNRSV (7.25%) and ACLSV (3.82%). ApMV and PDV were not detected in the all tested samples. These results demonstrated that we are facing to the problem of not having healthy nursery stocks for fruit trees.

Key words: Stone fruits, virus diseases, ELISA, Türkiye

INTRODUCTION

Turkey, one of the Mediterranean countries, has suitable ecological conditions for most of the fruit species and considered to be an important germplasm source for lots of fruits. According to recent statistics[1], stone fruits contribute with about 25% of the total fruit tree production in Turkey. Almost all of the Prunus species have been grown in Anatolia. Peach is mainly grown in Marmara Region, but also extended to the Aegean and Mediterranean regions, with especially low chilling requiring cultivars. Very late peach cultivars, ripening in mid-October from the highlands of Marmara and Mediterranean Regions are being exported. Cultivation of nectarine trees are very recent although they need the same climatic and soil conditions as peach trees[2]. Nectarine growing has economically started at late 70's and introduction of new varieties with high fruit quality increased the demand to its cultivation in many places[3]. Plant viruses are among the principal infectious agents affecting peach cultivation. Main viruses casing diseases in peach trees belong to the Ilarvirus, Nepovirus, Closterovirus and Potyvirus genera. On the other hand, little is known about the sanitary status of stone-fruit trees in Turkey. After Elibuyuk ve Erdiller[4] based on limited surveys, Sipahioglu *et al.*[5] carried out another survey in East Anatolia and identified Apple chlorotic leafspot trichovirus (ACLSV), Prunus necrotic ringspot ilarvirus (PNRSV) and Prune dwarf ilarvirus (PDV) that was the most common in the region. Plum pox potyvirus (PPV) has been recorded from the Marmara region[6,7], central Anatolia[8,9] and the Aegean region[10]. Baloglu *et al.*[11] did not find PPV in plum and peach trees in the Adana and Tarsus provinces. Some other works for few viruses in small areas were also done with limited budget[12].

Kahramanmaras, the city of eastern Mediterranean Region, has a production of about 687 tons/year and the number of peach trees reached up to 52 160[13]. The region has also climatic condition which constitutes a kind of passage between Mediterranean and Southeast Anatolia climates. This is an advantage to find out new varieties for the Kahramanmaras market after peach finishes at the Mediterranean market. University of Kahramanmaras Sutcu Imam (KSU) has started a research program to introduce new varieties to the area and established a research and experimental station for fruit trees such as stone fruits, olive, pistachio, etc. This present study was

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undertaken to evaluate the sanitary status of peach and nectarine trees in the research and experimental orchard of KSU in view of the possible implementation of clean-stock should the necessity arise.

MATERIALS AND METHODS

Field survey: Field inspection and collection of samples were carried out in the research and experimental peach and nectarine orchard at KSU. The plot was established with the grafted-nursery stocks supplied from Ataturk Central Horticultural Research Institute (Yalova, Istanbul), Egirdir Horticultural Research Institute (Egirdir, Isparta) of Ministry of Agriculture and some private nurseries in the growing seasons of 1998-1999. Surveys were done from mid-May onwards between 2004 and 2005. Plants with no-symptoms on the foliage were re-inspected at fruit ripening period. Leaf samples were collected from individual trees and stored at 4°C.

Serological tests: All samples collected were tested by DAS-ELISA[14] for the detection of ACLSV, PNRSV, PDV, PPV and ApMV. Antibodies for all viruses were commercially provided by the Loewe Biochemica GmbH, Germany (PDV, PNRSV, ApMV, ACLSV) and Bioreba AG, Switzerland (PPV). ELISA plates were read with a Titertek Multiskan SIRIO apparatus.

Biological tests: A 10% aliquot of samples selected at random was used as inoculum source to check for the presence of mechanically transmissible viruses. Young leaves were ground in 0.1 M phosphate buffer, pH 7.2, containing 2.5% nicotine and inoculated to *Cucumis sativus, Chenopodium quinoa, C. amaranticolor, Nicotiana benthamiana, N. clevelandii, N. occidentalis, Gompherana globosa.* Inoculated hosts were grown in a greenhouse at 22-24°C and inspected for symptom expression. Symptomatic plants were tested by ELISA. Negative controls were prepared by inoculating healthy plants with buffer.

RESULTS AND DISCUSSION

The present study provides a relatively clear picture of the sanitary condition of nursery stocks for stone fruits released from private and governmental nurseries. The trees in the research and experimental orchard at KSU were homogenous in terms of tree age (around 6-7 years old) and planting time. Some peach trees had started showing leaf symptoms 3-4 years after the planting. These symptoms were typical chlorotic spots and rings that turned necrotic on recently developed leaves which was induced by PNRSV and confirmed by laboratory tests. Later these necrotic tissues fallen out. Similar appearance on leaves and some necrotic areas on fruits were also seen in nectarine trees (Fig. 1A). In some cases vein clearing symptoms were very common in several peach and nectarine trees associated to leaf rolling (Fig. 1B). Some peach trees had yellow leaves (Fig. 1C).

In the course of field survey, the total number of 262 peach and nectarine trees were individually inspected. According to ELISA results, sixty samples out of 262 were infected by one or two viruses. PPV was the most common, being detected in 11.45% of the samples. PNRSV was the second most commonly found virus. It was detected in 7.25% of the total samples followed by ACLSV infection around 3.82% of the samples. This study found the mixed infection of PPV and PNRSV (0.4%) in only one tree. ApMV and PDV were not detected in the all tested samples (Table 1).

Biological tests showed that ACLSV induced vein clearing and leaf deformations in *N. occidentalis* plants. The virus had chlorotic spotting and mottling, with ring patterns in *Chenopodium quinoa.* The symptoms caused by ACLSV in *C. amaranticolor* were similar to *C. quinoa,* consisting of chlorotic spots. PNRSV caused chlorotic lesions tend to necrotic areas in *Cucumis sativus.* The buffer - inoculated healthy plants did not have any symptoms.

Although low level of virus infection were found in peach and nectarine trees, these viruses are in the list of quarantine and certification programme in many countries. PPV infection is the second time detected in Kahramanmaras. Caglayan *et al.*[15] did not find PPV and ApMV infection in the peach trees in Hatay (eastern Mediterranean region). Similar findings were also reported in peach and plum trees from other east Mediterranean cities[11]. However, a recent study done by Tolay-Arikan[16] showed the presence of PPV infection in stone fruits at Kahramanmaras provinces. Buzkan *et al.*[17] carried out another research in the same plot for apricots and they found PNRSV (13.41%), PPV (2.73%), PDV (1.63%) and ApMV (1.63%). ACLSV was not present in apricots. The source of the planting materials was coming from the same nurseries as used for peach and nectarine.

These findings support the idea that the viruses could have been introduced into the plot with infected propagation materials from the nurseries. The problem in the nurseries either private or governmental is not to have experts in the area of plant viruses and they usually do not have the facility to test the plant materials for disease diagnosis before they are planted in the field. This creates great risk of producing plant material infected by the

Fig. 1: Chlorotic rings and spots with necrotic areas in the center (A), yellowing leaves (B), chlorotic vein clearing with leaf rolling in peach and nectarine trees (C)

Table 1: Stone fruit viruses detected by ELISA at the research and experimental orchard of KSU

No. of trees			Single infection			Mixed infection		
Tested	Infected	%	PNRSV	PDV	ACLSV	ApMV	PPV	PPV + PNRSV
262	60	23.3	19	-	10	-	30	1

viruses and dispersing the infection through propagation. PPV is an enormous danger for stone fruit industry and its accidental introduction can be very destructive and also cause a veritable disease.

Propagative material is the first step for agricultural inputs. Healthy, good quality, high productivity and true-to-type fruit trees can be obtained by using certified materials. Concerning the certification of fruit and vine variety and rootstocks an official initiative was first started in 1997 by issuing The Circular on The General Principles of Certification on Fruit and Vine Propagation Materials. However, Turkey is unfortunately in delay of producing virus-free plant materials due to misapplication of the certification program for stone fruits[18]. On the other hand, the limited works on the virus and virus-like diseases of stone fruits cause insufficient knowledge on their presence and dissemination. Therefore, all efforts should be made to improve internal quarantine and a certification programme for reducing the incidence and spread of viruses in other provinces in which they occur.

ACKNOWLEDGMENT

This research was supported by Research fund of Kahramanmaras Sutcu Imam University, Kahramanmaras (Project No: 2003/5-2).

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