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Reaction of Some of the Turkish Plum and Apricot Cultivar to Plum Pox Virus

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ABSTRACT

The reaction to plum pox disease of 10 plum and 13 apricot local cultivars from Turkey were studied. Plum cultivars (Alerik, Can-2, Değirmendere, Aynalı, 1559 type, Papaz, Havran, Türbe çukuru, Istanbul and 1542) and apricot cultivars (Alyanak, Tokaloglu, Hacıhaliloğlu, Soğancı, Hasanbey, Şekerpare, Kabaaşı, Sakıt-2, 11/89 type, Çataloğlu, Çöloğlu, Mahmuduneriği and Hacıkız), which were among the commercial Turkish varieties, were grafted onto PPV infected apricot trees in Hungary in 2002 and 2003. Due to the freeze damage in Hungary in 2003, most of the grafts were damaged and no observation was possible. The experiment was carried out with the rest of the grafts which were Sakıt-2 and 11/89 type apricots; Aynalı, type 1559, Papaz and Havran plums. Sharka symptoms were observed and PPV presence has been confirmed by RT-PCR method. According to symptom development Papaz, type 1559 and Havran among plums and type 11/89 of apricots were free of sharka disease. Whereas, Aynali plum and Sakit-2 apricot cultivars were exhibited very strong symptoms of PPV. RT-PCR tests of both grafted shoots and rootstock leaves were correlated with the PPV symptoms except cv. Havran. Although type, 1559, Papaz plum cultivars and 11/89 apricot cultivar seemed to be tolerant to plum pox disease in this study, these studies should continue and confirm with further investigations.

Key words: *Plum pox virus,* Stone fruit trees, local cultivars, tolerance

INTRODUCTION

Turkey is the leading apricot producing country in the world and it ranks first for apricot production (440.000 tons) and 8th for plums (205.000 tons out of 10.109.515 tons of the world production) (Anonymous, 2003). Plum pox virus is one of the most important pathogen threatening stone fruit cultivation, even though it is not very widespread in Turkey.

The presence of PPV in Turkey was for the first time reported from Marmara and Central Anatolia Regions (Sahtiyancı, 1968; Kurçman, 1973). The Eastern Mediterranean Region and East Anatolia were reported as free of sharka (Çaglayan and Gazel, 1998; Sipahioglu, 1999; Yorganci et al., 2001). Turkish PPV isolates were

considered to be M serotype based on PCR (Caglayan et al., 2003), but possessing both D- and M- specific epitopes (Boscia et al., 1997; Myrta et al., 1998; Candresse et al., 1998). There is very limited knowledge about the tolerance of Turkish stone fruit varieties to PPV. Elibuyuk and Erdiller (1991) studied 8 apricot and 12 plum cultivars according to field symptoms on leaves, fruits and stones. PPV symptoms were observed in all cultivars except plum cv. Can.

The resistance or tolerance to PPV is one of the main ways of plum pox management in regions where this disease is widespread. The aim of this investigation was to determine the behaviour of Turkish plum and apricot varieties against PPV.

MATERIALS AND METHODS

The experiment was set up in early autumn of 2002 and 2003 in Erd-Elvira-Hungary in the Experimental Station of Research Institute of Fruit and Ornamentals in order to avoid the risk of contamination of PPV-free regions of Turkey. One year old branches of Turkish cultivars of apricot and plum were grafted onto naturally PPV infected apricot trees which were 10 years old and already grafted onto rootstocks. Alyanak, Tokaloglu, Hacıhaliloğlu, Soğancı, Hasanbey, Şekerpare, Kabaaşı, Sakıt-2, 11/89 type, Çataloğlu, Çöloğlu, Mahmuduneriği and Hacıkız apricot cultivars and Alerik, Can-2, Değirmendere, Aynalı, 1559 type, Papaz, Havran, Türbe çukuru, Istanbul and 1542 plum cultivars were selected for investigation of PPV susceptibility. The cultivars were grafted onto PPV infected apricots using T and chip budding with 6 repetitions. The transmission of PPV to grafted scion of apricot and plum cultivars was followed during two successive growing seasons by visual leaf symptom observations and confirmed by RT-PCR tests at the end of the second year.

For PCR analysis, nucleic acids were isolated according to Spiegel et al. (1996) and 220 bp PPV non coding region primers (Levy and Hadidi, 1994) were used.

RESULTS AND DISCUSSION

Due to the freeze damage in Hungary in 2003, most of the grafts were damaged and no observation was possible. The experiment was carried out with the rest of the grafts which were Sakıt-2 and 11/89 type apricots; Aynalı, type 1559, Papaz and Havran plums. One year after inoculation, PPV symptoms were observed on leaves of some grafted plants, but the intensity of symptoms varied greatly (Table 1). Sakıt-2 apricot cultivar showed 100% symptoms on leaves which were very severe chlorotic and oak mosaics. Whereas, apricot cv. type 11/89 did not show any symptoms. The plum cultivar of Aynalı showed chlorotic spots and rings on the surface of the leaves which were not as severe as Sakıt apricot. Among the six branches growing from six grafts of Havran cultivar, only one exhibited PPV symptoms. No symptoms were observed on plum cvs Papaz and type 1559. RT-PCR tests were performed in springtime from fully developed leaves in 2004. The tissues for nucleic acid extraction were selected from symptomatic leaves where possible. Visual observations were verified with the result of

RT-PCR tests (Fig 1). All symptomatic tested cultivars reacted positively for PPV in RT-PCR tests. On the other hand, three of five cv. Havran asymptomatic repetitions were detected as PPV infected. These three grafts were retested by RT-PCR and reacted again positively. It showed that PPV can be detected by RT-PCR even the symptoms not appeared.

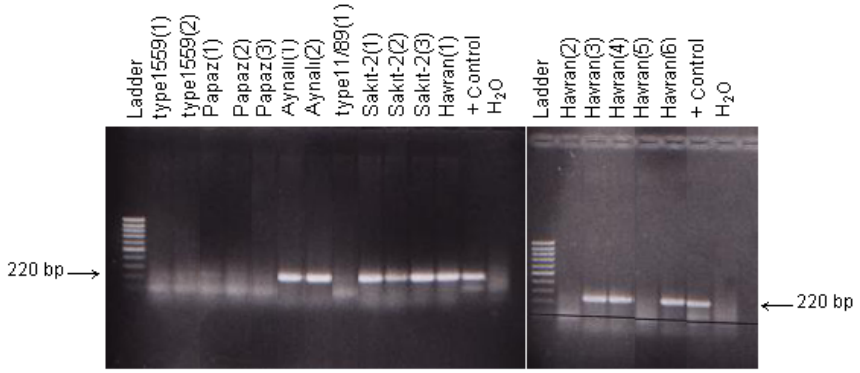

Fig 1. RT-PCR results of local apricot and plum cultivars grafted on PPV infected apricots in the field.

Table 1. Reaction of experimentally infected Turkish apricot and plum cultivars to PPV according to symptoms and RT-PCR

Tested Recipient Cultivars				Naturally Infected Donor Apricots		
Cultivars	Number of Grafts	Symptoms	RT-PCR	Number of Trees	Symptoms	RT-PCR
	K01/1	+++	+	17/1	+	+
Sakit-2	K01/2	+	+	17/1	+	+
	K01/3	++	+	17/1	+	+
Type11/89	K02/1	-	-	18/5	+	+
Aynali	SFI 4/1	+	+	19/4	+	+
	SFI 4/2	++	+	19/4	+	+
Type 1559	SFI 5/1	-	-	18/5	+	+
	SFI 5/2	-	-	18/5	+	+
	SFI 6/1	-	-	18/5	+	+
Papaz	SFI 6/2	-	-	18/5	+	+
	SFI 6/3	-	-	18/5	+	+
	E2/1	+	+	17/1	+	+
	E2/2	-	-	17/1	+	+
Havran	E2/3	-	+	17/1	+	+
	E2/4	-	+	17/1	+	+
	E2/5	-	-	17/1	+	+
	E2/6	-	+	17/1	+	+

+ : mild symptoms, ++ : severe symptoms, +++ : very severe symptoms, - : no symptoms

In the last twenty years, pathogen-derived resistance has been effective in the control of different virus diseases. Regarding PPV, breeding programmes are in

progress and all known cultivars of peach and plum are susceptible to PPV. However some of the tested cultivars of apricot in Spain like Stella, Stark Early Orange, Goldrich, Harcot, NJA2, Pandora and Avilara (Syrigiannidis, 1980) and also Veecot, Stella and Stark Earli Orange originating from North America were found highly resistant to the virus (Dosba et al., 1992). Because of East Anotolia and East Mediterranean regions of Turkey are big apricot suppliers for dry and table consumption; their cultivars were studied in this study for PPV tolerance. Typical PPV symptoms (oak mosaic, vein yellowing, leaf malformation, chlorotic spots) appeared in early spring time on many local cultivars. Preliminary results show that one apricot cv. type 11/89 and two plum cvs. type 1559 and Papaz seem to be tolerant to PPV. All others have shown sensitive reaction. This study shows that if PPV entered PPV-free regions, it represents a big danger for apricot cultivation in Turkey. We also demonstrated that cv. Sakıt-2 was susceptible to PPV but it was never found infected by this virus in the field conditions before.

In order to completely confirm the tolerance of tested cultivars to PPV, observation of fruits from grafted buds is also necessary. It will show us in the future how PPV affects yield and fruit quality of Turkish cultivars. Further observations are needed before final conclusions concerning the PPV susceptibility of the studied cultivars can be drawn.

ÖZET

TÜRK ERİK VE KAYSI ÇEŞİTLERİNİN ŞARKA HASTALIĞINA TEPKİLERİNİN ARAŞTIRILMASI

Türkiyenin 10 erik, 13 kaysı çeşidinin şarka hastalığına tepkisi araştırılmıştır. Ticari çeşitler olarak eriklerden Alerik, Can-2, Değirmendere, Aynalı, 1559 type, Papaz, Havran, Türbe çukuru, Istanbul ve 1542; kaysılardan ise Alyanak, Tokaloglu, Hacıhaliloğlu, Soğancı, Hasanbey, Şekerpare, Kabaaşı, Sakıt-2, 11/89 type, Çataloğlu, Çöloğlu, Mahmuduneriği and Hacıkız 2002-2003 yıllarında Macaristan'da PPV ile infekteli bir kaysı ağacına aşılanmıştır. Ancak 2003 yılında Macaristan'da yaşanan don zararı nedeniyle aşıların çoğu zarar görmüş ve değerlendirmeye alınanmamıştır. Deneme, kaysı çeşitlerinden Sakıt-2 ve tip 11/89; erik çeşitlerinden ise Aynalı, tip 1559, Papaz ve Havran ile devam ettirilebilmiştir. Bu bitkilerde şarka simptomu gözlenmiş ve PPV'nin varlığı RT-PCR testiyle de doğrulanmıştır. Simptom gelişmesine göre Papaz, tip 1559 ve Havran erikleri ile tip 11/89 kaysı çeşidi şarka hastalığından ari görünmektedir. Buna karşın Aynalı erik çeşidi ile Sakıt-2 kaysı çeşitlerinde çok şiddetli simptomlar gözlenmiştir. Anaç ve aşılanan bitkilerin yaprakları RT-PCR yöntemiyle testlendiğinde Havran çeşidi dışında PPV simptomlari ile parelellik saptanmıştır. Bu çalışmaya göre erik çeşitlerinden tip 1559, Papaz ve tip 11/89 kaysı çeşitleri şarka hastalığına tolerant görünmekle birlikte bu çalışmaların devam etmesi ve yeni çalışmalarla desteklenmesi gerekmektedir.

Anahtar Kelimeler: *Plum pox virus,* sert çekirdekli meyveler, yerli çeşitler, tolerans

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