

NEMATODES ASSOCIATED WITH APPLE (*MALUS PUMILA* MILL.) IN BALOCHISTAN, PAKISTAN

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ABSTRACT

Sixty rhizosphere soil samples of apple seedlings and rootstock were collected from six nurseries of Khuzdar and Kalat districts of Balochistan. Six different plant nematodes were found associated with the seedlings and rootstock. The most predominant nematode was *Xiphinema americanum*, whereas the nematode found from a single locality was *Tylenchus butteus*. A matrix of similarities with respect to nematode assemblages for the six nurseries was computed.

INTRODUCTION

Apple (*Malus pumila* Mill.) trees are the largest deciduous fruits planted in Balochistan, Pakistan and second most produced fruit after dates in the province. It covers 0.101 million hectares with production of 0.224 million tones (Shah *et al.*, 2011). Apple trees are prone to a number of bacterial, nematode and fungal problems which reduce the growth and yield (Rosenberger, 1988).

Several species of plant nematodes have been reported to damage crop. Jaffe and Mai (1979) found that rate of growth suppression of seedlings by *P. penetrans* were inversely proportional to seedlings age at time of nematode inoculation. Phillis (1995) found *Pratylenchus* sp., as the main pathogenic nematode of apple in Cyprus. Mokbel *et al.*, (2006) suggested that the nematodes found in high frequency associated with apple. El-Behera governorate, Egypt were *Pratylenchus penetrans* and *Meloidogyne incognita*. Ranjan (2005) reported *Meloidogyne incognita*, *Pratylenchus coffeae*, *P. crenatus* and *Tylenchorhynchus* spp., on rootstock of apple imported from Australia, U.S.A., Canada, France and Germany to India. Damage to apple in Pakistan is serious (Khan & Khan 1995, Islam *et al.*, 1994, Islam *et al.*, 1996, Khan *et al.*, 1997, Maqbool & Shahina, 2001). Seedlings and young trees can suffer from heavy infestation of plant parasitic nematodes that may cause stunting and necrosis. Nematode control in orchards is not effective if infected seedlings are transplanted (Gaur & Meher, 1994). Therefore, a study was undertaken to investigate different plant-nematodes associated with apple seedlings in nurseries of Kalat and Khuzdar districts, Balochistan.

MATERIALS AND METHODS

An extensive survey of apple var. Golden delicious seedlings from six localities and rootstock from two localities namely Jamiatabad and Kaley Abdullahjan was done from November 2012 to January 2013 in six localities of Khuzdar and Kalat districts of Balochistan. Seedlings showing symptoms of poor or stunted growth were sampled. Top few centimeters of soil layer around the plants was removed before collecting soil sample from a depth of 5–20 cm using a small soil corers and shovel. The soil samples from each locality were pooled to obtain composite sample. The galling and lesion on roots were observed from each sampling nursery. The nematodes were extracted from the 50 seedlings and 10 rootstock samples (200 ml) using the Baermann funnel technique (Southey, 1970). Root-knot females (*Meloidogyne* sp.) were extracted from the galls present on the roots and species identification was based on perineal pattern morphology. Isolated nematodes were fixed in T.A.F. (Courtney *et al.*, 1955) dehydrated in 1.2 percent glycerine and finally transferred to pure glycerine to prepared permanent slides for identification.

Similarities between six nurseries localities using nematode assemblages (counts) were computed using the index of Bray & Curtis (1957) and matrix prepared.

RESULTS AND DISCUSSION

The six nematodes recorded were *Helicotylenchus digonicus*, *Meloidogyne incognita* larvae, *Pratylenchus penetrans*, *Psilenchus iranicus*, *Tylenchus butteus* and *Xiphinema americanum* from six different nurseries of Khuzdar and Kalat district, Balochistan. Except for the nurseries Jamiatabad and Kaley Abdullahjan where both seedlings and rootstock were examined in the rest four nurseries only seedlings were examined. The nematode recorded in all the six nurseries was *X. americanum* followed by *H. digonicus* which was recorded in five nurseries (Table 1). The nematode recorded from a single locality was *T. butteus*. Similarities between nurseries of apple on the associations of nematodes in the assemblages are given in (Table 2). Highest similarities in nematode assemblages was found in localities Jamiatabad and Kaley Abdullahjan and Mangochar and Daniyal

Nursery, Noorani chowk, Khuzdar. The rest of the pairs of nurseries showed intermediate similarities ranging from 40 to 60 percent (Table 2). Presence of *Pratylenchus*, *Xiphinema* and *Meloidogyne* are of significant importance. Nickle (1991) reported that *Pratylenchus* spp., feed on root cortex. Cells and small roots are killed. The migratory parasitism of root lesion nematodes open up roots to secondary invasion by other soil microorganisms such as fungi and bacteria. Seedlings planted in infected soil often fail to grow to normal size. Growth of apple trees is reduced by 15–43% in *Meloidogyne* infested orchards as compared with trees grown in the absence of the nematode, subsequently fruit yield is reduced on heavily infected trees (Saigus & Mat Sumoto, 1961) at the same time they destroy the roots (Khan *et al.*, 2010) while *Xiphinema* spp., reduce the vigor of apple trees and more importantly they are vectors of nepoviruses (Nyezepir & Halbrendt, 1993). It is hypothesized that the nematode infestations originated from seedlings (Tzortzakakis, 2004), thus rootstock and seedling free of nematodes must be used (D'Errico & Ingenito, 2003).

Table 1. Nematodes associated with apple seedlings and rootstock in Khuzdar and Kalat district, Balochistan.

Nematodes	Nurseries					
	1*	2	3	4	5	6
<i>Helicotylenchus digonicus</i>	–	+	+	+	+	+
<i>Meloidogyne incognita</i> larvae	–	–	+	+	+	+
<i>Pratylenchus penetrans</i>	+	–	+	+	–	–
<i>Psilenchus iranicus</i>	+	+	+	+	–	–
<i>Tylenchus butteus</i>	–	+	–	–	–	–
<i>Xiphinema americanum</i>	+	+	+	+	+	+

Name of nurseries: 1 = Kalat Town; 2 = Rod Abdullah; 3 = Jamiatabad; 4 = Kaley Abdullahjan; 5 = Mangochar; 6 = Daniyal Nursery Noorani chowk Khuzdar (In location 3 and 4 seedlings as well as rootstock were examined)

Table 2. Matrix of Bray-Curtis similarity of nematode species in six nurseries of apple seedlings and rootstock in Balochistan.

	1*	2	3	4	5
2	40	-	-	-	-
3	60	50	-	-	-
4	60	50	100	-	-
5	20	40	60	60	-
6	20	40	60	60	100

* Localities same as table No. I

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