

AN ANALYSIS OF PHYTONEMATODE ASSOCIATED WITH POMEGRANATE IN KHUZDAR AND KALAT DISTRICT, BALOCHISTAN

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ABSTRACT: A survey of phytonematodes associated with pomegranate was conducted encompassing 12 localities of Balochistan Province. Twelve genera were recorded from the rhizosphere of pomegranate. The most dominant species was *Meloidogyne incognita*. Species diversity (H') was highest in Wadh while lowest in Ali Dasht. Equitability (J') component of diversity was highest in Kork and lowest in Ali Dasht, while species richness (d') component was highest in Alat. The soils associated with Pomegranate orchards were coarse-structured, alkaline with low maximum water holding capacity. In most cases similarities were low between localities.

Key Words: Nematodes; Pomegranate; Soil Characteristics; Diversity; Pakistan.

INTRODUCTION

Pomegranate (*Punica granatum* L.) is an important fruit crop of tropical and sub-tropical regions of Pakistan. It is cultivated on 13283 ha with a production of 50109 t (Anonymous, 2006).

Most of the pomegranate orchards were found infested with root-knot nematodes (Khan and Shaukat, 2005; Khan et al., 2005a). Severely infested plants showed yellowing of foliage and stunted growth. These plants produced less or undersized fruits or did not bear fruits which could be due to nematode induced nutritional deficiency as suggested by Sudheer et al. (2007).

A survey was conducted to observe nematode diversity in 12 localities of Khuzdar and Kalat districts of Balochistan, Pakistan.

MATERIALS AND METHODS

Samples were collected from the major pomegranate growing localities of Khuzdar and Kalat districts of Balochistan in February and March, 2009. The 12 localities chosen for the survey included Ornach, Wadh, Piromal, Khuzdar, Kork, Musiani, Alat, Surab, Ali-Dasht, Kalat, Kohing and Mangochar. The soil types in these localities were sandy loam, loamy

sand, loamy, rocky sand and sandy. The maximum temperature varies from 38°C to 42°C in Khuzdar, Wadh and Piromal while the minimum temperature falls below -10°C in Kalat. Soil and root samples were collected at 10 random locations within each field from the rhizosphere of trees in the 12 localities. Soil samples were collected from 5-30 cm depth using small soil corers and shovels. The soil samples from each locality were pooled to obtain composite samples. Nematodes were extracted from the samples using the Baermann funnel technique (Southey, 1970). Root-knot nematodes female (*Meloidogyne* spp.) were extracted from the galls present on the roots and species identification was based on perineal pattern morphology. Other nematode species were also identified (Siddiqi, 1988 and Ahmad, 1996) and their number recorded using a binocular microscope (x 50).

Soil texture was determined manually. The pH of soil was measured in soil paste (1:5 soil/distilled water) while water holding capacity was calculated according to USDA (1951) protocol. The soil was saturated in tin cans with a hole in the bottom. The soil was then oven-dried (100°C for 24 h). The water holding capacity was calculated as loss in weight (saturated soil-oven dried soil) and expressed as percentage of

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oven dried soil. Grass cover around the soil was recorded. Species diversity of nematodes was estimated using the Shannon-Wiener information theory function (H') as given in Magurran (1988). Equitability $J' = H'/H'_{\max}$ was calculated in accordance with Pielou (1969) and species richness as $d' = S/v N$ as suggested by Menhinick (1964). A similarity matrix between localities was calculated using Sorensen's coefficient of similarity (Mueller-Dombois and Ellenberg, 1974).

RESULTS AND DISCUSSION

Twelve genera were recorded from 12 different localities (Table 1). Gallings intensity of roots was observed on dissection of root galls where females with numerous eggs were present. *Meloidogyne incognita* was recorded from seven localities, while *M. javanica* was found in three localities. The second stage juveniles of *M. incognita* ranged from 12 to 300/200 ml soil while *M. javanica* ranged from 36 to 370/200 ml soil. Species diversity (H') was highest in Wadh followed by Piromal and Alat (Table 2), minimal diversity was recorded for Ali Dasht and Musiani. Equitability component of diversity (J') was highest in Kork followed by Alat and lowest in Ali Dasht and Wadh. The high-

est number of nematodes 10 were recorded from Wadh followed by Piromal, while in locality Ali Dasht only one nematode *Psilenchus khuzdarensis* was recorded.

Highest richness d' was observed for Alat while Wadh, Piromal and Surab also showed high species richness (Table 3).

The similarity matrix of nematode species composition for the 12 localities. The similarities ranged between zero and one hundred (Table 3). Kork showed 100% similarity with Kohing and Manghochar. Ornach also showed high similarity (66.6%) with Khuzdar, Kork, Kohing and Manghochar. However, most of the similarities were of low order and 31 similarities were zero.

The dominant grasses were *Cenchrus biflorus* Roxb. *Cynodon dactylon* L. and *Eleusine* sp.

The grasses were with low to medium cover in all localities except in two localities Alat and Surab. These grasses may support nematode populations (Roy et al., 2007), suggesting that grass cover should be removed from time to time to minimize the population of stylet bearing nematodes. Further studies on host range, histopathology and actual damage should be conducted to have a better picture of plant parasitic

Table 1. Densities of plant parasitic nematode in 200 cm³ soil in the rhizosphere of pomegranate in the 12 localities surveyed in Balochistan during 2009

Species	Localities											
	1	2	3	4	5	6	7	8	9	10	11	12
<i>Aphelenchus</i> sp.	-	-	14	-	-	-	4	-	-	-	-	-
<i>Basiria graminophila</i>	-	-	12	-	-	-	-	-	-	-	-	-
<i>Ditylenchus bilqeesae</i>	-	11	-	-	-	-	-	-	-	-	-	-
<i>Helicotylenchus digonicus</i>	56	60	-	-	-	-	26	-	-	-	-	-
<i>H. indicus</i>	-	13	-	156	-	-	-	-	-	-	-	-
<i>Longidorus</i> sp.	-	-	6	-	-	-	-	-	-	-	-	-
<i>Meloidogyne incognita</i>	12	-	-	213	300	-	-	151	-	299	46	58
<i>M. javanica</i>	-	39	300	-	-	-	-	40	-	-	-	-
<i>Merlinius brevidens</i>	-	1	10	-	-	9	-	7	-	-	-	-
<i>M. khuzdarensis</i>	-	-	21	-	-	-	-	-	-	-	-	-
<i>Pratylenchus penetrans</i>	30	-	-	-	35	-	-	-	-	27	29	28
<i>Psilenchus hilarulus</i>	-	4	10	-	-	-	-	-	-	-	-	-
<i>P. khuzdarensis</i>	-	4	-	-	-	-	10	-	5	-	-	-
<i>Tylenchorhynchus brassicae</i>	-	20	-	-	-	2	24	18	-	-	-	-
<i>Tylenchus</i> sp.	-	1	-	-	-	10	-	-	-	-	-	-
<i>Xiphinema basiri</i>	-	2	-	-	-	26	17	3	-	-	-	-

1 = Ornach, 2 = Wadh, 3 = Piromal, 4 = Khuzdar, 5 = Kork, 6 = Musiani, 7 = Alat, 8 = Surab, 9 = Ali Dasht, 10 = Kalat, 11 = Kohing, 12 = Mangochar

PHYTONEMATODE ASSOCIATED WITH POMEGRANATE

nematodes of pomegranate in Balochistan.

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Table 2. Soil characteristics and diversity of twelve sites (Average of six samples from each locality)

Sites	Soil	Soil pH	Max. water holding capacity (%)	Grass cover	Species diversity (H')	Equitability (J')	Richness (d')
Ornach	Sandy-loam	8.0	35.4	Low	0.571	0.519	0.159
Wadh	Sandy	8.0	35.6	Medium	1.432	0.421	0.352
Piromal	Sandy-loam	7.8	28.0	Medium	1.312	0.570	0.406
Khuzdar	Rocky-sand	8.0	36.0	None	0.920	0.442	0.370
Kork	Sandy	8.2	21.5	Low	0.671	0.968	0.102
Musiani	Sandy	8.1	22.4	Low	0.304	0.439	0.110
Alat	Rocky-sand	7.8	21.4	None	1.249	0.901	0.571
Surab	Loamy-sand	8.1	27.4	None	0.846	0.525	0.359
Ali Dasht	Loamy	8.0	34.3	Medium	-	-	0.164
Kalat	Sandy-loam	8.2	27.2	Medium	0.817	0.744	0.137
Kohing	Sandy-loam	8.0	33.2	Low	0.568	0.819	0.291
Mangochar	Loamy-sand	7.7	37.6	Low	0.504	0.727	0.173

Table 3. Similarity matrix of nematode communities associated with twelve localities of Pomegranate trees in Khuzdar and Kalat districts

Sites	1	2	3	4	5	6	7	8	9	10	11
2	8.33										
3	0	28.57									
4	66.66	9.09	0								
5	66.66	0	0	33.33							
6	0	40	20	0	0						
7	0	36.36	18.18	0	0	28.57					
8	14.28	36.36	30	16.66	16.66	50	25				
9	0	10	0	0	0	0	20	0			
10	100	8.33	0	66.66	66.66	0	0	14.28	0		
11	66.66	0	0	33.33	100	0	0	16.66	0	66.66	
12	66.66	0	0	33.33	100	0	0	16.66	0	66.66	100

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