Pakistan Journal of Nematology, 2014, Vol. 32(2): 237-240

Plant nematodes associated with grapevine seedlings and rootstock in Balochistan

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Abstract

Sixty-six samples of seedlings and rootstock of grapevine were selected from 6 vineyard from two districts of Balochistan, Pakistan. Seven species of nematodes were found associated with the seedlings/rootstock including *Aphelenchus avenae*, *Helicotylenchus indicus*, *Hoplolaimus indicus*, *Meloidogyne javanica*, *M. incognita*, *Xiphinema americanum* and *X. index*. A matrix of similarity between six vineyard-nurseries was computed using Bray-Curtis index.

Keywords: Plant nematodes, grapevine seedlings, rootstock, Balochistan

Balochistan province is endowed with a unique environment for the production of a great variety of quality fruits. Mountainous and sub-mountainous areas up to 200 m altitude or more are suitable for grapevine cultivation (Abbas, 2013). As compared to other developed countries the productivity is low (Ahujla *et al*., 2011) as this crop susceptible to several ecto and endo parasitic nematodes. Although published data was scarce the available data showed nematode causing substantial damage to grapevine. Raski (1986) reported that *Meloidogyne* spp., in vineyards losses as high as 20% as reported from California with a loss magnitude of $ 190 million.

Ferris *et al*., (2012) selected grape rootstocks through extensive screening programmes initiated with important source of resistance to *Meloidogyne* and *Xiphinema index* in *Vitis* species native to North America. Durability of this broad resistance was tested by challenging the selections with the target nematode pests of grapevines. Deimi & Mitowski (2010) reported from Iran the following nematodes associated with grapes, *Aphelenchoides limberi*, *Boleodorus thylactus*, *Criconema mutabile*, *Mesocriconema xenoplax*, *Ditylenchus myceliophagus*, *Irantylenchus clavidorus*, *Helicotylenchus digonicus*, *H. vulgaris*, *H. crenacauda*, *H. pseudorobustus*, *Hemicriconemoides mangiferae*, *Meloidogyne javanica*, *Geocenamous brevidens*, *G. rugosus*, *Pratylenchus neglectus*, *P. thornei*, *P. ritteri*, *Tylenchulus semipenetrans*, *Xiphinema index* and *Zygotylenchus guevarai*. Anwar and van Gundy (1992) studied the effect of nematodes on bud break, water relations and growth of grapevines varieties French Colombard and Red Ruby, they further reported *Pratylenchus vulvus* delayed 4 days the bud break of Ruby Red. *Meloidogyne incognita* and *P. vulnus* alone and in combinations initiated significantly earlier bud break in French Colombard. Mokbel and El-Saedy (2013) revealed that in a survey for identification and distribution of root-knot nematodes *Meloidogyne arenaria*, *M. incognita* and *M. javanica* in nursery infected and parasitized grapevine plantations in Alexandria and El-Bahera.

McKenry (1992) considered large populations of *Mesocriconema xenoplax* to reduce grape yields as 25% in the western United States. The present study was undertaken to evaluate the nematodes associated with grapevine seedlings and rootstock in two districts of Balochistan, Pakistan.

Materials and Methods

Sixty-six samples were collected from 6 vineyard seedling nurseries across Khuzdar and Kalat districts, Balochistan (Table 1). From the nurseries of Kalat town and Kaley Abdullahjan both seedlings as well as rootstock were examined. Most grape varieties grown are members of *Vitis vinifera* L. The seedlings in the study were composed primarily of *V. vinifera* cv. Shundokhani, one of the popular variety of Balochistan (Khair *et al*., 2009). Samples were composed of a composite of subsamples containing soil directly from roots and from the rhizosphere of vine seedlings. About 200 ml of combined soil and roots were collected in each sample. Additional samples were collected within each nursery from plants exhibiting distinct symptoms of abnormal growth (chlorosis, stunting and necrosis) and combined with the systematic samples, then a well mixed composite sample for nematode extraction from each nursery. Soil samples (80%) were texturally either sandy loams or loamy sands. Average daytime temperature ranged from 14 to 22 °C during the sampling period. Nematodes were extracted from the samples using Baermann funnel technique (Southey, 1970). The galling and lesion of roots were observed from each sampled nursery. Root-knot females were extracted from the galls present on the roots and species identification was based on perineal pattern (Eisenback *et al*., 1981). Isolated nematodes were fixed in TAF, dehydrated in 1-2 percent glycerine and finally transferred to pure glycerine for preparing permanent slides for identification according to Siddiqi (2000). Similarities between the six nursery localities using nematode assemblage (counts) were computed using the index of Bray & Curtis (1957) and the matrix prepared.

Table 1. Nematodes associated with grapevine seedlings and rootstock in Khuzdar and Kalat districts, Balochistan.

Nematodes	Nurseries					
	1*	2	3	4	5	6
Aphelenchus avenae	+	−	−	+	+	+
Helicotylenchus indicus	−	−	−	+	+	+
Hoplolaimus indicus	−	+	+	−	−	−
Meloidogyne javanica	+	+	+	+	+	+
M. incognita	+	+	−	−	−	−
Xiphinema americanum	+	+	−	−	−	−
X. index	+	+	−	−	−	−

*Name of nurseries: 1 = Kalat Town; 2 = Rod Abdullah; 3 = Kaley Abdullahjan; 4 = Umrani nursery, Wadh; 5 = Daniyal nursery, Noorani chowk, Khuzdar; 6 = Mangochar nursery (From locality 1 and 3 both seedlings and rootstock were examined).

Results and Discussion

In the present study seven different nematodes were found associated with grapevine namely *Aphelenchus avenae*, *Helicotylenchus indicus*, *Hoplolaimus indicus*, *Meloidogyne javanica*, *M. incognita*, *Xiphinema americanum* and *X. index*. The nematodes associated with all the 6 nurseries of grape was *Meloidogyne javanica* followed by *Aphelenchus avenae* from 4 nurseries (Table 1).

Similarities between six localities on the basis of association of nematode species presented in Table 2. Highest similarity was found in localities Umrani nursery, Wadh and Daniyal nursery, Norani Chowk, Khuzdar followed by Mangochar and Daniyal nursery, Norani Chowk, Khuzdar and Mangochar. Least similarity was recorded in nursery Kaley Abdullahjan. Nurseries pairs showed intermediate levels of similarities ranging from 16.66 to 75.

In the present survey the nematodes encountered in the rootstock were the same as those found associated with the grapevine seedlings. Mokbel *et al*., (2006) reported that the genera *Hemicriconemoides*, *Criconema*, *Hemicycliophora*, *Hoplolaimus*, *Paratylenchus*, *Pratylenchoides*, *Scutellonema*, *Tetylenchus* and *Xiphinema* were found associated with grape soil samples with 01-2.7% frequency of occurrence. Lowe & Walker (2006) suggested that resistance to *Meloidogyne* spp., in *Vitis* is conferred by a single, possibly dominant, gene that occurs frequently in the genus. Ferris *et al*., (2012) reported that there were many examples of plant resistance to plant pathogens broken in the presence of stylet-bearing nematodes and even of resistance to one nematode species being overcome in the presence of another. They further reported that nematode feeding and root damage on the resistance may be in providing avenues of ingress to root tissue, increasing leakage of sugars and amino acids from injured sites and hence enhancing the inoculum potential of the pest or pathogen or by producing physiological changes in the host tissue of grapevine (Mai & Abawi, 1987; Khan *et al*., 2009).

Deployment of resistant rootstock and providing uninfected seedlings to farmers when transplanted in the fields may exhibit greater tolerance and adaptability to change condition and survive in greater proportion as compared to infected seedlings (Sethi & Gaur, 1986) as practical control measure.

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

	1*	2	3	4	5
2	66.66	-	-	-	-
3	16.66	40	-	-	-
4	33.33	14.28	25	-	-
5	33.33	14.28	25	100	-
6	50	28.57	20	75	75

*Localities same as in Table 1.

Acknowledgement

The senior author is thankful to Pakistan Science Foundation, Islamabad for financial assistance to conduct this project.

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(Received: 13 March, 2014)