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Nematode Communities Associated with Chillies in Lower Sindh, Pakistan

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Abstract: A survey of nematode communities associated with chilli fields in eight localities of lower Sindh was conducted. In all eight species were recorded viz., *Meloidogyne* sp. larvae; *Helicotylenchus indicus; Pratylenchus penetrans; Tylenchus* sp. larvae; *Pratylenchus thornei; Tylenchorhynchus annulatus; Psllenchus hilarulus; Hoplolaimus indicus* and *Aphelenchus avenae.* A principal component ordination showed the relationships between localities and the species. Cluster analysis revealed the grouping of the nematode communities. Two main groups could be recognized, a small group having large populations of *Meloidogyne* sp. larvae and a large group comprising of communities with saprophytic nematodes and parasitic species such as *Helicotylenchus indicus, Tylenchorhynchus annulatus* and *Pratylenchus* spp. with variable densities.

Key words: Chilli, survey, nematodes, lower Sindh, Pakistan

Introduction

Chilli (*Capsicum frutescens* Linn.) is one of the most important cash crop in Sindh where it has been cultivated for thousands of years.

In spite of the presence of particularly favourable environmental conditions, the average yield of chillies in Sindh is low. The leaf and root pathogens are considered important limiting factors in chilli production.

Field surveys of nematodes as well as control experiments associated with chilli in Sindh have been carried our (Brown, 1962; Qamar *et al*., 1985; Khan *et al*., 1989, 1991; Shaukat and Khan, 1993; Siddiqui *et al*., 1999) but no proper survey has been conducted in the important chilli producing area of lower Sindh.

Materials and Methods

Soil samples were collected from eight localities namely Fant Farm (1), Goth Ludan Chandio (2), Karimabad (3), Kunri (4), Nasimabad (5), Nasirabad (6), Nusratabad (7) and New Kot (8) of lower Sindh, Pakistan during August 1998. For the extraction of plant parasitic nematodes from the soil, the tranquil filtering method (a modified Cobb's sieving method) was used. The nematodes were killed and fixed in TAF (Courtney *et al*., 1955), transferred to anhydrous glycerine and mounted on permanent slides. Specimens are preserved at the Commonwealth Institute of Parasitology, St. Albans, U.K.

For statistical analysis principal component analysis (PCA) was performed to data sets of localities (Ludwig and Reynolds, 1986). Group structure inherent in the data sets relevant to localities was exposed using average linkage clustering strategy (Orloci, 1978). Average linkage is a kind of hierarchical agglomerative clustering strategy. It provides spherical group structure. Euclidean distance was used as resemblance function.

Results and Discussion

Ordination: Fig. 1 shows the two dimensional PCA ordination biplot of localities based on nematode density. The first two components together explained 62.80 percent of the total variance inherent in the data set. Localities 1, 2 and 8 contained high populations of *Meloidogyne* spp. larvae (mostly situated towards the upper middle of ordination plane). Localities 4 and 6 situated near the left middle of the ordination contained only saprophytic nematodes. Localities 3 and 7 to the left of ordination are characterised by the presence of *Pratylenchus* spp.

Cluster analysis: The dendrogram resulting from average linkage clustering of 8 localities of chilli crop nematode communities is shown in Fig. 2. Two main groups can readily be recognized. A group of two localities where *Meloidogyne* sp. larvae are abundant. The other group of six localities has a well-defined subgroup of two localities that are characterised by the presence of only saprophytic nematodes. The other localities in the second group contain a mixture of species including *Helicotylenchus indicus, Tylenchorhynchus annulatus* and *Pratylenchus* spp. with varying density.

Some of the nematodes associated with chilli are of significant importance, for instance presence of *Pratylerichus penetrans* and *P. thornei* may cause root damage as these nematodes penetrate the parenchyma and often migrate intracellularly and form cavities in the cortex and feed on adjoining cells and multiply as observed earlier (Table 1) (Oyekan *et al*., 1972).

Table 1: Nematodes associated with chilli in different localities of lower Sindh, Pakistan

Localities range/	Nematodes	Population 100 ML soil
Kunri	*Meloidogyne* sp. larvae	80-100
	Helicotylenchus indicus	3-6
Newkot	*Meloidogyne* sp. larvae	36-40
Nusratabad	*Pratylenchus penetrans*	26-40
	Tylenchus sp. larvae	4-8
Goth ludan Chandio	Only saprophytic seen	
Karimabad	*Helicotylenchus indicus*	6-10
	Tylenchorhynchus annulatis	30-44
	Pratylenchus hilarulus	14-24
	Pratylenchus thornei	20-25
Fant fram	Only saprophytic seen	
Nasirabad	*Hoplalaimus indicus*	36-58
	Pratylenchus penetrans	26-35
	Aphelenchus avenae	4-6
Nasimabad	*Meloidogyne* sp. larvae	86-120
	Hoplalaimus indicus	38-42
	Tylenchorhynchus annulatis	30-40
	Helicotylenchus indicus	4-6
	Tylenchus sp. larvae	6-8

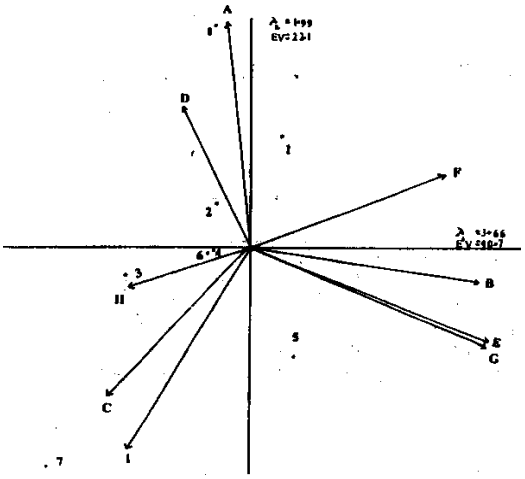

Fig. 1: Ordination biplot of nine nematode species and eight localities. Arrows show species vectors. Species and localities number codes are as follows

1. Kunri 2. Newkot ,3. Nusratabad 4. Goth Ludan Chandio 5. Karimabad 6. Font Farm 7. Nasirabad 8. Nusimabad

The eight nematodes are:

A. Meloidogyne sp. larvae
B. *Helicotylenchus indicus*
C. *Pretylenchus penetrans*
D. *Tylenchus* sp. larvae
E. *Pratylenchus thomei*
F. *Tylenchorhynchus annulatus*
G. *Psilenchus hilarulus*
H. *Hoplolaimus indicts*
I. *Aphelenchus evens*

EV = explained variance and lambda = eigenvalue

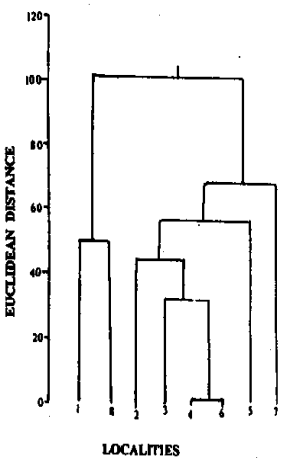

Fig. 2: Dendograrn of eight localities resulting from cluster analysis. See legend on Fig. 1 locality codes

Similarly *Meloidogyne* species is of concern as the nematode damages the vascular system due to disruption resulting in extensive hypertrophy and hyperpfasia of root cells. Besides roots of plants having infection usually show uneven and poor growth with general wilting symptoms. The damage is aggravated by interaction of parasites with other microorganisms such as fungi (*Rhizoctonia, Fusarium, Pythium, Curvularia*) and bacteria (*Pseudomonas, Agrobacterium*) (Siddiqi, 1985). Rohini *et al*. (1992) reported that *Meloidogyne incognita* population densities ranging from 16 to 512 eggs and juveniles per ml of soil greatly reduced plant growth. Occurrence of large populations of parasitic nematodes associated with chilli in lower Sindh may become a serious hurdle to chilli production. There is therefore need for study of host-parasite relationships of the nematodes associated with chilli.

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