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Distribution Pattern of Frequently Met Phytonematode Genera on *Allium sativum* (Garlic) in Jammu and Kashmir and a Description Note on *Hirschmanniella microtyla* Sher, 1968

Sheikh Javaid Hassan

Department of Zoology, Government Degree College, Kulgam, Jammu and Kashmir, India

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Abstract: *Hirschmanniella microtyla* Sher, 1968 was predominantly found to occur on *Allium sativum*. The species was identified on the basis of morphometric dimensions but the population was found to vary from the original in the value of V i.e. 57 per cent in the present specimens as compared to 53 per cent in the original dimensions and description by Sher (1968), probably as a result of nematode adaptation to host variability. *H. microtyla* is being reported for the first time in the valley of Kashmir, hence forming new host, new place record of same. The species is earlier reported by Sher (1968) on *Vallisneria americana*. The study includes the genera build up viz-a-viz their district wise distribution pattern on this host. *Hirschmanniella*, *Psilenchus*, *Tylenchus*, *Aglenchus*, and *Pratylenchus* were encountered on examining the soil and root samples of *Allium sativum* during the period of study. The values reflect that the population build up on the said host is in the decreasing order of Anantnag>Kupwara>Srinagar.

Keywords: *Allium sativum*, *Hirschmanniella microtyla*, Distribution pattern, Kashmir.

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Introduction

Nematodes, the most abundant and diverse group, are one of the important components of the soil fauna across all ecosystems. Nematode biodiversity is correlated to the soil health properties owing to their roles in ecosystem services (Neher *et al.*, 2005). Most of the nematode biodiversity studies can be linked to the ecology indicators and sustainable management of the agriculture

(Shi *et al.*, 2008). Yeates (1999) reported that nematode diversity is greatest in ecosystems with least disturbance, and bacterial-feeding nematodes make the greatest contribution to the decomposer food web in more intensively managed ecosystems.

The tylenchida (Throne, 1949) are the largest and economically the most important group of plant parasitic nematodes. The plant

parasitic Tylenchida, also known as eelworms, phytonematodes, phytohelminthes or simply plant nematodes, are equipped with a protrusible hollow stylet which is thrust into plant tissues for obtaining nutrition after the dissolution of the cell contents. These small worms exploited all plant organs including flowers and seeds, but mostly they attack roots and utilize chemical activity of bacteria, which hydrolyze carbohydrates, split proteins, cellulose and other organic substances of plant origin. These phytophagous nematodes are common pests of vegetable crops and its yield loss is often due to their high densities. Few studies regarding plant parasitic nematodes in India are performed by Prasad (1960) in I.A.R.I. farm on vegetable and fruit crops; Siddiqui (1963) on nematodes of citrus plants in 13 districts of Uttar Pradesh, Prasad *et al.* (1965) on the nematodes of onion; Khan and Basir (1965) on *Scutellonema mangiferae* from the soil around the roots of *Mangifera indica* from U.P.

In the present study an intensive survey of plant parasitic nematodes affecting *Allium sativum* was conducted in the Kashmir valley.

Materials and Methods

A total of 60 samples, each of soil and root samples of *Allium sativum* (Garlic) were collected from three districts (Anantnag, Kupwara, Srinagar) of Jammu and Kashmir, India to work out the distribution pattern of the frequently met nematode genera. Composite root and soil samples were drawn from host at 0–15 cm depths. A composite root sample of 1 g from the plants were taken and observed for nematode population. Similarly, a composite soil sample of 200 g was processed for nematode assay by decanting and sieving followed by the

modified Baermann funnel technique. The root samples were more thoroughly washed in running tap water, chopped and thoroughly mixed and the nematode population in root was estimated by traction through maceration by using a kitchen blender. Nematodes collected from soil samples were killed in hot water and later fixed in 4 % formaldehyde solution. Nematode population was estimated by using a stereoscope microscope. Plant parasitic nematodes were identified up to genus level by using standard monograph.

The population sizes of the met genera were correlated to include absolute frequency, absolute density and prominence value to work out the distribution study. The said parameters were calculated as follow:

Frequency (N) = It shows how often a taxon occurs in the collected samples. The frequency of a nematode genus represents the number of samples in which it is found.

Absolute frequency (AF) = Number of samples containing a genus ÷ Total Number of samples collected × 100

Relative frequency (RF) = Absolute Frequency of a genus ÷ Sum of Absolute frequencies of all genera × 100

Density (D) = Number of nematodes of the genus in all samples ÷ Total number of samples collected.

Relative density (RD) % = Density of the genus ÷ Sum of densities of all nematode genera × 100

Absolute Density % = Density of the genus ÷ Volume or mass units of the sample × 100

Prominence value (PV) = Density √ absolute frequency

Relative Prominence Value (RPV) % = Prominence value of the genus ÷ Sum of Prominence value of all nematode genera × 100

Mean Intensity = Number of individuals of a genus collected ÷ Number of infected hosts with that genus.

Results and Discussion

Hirschmaniella, *Psilenchus*, *Tylenchus*, *Aglenchus*, and *Pratylenchus* were encountered on examining the soil and root samples of *Allium sativum* during the period of study. In order to work out the region wise distribution pattern of these commonly met

genera, the average values of the prevalence parameters were statistically calculated. *Aglenchus* was met with the highest percentage of Absolute frequency of 97% in District Anantnag. Srinagar has the lowest absolute frequency of 64% in case of *Hirschmanniella*. 27.4% of relative frequency was met in Anantnag in the population of *Aglenchus*. Absolute density of 37.9% was calculated for *Tylenchus* in the District Anantnag and the corresponding lowest value was met in District Srinagar. *Psilenchus* has highest proportion of absolute density of 37.9% and lowest value of 22% in case of *Pratylenchus*. The mean intensity value of the said genera are 93, 96, 75, 60 and 54, respectively (Table 1, Fig.1). The values reflect that the population build up on the said host is in the decreasing order of Anantnag>Kupwara>Srinagar (Fig. 2). The reasons can be attributed to the soil texture, soil moisture and climatic conditions over a period of the year.

The present results in regard with the survey and population analysis part on this host is in good conformity with the work of other researchers over different parts of the world. A general survey of plant parasitic nematodes associated with Sweet potato in Niger was carried out by (Haougui *et al.*, 2011) whose results validate the present variables. Bhattacharya *et al.* (2012) studied the biodiversity of plant parasitic nematodes of Cashew Plantations in Tripura, India and listed the similar results. Plant parasitic nematodes associated with vegetables growing greenhouses in south eastern Anatolia region, Turkey were studied by Tan and Kilic (2012) depicting sort of similar results. Studies of other investigators (Fotedar

and Mahajan, 1972; Fotedar and Handoo, 1977; Javaidhassan *et al.*, 2009; Kaul, 1985; Manjrekar and Talgeri, 1969; Mahajan 1973) conform well with the present results.

Hirschmanniella microtyla Sher, 1968 was predominantly found to occur on *Allium sativum*. The species was identified on the basis of morphometric dimensions which did vary from the original dimensions and description as by Sher (1968) probably as a result of nematode adaptation to host variability. The description note is detailed hereunder.

***Hirschmanniella microtyla* Sher, 1968**

Female: L = 0.94 – 1.37, a = 37.5 – 53.3, b = 8.1 – 10.0 c = 13 – 18, c' = 3.4 – 4.4, v = 57 – 59%, stylet = 17.9 – 21 μ

Male: L = 0.96 – 1.145, a = 37 – 47, b = 8.6 – 10.6, c = 15.3 – 17.1, c' = 3.4 – 4.1, Stylet = 20.3 – 21.0 μ .

(L = total body length in mm; a = body length divided by greatest body width; b = body length divided by distance from anterior end to junction of oesophagus and intestine; c = body length divided by tail length; c' = tail length divided by body width at anus or cloaca; V = distance of vulva from anterior end X100 ÷ body length).

Lip region hemispherical, 6 annules, Stylet knobs large, rounded, excretory pore slightly anterior to oesophago-intestinal valve. Intestine not overlapping rectum. Outer bands of lateral fields incompletely aereolated in posterior part of body. Body annules near tail terminus absent. Tail terminus with pointed peg like extension. Males appear to be rare in this species.

Habitat and Locality: The specimens were collected in the soil around roots of *Allium sativum* (garlic) from Kashmir valley.

Table 1: Community analysis of plant parasitic nematodes associated with *Allium sativum* (Garlic) and its district wise distribution pattern

Genus	District	AF (%)	RF (%)	RD (%)	AD (%)	RPV (%)	MI
<i>Hirschmaniella</i> ,	Kupwara	70	16.5	20.8	33	19	93
	Srinagar	64	14	17.6	27.7	17.3	88
	Anantnag	74	21	23.7	36	23	96
<i>Psilenchus</i>	Kupwara	73.3	17.3	22.7	36	21	96
	Srinagar	67	17	21.1	31.9	21	92
	Anantnag	77	21	27.9	42	26.7	99
<i>Tylenchus</i>	Kupwara	90	21	21.7	34.5	22.6	75
	Srinagar	87	17	19	31	21	72
	Anantnag	93	23.7	23	37.9	26.6	78
<i>Aglenchus</i>	Kupwara	96.6	23	18.5	29.4	20	60
	Srinagar	90	20.7	17	27	18	56
	Anantnag	97	27.4	22	30.6	28	72
<i>Pratylenchus</i>	Kupwara	93.3	22	16	25.5	17	54
	Srinagar	89	14	17	22	22	56
	Anantnag	96.3	26.4	21	27	21	63

AF= Absolute frequency, RF= Relative frequency, RD= Relative Density, AD= Absolute density, RPV= Relative prominence value, MI= Mean Intensity.

Fig.1: Graphical representation of genera build up vis-a-vis their district wise distribution pattern.

Fig. 2: Graphical representation of various parameters of genera build up vis-a-vis their district wise distribution pattern.

Hirschmaniella microtyla Sher, 1968

A---- Anterior end of female.

B---- Male posterior region.

Measuring scale= 100x

Remarks: The *H. microtyla* is being reported for the first time in the valley of Kashmir, hence forming new host, new place record of same. The species is earlier reported by Sher (1968) on *Vallisneria americana*. The variation

is in the value of V i.e. 57 per cent in the present specimens as compared to 53 per cent in the original dimensions and description as by Sher (1968).

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