International Journal of Innovative Research and Advanced Studies (IJIRAS)
Volume 3 Issue 5, May 2016

ISSN: 2394-4404

Nematode Infestation On Solanum Tuberosum And Raphanus Sativus With Generic Buildup Statistics- A First Report From Kashmir

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Abstract: ***On examining the soil and root samples, during a survey which was conducted to investigate plant parasitic nematodes associated with Solanum tuberosum and Raphinus sativus in the valley of Kashmir during the year 2013-2014, Helicotylenchus, Pratylenchus and Boleodorus were met on Raphinus sativus with 80%, 86.6% and 93.3% of absolute frequencies respectively. Helicotylenchus population was recovered with highest relative density of 35% among the genera met. The three genera were met with the relative prominence values of 33.6, 31 and 35.2% respectively. This survey revealed Tylenchus, Psilenchus and Aglenchus in addition to Helicotylenchus on Solanum tuberosum with their absolute frequencies of 90%, 86.6%, 76.6% and 80% respectively. Aglenchus was found with the highest mean intensity and Helicotylenchus with lowest Relative Prominence value on Solanum tuberosum.***

Keywords: ***Phytonematodes, Solanum tuberosum, Raphinus sativus, Kashmir, Population statistics.***

I. INTRODUCTION

Phytonematodes have a significant impact on nutrient cycling and primary productivity in almost every eco-systems. Growing recognition that nematode populations can respond in predictable ways to ecosystem disturbance has led to suggestions that nematode community composition or life history indices thereof can be used as sensitive indicators of ecosystem change. As key members of soil food webs they affect the decomposition rate of plant litter and the turnover of nutrients from soil organic matter, and as important plant parasites they can directly affect plant growth and vigor. Nematodes utilize directly or indirectly, the living material of plants as sources of nutrition and often as habitat and sites for reproduction. They utilize chemical activity of bacteria, which hydrolyze carbohydrates, split proteins, cellulose and other organic substances of plant origin. The phytophagus nematodes are common pests of commercially grown vegetables and fruit crops including the hosts in question and their yield loss is often due to their high densities. These small worms are equipped with a protrusible hollow stylet which is thrust into plant tissues for obtaining nutrition after the dissolution of the cell contents. Brmez et al. [1] have studied the population dynamics of nematodes in winter wheat on the area of Knezebo. Knight et al. [2] carried out a study on the impact of climate change on the geographical spread of agricultural pests particularly nematodes.

II. MATERIALS AND METHODS

In the year 2013 a survey on phytonematodes affecting many commercially grown vegetables and fruit crops was conducted in the Kashmir valley. Fifty soil and root samples were collected from the two hosts. Composite root and soil samples were drawn from plants individually at 0-15 cm depths. A composite root sample of 1g from the plants were taken and observed for nematode population. Similarly, a composite soil sample of 200g was processed for nematode assay by decanting and sieving followed by the modified Baermann funnel technique. The root sample more thoroughly washed in running tap water finely 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 as estimated by using a stereoscope microscope. Plant parasitic nematodes were identified up to genus/species level by using standard monograph. The absolute frequency absolute density and prominence value of the nematodes was calculated by using following formula.

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

Absolute Density % = Density of the genus ÷ Total No. of samples collected × 100

Prominence value = Absolute density × √Absolute frequency

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

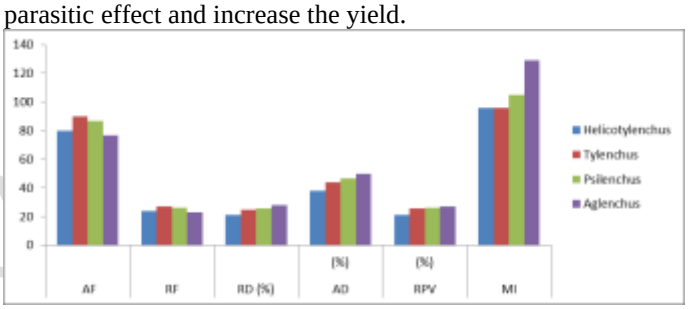
Mean Intensity = Number of individuals of a genus collected ÷ Number of infected hosts with that genus.

III. RESULTS AND DISCUSSION

The present study revealed that the Tylenchid genera buildup on *Solanum tuberosum* were *Helicotylenchus, Tylenchus, Psilenchus* and *Aglenchus* with their absolute frequency of 80%, 90%, 86.6% and 76.6% respectively. *Tylenchus* appeared in most of the samples collected. Population of *Aglenchus* happened to be highest with the absolute density and mean intensity of 50% and 129% respectively. Among these four genera recorded Table (i) and Figure (i) on *Solanum tuberosum* the Relative prominence value of 21% is lowest for *Helicotylenchus* and 27% for *Aglenchus*. The four genera were found with sort of equal mean intensities except *Aglenchus* with the highest value. *Helicotylenchus* population was found to be with lowest prominence value.

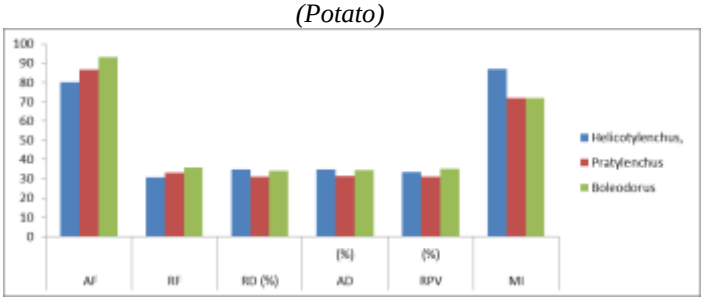
Raphanus sativus was found with three Tylenchid genera with their varied frequencies, density and prominence values. Among the three taxons Table (ii) and Fig. (ii) which are *Helicotylenchus, Pratylenchus* and *Boleodorus* , *Boleodorus* was met with highest value of 93.3% of frequency. 35%, 31.5% and 34.5% were the Absolute density of the said genera. *Helicotylenchus* showed highest i,e 87% as the mean intensity value among the genera. Mean intensity values did not differ much for three genera. Relative prominence values indicate the same trend for the phytonematode infestation. The study indicated the more susceptibility of the host to *Boleodorus* and reverse to the genus *Helicotylenchus.*

The present observations in regard with the generic statistics of the tylenchid nematodes on these hosts is in good conformity with the work of other researchers in Kashmir on some other hosts and over different parts of the world. Javaid Hassan, (2009) in similar studies revealed the significant results of same sort. A general survey of plant parasitic nematodes associated with Sweet potato in Niger was carried out by Haoungni *et al*., (2011) whose results validate the present variables. Bhattacharya *et al*., (2012) who studied the biodiversity of plant parasitic nematodes of Cashew Plantations in Tripura, India have listed the similar sort of results. The population analysis in the present study are in total conformity with the Biodiversity study of nematodes in potato growing areas of Kashmir by Javaid Hassan, (2012). 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. The data is useful in knowing the community structure of the tylenchids on these hosts and shall be highly useful in devising management strategies in order to minimize the parasitic effect and increase the yield.



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

Figure 1: Graphical presentation of various ecological parameters of different genera on Solanum tuberosum (Potato)



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

Figure 2: Graphical presentation of various ecological parameters of different genera on Raphanus sativus (Radish)

Genus	AF (%)	RF (%)	RD (%)	AD (%)	RPV (%)	MI
Helicotylenchus	80	24	21	38	21	96
Tylenchus	90	27	24.7	44	25.7	96
Psilenchus	86.6	26	25.8	46.5	26	105
Aglenchus	76.6	23	28	50	27	129

ISSN: 2394-4404

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

Table 1: Community Analysis Of Plant Parasitic Nematodes Associated With Solanum uberosum (Potato)

Genus	AF (%)	RF (%)	RD (%)	AD (%)	RPV (%)	MI
Helicotylenchus,	80	30.7	34.9	35	33.6	87
Pratylenchus	86.6	33.3	31	31.5	31	72
Boleodorus	93.3	35.8	34	34.5	35.2	72

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

Table 2: Community Analysis Of Plant Parasitic Nematodes Associated With Raphanus sativus (Radish)

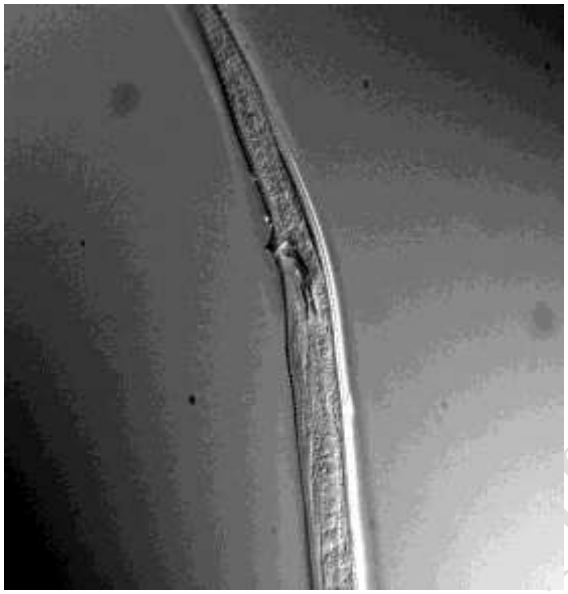


Figure 3: Tylenchus arcuatus

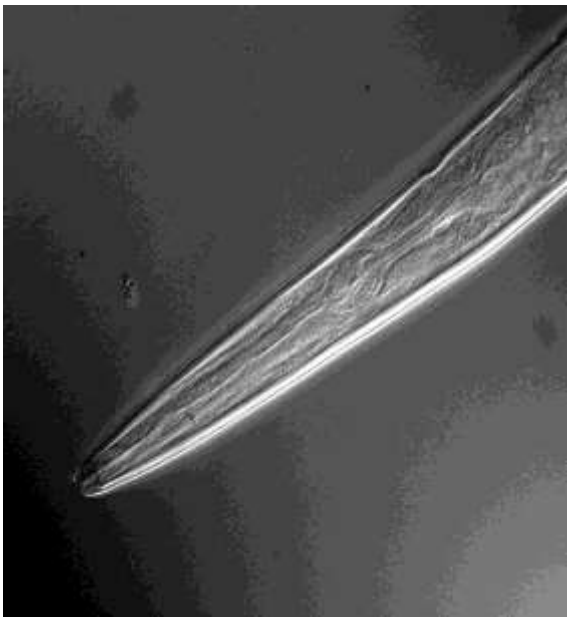


Figure 4: Psilenchus haki

Figure 5: Helicotylenchus chishtii

Figure 6: Boleodorus cylindricus

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