International Journal of Advanced Educational Research
ISSN: 2455-6157
Impact Factor: RJIF 5.12
www.educationjournal.org
Volume 3; Issue 2; March 2018; Page No. 157-159

Phytonematode infestation on *Brassica oleracea* with special emphasis on *Boleodorus cylindricus* Dhanachand, Renubala & Anandi, 1993

Javaid Hassan[1], MA Ahangar[2]
[1] Department of Zoology, Sri Pratap College, Srinagar, Jammu and Kashmir, India
[2] Centre of Research for Development, University of Kashmir, Srinagar, Jammu and Kashmir, India

Abstract
As a part of a larger project the phytonematode infestation on *Brassica oleracea* was looked into to evaluate the density fluctuations of various nematode genera for planning an integrated management for better yield. The host was found infested with *Boleodorus, Psilenchus, Helicotylenchus, Merlinius, Aglenchus* and *Filenchus* with varied statistical parameters. The absolute frequency of 93.3% was found in *Boleodorus* and *Helicotylenchus* with the lowest frequency of 76.6% in *Psilenchus.* The population of *Boleodorus cylindricus* Dhanachand, Renubala & Anandi, 1993 were met with variations in the lengths of body, stylet, oesophagous and tail.

Keywords: phytonematode, *Boleodorus cylindricus*, cauliflower, Kashmir

Introduction

Nematodes happen to be an important group of invertebrates that inhabit marine, freshwater as well as terrestrial environments, forming a diverse phylum Nematoda, these are the parasites of animals and of plants. However, most nematodes are not parasites but free living, feeding on bacteria, fungi, algae and other such nematodes. Nematodes cause severe damage to the field crops. They 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 crops 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. Lambshead (1993) [17] estimates that there may be as many as 1 X 10^8 nematode species in the deep sea, but the number of described species of nematodes is only about 20,000, of which more than 4000 are free-living marine organisms (Gerlach 1980) [10]. These figures are low in comparison with the estimated number of insect species described (about 80,000; Gaston 1991) [11]. Nematodes are considered the most abundant metazoan taxon, with estimates that 80% (Bongers 1988) [2] or 90% (Jairajpuri & Ahmad 1992) [16] of all metazoa are nematodes. Recently, it has been claimed that nematodes are one of the three major radiations that have produced most of the world's multicellular species (May 1988; Gaston 1991) [18, 11]. Plant parasitic nematodes cause significant economic loses to a wide variety of crops. According to Sasser and the Fackman (1987) [9] crop losses by nematodes range from 8 to 20 % on major crops around the world.

Materials and methods

A survey was conducted in 2015-2016 to find out the nematode populations and various genera affecting various vegetable crops was conducted in Kashmir valley. A total of 50 each of soil and root samples were collected from Cauliflower. Composite root and soil samples were drawn from plants individually 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 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 nematode was identified by using standard monograph. The absolute frequency absolute density and prominence value of the nematodes was calculated by using following formula.

$$\text{Absolute frequency} = \frac{\text{Number of samples containing a genus}}{\text{Total Number of samples collected}} \times 100$$

$$\text{Relative frequency} = \frac{\text{Number of samples containing a genus}}{\text{Sum of Absolute frequencies of all genera}} \times 100$$

$$\text{Density} = \frac{\text{Number of nematodes of the genus in all samples}}{\text{Total Number of samples collected}} \times 100$$

$$\text{Relative density \%} = \frac{\text{Density of the genus}}{\text{Sum of densities of all nematode genera}} \times 100$$

$$\text{Absolute Density \%} = \frac{\text{Density of the genus}}{\text{Volume or mass units of the sample}} \times 100$$

Prominence value (PV) = Density √absolute frequency

$$\text{Absolute Density \%} = \frac{\text{Prominance value of the Genus}}{\text{Sum of Prominance value of all nematode genera}} \times 100$$

$$\text{Mean Intensity \%} = \frac{\text{Number of individuals of a genus collected}}{\text{Number of infected hosts with that genus}} \times 100$$

Results and Discussions

As a part of the programme the nematode populations collected were measured under a stereo zoom microscope for the record of alterations as a consequence of habitat and host change. The values were recorded for males and female paratypes with the following details.

***Boleodorus cylindricus* Dhanachand, Renubala & Anandi, 1993**

Female: L= 0.62- 0.66, a= 38.2- 42.4, b= 4.2- 5.4, c= 4.8- 6.4, c'= 8.2-9.4, V= 60.2-66.2, stylet= 4.1- 5.9, G1= 28.4- 34.8, G2= 2- 3.2, Tail= 89.4- 106.7, ABD= 6.4- 8.2.

Males: L= 0.52- 0.62, a= 38.4- 44.6, b= 4.8- 6.2, c= 5.2- 6.2, c'= 8.2-9.4, , stylet= 4.6- 5.4, Spicules= 13- 14.6, Tail= 81.6- 90.8, ABD= 8.2- 9.8.

Straight to slightly ventroid body upon fixation, cylindrical, tapering towards both the extremities. Finely and transversely striated cuticle. Elevated lip region with transverse indistinct striations. Lateral lines with 4 incisures. Stylet slender, 4.1 - 5.9 µm long with posteriorly directed basal knobs. Orifice of dorsal oesophageal gland situated at 43 - 56% of oesophagous. Basal bulb cylindrical, 14.4 - 18 µm long. Distinct cardia. Excretory pore situated in the region of basal oesophgeal bulb. Nerve ring situated in the region of basal anterior end of body. Vulva post - equatorial, mono - prodelphic reproductive system, ovary outstretched and oocytes arranged in single row. Post vulval uterine sac about one body - width long. Filiformous tail, 89.4 - 106.7 µm long ending into a rounded terminus.

Male: Body similar to female. Spicule paired 13 – 14.6 µm long. Gubernaculums small, 2.3 - 4.9 µm in length.Bursa 20.4 - 26.2 µm long, adanal. Tail 81.6 - 90.8 µm long with rounded tip.

Habitat and locality: The specimens were collected in the soil around roots of *Brassica oleracea* (Cauliflower) from wagam area of Budgam.

Remarks: The morphological details of the present specimen conform well with those given by Dhanachand *et al*., (1993) though variations are found in the lengths of body, stylet, oesophagous and tail.

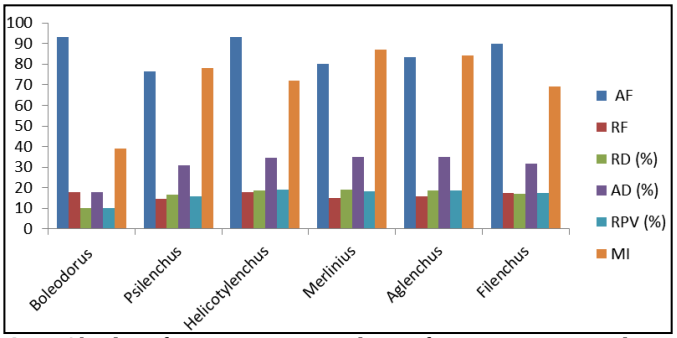
In order to determine the population buildup of various genera on the selected host, the set protocol was adopted by analysing soil samples through Cobb's sieving and decantation method and Baerman's funnel method.

On examining the soil samples as well as root samples of *Brassica oleracea Boleodorus, Psilenchus, Helicotylenchus, Merlinius, Aglenchus* and *Filenchus* were encountered with their absolute density of 18%, 31%, 34.5%, 35%, 35% and 31.5%. The absolute frequency of 93.3% was found in *Boleodorus* and *Helicotylenchus* with the lowest frequency of 76.6% in *Psilenchus.* Among the genera recorded on Cauliflower relative prominence value happened to be highest on *Helicotylenchus* with the value as 19% and lowest on *Boleodorus* with the value of 10%.

Table 1: Community analysis of plant parasitic nematodes associated with *Brassica oleracea* (Cauliflower)

Genus	AF (%)	RF (%)	RD (%)	AD (%)	RPV (%)	MI
Boleodorus	93.3	18	10	18	10	39
Psilenchus	76.6	14.8	16.6	31	15.7	78
Helicotylenchus	93.3	18.0	18.5	34.5	19	72
Merlinius	80	15	19	35	18.4	87
Aglenchus	83.3	16	18.8	35	18.5	84
Filenchus	90	17.4	17	31.5	17.3	69

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



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

Fig 1: Graphical presentation of various ecological parameters of different genera on *Brassica oleracea* (Cauliflower).

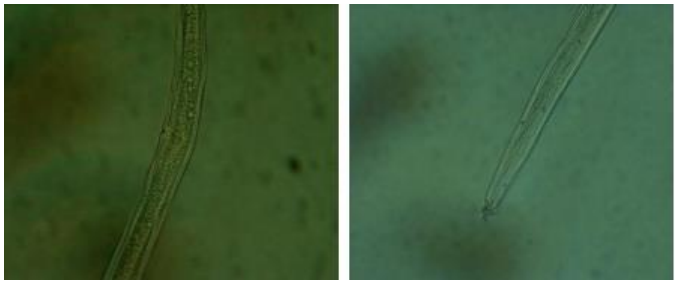


Fig 2: *Boleodorus cylindricus* Dhanachand, Renubala & Anandi, 1993

References

1. Andrassy I. Evolution as basis for the systematization of nematodes. Pitman Publishing Co., London. 1976; pp. 287.
2. Bongers T. De Nematoden Van Nederland. Koninkliijke Nederlandse Natuurhistorische Vereniging, Utrecht, The Netherlands, 1988.
3. Chishti MZ. Nematodes associated with *Brassica compestris* and their control. World Applied Sciences Journal. 2008; 5(5):543-545.
4. Chitwood BG. Nomenclatorial notes, I. Proc. Helminth. Soc. Wash. 1937; 2:51-54.

5. Cobb NA. Estimating the nema population of soil. Agric. Tech. Circ. U.S. Deptt. Agric. 1918; 1:48.
6. Fotedar DN, Kaul, Virender. Plant parasitic nematodes associated with various crops in Kashmir. Kashmir University Research Journal. 1982; 2:26-31.
7. Fotedar DN, Mahajan R. On a new species of *Tylenchorhynchus* Cobb, 1913 (Nematoda: Tylenchorhynchidae) from Kashmir, India. *Kmr*. *Sci*. 1971; 8(1):120-122.
8. Fotedar DN, Mahajan R. Four new species of the genus Helicotylenchus steiner 1945 (Nematoda: Hoplolaminae) from India. *Revista Parasitol*. 1974; 35:119-124.
9. Sasser JN, Freckman DW. A World perspective on Nematology: the role of the society In: Veech JA, Dickson DW (eds) vistas nematology: a commemoration of the 25 anniversary of the society of nematologists. Society of nematologists, Lakeland, FL. 1987; pp. 7-14.
10. Gerlach S. Development of marine nematode taxonomy up to 1979. Veroffentlichungen des Instituts fur Meeresforschung in Bremerhaven. 1980; 18:249-255.
11. Gaston KJ. The magnitude of global insect species richness. Conservation Biology. 1991; 5:283-296.
12. Hassan J. A report of Hirschmanniella sp. And Tylenchus sp. On rice in Kashmir with a control strategy. World Applied Sciences Journal. 2008; 5(5):546-548.
13. Hassan J. Effect of Hoeing and 5% Garlic (*Allium sativum*) solution on nematodes infesting *Brassica oleracea* crop. *The Ecotech*, *an.* International biannual Journal of Ecology and Environmental Science. 2009; 1(1):59-60.
14. Hassan J. Nematodes associated with *Zea mays* and their control through organic soil amendments. International journal of plant production. 2009; 3(4):73-78.
15. Hassan J. Seasonal nematode population density on maize and mustard. World Applied Sciences Journal. 2009; 6(6):734-736.
16. Jairajpuri MS, Ahmad W. Dorylaimida. Free-living, preda- ceous and plant-parasitic nematodes. Oxford & IBH Publishing, New Delhi, 1992.
17. Lambshead PJD. Recent developments in marine benthic biodiversity research. Oceanis. 1993; 19(6):5-24.
18. May R. How many species are there on earth? Science. 1988; 241:1441-1449.