

Nematodes associated with *Zea mays* and their control through organic soil amendments

J. Hassan^{*}, M.Z. Chishti, M. Rasheed, I. Ahmad, F. Ahmad,
B. A. Lone

Department of Zoology, University of Kashmir, Srinagar, India, 190006.
^{*}corresponding author; Email: javajdsj@gmail.com

Received 30 March 2009; Accepted after revision 3 August 2009; Published online 17 September 2009

Abstract

On a survey during the period of 2006-2007 a number of tylenchids were found associated with *Zea mays* in Kashmir valley such as *Pratylenchus sativus* kaul, 1985, *Aphelenchoides srinagensis* Kaul, 1985 and *Tylenchorhynchus zae* Sethi and G. Swarp, 1968. These species were found to have morphometric variations probably due to habitat alteration from the originally described ones. As a part of the programme it was to look for management of these nematodes through organic soil amendments such as Poultry manure, Pigeon manure and Saw dust. It was found that the population densities of nematodes were reduced by the organic amendment to a varied extent and Poultry manure caused greatest reduction of nematode populations.

Keywords: Pigeon manure and Saw dust; Poultry manure; Tylenchid; *Zea mays*

Introduction

Phytoparasitic Nematodes obtain nutrients for development and reproduction from cytoplasm of the living plant cells rendering them weak and causing enormous economic losses. They use a hollow, protrusible stylet to penetrate the wall of a plant cell, inject secretions into the cell and withdraw nutrients from the cytoplasm frequently causing cell death.

The work taken up in the present problem deals with the study of plant parasitic nematodes of *zea mays* in Kashmir valley and objectives supposed to be worked out were survey of nematodes occurring on the *zea mays* and their control strategies especially the application of organic amendments like Poultry manure, pigeon manure and Saw dust. For better management strategies the basic taxonomy as well as control measures is a need of the time. Alam¹ found that Saw dust significantly reduced the population of plant parasitic nematodes on carrot, radish, wheat, turnip and barley. Poultry manure is more effective compared to urea and super phosphate in controlling *Ditylenchus sp.* *Helicotylenchus indicus* and *Pratylenchus scribneri* and *Tylenchus mirus*⁴.

Materials and Methods

A field plot at a kandi area of District kupwara was chosen for carrying out the study. The plot was divided into micro plots each with an area of 1m². Pretreatment soil samples were taken from the rhizosphere of the maize for determining the initial population expressed as number/100ml of soil. Nematodes were isolated after two days by modified Baermann's funnel technique and later were fixed in 4% formalin. Slides were prepared from the specimens. Nematodes were identified and counted under stereomicroscope. In order to carry out another part of the programme, the experiment was conducted in a randomized complete block Design (RCBD) with three replication. The micro plots were treated with Poultry manure, Pigeon manure and Sawdust. These organic amendments were added at a rate of 800kg/ha to the soil. Untreated plots served as controls. Soon after the treatment the plots were watered for ensuring proper decomposition of the organic additives. Small seedlings of maize were transplanted. Final population of nematodes in treated and control micro plots was determined. The data was subjected to statistical analysis.

Results and Discussion

Pratylenchus sativus Kaul, 1985

Order: Tylenchida

Suborder: Tylenchina

Superfamily: Tylenchoidea

Family: Pratylenchidae

Subfamily: Pratylenchinae

Genus: *Pratylenchus*

Species: *sativus*

Female L=0.45-0.47 mm, a=25.2-25.7, b=3.9-4.51, c=21.01-22.0, v=83-84%,

Spear=16.09-18 μ

Body is tapering towards both the extremities, more abrupt posteriorly to blunt tail. Lateral field with four incisures. Head low, flattened anteriorly set off from the body contour by a distinct constriction and bear 2 labial annules. Labial framework well developed, buccal spear is also well developed, measuring 16.09-18 μ with anterior surfaces of basal knobs slightly slopping forwards. Procorpus is slightly longer than Isthmus. Median oesophageal bulb well developed, oval in outline, measuring 14 x 9 μ from the anterior end. Oesophageal glands overlap intestine ventrally as a long lobe, more than two widths long. Vagina extending to nearly half of body width. Vagina leads into muscular uterus which bears spherical spermatheca filed with sperms. Tail subcylindrical, 2.3-2.5 times as long as anal body diameter, with unstriated narrowly rounded terminus.

Males: Not found

Habitat: The specimens were collected in the soil around roots of maize crop.

Remarks: The species as is collected from *Zea mays* is a first time report of its occurrence on this host in this region of India as it was found by Kaul (1985) on *Eruca sativa*. The original dimensions vary to the present in values of V i.e., 83 per cent in the present specimens as compared to 81.38 per cent in the original description.

Aphelenchoides srinagensis Kaul, 1985

Order: Tylenchida

Suborder: Aphlenchina

Superfamily: Aphelenchoidea

Family: Aphelenchoididae

Subfamily: Aphlenchoidinae

Genus: *Aphelenchoides*

Species: *srinagensis*

Females L=0.42-0.45 mm, a=21.04-22.0, b=4.1-4.9, c=13-15.5, v=66.31-67.99%,

Spear=9-9.7 μ

Males L=0.32-0.35 mm, a=33.2-36.0, b=3.37-4.1, c=11.8-13.0, Spear=7.6-8.1 μ ,

Spicule=17-18.1 μ

Body posteriorly curved, slightly ventrally when relaxed by gentle heat. Cuticle with very fine transverse striations. Lateral field marked by three incisures. Head distinctly set off from body. Labial framework moderately sclerotized. Spear 9.0-9.7 microns long with a basal thickening carrying poorly defined knobs. Oesophagus comprises a narrow procorpus 26-28 μ long, and a prominent median bulb 10 x 9 microns in dimension. Narrow constriction marks junction of procorpus and median bulb. Isthmus is encircled by nerve ring at the posterior end. Excretory pore is also present near the level of the nerve ring. Oesophageal glands overlap intestine dorsally as a long lobe.

Vulva a transverse slit with its lips slightly protruded. Vagina 1/2 the body width long. Ovary single, long, out-stretched. Spermatheca elongated to rounded and filled with sperms. Oocytes arranged in a double row. Post- vulvar uterine branch, nearly two body widths long.

Habitat: The specimens were collected in the soil around roots of maize crop.

Remarks: The present dimensions and description is in absolute conformity with the original as provided by Kaul (1985) on *Brassica oleracea* var. *acephala* except for, species is recorded for the first time on *Zea mays* in the Kashmir valley and there is a variation in the stylet of females i.e., 9.7 μ in the present as compared to 8.9 in the original dimensions.

Tylenchorhynchus zae Sethi and G. Swarp, 1968

Order: Tylenchida

Suborder: Tylenchina

Superfamily: Tylenchoidea

Family: Belonolaimidae

Subfamily: Telotylenchinae

Genus: *Tylenchorhynchus*

Species: *zae*

Females L=0.54-0.66 mm, a=27-31, b=4.9-6, c=15-17, v=58-60%, Spear=17.1-20 μ

Males L=0.57-0.60 mm, a=29-35, b=5-5.6, c=16-20, Spear=18-20 μ

Body cylindrical, slightly ventral arcuate when relaxed by gentle heat. Lip region with four annules, continuous with body contour, labial framework slightly sclerotized. Body striations averaging 1.3 μ apart at mid body. Lateral field with four incisures. Stylet with anteriorly flattened knobs. Dorsal oesophageal opening 2-3 μ m behind spear base. Median oesophageal bulb well developed, excretory pore opposite level of anterior end of basal bulb. Hemizonoid prominent, two annules in length, just in front of excretory pore.

Habitat: Specimens were collected from around the roots of *Zea mays*.

Remarks: the value of c in females of the present specimens is 17 as compared to 20 in the original. The species is a first time record in the Kashmir valley and again it is first time report on maize in this region. It is earlier recorded on maize in other parts of India.

The organic amendments significantly affected the population density of the three nematodes species i.e. *Pratylenchus sativus* kaul³, 1985, *Aphelenchoides srinagrensis* Kaul³, 1985 and *Tylenchorhynchus zae* Sethi and G. Swarp⁶, 1968. The overall Nematode density also differed significantly. The population density of *Pratylenchus sativus* kaul, 1985 was reduced by the amendments in the order Poultry manure >Pigeon manure >Sawdust (Table 1). The amendments reduced the population size of *Aphelenchoides srinagrensis* Kaul, 1985 in the order Poultry manure >Pigeon manure >Sawdust. While that of *Tylenchorhynchus zae* Sethi and G. Swarp, 1968 was abated in the order Poultry manure =Pigeon manure >Sawdust.

As suggested by Barman and Das² good control of nematodes by organic amendments can be achieved but it requires large quantities in actual field conditions for effective management. It would therefore be advisable to evaluate a management scheduled to apply organic amendments in combination with a nematicides /herbicides⁵.

Table 1. Effects of treatments on the nematode density occurring on maize. Population mean values followed by standard errors.

Nematode species	Initial density	Control	Poultry manure	Pigeon manure	Sawdust
<i>Pratylenchus sativus</i> kaul, 1985	66.15±5.92	71.5±0.95	25.15±1.79	35.5±2.6	37±3.1
<i>Aphelenchoides srinagrensis</i> Kaul,1985	122.35±8.2	127.75±3	35.75±0.8	48.5±8.7	76.25±9.91
<i>Tylenchorhynchus zae</i> Sethi and G. Swarp, 1968	65.25±2.15	59±2.97	19.5±0.64	19.75±2.6	57.75±2.35

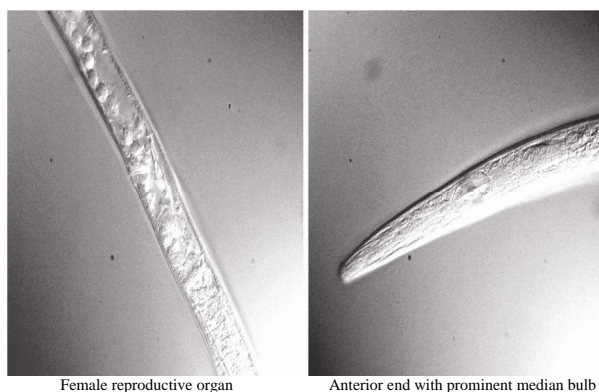


Figure1. *Aphelenchoides srinagrensis* Kaul, 1985.

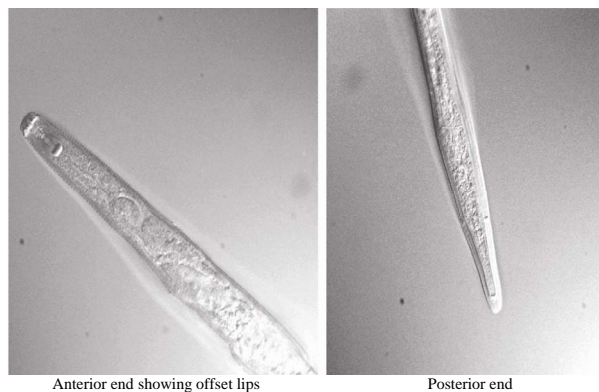


Figure 2. *Pratylenchus sativus* Kaul, 1985.

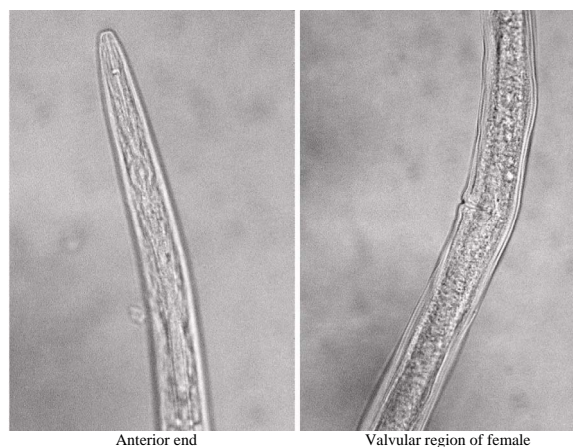


Figure 3. *Tylenchorhynchus zae* Sethi and G. Swarp, 1968.

References

- Alam, M.M., 1991. Effect of sawdust and ammonium sulphate on the population of plant parasitic nematodes and plant growth. Pak. J. Nematol., 9: 31-38.
- Barman, M., Das, P., 1996. Effect of chemical seed dressing and organic amendments alone and in combination for the management of root-knot nematode on green gram. Indian J. Nematol., 26: 72-76.
- Kaul, V., 1985. Studies on the plant parasitic nematodes of Kashmir. Ph.D thesis submitted to Department of Zoology, University of Kashmir, Srinagar.
- Khan, A., Rajput, T., Bilqees, F.M., 1986. Influence of some fertilizers on plant parasitic nematodes. Pakistan J. Zool., 18: 311-316.
- Khan, A., Shaukat, S.S., 1999. Interaction of organic amendments and a herbicide on population density of two nematode species and growth parameters of rice var. Lateefy, International J. Nematol., 9: 191-195.
- Sethi, C.L., Swarp, G., 1968. Plant parasitic Nematodes of Northwestern India. Nematologica, 14: 77-88. E.J. Brill, Leiden.