

# Host Range of *Psilenchus* de Man, 1921 among Mostly Grown Crops in Kashmir and its Respective Population Build-up

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## ABSTRACT

As a part of the project in 2019-2020, a general survey was conducted in all the ten districts of the Kashmir valley to investigate the occurrence of various plant parasitic nematodes on most commonly grown crops. *Psilenchus* spp. was isolated from *Solanum tuberosum*, *Brassica oleracea*, *Capsicum frustscens* and *Spinacia oleracea* with the varied population build-up. *Psilenchus* spp. was met with a varied occurrence parameters of 86.6 % of absolute frequency and 26% of relative prominence value on *Solanum tuberosum*. 76.6% of absolute frequency of this nematode was met on *Brassica oleracea* with 15.7% of relative prominence value. *Spinacia oleracea* was met with a varied occurrence parameters of 86.6 % of absolute frequency and 26% of relative prominence value of the *Psilenchus* spp. In all the samples of *Capsicum frustscens* screened the nematode was met with 100% absolute frequency making the crop comparatively one among highly vulnerable hosts.

**Key words:** *Brassica oleracea*, Kashmir, *Psilenchus*, *Solanum tuberosum*, Nematode.

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## INTRODUCTION

Nematode biodiversity is correlated to the soil health properties owing to their roles in ecosystem services.<sup>[1]</sup> Nematodes live in soil and water, are microscopic eel-like organisms<sup>[2]</sup> that play a role in the break down and release of nutrients from organic matter.<sup>[3]</sup> Nematode diversity tends to be greatest in ecosystems with least disturbance and bacterial-feeding nematodes make the greatest contribution to the decomposer food web in more intensively managed ecosystems.<sup>[4]</sup> The Tylenchida<sup>[5]</sup> are the largest and economically the most important group of plant parasitic nematodes. These are the most abundant multicellular organisms on earth. Unfortunately there are several species of nematodes that parasitize roots, stems or bulbs resulting in

significant yield reduction in mostly grown crops in the valley of Kashmir. Genus *Psilenchus* de Man, 1921, the parasite of interest in this paper measures 0.7-1.7 mm long, usually curved upon fixation. Lateral fields with four incisures. Amphidial apertures transverse, slit like at base of lateral lip area. Important surveys known so far on plant parasitic nematodes in India are in I.A.R.I.<sup>[6]</sup> farm on vegetable and fruit crops; on nematodes of citrus plants in 13 districts of Uttar Pradesh;<sup>[7]</sup> on the nematodes of onion;<sup>[8]</sup> on *Scutellonema mangiferae* from the soil around the roots of *Mangifera indica* from U.P.<sup>[9]</sup> The aim of this work of population analysis is to set the stage for the effective management of the parasite for the better yield in the valley.

## MATERIALS AND METHODS

During the summer of years 2019-2020, an intensive survey of plant parasitic nematodes affecting mostly grown crops was conducted in the Kashmir valley. A total of 100, each of soil and root samples were collected from the hosts from all the ten districts. Composite root and soil samples were drawn from plants individually

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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 Cobb's<sup>[10]</sup> 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 level by using standard monograph. The absolute frequency, absolute density and prominence value of the nematodes was calculated by using following formula.

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  $\sqrt{\text{absolute frequency}}$

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

In order to determine the population buildup of Tylenchida on the selected hosts, the set protocol was adopted by analysing soil samples through Cobb's sieving and decantation method and Baerman's funnel method. *Psilenchus* de Man, 1921 was encountered with varied population statistics on *Solanum tuberosum*, *Brassica oleracea*, *Capsicum frutescens* and *Spinacia oleracea*.

### Genus *Psilenchus* de Man, 1921

#### Diagnosis

Body 0.7-1.7 mm long, usually curved upon relaxation. Lateral fields each with four incisures, inner two may be indistinct or absent. Amphidial apertures transverse, slit-like, at base of lateral lip areas. Phasmids distinct, on tail, anterior to its middle. Cephalic region elevated, rounded or conoid, smooth or striated; framework slightly sclerotized, with conspicuous outer margins extending into body. Stylet cylindrical, 10-24  $\mu\text{m}$  long, conus distinctly shorter than shaft, basal knobs absent (Figure 2). Median bulb prominent, generally oval, usually behind middle of oesophagus. Basal bulb small, pyriform; cardia discoidal or rounded. Vulva near middle (V= 45-53), lacking epiptygma and lateral membranes. Ovaries paired, outstretched in opposite directions. Spermathecae elongate, axial. Tail elongate, with clavate or non-clavate rounded tip. Bursa prominent, adanal. Sperm round, moderately large. Spicules tylenchoid, 25-33  $\mu\text{m}$  long. Gubernaculum simple, trough-shaped, fixed (Figure 3).

Type species

*Psilenchus bilarulus* de Man, 1921

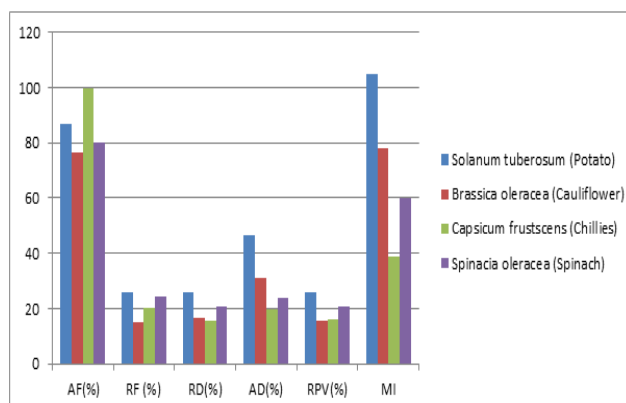
## DISCUSSION

The present study revealed that the Tylenchid genera buildup on *Solanum tuberosum* included *Psilenchus* spp. with its absolute frequency of 86.6%. Relative frequency of 26 % and relative density of 25.8 % was found on this host. RPV of 26% and mean intensity was met at 105.

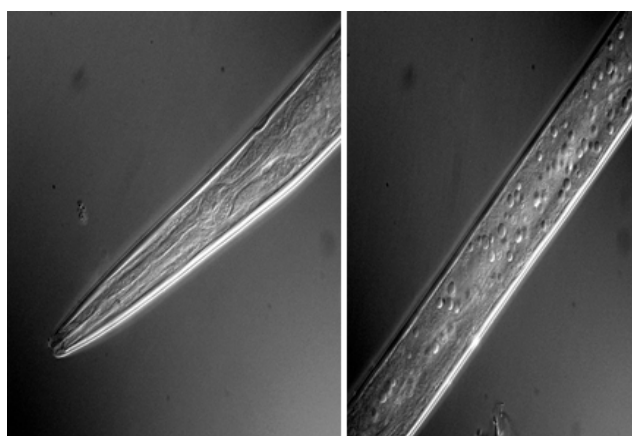
**Table 1: Analysis of *Psilenchus* spp. associated with the studied hosts.**

Host	AF(%)	RF (%)	RD(%)	AD(%)	RPV(%)	MI
<i>Solanum tuberosum</i> (Potato)	86.6	26	25.8	46.5	26	105
<i>Brassica oleracea</i> (Cauliflower)	76.6	14.8	16.6	31	15.7	78
<i>Capsicum frutescens</i> (Chillies)	100	20	15.7	19.5	16	39
<i>Spinacia oleracea</i> (Spinach)	80	24.4	20.9	24	20.5	60

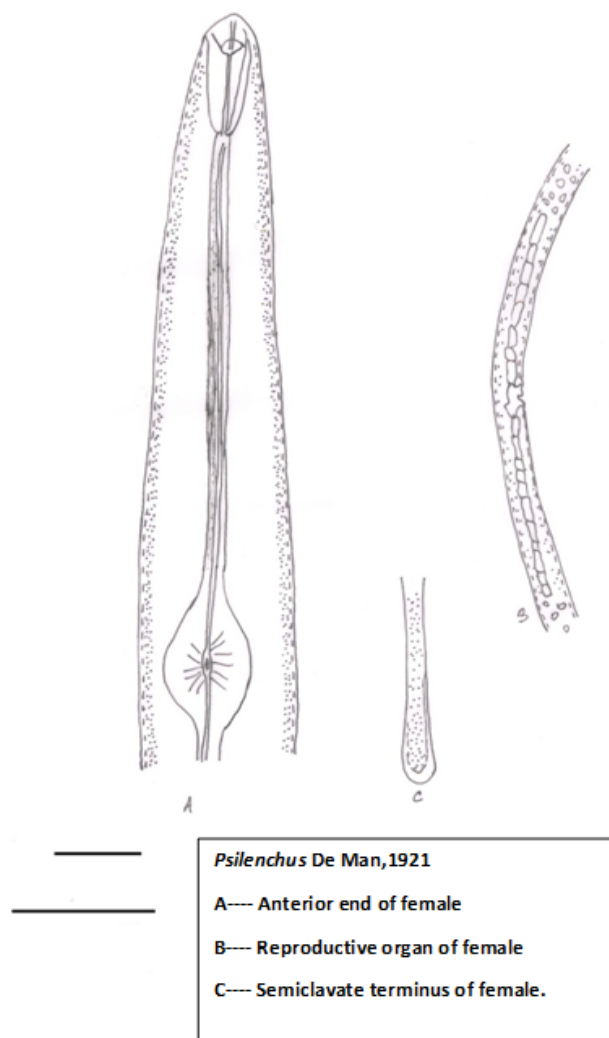
AF= Absolute frequency, RF= Relative frequency, RD= Relative Density, AD= Absolute density, RPV= Relative prominence value, MI= Mean Intensity.



**Figure 1: Graphical presentation of various ecological parameters of *Psilenchus* spp. on the respective hosts. AF= Absolute frequency, RF= Relative frequency, RD= Relative Density, AD= Absolute density, RPV= Relative prominence value, MI= Mean Intensity.**



**Figure 2: *Psilenchus* De Man, 1921.**



**Figure 3: Line Drawing of *Psilenchus***

On *Brassica oleracea* (Cauliflower) the absolute frequency of the nematode incidence was found to be 76.6 % (Table 1) (Figure 1) and the figure for *Capsicum frustscens* and *Spinacia oleracea* were respectively 100% and 80%. The lowest value of 15.7 % of the Relative prominence value was met on *Brassica oleracea* and its highest value of 26% was found on *Solanum tuberosum*. A general survey of plant parasitic nematodes associated with Sweet potato in Niger was carried out and its results validate the present variables.<sup>[11]</sup> The studied the biodiversity<sup>[12]</sup> of plant parasitic nematodes of Cashew Plantations in Tripura, India have listed the similar results. Plant parasitic nematodes associated with vegetables growing greenhouses in south eastern Anatolia region, Turkey were studied by Tan and Kilic depicting sort of similar results.<sup>[13]</sup> Results of some other noteworthy workers<sup>[14-16]</sup> conform well with the present results.

## CONCLUSION

The basic taxonomy is essentially the scientific basis to work out the management strategy especially in the valley of Kashmir where very little work has been carried out in this direction. *Psilenchus* spp. was redescribed herein with its Stylet cylindrical, 10-24  $\mu$ m long, conus was found distinctly shorter than shaft with the basal knobs absent. Median bulb was observed very prominent, generally oval, usually behind middle of oesophagus. The phytonematodes are parasites studied very less, largely because of their very small size and they are known to influence the crop production because of their high population densities on the crops. *Psilenchus* spp. which was isolated from *Solanum tuberosum*, *Brassica oleracea*, *Capsicum frustscens* and *Spinacia oleracea* with the varied population build-up was met with 86.6 % of absolute frequency and 26% of relative prominence value on *Solanum tuberosum*. 76.6% of absolute frequency

of this nematode was met on *Brassica oleracea* with 15.7% of relative prominence value. *Spinacia oleracea* was met with a varied occurrence parameters of 86.6 % of absolute frequency and 26% of relative prominence value of the *Psilenchus* spp. In all the samples of *Capsicum frutescens* screened the nematode was met with 100% absolute frequency making the crop comparatively one among highly vulnerable hosts.

## CONFLICT OF INTEREST

There is no conflict of interest in this research work.

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