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Population Dynamics of *Tylenchus arcuates*, Siddiqi, 1963 on some crops of Kashmir and its morphological redescription

Javaid Hassan, MA Ahangar
Department of Zoology, Sri Pratap College, Srinagar, Jammu and Kashmir, India

Abstract
On evaluating the density fluctuations of a wide spread phytonematode species *Tylenchus arcuates*, Siddiqi, 1963, it was found with varied statistical parameters on some commercially important crops in Kashmir valley. On *crocus sativus* the nematode was met with 86.6% of absolute frequency, 16.7% of relative prominence value and 87.6% of mean intensity. In contrast the respective figures met on chillies were 80%, 21% and 63%. The population was found to vary morphologically in the values of spear length and V.

Keywords: population analysis, *Tylenchus arcuates*, saffron, Kashmir, chillies

Introduction
Nematodes are considered the most abundant metazoan taxon, with estimates that 80% (Bongers 1988) [2] or 90% (Jairajpuri & Ahmad 1992) [13] 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) [16, 9]. Lambshead (1993) [15] 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) [8]. These figures are low in comparison with the estimated number of insect species described (about 80,000; Gaston 1991) [9]. *Tylenchus arcuates*, Siddiqi, 1963 [17], is supposed to be abundantly present on the common crops in this region of the world. In order to work out the impact and the population fluctuations of this parasite a survey was carried out in 2015-2016 and the populations collected were studied morphologically too to understand the variations.

Materials and Methods
During 2015-2016 a programmed survey of *Tylenchus arcuates*, Siddiqi, 1963 [17] affecting various vegetable crops was conducted in Kashmir valley. A total of 50 each of soil and root samples were collected from the Saffron and Chillies. 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.
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 Prominance Value (RPV)% = Prominance value of the Genus ÷ Sum of Prominance value of all nematode genera × 100 Mean Intensity = Number of individuals of a genus collected ÷ Number of infected hosts with that genus.

Results and Discussions
In order to determine the population buildup of *Tylenchus arcuates*, Siddiqi, 1963 [17] 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 already discussed under material and methods.
On examining the soil samples as well as root samples of *Crocus sativus Tylenchus arcuates*, Siddiqi, 1963 [17] was encountered with its absolute density of 37.9%, absolute frequency of 86.6%, relative frequency of 19.3%, relative density of 16.9%, relative prominence value of 16.7% and mean intensity of 87.6%. The present study revealed that the the nematode buildup on *Capsicum frustscens* (Chillies) was met with its absolute density of 27%, absolute frequency of

80%, relative frequency of 18%, relative density of 22%, relative prominence value of 21% and mean intensity of 63%.

Table 1: Community analysis of *Tylenchus arcuates*, Siddiqi, 1963 [17] associated with *Crocus sativus* (Saffron) and *Capsicum frustscens* (Chillies).

Host	AF (%)	RF (%)	RD (%)	AD (%)	RPV (%)	MI
Crocus sativus (Saffron)	86.6	19.3	16.9	37.9	16.7	87.6
Capsicum frustscens (Chillies)	80	18	22	27	21	63

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

***Tylenchus arcuatus* Siddiqi, 1963** [17]

Female: L = 0.54 – 0.67 mm, a = 26.3 – 45.1, b = 4.98 – 6.21, c = 3.9 – 5.81, spear = 10.3 – 14.1 µ, Maximum body width= 13.6 - 15.3 V = 63-65.11%, Tail= 105- 151, ABD= 8.2- 10.1

Male: L = 0.53-0.64 mm, a = 30-34.6, b= 6.4-7.1, c = 4.8-5.5, spear = 9.5- 15.1µ, Spicules = 15-18µ, Gubernaculum = 6-7.3µ., ABD= 6.8- 8.5, Bursa= 19.1- 22.4

Body is slender, gradually tapering porteriorly, but slightly ventrally when heat relaxed. Cuticle thin, annules 1-1.2µ wide at mid body. Lateral fields narrow, having four smooth incisures which disappear beyond the anal region.

Head hemispherical, not set off from the body; oral field plain, not convex; lips not marked off. 3-4 amalgmated annules on head. Labial frame work weakly sclerotized. Spear 10.3-14.1 µ long moderately developed, slender. Spear knobs small, rounded in females and 9.5-15.1 µ in males.

Procorpus slender, slightly smaller than isthmus in length; median oesophageal bulb oval, well developed. Isthmus more slender and slightly longer than procarpus enveloped by a nerve ring.

Male spear is slightly of lesser length, Bursa, Guberneculum and spicules measuring about 19.1- 22.4, 6- 7.3 and 15- 18µ.

Habitat and Locality

The specimens were collected in the soil around roots of *Crocus sativus* (Saffron) in the Pampore area.

Remarks

The present description and dimensions conform well with the original dimensions of *T. arcuatus* as provided by Siddiqi, 1963 [17] except for having higher values of spear length i.e. 15.1 µ as compared to 14 µ in the original in males and V in females i.e. 63 per cent as compared to 56.19 per cent. The occurrence of this parasite on *Crocus sativus* (Saffron) is a first time host record in Kashmir valley as it was met on *Brassica rapa* earlier.

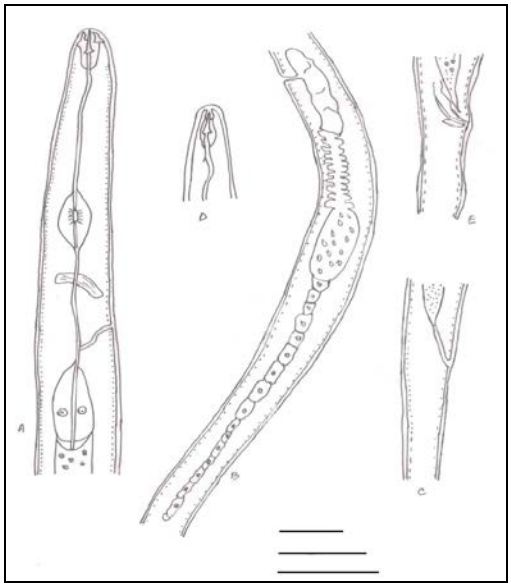
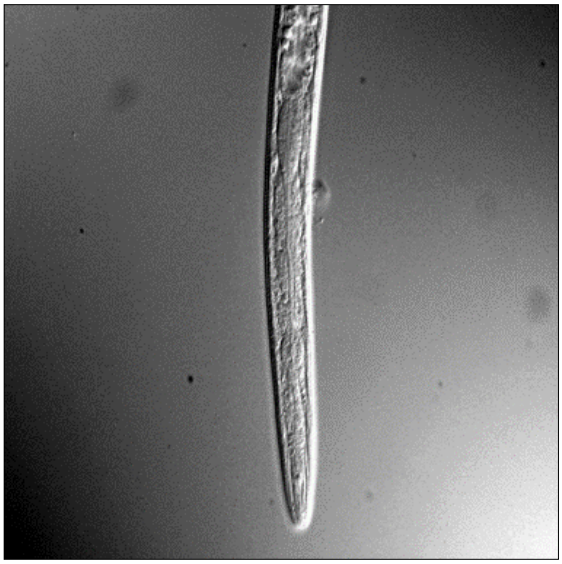
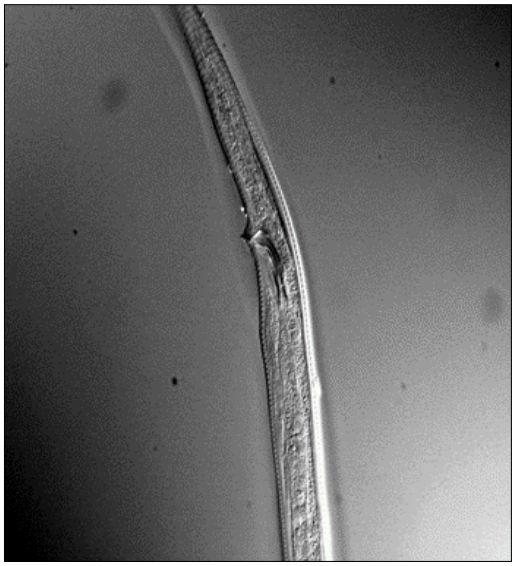


Fig 1: *Tylenchus arcuatus* Siddiqi,1963 [17], A-----female oesophageal region, B----Reproductive organ of female, C--- Female posterior end, D----Male anterior end, E -----Male posterior



Oesophageal region



Spicules and guberneculum

Fig 2: *Tylenchus arcuatus* Siddiqi, 1963 [17]

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