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Rashid Pervez
Principal Scientist, Division of Nematology, ICAR-Indian Agricultural Research Institute, New Delhi, India

Uma Rao
Division of Nematology, ICAR-Indian Agricultural Research Institute, New Delhi, India

Corresponding Author:
Rashid Pervez
Principal Scientist, Division of Nematology, ICAR-Indian Agricultural Research Institute, New Delhi, India

Diversity and community structure of the plant and soil nematodes associated with jamun (*Syzygium cumini* L.) rhizosphere from New Delhi, India

Rashid Pervez and Uma Rao

Abstract
Jamun (*Syzygium cumini* L.) is one of the most important medicinal tree, belong to family Myrtaceae and native to the Indian subcontinent. Very little information is available on the diversity and community structure of plant and soil nematodes associated with the rhizosphere of jamun trees. Hence, present study was undertaken to determine the present status of diversity and community profile of nematodes associated with jamun. Total seventeen nematode genera have been encountered during present study. Among them, seven belong to plant feeder, five belong to predaceous nematodes and five belong to microbivorus nematodes were encountered. Community analysis data revealed that *T. mashhoodi* in plant feeder, *Mesodorylaimus* sp. in predaceous and *Rhabditis* sp. in microbivorus was most frequent, abundant and prominent nematodes in the community. Such efforts to document that nematode assemblages associated with wild, uncultivated perineal trees help to monitor the diversity of plant and soil nematodes and assist in assessing any unforeseen damage.

Keywords: Jamun, *Syzygium cumini*, nematodes, diversity, community analysis

Introduction
Jamun (*Syzygium cumini* L.) is an evergreen tropical flowering tree, belong to family Myrtaceae, native to the Indian subcontinent and adjoining regions of Southeast Asia like Bangladesh, Pakistan, Nepal, Sri Lanka, Malaysia, Philippines, and Indonesia. Jamun fruit is a mixture of sweet, slightly sub acid spicy flavor that stands out even after eaten since it turns the tongue into purple color. The fruit is universally accepted to be very good for medicinal purposes, especially diabetics. The seed is also used in various alternative healing systems like ayurveda, unani and Chinese medicine for digestive ailments. The leaves and bark are used for controlling blood pressure and gingivitis. In addition to these, wine and vinegar are also made from the fruit.
Study on nematode community is essential to evaluate the role of nematodes with the soil ecosystem [1, 2]. Meaningful explanations of the equivalent relationships between plant feeder, predaceous and microbivorus nematodes may be made using techniques indicating relative diversity, relative frequency, relative density etc [3, 4]. Very little information is available on the diversity and community structure of plant and soil nematodes associated with the rhizosphere of jamun trees. Hence, present study was undertaken to determine the present status of diversity and community profile of nematodes associated with jamun trees from ICAR-Indian Agricultural Research Institute, New Delhi campus.

Materials and Methods
Soil samples collection site
Soil samples were collected from rhizosphere of jamun from different locations of ICAR-Indian Agricultural Research Institute, New Delhi campus during September and October 2019. Within collection sites, 20 soil samples were collected at a depth of 10-20 cm using a hand trowel, each sample containing a composite from 3-5 random subsamples. These samples were mixed to make a composite sample and from this 100 cc of soil were taken for further processing. The hand trowel was sterilized with 70% ethanol before leaving the sampling site. Samples were placed in polyethylene bags to minimize dehydration, tag a label providing all necessary information and transported in to the laboratory.

Isolation of nematodes from soil

Soil samples were processed for nematode extraction by Cobb's sieving and decanting method [5].

Identification of nematodes

Nematodes were fixed and processed to dehydration as per the method described [6] and prepared slides for identification. Identification up to generic level was done using taxonomic key as described [7, 8, 9, 10, 11].

Counting of nematodes

Nematodes were collected and fixed in hot TAF (Triethelene Amine Formaline) and stored for population analysis. The population of nematodes in each sample was counted five times with the help of Syracuse counting dish under the stereoscopic zoom microscope and mean value was worked out.

Community analysis

Community analysis was made by determining parameters *viz.*, absolute frequency, density and prominence value as described [3, 12].

Results and Discussion

Diversity of plant and soil nematodes

Total seventeen nematode genera have been encountered during present study. Among them, seven belong to plant feeder *viz.*, *Rotylenchulus reniformis*, *Helicotylenchus indicus*, *Hoplolaimus indicus*, *Tylenchorhynchus mashhoodi*, *Paralongidorus* sp., *Hemicriconemoides* sp. and *Basiria* sp.; five belong to predaceous nematodes *viz.*, *Discolaimus* sp., *Microdorylaimus* sp., *Discolaimoides* sp., *Mesodorylaimus* sp. and *Paractinolaimus* sp.; five to microbivorus nematodes *viz.*, *Cephalobus* sp., *Mesorhabditis* sp., *Panagrolaimus* sp., *Rhabditis* sp. and *Acrobeles* sp. (Table 1).

Table 1: Plant and soil nematodes associated with Jamun

Trophic group		Nematodes	
A.	Plant feeder Nematodes	1.	*Rotylenchulus reniformis* (Linford & Oliveira, 1940)
		2.	*Helicotylenchus indicus* (Siddiqi, 1963) [9]
		3.	*Hoplolaimus indicus* (Sher, 1963)
		4.	*Tylenchorhynchus mashhoodi* (Siddiqi and Basir, 1959) [9]
		5.	*Paralongidorus* sp. (Siddiqi, 1959) [9]
		6.	*Hemicriconemoides* sp. (Chitwood & Birchfield, 1957 *Bakernema* Wu, 1964)
		7.	*Basiria* sp. (Siddiqi, 1959) [9]
B.	Predaceous Nematodes	8.	*Discolaimus* sp. (Cobb, 1913) [5]
		9.	*Microdorylaimus* sp. (Andrassy, 1986)
		10.	*Discolaimoides* sp. (Heyns, 1963)
		11.	*Mesodorylaimus* sp. (Butschli, 1873) Andrassy, 1959
		12.	*Paractinolaimus* sp. (Meyl, 1957)
C.	Microviborus Nematodes	13.	*Cephalobus* sp. (Bastian, 1865) [15]
		14.	*Mesorhabditis* sp. (Osche, 1952)
		15.	*Panagrolaimus* sp. (Fuschs, 1930)
		16.	*Rhabditis* sp. (Dujardin, 1845)
		17.	*Acrobeles* sp. (von Linstow, 1877)

Community analysis of plant and soil nematodes

Frequency

The number of plant and soil nematodes occurs in the soil samples were varying species to species of nematodes. Results shows that plant feeder nematodes, *T. mashhoodi* was the most frequent (AF – 60%), followed by *Helicotylenchus indicus* (AF- 45%), while, *Paralongidorus* sp. was less frequent (AF- 15%). In case of the predaceous nematodes, *Mesodorylaimus* sp. was more frequent (AF- 35%) followed by *Discolaimoides* sp. (AF- 30%), whereas *Paractinolaimus* sp. was less frequent (AF- 10%). Among the microbivorus nematodes, *Rhabditis* sp. was more frequent (AF- 70%), followed by *Acrobeles* sp. (AF- 60%), whereas *Panagrolaimus* sp. (AF- 40%) was less frequent nematode in the community (Fig. 1).

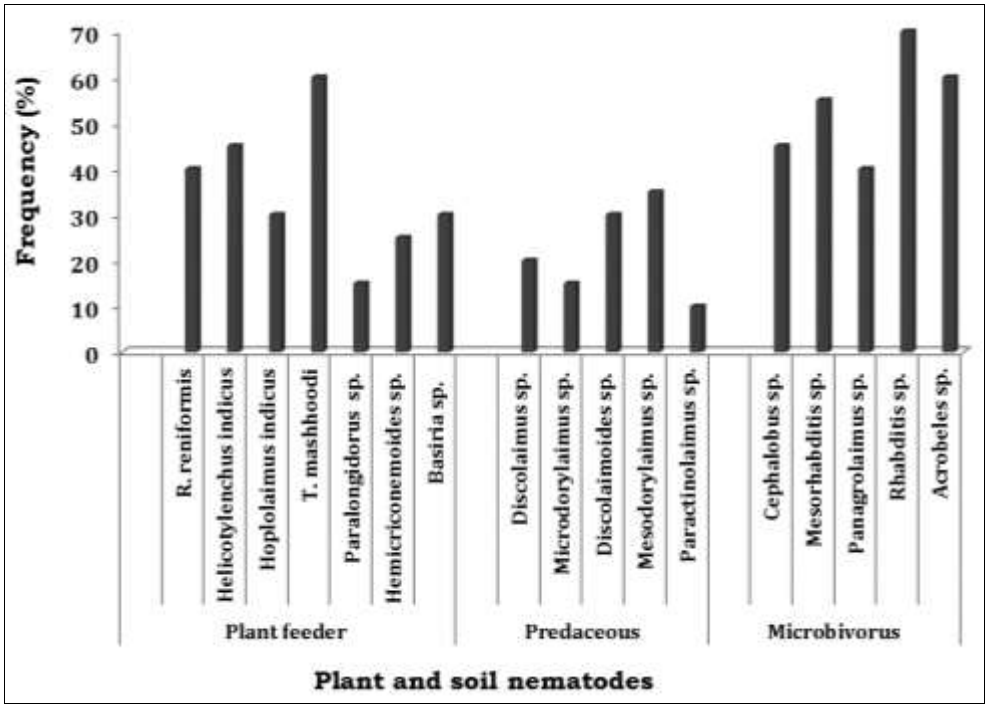

Fig 1: Absolute frequency of plant and soil nematodes associated with Jamun

Density

The densities of plant and soil nematodes per soil sample were varying species to species of nematodes. Results shows that plant feeder nematodes, *T. mashhoodi* was the most abundant (D – 7.12), followed by *Basiria* sp. (D – 5.65), while, *Paralongidorus* sp. was less abundant (D – 0.63). In case of the predaceous nematodes, *Mesodorylaimus* sp. and *Discolaimoides* sp. were more abundant (D – 1.15 and 1.05, respectively) followed by *Microdorylaimus* sp. (D – 0.91), whereas *Paractinolaimus* sp. was less abundant (D – 0.42). Among the microbivorus nematodes, *Rhabditis* sp. was more abundant (D-8.65), followed by *Mesorhabditis* sp. (D – 5.72), whereas *Panagrolaimus* sp. (D – 2.91) was less abundant nematode in the community (Fig. 2).

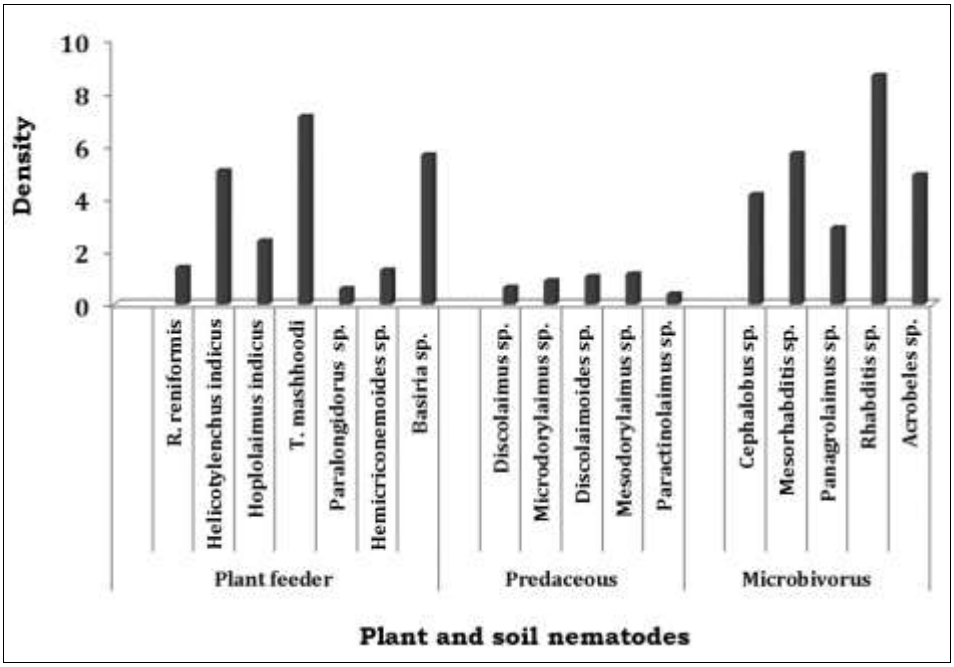

Fig 2: Density of plant and soil nematodes associated with Jamun

Prominence value

The plant and soil nematodes being prominent in the community based on the frequency and density of nematodes. Results shows that plant feeder nematodes, *T. mashhoodi* was the most prominent (PV– 54.99), followed by *Helicotylenchus indicus* (PV–33.87), while, *Paralongidorus* sp. was less prominent (PV–2.32). In case of the predaceous nematodes, *Mesodorylaimus* sp. was more prominent (PV–6.80) followed by *Discolaimoides* sp. (PV–4.69), whereas *Paractinolaimus* sp. was less prominent (PV–1.26). Among the microbivorus nematodes, *Rhabditis* sp. was more prominent (PV–72.37), followed by *Mesorhabditis* sp. (PV–42.27), whereas *Panagrolaimus* sp. (PV–18.34) was less prominent nematode in the comunity (Fig. 3).

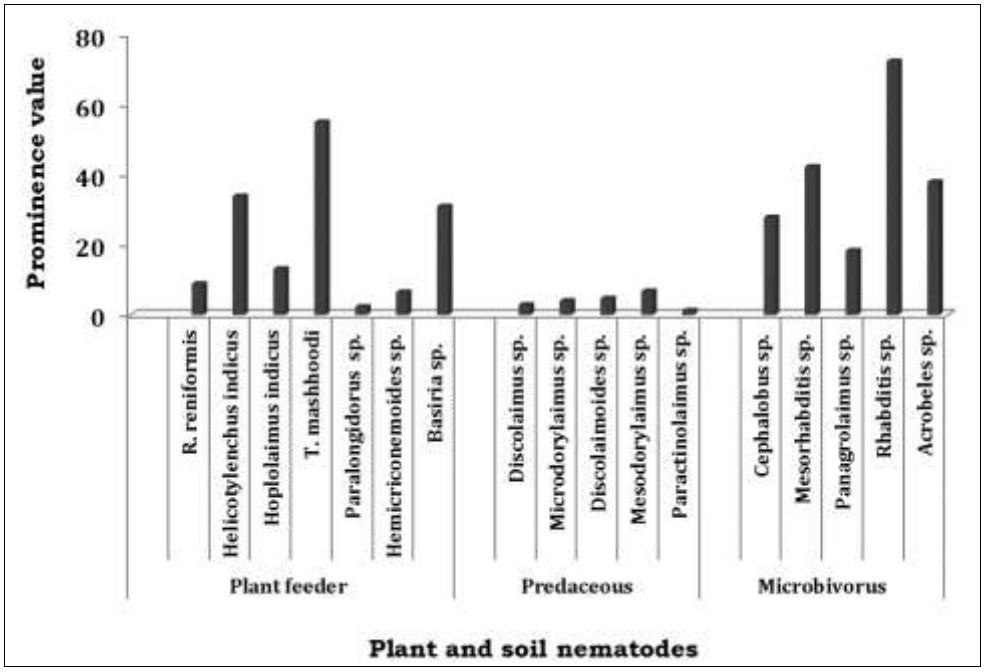

Fig 3: Prominence value of plant and soil nematodes associated with Jamun

Diversity among the soil nematodes could not be compared due to lack of information but it may be assumed that diversity vary considerably with habitat, area and the number of individual [13, 14]. Predatory nematode species form an important component of nematode community of soil ecosystem. There is a need to assess various ecological parameters governing population structure to explore their possibility in plant parasitic nematode management [15,16]. The information generated from present study may use for the management point of view in the area.

Conclusion

It is concluded that, *T. mashhoodi* in plant feeder, *Mesodorylaimus* sp. in predaceous and *Rhabditis* sp. in microbivorus was most frequent, abundant and prominent nematodes in the community. Such efforts to document that nematode assemblages associated with wild, uncultivated perineal trees help to monitor the diversity of plant and soil nematodes and assist in assessing any unforeseen damage.

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