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A preliminary report of *Mononchus tunbridgensis* Bastin, 1865 (Nematoda: Mononchidae) associated with grape orchids

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Abstract

This study presents a preliminary report on the occurrence of *Mononchus tunbridgensis* Bastin, 1865, a member of the Nematoda: Mononchidae family. In this study, soil samples were collected from a grape orchard in Jammu and Kashmir, India, and nematodes were isolated and identified using morphological and anatomical analyses. The study confirms the presence of *Mononchus tunbridgensis* in the grape orchard environment. This finding expands our understanding of the distribution and habitat preferences of this species, shedding light on its ecological significance in agricultural ecosystems.

Key words : *Mononchus,* Nematode, Grape orchids, report, J&K, India.

Plant parasitic nematodes are minuscule organisms that pose a significant threat to global agriculture by inflicting extensive damage on crops[23]. These nematodes, originating from various genera, target the roots of a broad spectrum of crops, resulting in diminished nutrient absorption, inhibited growth, and ultimately, decreased yields[20]. Recent studies, such as those conducted by Siddique *et al.,*[26] have elucidated the intricate interactions between plant hosts and nematodes, providing insights into the molecular mechanisms underlying nematode parasitism. The management strategies for nematodes are continuously evolving, incorporating advances in breeding for resistance, the development of resistant crop varieties, and the exploration of environmentally sustainable control methods, as exemplified by the research findings of Phani *et al.*[24]. Criconematidae, a family of plant-parasitic nematodes, encompasses several species renowned for their detrimental effects on agricultural crops[25]. These minute roundworms are commonly known as ring nematodes due to the distinct rings or constrictions present in their cuticle[10].

The understanding of Mononchid taxonomy grew increasingly intricate with the discovery of numerous new genera. Consequently, higher taxonomic classifications were proposed

to accommodate these related genera. Jairajpuri made significant contributions to the systematic study of Mononchs nematodes. He meticulously described Indian species across various genera such as *Mononchus*, *Clarkus*, *Hadronchus*, *Sporonchulus*, *Miconchus*, and *Iotonchus*[13, 14,15,16]. Jairajpuri also elevated Mononchs to an independent ordinal rank, distinct from *Dorylaimida*, and in 1971, recognized two suborders: *Mononchina* and *Bathyodontina*, each with its own superfamilies[11]. This reclassification was pivotal in clarifying the taxonomy of Mononchs, separating them from their previous classification within *Dorylaimida*. Jairajpuri's work not only unveiled numerous genera and species of Mononchs from India but also elucidated their systematic classification[18]. His efforts led to Mononchida being accepted as a separate order by the majority of researchers. Further advancements in the classification were made by Thorne[29] and Andrassy[4], who recognized additional suborders and families within Mononchida. Subsequent studies by various researchers continued to expand the taxonomy of Mononchs, describing new genera and species from diverse geographical regions[1,4,5,9,17,18,21,27]. The taxonomic revisions proposed by Jairajpuri and Khan in 1982 provided a comprehensive overview of the morphology and systematics of Mononchs, including keys for identifying higher taxa and species[18]. Despite the significant progress in understanding Mononchid taxonomy, research on this group has been relatively limited compared to parasitic nematodes. Hussain[12] reported 19 species of the suborder Mononchina from samples collected in Jammu and Kashmir State, providing detailed descriptions of both new and known species. Ali *et al.,*[3] documented the presence of *Mononchus tunbridgensis* Bastian, 1865 in the Marathwada region of India, specifically in the vicinity of *Saccharum officinarum* roots.

As a part of the nematode diversity assessment in Jammu and Kashmir, soil samples were collected from Pounichak in District Jammu, located at coordinates 32°44'02"N 74°47'18"E, at an altitude of 307 m (1007.22 ft.) (Figure 1). The collection was made in September 2023 from an agricultural land with grapevines, at depths ranging from 0 to 15 cm and 10 to 20 cm. In order to inhibit evaporation, the samples were meticulously preserved in polythene bags that were tightly fastened with rubber bands. The Baerman funnel technique and decanting method was used for nematode isolation during the processing of soil samples[21]. Using the Baerman funnel method, the turbid solution was delicately agitated manually to disintegrate clumps. The solution was further filtered using a coarse sieve to remove any unwanted particles, and then passed through a 300-micron mesh sieve to specifically catch root nematodes by Cobb's sieving and decanting method (Cobb)[6] and Baermann funnel technique[28]. The decantation technique involves the amalgamation of soil and water, followed by the process of sedimentation, and finally, the separation of the water by pouring it out. The mud suspension was deposited onto a petri dish containing a small quantity of water, thereby exposing nematodes suspended or attached to the surface of the dish. Individual live nematodes were selected using a size 0 brush. The nematodes were exterminated by immersing them in test tubes containing a solution of 70 percent alcohol. They were then kept undisturbed for a duration of 24 hours prior to

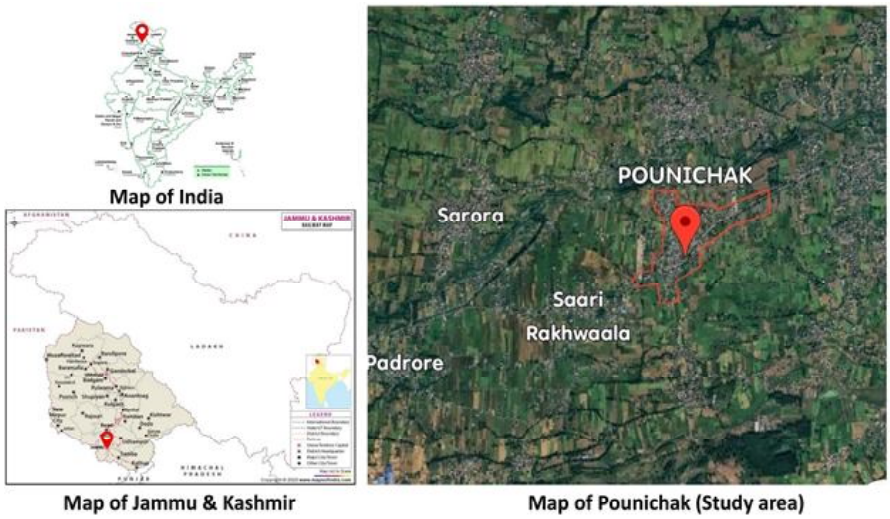

Figure 1. Map of the study area.

further handling. Lactophenol was used for the purpose of conducting morphological and anatomical analysis, namely during the process of cleaning and mounting. Accurate categorization of nematodes was achieved by the use of morphological and image-based analysis. For the identification of nematodes, temporary slides were made and studied under Olympus BX51 compound microscope and identification was confirmed with the help of available literature[2,7,8,17,22,30].

Species account :

Phylum: Nematoda
Class: Secernentea
Order: Mononchida Jairajpuri, 1969
Superfamily: Mononchoidea Filipjev, 1934
Family: Mononchidae Filipjev, 1934
Subfamily: Mononchinae Filipjev, 1934
Genus: *Mononchus* Bastian, 1865
Species: *M. tunbridgensis* Bastian, 1865

Species examined :

1 ♀, INDIA, Jammu and Kashmir, District Jammu, Tehsil Jammu, 32°44'02"N 74°47'18"E, 307m, 10.09.2023, Jatinder Singh, Voucher specimen (DOZ-J&K-20).

Species description :

The female *Mononchus tunbridgensis* is characterized by its slender and elongated body (5.20 mm) (Figure 2). The cuticle is smooth and transparent, allowing for easy observation of internal structures. The anterior end is pointed, housing the sensory structures and the mouth opening, which is surrounded by lips and denticles for feeding. The buccal cavity may vary in size and shape depending on the food preferences of the individual nematode. Moving posteriorly along the body, the esophagus extends into a distinct pharynx, which serves as a muscular pump for ingesting food particles. Behind the pharynx, the intestine

traverses the length of the body, branching into smaller intestinal canals that aid in digestion and nutrient absorption. The reproductive system of the female *Mononchus tunbridgensis* consists of a single, well-developed ovary containing developing oocytes, leading into a long and straight oviduct. The oviduct terminates in a vulva located at approximately the mid-body region, through which eggs are expelled during oviposition. Externally, the female nematode may exhibit a slightly swollen region around the mid-body, indicating the presence of developing eggs within the reproductive tract. However, this characteristic may vary depending on the reproductive status of the individual. The posterior end of the female *Mononchus tunbridgensis* tapers to a blunt tip, lacking any specialized structures or appendages.

Host plants :

Mononchus tunbridgensis is a species of predatory nematode, commonly known as a "stilt nematode." These nematodes primarily feed on other microscopic organisms such as bacteria, fungi, and smaller nematodes rather than plants. Therefore, they do not have specific host plants in the same way that plant-parasitic nematodes do. Instead, they inhabit soil and leaf litter environments where they can find suitable prey organisms[30]. Their presence can sometimes be beneficial in controlling populations of harmful organisms in soil ecosystems. In this study, we have collected this species from grape orchids. While the species primarily feeds on microorganisms like bacteria, fungi, and smaller nematodes, it is not uncommon to find them in various environments, including grape orchards[20]. In vineyard soils, they might feed on the microorganisms present in the soil, or they may occasionally encounter small plant roots or other organic matter associated with grape vines. However, they are not considered plant parasites, so their presence in grape orchards is more likely due to the availability of suitable habitat and prey rather than a direct interaction with grape plants themselves.

Figure 2. Mononchus tunbridgensis (female).

Mononchus tunbridgensis, a member of the Mononchidae family, is a predatory nematode with a wide distribution. While previous research has predominantly focused on plant-parasitic nematodes, there is increasing interest in understanding the ecology and biology of predatory nematodes like *Mononchus tunbridgensis*. Our study confirms the presence of this species in a grape orchard environment, indicating its potential role in regulating populations of microorganisms within the soil ecosystem. Although *Mononchus tunbridgensis* primarily feeds on bacteria, fungi, and smaller nematodes, its presence in grape orchards suggests a dynamic interaction with the surrounding environment. The discovery of Mononchus tunbridgensis in grape orchids adds to our knowledge of nematode diversity and distribution in agricultural settings. Further research is needed to elucidate the ecological interactions between *Mononchus tunbridgensis* and other organisms within the grape orchard ecosystem. Understanding the factors influencing the abundance and distribution of predatory nematodes like *Mononchus tunbridgensis* can inform sustainable agricultural practices aimed at promoting beneficial soil fauna while minimizing the impact of plant-parasitic nematodes. This study provides a preliminary insight into the occurrence of *Mononchus tunbridgensis* in grape orchids, highlighting the importance of considering predatory nematodes in soil ecology research and agricultural management strategies. Future studies should focus on elucidating the ecological roles and interactions of *Mononchus tunbridgensis* in diverse agricultural ecosystems to develop effective strategies for nematode management and soil health maintenance.

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