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Plant parasitic nematodes associated with tuberose growing areas of Kamrup, Morigaon and Jorhat district of Assam

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Abstract
A roving survey was conducted in Kamrup, Morigaon and Jorhat district of Assam during the year 2018-20 in order to determine the most important plant parasitic nematodes species associated with tuberose. The analysis of soil and root revealed the presence of seven different genera of plant parasitic nematodes *viz*., *Meloidogyne incognita*, *Helicotylenchus* spp., *Hoplolaimus* spp., *Tylenchorhynchus* spp., *Pratylenchus* spp., *Rotylenchulus reniformis* and criconematids. The present investigation revealed that *M. incognita* is one of the serious limiting factors in commercial cultivation of tuberose in Assam.

Keywords: Plant parasitic nematodes, survey, tuberose, root-knot nematode, *Meloidogyne incognita*, Assam

Introduction
Tuberose is one of the most popular bulbous ornamental crops. It is perennial in nature and belongs to the Amaryllidaceae family. Tuberose is widely used both as loose and cut flowers. In India commercial cultivation of tuberose is mostly confined to West Bengal, Tamil Nadu, Karnataka, Maharashtra, Chhattisgarh and Assam. In Assam; tuberose cultivation is mostly popular in Kamrup, Morigaon and Jorhat district. The total tuberose production in Assam is about 5.50 tonnes (Anon., 2015-16) [1]. Tuberose is infested by a number of plant parasitic nematodes. Among the plant parasitic nematodes, mostly three nematodes are found to be pathogenic to this crop *viz*., root-knot nematode (*Meloidogyne* spp.), reniform nematode (*Rotylenchulus reniformis*) and foliar nematode (*Aphelenchoides besseyi*) (Singh, 2006) [11]. To meet the increasing demand of cut flowers, tuberose cultivation has become a very popular option among the flower growers of Assam, but no work has been carried out to establish the distribution and abundance of various plant parasitic nematodes associated tuberose fields of Assam.

Materials and Methods
A roving survey was carried out during 2018-20 in different tuberose growing fields of Kamrup, Morigaon and Jorhat district of Assam to study the occurrence and distribution of plant parasitic nematodes associated with tuberose. Soil samples were collected randomly from the rhizosphere of tuberose plant and stored in polythene bag with proper label in the laboratory for processing. Root samples of tuberose were collected from root-knot nematode infested field. All the relevant information was recorded at the time of collection of samples. The extraction of nematode from soil samples were done by modified Cobb's sieving and decanting technique (Christie and Perry, 1951) [3]. The killing and fixing of nematode was done in 8% hot formalin.

Staining of roots
For staining of nematodes in plant tissue, acid fuchsin in lactophenol method was followed (Bybd *et al*., 1983) [2]. Root-knot nematode infested roots were washed to free from soil and other adhering debris and were cut into small pieces with the help of a scissor. Cut roots were then wrapped with muslin cloth and tied with a twine thread. The muslin cloth was then plunged into boiling lactophenol containing 0.05-0.1 percent acid fuchsin stain and boiled for 2-5 minutes. The stained materials were then taken out and again washed out to remove excess stain in running tap water and the materials were placed on petridish containing pure lactophenol. The roots were allowed to differentiate for overnight.

Stained roots were then observed under stereoscopic binocular microscope.

Preparation of perineal pattern

The stained plant tissues were teased out under a stereoscopic binocular microscope and adult females of root-knot nematode were collected. The posterior part of the adult female was cut off and cleaned the perineal area in a drop of glycerine with the help of a brush, and the section was mounted in lacto phenol and examined to ascertain the actual identification of the nematode.

Results and Discussion

In the present investigation, total 92 samples were collected from the rhizosphere of tuberose plant from different fields of Kamrup, Morigaon and Jorhat district of Assam. Seven genera of plant parasitic nematodes were recorded from the rhizosphere of different tuberose growing fields of the three districts. The nematode genera recorded from Jorhat district were *viz*., *Meloidogyne incognita*, *Helicotylenchus* spp., *Hoplolaimus* spp., *Tylenchorhynchus* spp., *Pratylenchus* spp., *Rotylenchulus reniformis* and criconematids. The nematode genera recorded from Morigaon district were *viz*., *M. incognita*, *Helicotylenchus* spp., *Hoplolaimus* spp., *Tylenchorhynchus* spp. and criconematids. The nematode genera recorded from Kamrup district were *viz*., *M. incognita*, *Helicotylenchus* spp., *Hoplolaimus* spp., *Tylenchorhynchus* spp., *Pratylenchus* spp., *Rotylenchulus reniformis* and criconematids. Root-knot nematode infested root samples were collected from all the surveyed localities and perineal pattern study was done. The perineal pattern study (Plate 1) confirms the species of root-knot nematode as *Meloidogyne incognita*. The nematode population and their frequency of occurrence are presented in Table 1 to 3.

The maximum population of *M. incognita* (120.40) was recorded from Sesa of Kamrup district whereas; minimum population (11.42) was recorded from Bhatemora of Jorhat district. Similarly, the spiral nematode, *Helicotylenchus* spp. with maximum population of 175 was recorded from Amalighat of Morigaon and minimum population of 28.33 was recorded from Kulhati of Kamrup district. Further, the lance nematode, with maximum population of 20.14 was recorded from Lality chapori of Jorhat district and the minimum population of 7.20 was recorded from Sesa of Kamrup district.

The highest population of stunt nematode, *Tylenchorhynchus* spp. was recorded from Lality chapori of Jorhat (63.42) and minimum (14) was recorded from Bongora of Kamrup district. Similarly, the lesion nematode, *Pratylenchus* spp. with maximum population of 112.14 was recorded from Bhatemora of Jorhat while minimum population (10.26) was recorded from Kahikuchi of Kamrup district. The highest population of reniform nematode, *R. reniformis* was recorded from Sesa (64.45) and minimum was recorded from Bongora (12.42) of Kamrup district. Maximum population of criconematids were recorded from AAU Orchard of Jorhat district (27.33) and minimum population (5.66) was recorded from Kulhati of Kamrup district.

The highest frequency of occurrence (100%) for *Meloidogyne incognita* were recorded from Na-chungi of Jorhat district, Amalighat of Morigaon district, Santola, Sesa and Kulhati of Kamrup district while the minimum frequency of occurrence (28.57%) was recorded from Bhatemora of Jorhat district. The highest frequency of occurrence (100%) for *Helicotylenchus* spp. were recorded from AAU Orchard, Lality chapori of Jorhat district, Kalbari and Neli of Morigaon district and Kahikuchi, Kulhati and Hingimari of Kamrup district while the minimum frequency of occurrence (42.85%) was recorded from Bhatemora of Jorhat district. The highest frequency of occurrence (42.85%) for *Hoplolaimus* spp. was recorded from Lality chapori of Jorhat district while the minimum frequency of occurrence (25%) was recorded from Sesa of Kamrup district. The highest frequency of occurrence (83.33%) for *Tylenchorhynchus* spp. was recorded from Potia gaon of Jorhat while minimum frequency of occurrence (42.85%) was recorded from Bongora of Kamrup district. Bhatemora of Jorhat district was recorded with highest frequency of occurrence (100%) for *Pratylenchus* spp. while Kahikuchi of Kamrup district was recorded with minimum frequency of occurrence 33.33%. Similarly, the highest frequency of occurrence (87.50%) for *Rotylenchulus reniformis* was recorded from Sesa of Kamrup district while minimum frequency of occurrence (28.57) was recorded from Bongora of Kamrup district. Further, the highest frequency of occurrence (60%) for criconematids was recorded from Na-chungi of Jorhat district while minimum frequency of occurrence (20%) was recorded from Borbheta of Jorhat district.

The highest frequency of occurrence (100%) of *M. incognita* was recorded from Na-chungi of Jorhat district, Amalighat of Morigaon district, Santola, Sesa and Kulhati of Kamrup district. Root-knot nematode infested fields showed stunted growth of the plant, yellowing of the leaves and reduced flowering. *Helicotylenchus* spp. was reported from almost all the surveyed localities. The highest frequency of occurrence (100%) of *Helicotylenchus* spp. was recorded from AAU Orchard, Lality Chapori of Jorhat district, Kalbari and Neli of Morigaon district and Kahikuchi, Kulhati, Hingimari of Kamrup district. The highest frequency of occurrence of *Hoplolaimus* spp. was recorded from Lality chapori (42.85%) of Jorhat district, Kalbari (40%) of Morigaon district, Kulhati (33.33%) of Kamrup district. The highest frequency of occurrence of *Tylenchorhynchus* spp. was recorded from Potia gaon (83.33%) of Jorhat district, Kalbari (60%) of Morigaon district and Hingimari (66.66%) of Kamrup district. The highest frequency of occurrence of *Pratylenchus* spp. was recorded from Bhatemora (100%) of Jorhat district and Santola (66.66%) of Kamrup district.

The highest frequency of occurrence of *Rotylenchulus reniformis* was recorded from Potia gaon (50%) of Jorhat district, Sesa (87.5%) of Kamrup district. Similarly, the highest frequency of occurrence of criconematids was recorded from Na-chungi (60%) of Jorhat district, Neli (33.33%) of Morigaon district, Santola (33.33%) and Kulhati (33.33%) of Kamrup district.

Hunt and Judith (1957) [6], Minz (1958) reported that root-knot nematode (*Meloidogyne* spp.) caused severe injury to the tuberose plants grown in containers. Rao and Singh (1976) [9] reported *M. incognita* as the major nematode pest of tuberose in the Bengaluru district of Karnatka. Preethi (2011) [8] reported *Meloidogyne incognita*, *Helicotylenchus* spp., *Hoplolaimus* spp. and *R. reniformis* as major nematode pest of tuberose in and around Bengaluru district. Devappa *et al*. (2012) [4] recorded *Meloidogyne* spp. as the most common nematode species in the rhizosphere of tuberose. Saha and Khan (2016) [10] recorded of major plant parasitic nematodes in tuberose in West Bengal. They were identified as *Aphelenchoides besseyi*, *R. reniformis*, *Helicotylenchus* spp.,

Meloidogyne incognita, *M. javanica*, *Tylenchorhynchus mashhoodi* and *Hoplolaimus indicus*. Among them *A. besseyi*, *M. incognita* and *M. javanica* were found as major problem in tuberose. Holajjer *et al*. (2018) [5] reported eight genera of plant parasitic nematodes from the rhizosphere of tuberose *viz*., *Meloidogyne* spp., *R. reniformis*, *Pratylenchus* spp., *Helicotylenchus* spp., *Hoplolaimus* spp., *Tylenchorhynchus* spp., *Longidorus* spp. and *Xiphinmea* spp. Nilambika *et al*. (2018) [7] recorded *Meloidogyne* spp., *Helicotylenchus* spp., *Tylenchorhynchus* spp., *Rotylenchulus reniformis* from the tuberose growing fields of Belgaum, Gadag, Dharwad and Bagalkote districts of Bangalore.

Table 1: Plant parasitic nematodes associated with tuberose in Jorhat district

Sl. No	Locality	Samples collected	MI	HL	HP	TY	PR	RO	CN
1.	AAU Orchard	6	21.53 (33.33)	230 (100)	-	35.53 (50)	-	-	27.33 (33.33)
2.	Borbheta	5	36 (40)	132.75 (80)	12.50 (40)	-	-	-	10 (20)
3.	Potia gaon	6	-	112.50 (83.33)	-	20.66 (83.33)	-	52.17 (50)	-
4.	Bhatemora	7	11.42 (28.57)	64.71 (42.85)	-	-	112.14 (100)	-	-
5.	Lality chapori	7	32.50 (42.85)	45.57 (100)	20.14 (42.85)	63.42 (71.42)	-	-	-
6.	Na-chungi	5	62 (100)	-	-	18.33 (60)	32 (40)	-	16.33 (60)

Table 2: Plant parasitic nematodes associated with tuberose in Morigaon district

Sl. No	Locality	Samples collected	MI	HL	HP	TY	CN
1.	Amalighat	6	112.50 (100)	175 (83.33)	-	-	-
2.	Kalbari	5	36.53 (40)	88 (100)	10.33 (40)	25.66 (60)	-
3.	Neli	6	57.33 (83.33)	64.30 (100)	-	10.16 (50)	22.16 (33.33)

Table 3: Plant parasitic nematodes associated with tuberose in Kamrup district

Sl. No	Locality	Samples collected	MI	HL	HP	TY	PR	RO	CN
1.	Santola (Mirza)	6	91.52 (100)	20.30 (50)	-	-	65.16 (66.66)	-	14.66 (33.33)
2.	Bongora (Mirza)	7	35.71 (57.14)	-	-	14 (42.85)	-	12.42 (28.57)	-
3.	Kahikhuchi	6	24.66 (66.66)	126.53 (100)	-	-	10.26 (33.33)	-	-
4.	Sesa	8	120.40 (100)	44.58 (75)	7.20 (25)	-	-	64.45 (87.5)	-
5.	Kulhati	6	85.35 (100)	28.33 (100)	11.66 (33.33)	-	-	18.16 (50)	5.66 (33.33)
6.	Hingimari	6	64.33 (66.66)	72.66 (100)	-	26.66 (66.66)	-	-	-

*Figures in parentheses are the frequency of occurrence
MI: *Meloidogyne incognita*, HL: *Helicotylenchus* spp., HP: *Hoplolaimus* spp.,
TY: *Tylenchorhynchus* spp., PR: *Pratylenchus* spp., RO: *Rotylenchulus reniformis*, CN: Criconematids

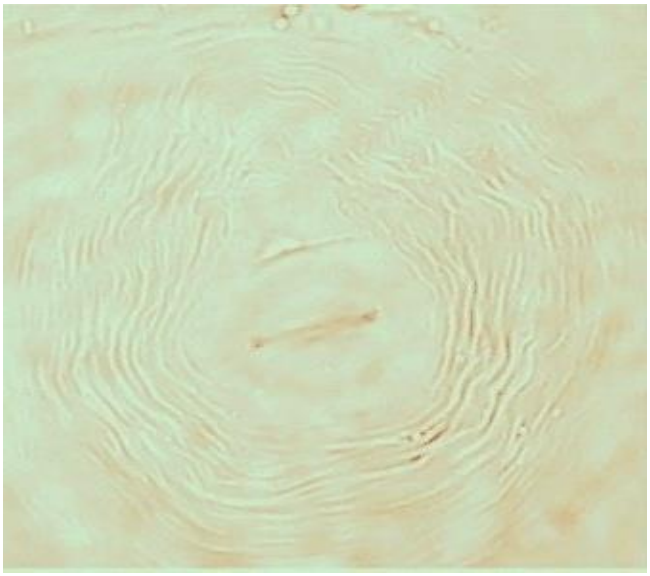

Plate 1: Perineal pattern of *Meloidogyne incognita*

Plate 2: Infested tuberose plant collected from field

Plate 3: Root-knot nematode infested tuberose field

References

1. Anonymous. Horticulture: Flower Crops: Tuberose. http://www.agritech.tnau. ac.in/horticulture, 2015.
2. Bybd DW, Kirkpatrick T, Marker KR. An improved technique for cleaning and staining plant tissues for detection of nematodes. J Nematol. 1983; 15:142-143.
3. Christie JR, Perry VG. Removing nematodes from soil. Proc. Helminth. Soc. Wash. 1951;18:106-108.
4. Devappa V, Khan MR, Jahagirdar S, Shrikant K. Nematode Infestation in Carnation, Crossandra, Chrysanthemum, Gladiolus, Jasmine, Rose and Tuberose. In: Nematode Infestation Part III: Horticulture Crops. National Academy of Sciences, India, 2012, 445-463.
5. Holajjer P, Saha TN, Girish KS, Singh KP, Deepak E. Population dynamics of some plant parasitic nematodes in the rhizosphere of tuberose and marigold. Hort. Flora. Res. Spect. 2018;7(2):149-151.
6. Hunt, Judith. List of intercepted plants pests, in 1956. U.S.D.A. Res. Serv. Pl. Quarant. Div., 1957, 63p.
7. Nilambika, Sumangala K, Netravati. Survey and distribution of plant parasitic nematodes on tuberose in four districts. 2018;7(2):1622-1625.
8. Preethi DM. Studies on root-knot nematode, *Meloidogyne incognita* (Kofoid and White, 1919) Chitwood, 1949 infecting tuberose (*Polianthes tuberosa* L.). M.Sc. (Agri) Thesis. Univ. of Agricultural Sciences, Bengalore, 2011, 64-73.
9. Rao VR, Singh DB. The root-knot nematode on commercial plantings of tuberose in India. Curr. Sci. 1976;45:348.
10. Saha T, Khan MR. Plant and soil nematodes associated with tuberose in West Bengal, India. Bangladesh J Bot. 2016;45(5):1015-1025.
11. Singh AK. Flower crops cultivation and management. New India publishing agency, Pitam Pura, New Delhi-110 088, 2006, 658p.