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POPULATION DYNAMICS OF SOME PLANT PARASITIC NEMATODES IN THE RHIZOSPHERE OF TUBEROSE AND MARIGOLD

Prasanna Holajjer[1*], Tarak Nath Saha, K. S. Girish, K. P. Singh and E. Deepak

ICAR-Directorate of Floricultural Research, Pune-411005

[1]*Present address: ICAR-National Bureau of Plant Genetic Resources, Regional Station, Hyderabad-500030*

**Corresponding Author's E-mail : prasannaiari@gmail.com*

ABSTRACT : Population dynamics of some plant parasitic nematodes in the rhizosphere of tuberose and marigold crops were studied. Population density was recorded at monthly interval from May, 2016 to February, 2017 in tuberose and from June, 2016 to November, 2016 in marigold. High population density (>200 nematodes / 200 cc soil) of root-knot nematode, *Meloidogyne incognita* and reniform nematode, *Rotylenchulus* spp. was recorded in tuberose from July, 2016 to November, 2016. Population dynamics of other nematodes such as *Pratylenchus* spp. and ectoparasitic nematodes were also recorded in the rhizosphere of tuberose crop. In marigold, population density of plant parasitic nematodes such as *Pratylenchus* spp., *Hoplolaimus* spp., *Helicotylenchus* spp., *Tylenchorhynchus* spp. and *Longidorus* spp. were decreased when marigold cultivars Pusa Narangi Gainda and Pusa Basanti Gainda were grown in sequence on the same field. However, these marigold cultivars did not influence the population density of *Xiphinema* spp.

Keywords : *Population dynamics, nematodes, rhizosphere, tuberose, marigold.*

Tuberose (*Polianthes tuberosa* L.), a popular bulbous flower crop, is widely cultivated in commercial scale in many states of India. Plant parasitic nematodes are one of the serious threats in commercial cultivation of tuberose. Root-knot nematode, *Meloidogyne spp.* is known to reduce the yield of the crop by more than 10% (Khan and Parvatha Reddy, 4). During the recent survey, incidence of root-knot nematode was recorded in the range of 15-45 % with severity range of 50-80% in tuberose grown in Maharashtra. Association of several plant parasitic nematodes were also recorded in the rhizosphere of tuberose plants during the routine survey. On the other hand, marigold (*Tagetes* spp.) crop is one of the most widely studied plant genera in a sequential cropping system (rotation crop) and as a cover crop, and inter crop for the management of plant parasitic nematodes due to its allelopathic potential against nematodes (Hooks *et al.,* 3). Marigolds can prevent the population build up of 14 genera of plant parasitic nematodes with lesion nematodes (*Pratylenchus* spp.) and root-knot nematodes (*Meloidogyne* spp.) the most affected (Suatmadji, 11; Hooks *et al.,* 3). In order to understand the nematode population dynamics for effective implementation of nematode management options, study was undertaken to know the population dynamics of some plant parasitic nematodes in the rhizosphere of tuberose and marigold crops.

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MATERIALS AND METHODS

A field study was conducted at Shivajinagar farm of ICAR-Directorate of Floricultural Research, Pune, during 2016-17 in tuberose and marigold crops. The tuberose cultivar (Phule Rajani) was planted during the first week of June, 2015. The root-knot nematode infection in tuberose and high number of other soil nematode populations was noticed in the rhizosphere of tuberose crop during *kharif*, 2015. Therefore, soil sample was collected from May, 2016 to February, 2017 to study the population dynamics of nematodes in tuberose. To study the dynamics of nematode population in marigold, two African marigold (*Tagetes erecta*) cultivars were grown in sequence on the same field. Marigold cultivar, Pusa Narangi Gainda was planted in the 1st week of May, 2016 and Pusa Basanti Gainda was planted in the same field during the last week of September, 2016 after the harvest of Pusa Narangi Gainda cultivar. Soil sample were collected at monthly intervals on every first of month from June, 2016 to November, 2016. The sampling area was represented by five locations (replications) of 2 $\times$ 5 meter area in a tuberose field and 0.6 $\times$ 5 meter (raised bed) area in marigold field by placing four stakes in each corner. Five cores from each location were

collected from the rhizosphere of the crop (5-15cm depth) and all five cores were pooled together to make a composite sample. From each composite sample, 200 cc of soil sample were removed and collected for extraction of nematodes by Cobb's sieving and decanting technique followed by Baermann funnel technique. The nematodes extracted after 48 h at room temperature and counted subsequently with counting dish using a stereoscopic zoom microscope.

RESULTS AND DISCUSSION

Population dynamics of eight genera of plant parasitic nematodes were studied in tuberose. The population of root-knot nematode, *Meloidogyne* spp. was increased during the first six months starting from May, 2016 and reached highest population density (352 nematodes / 200 cc soil) in the month of October, 2016 followed by decline. However, population density of reniform nematode, *Rotylenchulus* spp. reached highest population density (245 nematodes/ 200 cc soil) in the month of August, 2016 and maintained the population density in the range of 175-245 nematodes/ 200cc soil from August 2016 to February, 2017. The low population density (9-56 nematodes/200 cc soil) of lesion nematode, *Pratylenchus* spp. was also recorded from the month May, 2016 to February, 2017. The ectoparasitic nematode population (*Hoplolaimus* spp., *Tylenchorhynchus* spp., *Helicotylenchus* spp. and *Xiphinema* spp.) were not detectable level during the initial period. However low density of all the ectoparasitic nematode population were recorded during later months (Fig. 1). Association of several plant parasitic nematodes from tuberose crop have been reported (Borgohain, 2). Saha and Khan (9) recorded the association of soil inhabiting plant parasitic nematodes, *R. reniformis* with high densities and ectoparasitic nematodes such as *Helicotylenchus spp., T. mashhoodi* and *H. indicus* in low densities from tuberose rhizosphere.

Changes in population density of six genera of plant parasitic nematodes in the rhizosphere of marigold crop were studied from June to November, 2016. Population density of all the plant parasitic nematodes except, dagger nematode, *Xiphinema spp.* decreased in the presence of marigold crop (Fig 2). The decrease in population density of different nematode in the rhizosphere at the end of the experiment ie after the six month of marigold crop is 44.45% in *Pratylenchus* spp.; 33.33% in *Hoplolaimus* spp.; 34.09% in *Helicotylenchus* spp.; 44.20% in *Tylenchorhynchus* spp. and 78.38% in *Longidorus* spp. There are several reports where suppression in nematode population build up was observed in the

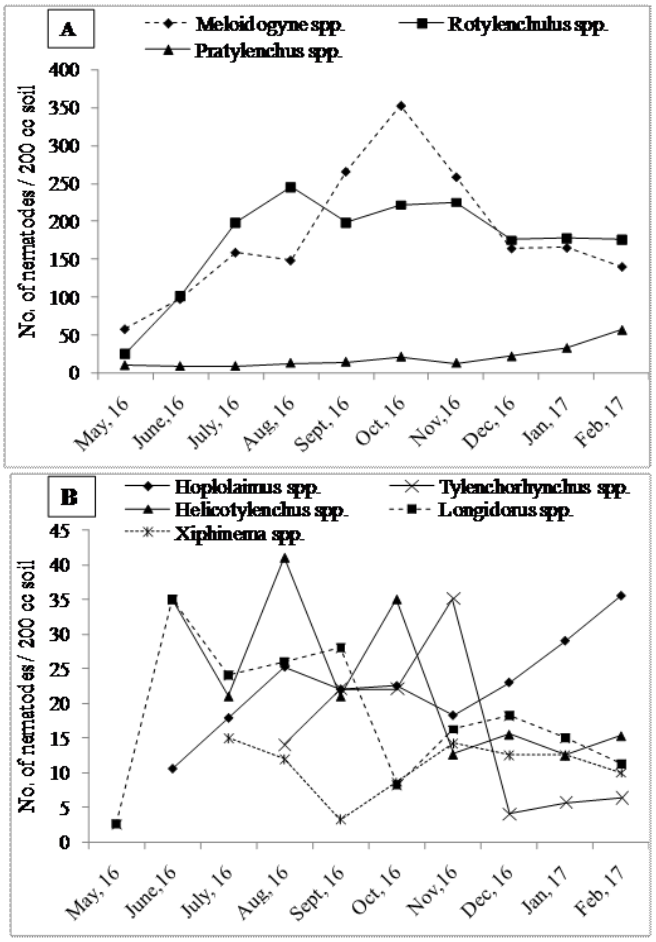

Fig. 1: Population dynamics of endoparasitic nematodes (A) and ectoparasitic nematodes (B) in the rhizosphere of tuberose crop.

presence of marigold crop (Siddiqui and Alam, 10; Ploeg, 8; LaMondia, 6). Alam *et al.* (1) found the suppression of *Radopholus similis*, *H. multicintus, R. reniformis*, and *H. indicus* when *T. erecta* was intercropped with banana. The population of dagger nematodes, *Xiphinema* spp. was not affected and

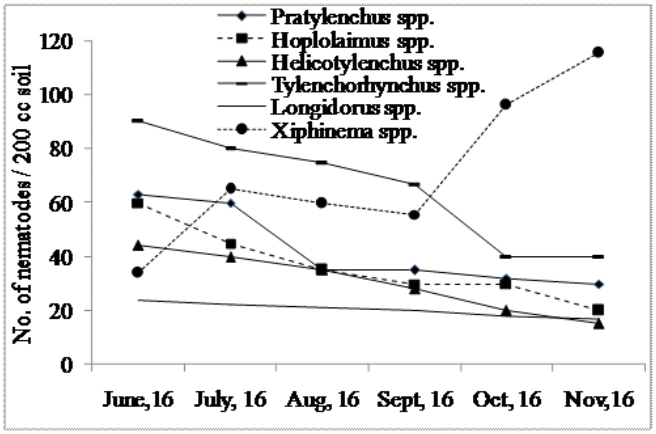

Fig. 2: Population dynamics of endoparasitic and ectoparasitic nematodes in the rhizosphere of marigold crop.

population was stable during initial first four months when marigold cultivar, Pusa Narangi Gainda was grown. However, in the presence of marigold cultivar, Pusa Basanti Gainda, *Xiphinema spp.* population was increased (2.07 times) from September to November, 2016. McSorley *et al.* (7) reported the increase of ectoparasitic nematode, *H. dihystera* (spiral nematode) over time on *T. patula.* Suatmadji (11) reported that *Tagetes erecta* suppressed *M. arenaria, M. incognita,* and *M. javanica,* but not *M. hapla*. The variation in suppression of nematodes among different varieties of marigold is also reported (Krueger *et al.*, 5).

In conclusion, this research demonstrated that high population density (>200 nematodes / 200 cc soil) of root-knot nematode, *M. incognita* and reniform nematode, *Rotylenchulus* spp. in tuberose can be found during July to November, 2016 indicating that appropriate management strategies need to be initiated before the onset of southwest monsoon or during the *kharif* season in nematode infested field in order to prevent the further population build up and damage to the tuberose crop. The marigold crop (cv Pusa Narangi Gainda and Pusa Basanti Gainda) can be effectively used in crop rotation as crop reduced population density of plant parasitic nematodes such as *Pratylenchus* spp., *Hoplolaimus* spp., *Helicotylenchus* spp., *Tylenchorhynchus* spp. and *Longidorus* spp.

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