*Research Article* *Ann. Pl. Protec. Sci.* ***27*** *(2) : 285-288 (July, 2019)*

***doi: 10.5958/0974-0163.2019.00059.4***

# Weeds as alternate hosts of root-knot nematode, *Meloidogyne incognita* in Coconut garden

**Rajkumar, Rashid Pervez*, Surekha and Ravi Bhat**

*ICAR – Central Plantation Crops Research Institute, Kasaragod – 671 124;*
**ICAR – Indian Agricultural Research Institute, New Delhi – 110 012, India*
*<rajkumarcpcri@gmail.com>*

**Date of Receipt: 20.09.2018; Accepted: 30.05.2019**

## ABSTRACT

In this study, four weed species were found to be hosts for *Meloidogyne incognita* in coconut garden in costal sandy soils of Kasaragod, Kerala. Egg mass production and gall/knot index differed (P<0.05) among these weed species, *Alternanthera sessilis* (4.4 gall index) and *Vernonia cinerea* (3.8 gall index) were highly infected by the root knot nematode with maximum knots/galls compared to *Ageratum conyzoides* (2.5 gall index) and *Leucas aspera* (1.0 gall index). These weeds were more frequently encountered in coconut garden where plant parasitic nematodes are serious problem in vegetables, spices, fruits and other crops grown as intercrop/mixed crop in the coconut garden. Since, weeds are alternate host for plant parasitic nematodes, weed management is important for preventing multiplication of *M. incognita* and reduce the population build up in coconut gardens interm of growing nematode free intercrops/mixed crops and better yield to sustain the additional income of the farmer.

**Keywords:** Coconut, *Meloidogyne incognita*, Weeds.



Weeds grown along with crop plants compete not only for light, space, water, and nutrients but also, they serve as reservoirs of pests including plant parasitic nematodes (Davis & Webster, 2005). In the absence of a suitable crop host, weeds act as alternative hosts for plant parasitic nematodes, thus help in maintaining nematode populations targeted for suppression by various management strategies (Thomas *et al*., 2005). World's most economically damaging crop pathogen and can infect, feed on and reproduce on more than 3,000 species of wild and cultivated crop plants (Hussey & Janssen, 2002). Among the weed host, *Amaranthus spinosus* and *Portulaca oleracea* (Brito *et al*., 2008), *Cyperus rotundus, Amaranthus* spp., *Chenopodium album* and *Digitaria* spp. are often cited in the literature (Myers *et al.*, 2004; Singh 2010). These intercrops are highly susceptible to root-knot nematodes (Rajkumar 2016). The annual yield losses in tomato, brinjal and okra caused by *Meloidogyne* spp. have been estimated up to 16.9% (Gaur *et al.,* 1993, Kumar *et al.,* 1993). Since, these weeds can act as a potential alternate hosts for nematode multiplication, control of these weeds reduce the multiplication of nematode hence, the present observations were undertaken to identify the common weed hosts of root knot nematode in coconut garden.

## Materials and Methods

The observation was carried out in coconut gardens of ICAR-CPCRI Experimental farm, Kasaragod, Kerala during 2014 and 2015. The root samples were collected randomly with the help of

nematode sampling spade from infested weeds at 15-20 cm depth covering 20-30 cm radius and examined the entire root system for the presence of root galls characteristic of RKN infection (Mani *et al.,* 1998). Root knot nematode and species were identified with the help of morphological characterization and perineal pattern.

Number of root galls and egg masses were recorded and rating was given based on a root gall and egg mass index scale from 0 to 5 (0 - no galls or egg masses; 1-1 or 2 galls or egg masses; 2-3 to 10 galls or egg masses; 3-11 to 30 galls or egg masses; 4-31 to 100 galls or egg masses; and 5-more than 100 galls or egg masses). The data obtained were analyzed statistically as mean values from the Analysis of Variance (ANOVA) for root gall index (RGI), egg masses and number of eggs produced / egg mass.

## Results and Discussion

There was significant ($p<0.05$) difference in scale of galling, egg mass production and number of eggs produced by root knot nematode infested weeds collected from coconut garden (Table 1). It was also observed that higher numbers of nematode infested galls/knots were increased with increase in root biomass of weeds. This is due to the fact that generally perennial growing fields were left without weeding for several days which may help the matured females of root-knot nematode to reproduce eggs and complete its life cycle in susceptible weed species growing on that location, release nematode juveniles and eggs in the soil without much human interference. Species of root knot nematode associated with *A. sessilis, V. cinerea, A. conyzoides* and *L. aspera* identified as *M. incognita* on the basis of morphological characterization and perineal pattern study.

The cropping pattern in coconut gardens including intercrops canopy shade may provide micro/conducive environment for growth of plant parasitic nematode in susceptible weeds and other intercrops grown in available interspaces. Among the weed sp., *A. sessilis* (4.4 gall index) (Fig. 1) and *V. cinerea* (3.8 gall index) (Fig. 2) were highly infected with the root knot nematode, *M. incognita* followed by *A. conyzoides* (2.5 gall index) (Fig. 3) and *L. aspera* (1.0 gall index). The presence of egg masses on the weed hosts indicated their ability to sustain root-knot nematode populations and thus they act as potential host. Since this nematode is multiplied on these weed species, control of weeds is of high importance in perennial crops for preventing nematode multiplication (Gaur *et al.,* 1993).

On the roots of other observed weeds, no gall and egg masses were noticed. Although there are several reports on weeds as hosts of different species of RKN in the world (Rich *et al.,* 2009), there is very little information available from India (Gaur *et al.,* 1993; Kumar *et al.,* 1993) which indicated that the weed species, *Ageratum conzyoides, Vernonia cinerea, Amaranthus spinosus, Eleusine indica* and *Portulaca oleracea* were among the world's worst weeds and are multiple hosts of *Meloidogyne* spp. Myers *et al.* (2004) reported *Cyperus rotundus*, *Amaranthus* spp., *Chenopodium album,* and *Digitaria* spp. as weed hosts of root-knot nematodes, whereas *Amaranthus graecizans, A. hybridus, A. palmeri, A. retroflexus, A. spinosus, A. viridis, Chenopodium album, C. murale.* Tabil and Walia (1996) reported two chenopodium species were found attacked by *M. incognita* juveniles. The extracts of some of the weed extracts were found

**Table 1. Gall index of different weeds grown in coconut garden**

| Weed species | Family | Common name | RGI | Egg masses /5 g roots | Number of eggs/egg mass |
|---|---|---|---|---|---|
| *Ageratum conyzoides* | Asteraceae | Goat/Chick weed | $2.5^{c}$ | $2.1^{b}$ | $62.2^{a}$ |
| *Vernonia cinerea* | Asteraceae | Puvankurutala | $3.8^{b}$ | $3.1^{a}$ | $69.6^{a}$ |
| *Alternanthera sessilis* | Amaranthaceae | Dwarf copper leaf | $4.4^{a}$ | $3.3^{a}$ | $62.4^{a}$ |
| *Leucas aspera* | Lamiaceae | Thumbai | $1.0^{d}$ | $1.2^{c}$ | $28.1^{b}$ |

**Fig. 1. *Meloidogyne incognita* infected root of *Alternanthera sessilis.***


**Fig. 2. *Vernonia cinerea*: A & B – *Meloidogyne incognita* infected root; C- healthy root**


**Fig. 3. *Ageratum conyzoides*: A & C – *Meloidogyne incognita* infected root; B & D - healthy root**

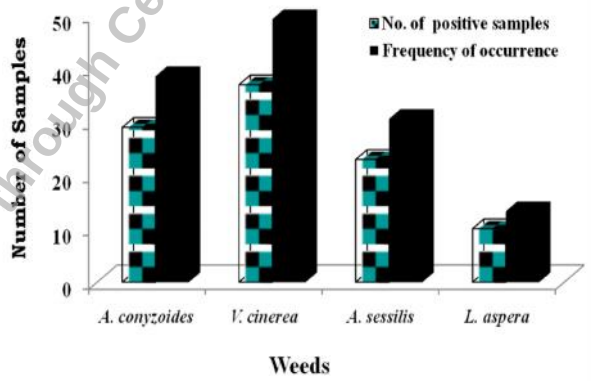


**Fig. 4. Frequency of occurrence of *Meloidogyne incognita* from weeds in coconut garden**

effective to control nematodes (Prasad *et al.*, 2002), *Digitaria horizontalis, Lactuca saligna, Malva neglecta, Physalis* spp., *Polygonum persicaria, Solanum americanum, S. nigrum, S. torvum, Sonchus oleraceus* and *Verbena officinalis* were infected by *M. incognita* in Florida (Brito *et al.*, 2008). Among the observed nematode infested weed species *Vernonia cinerea* and *Ageratum conyzoides* are of the highest frequency of occurrence followed by *Alternanthera sessilis* and *Leucas aspera* (Fig. 4).

Preliminary study suggested that the weed species *Alternanthera sessilis, Vernonia cinerea* and *Ageratum conyzoides* can serve as a potential alternate hosts for root knot nematodes in coconut garden and therefore it may be the reason for the

root-knot nematode to persist in the soil throughout the year.

**Acknowledgements:** The author thanks to the Director, ICAR- Central Plantation Crops Research Institute, Kasaragod (Kerala) for providing the research facilities and Indian Council of Agricultural Research, New Delhi for financial support.

## References

Brito, J.A., R. Kaur, R. Cetintas, J.D. Stanley, M.L. Mendes, E.J. McAvoy, T.O. Powers and D. W. Dickson (2008). Identification and characterization of *Meloidogyne* spp. infecting horticultural and agronomic crops, and weeds in Florida. *Nematology* **10**: 757-766.

Davis, R.F. and T.M. Webster (2005). Relative host status of selected weeds and crops for *Meloidogyne incognita* and *Rotylenchulus reniformis*. *J. Cotton Sci.* **9**: 41-46.

Gaur, H.S., E. Khan and M. Sehgal (1993). Occurrence of two species of root knot nematodes infesting rice, wheat and monocot weeds in Northern India. *Ann. Pl. Protec. Sci.* **1**(2): 141-142.

Hussey, R.S. and J.G.W. Janssen (2002). Plant Resistance to Parasitic Nematodes (Eds., Starr, J. L., R. Cook and J. Bridge) CAB International, Wallingford Oxon, UK, pp. 231.

Kumar, D. S.K. Kaushik and R.C. Gautam (1993). Effect of soil moisture conservation and weed control on pearl millet. *Ann. Pl. Protec. Sci.* **2**(2): 121-125.

Mani, A., S. Muzna, Al-Hinai and Z.A. Handoo (1998). Plant parasitic nematodes of crops in Dhofar Governorate Sultanate of Oman. *Nematropica* **28**(1): 61-69.

Myers, L., K.H. Wang, R. McSorley and C. Chase (2004). Investigations of weeds as reservoirs of plant parasitic nematodes in agricultural systems in Northern Florida. *Proceedings of 26th Annual Southern Conservation Tillage Conference for Sustainable Agriculture. North Carolina Agricultural Research Service Technical Bulletin TB-321*, pp. 258-267.

Prasad, D., D. Ram and Imtyaz Ahmad (2002). Management of plant parasitic nematodes by the use of botanicals. *Ann. Pl. Protec. Sci.* **10**(1): 360-364.

Rajkumar, H.P., P. Maheswarappa, Subramanian and R. Surekha (2016). Management of plant parasitic nematodes in coconut based cropping system. pp 19-20 In: *National seminar on Plantation based cropping system for improving livelihood security*, CPCRI, Kasaragod, 22 - 23 July, 2016.

Rich, J.R., J.A. Brito, R. Kaur and J.A. Ferrell (2009). Weed species as hosts of *Meloidogyne:* A review. *Nematropica* **39**:157-185.

Singh, H.P. (2010). Empowering coconut growers with viable technologies. *Indian Horticulture* **23**: 1-7.

Tabil, M.A. and K. Walia (1996). Effect of two *Chenopodium* species on the hatching and mortality of *Meloidogyne incognita* juveniles. *Ann. Pl. Protec. Sci.* **4**(1): 18-15.

Thomas, S.H., J. Schroeder and L.W. Murray (2005). The role of weeds in nematode management. *Weed Science* **53**: 923-928.