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Studies of Plant Parasitic Nematodes in Sugarcane Plants in Nizamabad District (Telangana), India

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Abstract:

Nematodes are microscopic round worms that feed on roots and soil, Endoparasitic nematodes enter in to the roots feed and reproduce in the roots. Ectoparasitic nematodes live in the soil and feed outside the roots. , Ectoparasitic nematodes and Endoparasitic nematodes damage the sugarcane crop.

Keywords: Plant nematodes, Ectoparasitic nematodes, Endoparasitic nematodes

1. Introduction

sugarcane is a major agricultural crop in Nizamabad district (Telangana), India. Many species of plant parasitic nematodes are associated with sugarcane crop. Ectoparasitic nematodes are examples Xiphinema and Helicotylenchus (spiral nematode) Endoparasitic nematodes are examples Pratylenchus (Lesion nematodes) and Heterodera (cyst nematode). Lesion nematodes enter in to the roots tips and damage the sugarcane. (Perry, R.N. and M.Moens (2006) In Plant roots Paratylenchus, Scutellonema, and Pratylenchus cause economic damage, but Helicotylenchus nematodes only cause economic damage when populations are sufficiently high. Identification of nematode species based on morphology (J.P.Bond, 2000). . At present 48 genera and 275 species of nematodes have been associated with sugarcane from 36 countries (Spaull and Cadet 1990). Species of five genera viz. Tylenchorhynchus, Helicotylenchus, Hoplolaimus, Pratylenchus and Meloidogyne can be listed as the major plant parasitic nematodes: they have a wide distribution of common occurrence in sugarcane soils of India (Mehta, 1992).). Plant parasitic nematodes cause serious damage to sugarcane (Cadet and Spaill,2005; Blair and Stirling,2007).

2. Materials and Methods

2.1. Collection of Soil Sample

Generally the soil samples are collected from the root zones of plants and 1-3 feet away from the collar region of large perennial tree and bushes, close to the feeder roots, where parasitic nematodes concentration is expected to be relatively high Random sample (4-5) are taken, variation in sampling depth depends on the presence of moisture in the soil. it should be noted that in rainy and winter season the moisture level in the soil is fairly high and that most of the nematodes could be obtained from soil 3-6 inches below the surface ,whereas in summer time when top soil become dry, nematodes may migrate to depth greater than one foot. In view of this in dry periods soil samples are collected from the lower depths.(J. Van Bezooijen (2006)

2.2. Equipment for Soil Sampling

Different types of soil samples of varying lengths are available. Normally soil augers are used. In the absence of a proper soil sample ordinary khurpi or a trowel can be used. Polyethylene bags of suitable size are best for collecting and storing the soil samples. For the purpose of recording information about the sample suitable labels and forms should be prepared in advance and kept ready. These should contain detailed information about the location of field, the crop sampled, the symptoms observed, the cropping history of at least the past two to three years together with approximate losses if any or cash returns, approximate size of the area sampled, the name and address of the farmer and other details.

2.3. Collection of Root Sample

For collection of herbaceous plant roots, the whole plant may be uprooted in a manner that would enable the removal of finer roots intact from the soil with the aid of a khurpi. In case of shrubs and trees the finer roots with soil may be dug out from varying depths with a shovel or auger. The soil adhering to the roots may be tapped off and roots subjected to treatment for desired purpose.

2.4. Baermann Funnel Method

This method is useful for collecting small nematodes from the soil or endoparasitic nematodes from infected plant tissue; it is based on the principle that nematodes have a tendency to move downward when the soil or plant material is placed in a funnel. Only active and motile nematodes can be collected by this method(Kavitha Govindasamy, jimmy R.Rich Maria. L.Mendes)

The Baermann Funnel is a regular glass or plastic funnel, about 7.5 to 15 cm in diameter with a piece of rubber tubing attached to the stem and closed with a clamp or pinchcock. A molded wire gauge is placed in the funnel. The funnel is filled with fresh tap water. Care should be taken to ensure that there are no air bubbles in the funnel or rubber tubing. The wire gauge is covered with a layer of muslin cloth and then with double thickness of tissue paper. The edge of the tissue paper should not protrude out of the funnel otherwise water will flow out. The material for extraction is placed on the muslin cloth – tissue paper lined wire gauge. The soil sample taken 50-100 Gms and small roots cut into 2 cm pieces. Soil mixed with infested roots, washing obtained and from 325 mesh sieve. A modification of the method that is followed in many laboratories is to take the sample in a cup matching the inner diameter of the funnel. A piece of cloth is placed over the cup and secured with a rubber band. The cup is inverted rapidly in the funnel filled with water. The entire setup is kept undisturbed for several hours to two to three days at room temperature. Fresh water is added daily to the funnel to compensate for loss by evaporation. The funnel may be covered with a petridish. In no case the material should become dry. Do not pour water through the sample, add through the sides. The nematodes being active migrate to the bottom of the rubber tubing through the cloth tissue paper. At the end of the waiting period 5 to 10 ml of the water containing the nematodes can be collected for counting and examination of the nematodes.

Extraction root sample: The infested plant roots is washed gently with water and placed in a shallow dish or watch glass with little water. The dish is placed under a dissecting microscope. The material is carefully teased apart with the help of two dissecting needles. If nematodes are present they come out in the water.

3. Result and Discussion

3.1. *Helicotylenchus*

Helicotylenchus is the most common species in sugarcane crop. Common name is spiral nematode. The female is worm like and spiral shaped, the body may take a spiral shape after death. Most are Ectoparasites of plant roots; they insert their stylet in to root epidemis to feed. Tail 1 to ½ body diameters long, typically more curved dorsally. *Helicotylenchus dihystra* did not impair root function enough to suppress yield, despite being the dominant Ectoparasite present in planted sugarcane (Cadet.et.al 1982).the spiral nematode is the most frequently encountered nematode in the sugarcane fields(S.R.Mishra and M.Pushpalatha).

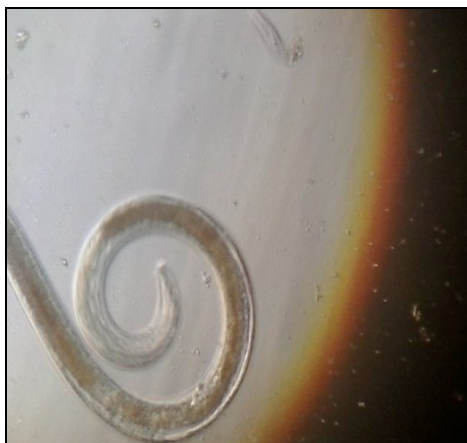


Figure 1: *Helicotylenchus* female Head



Figure 2: *Helicotylenchus* female Tail



Figure 3: *Helicotylenchus* juvenile stage

3.2. *Heterodera*

The nematodes belonging to the genus *Heterodera* are called cyst nematodes because at the time of death the mature females get converted in to a brown cyst or light yellow color cyst in which the eggs are held. Anterior neck like region, swollen body, shape lemon or rounded. Weak cephalic frame work. Ovaries coiled or reflexed. Castille (1973) reported *Heterodera* and *Pratylenchus* as nematodes associated with yield reduction of sugarcane at fields in Bacita, Nigeria



Figure 4: *Heterodera* juvenile stage

3.3. *Pratylenchus*

Pratylenchus is a genus of nematodes known commonly as lesion nematodes, they are parasitic on plants. Body length 0.4-0.8 mm, lip area low, lesion nematodes are migratory endoparasites that feed and reproduce in the roots. *Pratylenchus* has a strong stylet .males are rare. Ventrally overlapping the dark intestine *Pratylenchus* species is migratory, moving and intra or inter cellular in the root cortex (Trudgill 2001). *Pratylenchus* species is the most important species in the worldwide (Spaull and Cadet 1990).



Figure 5: *Pratylenchus* (Male)

4. Conclusion

Many plant parasitic nematodes were associated with sugarcane crop in Nizamabad district. Ectoparasitic nematode species (*Helicotylenchus*) and Endoparasitic nematode species (*Pratylenchus*, *Heterodera*) Species population densities of *Pratylenchus* species during growing season were above damage threshold level at many locations. Although population levels of *Helicotylenchus* species were below economic damage to the sugarcane crop.

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