Survey of Entomophilic Nematodes in Kerala

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Bio-pesticides over chemical pesticides are in demand today due to increasing concern about pesticide residues and hazards to environment. Nematodes are efficient bio-control agents against a number of insect pests (Poinar, 1979). For bio-management, it is important to use naturally occurring nematodes as these will reduce risk to non-target organisms. By conducting surveys, wild strains that are pathogenic to native insect pests can be isolated. The objective of this study was to survey parts of Kerala to determine the occurrence of entomophilic nematodes and to identify the nematodes associated with the pests of coconut.

Collection sites : Four hundred thirty soil samples were collected from 7 districts in Kerala. Collection sites included coconut plantations, undisturbed areas, forest land, cowdung pits etc. Each soil sample consisted of 3 pooled sub-samples, collected within an area of 3 m^2 and a depth of 10-15 cm. The sub-samples were thoroughly mixed, taken in polyethylene bags and further processed in laboratory.

Coconut palms, with visible symptoms of red weevil, *Rhynchophorus ferrugineus* F. (Curculionidae: Coleoptera) infestation such as presence of holes on the stem, oozing out of a viscous brown fluid, extrusion of chewed up fibres through the holes, longitudinal splitting of leaf base, wilting of central shoot etc. were selected and frass and various stages of the pest were collected and brought to the laboratory.

Different stages of the rhinoceros beetle, *Oryctes rhinoceros* L. (Scarabaeidae: Coleoptera), encountered during survey, were collected and examined for nematode infestation.

Isolation of nematodes: Nematodes in soil samples were baited using last instar *Corcyra cephalonica*

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Staint. (Galleridae: Lepidoptera) larvae. Five live last instar *Corcyra* larvae were placed at the bottom of 300ml plastic jars and the soil was lightly packed into it. The container was kept at 25-28°C for 3-5 days after which the larvae showing signs of parasitism were collected, rinsed in distilled water, then in 0.01% formalin and incubated in modified White traps. Samples in which insect mortality did not occur in 10 days were discarded. Samples positive for entomophilic nematodes were analysed for soil type.

Different stages of *Oryctes* collected during survey were rinsed in distilled water and the dead stages were placed in While traps and live ones with symptoms of infestation, either dissected or periodically observed. The frass collected from coconut palms was washed and nematodes collected.

The nematodes collected were multiplied on conditioned last instar *Corcyra* larvae. The basic *in-vivo* production method by Woodring & Kaya (1998) for multiplication and storage of nematodes was followed. The nematodes were observed under Stereoscopic binocular microscope and identified by comparative morphometrical studies.

Of 430 samples, 129 (30%) were positive for entomopathogenic nematodes. *Heterorhabditis indica* occurred in 128 samples (99% of positive samples) and *Steinernema* sp. in one sample (0.8% of positive samples).

Analysis of soil type of positive samples revealed that the percentage of nematode occurrence was high in sandy loam soil (48%) followed by laterite type (29%). Least nematode occurrence was found in clayey soil. Similar trends were observed in surveys conducted in Sri lanka (Amarsinghe *et al.*, 1994) and also in South Andamans (Shyamprasad *et al.*, 2001). Clay type soil restricts the movements of nematodes (Sivakumar, 1998) and this may be the probable reason for their low percentage occurrence in them.

Six soil samples collected from termite mounts in forest area did not yield any nematodes.

Ninety per cent of the frass collected from red palm weevil infested coconut palms yielded the nematode, *Terratorhabditis palmarum* (Gerber & Robin, 1990). The nematode was also isolated from adult weevils, pupae and grubs of various instars of the pest. Pathogenicity tests revealed that the nematode was only entomophilic and not entomopathogenic.

Rhabditis sp. and *Thelastoma* sp. were recovered from grubs and pupae of *Oryctes* collected from cow-dung pits. The grubs and pupae carrying these nematodes displayed a slight discolouration and the nematodes were recovered on dissection of them in Ringers solution. *Thelastoma* sp. could not be cultured on conditioned *Corcyra* larvae in White traps.

H. indica and *Steinernema* sp. were pathogenic to *O. rhinoceros, R. ferrugineus, Leucopholis coneophora* and *Opisina arenosella*, pests of coconut and *Odoiporus longicollis*, the pseudo-stem borer of banana.

Survey results reveal that *H. indica* is distributed throughout Kerala and the isolates of entomopathogenic nematodes provide a pool of bio-control agents for control of important insect pests without indroducing new strains.

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