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Occurrence and distribution of entomopathogenic nematodes in white grub endemic areas of Kerala

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Abstract

A random survey was conducted in White grub endemic areas (Kasaragod and Nileshwaram) in Kerala , India to know the occurrence and distribution of Entomopathogenic nematodes. A total of 100 samples were collected from different soil types. *Steinernema* sp. was recorded in seven per cent samples and *Heterorhabditis* sp. in 11 per cent samples. The pH of the positive samples ranged from 4.93 – 6.39. Based on the morphometric analysis all the *Heterorhabditis* were identified as *Heterorhabditis indica.* Entomopathogenic nematodes were isolated from the rhizosphere of coconut and clove.

Key words : Entomopathogenic nematodes , White grub, *Steinernema* sp., *Heterorhabditis* sp, survey.

Introduction

Entomopathogenic nematodes belonging to the genera *Steinernema* Travassos, 1927 , *Heterorhabditis* Poinar , 1976 and *Neosteinernema* Nguyen and Smart , 1994 (Rhabditidae : Nematoda) are used as biocontrol agents against crop pests. The non-feeding infective juveniles carry the symbiotic bacteria, *Xenorhabdus / Photorhabdus* in their gut. The nematode search for / ambush a suitable insect host, enter through natural openings and also through cuticle and release the symbiont into the haemolymph. Proliferation of the bacterium leads to death of the insect host. The search for indigenous strains is warranted because collection of such strains may provide isolates more suitable for inundative release against local insect pests because of adaptation to local climate. Native isolates will have ecological compatibility with pest species , reduction of the risk of significant impact on non-target organism when compared with exotic isolates. Therefore a survey was conducted to study the occurrence and distribution of entomopathogenic nematodes in white grub, *Leucopholis coneophora* Blanch endemic areas (Kasaragod and Nileshwaram).

Material and Methods

A total of 100 soil samples was collected from the rhizosphere of different crops *viz.*, coconut, nutmeg, banana and clove from Kasaragod and Nileshwaram during August, 2004. The samples collected randomly at a depth of 10 to 15cm from an area of $1m^2$, were pooled and made upto 250g and transported in polythene bags to laboratory. Information on locality, soil type, rainfall and habitat were noted for each sample. The bioassay of samples was conducted by the soil baiting technique (Bedding and Askhurst , 1975) using fifth instar larvae of *Corcyra cephalonica* Stainton (Pyralidae : Lepidoptera). Ten bait insects were placed at the bottom of a plastic container (250ml capacity) filled with sampled soil and incubated at room temperature for six to eight days. The dead larvae were washed twice in sterile distilled water and placed in white trap (White, 1927) to collect infective juveniles. The infective juveniles were stored in 0.05 per cent formaldehyde at 25 ±1°C in 250ml conical flasks.

Results and Discussion

Entomopathogenic nematodes belonging to *Steinernema* and *Heterorhabditis* were recorded in 18 per cent of the samples collected . The frequency of occurrence of *Steinernema* sp. was more (11%) than *Heterorhabditis* sp.(7%). In the first baiting 10 samples were found to be positive (10%) and the number of positive samples increased to 18 (18%) in the subsequent baiting. Both the nematode species were not found

occurring in same sample. The pH of the positive samples ranged from 4.93 – 6.39 . The nematodes are present in sandy , red sandy loam and laterite soils but the frequency of occurrence was more in sandy soil followed by sandy loam. Laterite soil recorded the least (Table 1).

Table 1. Distribution of entomopathogenic nematodes in different soil types

Soil Type	No. of samples	Samples positive for	
		Steinernema sp.	*Heterorhabditis* sp
Littoral Sand	16	50.00	0.00
Red Sandy Loam	54	5.56	11.11
Laterite	30	0.00	3.33

Among different crops surveyed entomopathogenic nematodes were recovered from the rhizosphere of coconut and clove. Most of the *Steinernema* sp. was recorded from <500m from seashore. Based on morphometric analysis all the *Heterorhabditis* were identified as *Heterorhabditis indica* (Poinar *et. al.*, 1992).

Entomopathogenic nematodes are widely distributed in tropical, sub tropical and temperate countries. The recovery rate of nematodes in present study was higher than earlier reports by Boag *et al.*, (1992) in Scotland (2.20%), Ozer *et al.*, (1995) in Turkey (4.72%), Miduturi *et al.*, (1997) in Belgium (8.47%), Hazir *et al.*, (2003) in Turkey (2%), and Griffin *et al.*(2000) in Indonesia (11.7%). But higher rate of recovery upto 70 per cent was also documented by Mracek and Becver (2000) in Czech Republic.

In the present study increase in recovery per cent was observed during second baiting. Similar observation was recorded by Haukeland (1993). Soil type plays an important role in the occurrence of entomopathogenic nematodes. Steinernematids were found to occur more in sandy soils in Sweden (Burman *et al.*, 1986) and sandy to loam sand in Belgium (Miduturi *et al.*, 1997). Soil texture influences nematode survival and mobility. Generally higher clay content results in lower nematode survival which may be due to decreased pore size and reduced oxygen availability. Nematodes are generally more mobile in sandy soils and the mobility decreases as the clay and silt increases (Barbercheck and Kaya , 1991). Occurrence of Entomopathogenic nematodes in coastal area was reported by Griffin *et al.*, 2000.

Table2. Association of entomopathogenic nematodes with crops

Crop	No. of samples	Samples positive for	
		Steinernema sp.	*Heterorhabditis* sp
Coconut	76	14.47	3.95
Banana	10	0.00	0.00
Clove	10	0.00	40.00
Nutmeg	4	0.00	0.00

The present study indicated the wide spread occurrence of entomopathogenic nematodes in white grub endemic areas which will be evaluated for their control potential against white grub. The indiginous isolates can be used as a component in the IPM of white grubs of coconut since local isolates pose less risk to non target organisms.

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