Scope of Entomopathogenic Nematodes in Coconut Pest management

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Entomopathogenic nematodes (EPNs) in the genera *Steinernema* and *Heterorhabditis* are proven bio - control agents and are widely used to control economically important insect pests of various crops across the world. They are associated with mutualistic bacteria genus *Xenorhabdus* in case of *Steinernematidae* and *Photorhabdus* in Heterorhabditidae, respectively. Infective juveniles (IJs), the only free-living stage of EPN (Fig1 a & b) enters insect hosts through natural openings (mouth, anus, and spiracles), or in some cases, through the cuticle. After entering the host's haemocoel, nematodes release their bacterial symbionts, which are primarily responsible for killing the host usually within 24 to 48 hr, defending against secondary invaders and thereby creating the environment for nematodes multiplication. EPNs have numerous attractive attributes such as durable infective stage, amenable to ease mass multiplication under laboratory conditions; host-seeking ability, safe to mammals and other non target organisms, and are exempted from registration in many countries. Moreover, EPNs can be stored for 9 - 12 months, which aids in the marketing of nematode-based products.

Mass multiplication of EPN on host insect, Galleria mellonella

Larvae of greater wax moth, *Galleria mellonella* can be used for mass multiplication of entomopathogenic nematodes (EPNs) of steinernematid and

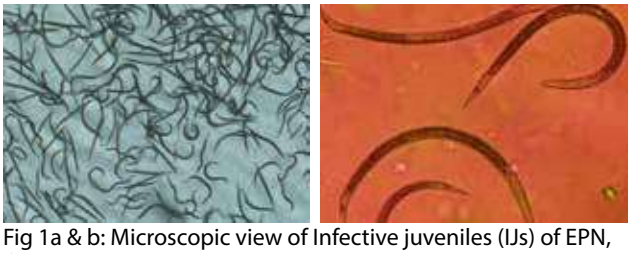

Fig 1a & b: Microscopic view of Infective juveniles (IJs) of EPN, S. carpocapsae

G. mellonella rearing on artificial diet

Extracting IJs from infected host insect

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Fig 4a: Healthy root grub

Fig 4b: EPN infected root grub

Fig 5: Kalpa EPN liquid formulation

heterorhabditid under laboratory conditions as they are highly susceptible to most of the EPN species and produces highest number of infective juveniles per unit body weight (Fig 3). They can be easily reared on artificial diet consisting of wheat & maize flour, rice bran, honey, yeast powder and milk powder in large numbers (Fig 2).

Utilization of EPNs in palm pest management

During 2014, ICAR - Central Plantation Crops Research Institute (CPCRI), Kasaragod developed an aqua formulation with virulent native isolates of EPNs, *Steinernema carpocapsae* {Kalpa EPN (CPCRI - SC1) for the management of white grub and other insect pests in the palm based cropping ecosystem. White grub or root grub, *Leucopholis coneophora Burm,* is a univoltine pest of coconut, arecanut and intercrops grown in sandy loam soils especially in southern states of India. Grub damages seedlings and adult palms by feeding on the roots affecting the water and nutrient uptake, which leads to death of the seedlings and yellowing of the fronds and complete yield loss in adult palms (Fig. 4a & b). Since the grubs are subterranean, their management have always been a difficult task. Since 2014, the efficacy of these EPN strains were widely demonstrated at farmers gardens across Kerala and Karnataka In collaboration with DASD sponsored project on Demonstration of EPN in arecanut for the management of root grubs, ICAR - KVK, Kasaragod and ICAR - All India Coordinated Research Project (AICRP) on Palms. Due to its efficacy, the root grub population was significantly reduced in the treated plot by 80 % following three year treatment period. This formulation can be used for the management of root grub in coconut and leaf eating caterpillars (Tobacco caterpillar, leaf rollers in

Fig 6a: EPN infected Galleria Cadaver b. Ready to transport cadaver formulation

Okra, cabbage, Diamond back moth on cauliflower etc.,) in the associated intercrops grown in palm cropping system. Attempts were also made and could successfully manage the infestation of red pumpkin beetle in cucurbits and pseudostem weevil in banana with EPN technology.

For the management of white grubs in arecanut/ coconut, drench the palm basin with 500 ml of EPN solution by mixing Kalpa EPN aqua formulation @ 150 ml in 10 liters of water during June - July and September – October (Fig.5). Similarly, foliar spray of EPN solution can taken up by mixing Kalpa EPN aqua formulation @ 150 ml in 15 liters of water for the management of leaf eating caterpillars in vegetables. Currently, ICAR - Central Plantation Crops Research Institute (CPCRI), Kasaragod is involved in distributing EPNs to the farmers on need basis. The cost of the 'Kalpa EPN aqua formulation" is fixed at Rs. 100 / 150 ml packet having 3 months shelf life and cadaver formulation @ Rs.5 / EPN infected *Galleria cadaver* (Fig.6 a & b). ■

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Farmers Field Day Training programme

Coconut Development Board, State Centre, Thane organized field day farmers training programme in association with Krishi Vigyan Kendra, Lanja on 2nd March 2021 at Krishi Vigyan Kendra, Lanja, Ratnagiri. The Training Programme was inaugurated by Dr.Anand Hanmante, Programme Co ordinator, KVK, Lanja in the presence of Dr.Sandeep S Patil,SMS, Extension, Prof. Sudeshk Urnar S Chavan, SMS, Plant Protection, Prof. Mahesh Mahal. SMS, Agronorny, Shri.Sharad S Aglawe, Field Officer, CDB, State Centre, Thane and Shri. V.V. Salvi, Programme Assistant.

Dr. Anand Hanmante, Programme Co ordinator, KVK, Lanja welcomed the gathering and spoke on activities of KVK in Ratnagiri, Prof. Mahesh Mahale,SMS, Agronomy briefed on Scientific Coconut Cultivation Technology and Prof. Sudeshkurnar S Chavan, SMS, Plant Protection, delivered a lecture on Pest and Disease Management of Coconut in Maharashtra

Shri.Sharad S. Aglawe, Field Officer, CDB State

Centre, Thane spoke on the Coconut Development Board scheme and activities for promoting scientific coconut farming and processing and value addition in coconut and marketing of coconut products in the State of Maharashtra.