

# Biological Control of Coconut Black Headed Caterpillar

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The coconut palm, *Cocos nucifera* L. belonging to family Arecaceae is known as “Tree of Life” or “Kalpavriksha” which provides livelihood to billions of people across the world. *Opisina arenosella* Walker is one among the major pests infesting coconut, which causes severe damage to the foliage, deprive the palm of its photosynthetic area and thus, directly affects the yield. The black headed caterpillar is one of the serious and endemic pests of coconut in India. Caterpillars of this pest remain in a gallery of frassy material and they feed on leaf chlorophyll. They cause drying of leaves/leaflets leaving only the upper epidermis intact or in case of older infestation, only midrib of the leaflet remains. When palms are severely damaged, the attacked leaves droop, bunches buckle and the immature nuts shed heavily. Intensive and successive foliar applications of broad spectrum chemical insecticides for controlling larval stages leads to environmental pollution and disturbance in the natural balance in addition to insecticide resistance development.

The use of biological control agent is one approach to reduce the undesirable ecological and health problems associated with overuse of chemical insecticides in agro ecosystems. Biological control is a naturally occurring phenomenon and the biocontrol agents act on the crop pests and maintain them at certain densities. However, this may not be sufficient in certain situations and pests break out and cause economic damage. Then we have to supplement the activity of the naturally occurring biocontrol agents viz., parasitoids, with introduction of appropriate agents. There are two aspects, one is conservation of parasitoids and enhancement of

their activities to keep the pests under check. The second approach is use of biocontrol agents by way of mass culturing and release of selective natural enemies. This can be done in two ways, inoculative release wherein the released biocontrol agent establishes and multiply generation after generation and persist for longer periods. In the other we use them as a ‘biological insecticide’ and bring about control of the pest in a shorter period and do not expect the agent to survive and multiply. Either it is conservation and enhancement or mass culture and release, a thorough knowledge of the crop ecosystem and the pests occurring is essential for successful implementation of the biocontrol programmes.

During the Year - 2017-18 (September to April), the incidence of black headed caterpillar was noticed in the range of 31.25 to 53.37% on the coconut palms grown in villages of Palalli, Arasaguppe, Ankegowdanakoppalu, Hadanuru, Hulukatte, Nagathihally, Nonavinakere, Kaidalu, Kibbanahalli and Kyathanahalli with the higher damage intensity of 5-7 damaged fronds per palm with clear drying symptom was noticed in an area upto to 250 acres. The percent infestation by coconut black headed caterpillar was noticed in 5 major coconut growing villages namely, Palalli (34%), Arasaguppe (41%), Ankegowdanakoppalu (32%), Hadanuru (44%), and Kyathanahalli (53%) in Tumkur district of Karnataka state. Considering the harm caused to the ecosystems by the spray of harmful chemical insecticides, the ICAR - All India Coordinated Research Project on Palms centre, Horticulture Research and Extension Centre, Arsikere, University of Horticultural Sciences, Bagalkot, Karnataka conducted the



Parasitoid production at AICRP on Palms, HREC Arsikere

Coconut black headed caterpillar infested palms			
Parasitoids release:			
SI No.	Name of the village in Tumkur district	Number of parasitoids released	
		Goniozus nephantidis	Bracon brevicornis
1	Palalli	24400	18321
2	Kyathanahalli	19500	15621
3	Ankegowdana-koppalu	21365	23568
4	Hadanuru	28147	22314
5	Arasaguppe	23458	15489
	<b>Total</b>	<b>116870</b>	<b>95313</b>



Parasitoid release techniques

training programme and meetings with an aim to create awareness among the farmers on the pest stages, damage symptoms and the management by parasitoid release techniques.

The farmers of Palalli, Arasaguppe, Ankegowdanakoppalu, Hadanuru and Kyathanahalli villages in Tumkur district were supplied with a total of 1,16,870 Nos. of *Goniozus nephantidis* and 95,313 Nos. of *Bracon brevicornis* for the inoculative (augmentative) release on the black headed caterpillar affected palms. As medium level of infestation was observed, a total of 4-5 release of stage specific parasitoids were made at the rate of 20 Nos. of *G. nephantidis* and 30Nos. of *B. brevicornis* per palm in the infested area.

### Parasitoid release techniques

#### ► Parasitoid establishment and pest management

One of the farmers, Shri Devarajappa from

Arasaguppe village, where approximately 34 acres orchard was infested by black headed caterpillar released the stage specific parasitoids, *B. brevicornis* (15489No's) and *G. nephantidis* (23458No's) four times. This in turn resulted in sharp reduction in the pest population. The parasitoid recovery studies were also undertaken randomly in the pest affected areas to determine the establishment and build up of these natural enemies in the pest attacked gardens. Data on parasitoid establishment after third and six months of bio agents release revealed that the natural enemies established well in the affected gardens and bio-agents successfully paralysed *O. arenosella* caterpillars. The pest population showed



Coconut black headed caterpillar infested palms



Recovered garden



Establishment of parasitoid on black headed caterpillar



a quick decline after the parasitoid release. The larval population of *O.arenosella* decreased by 22.18 to 59.14 % after three months of release and up to 95.14 to percentage after six months of release of parasitoids. Similarly, the pupal population also decreased by 13.56 to 74.15 % after three months and the process led to decrease in the pupal population by cent percentage.

After six months of parasitoid release, the suppression of the pest was clearly visible, emerged cocoons of *G. nephantidis* and *B. brevicornis* were noticed in the orchard and there was no black headed caterpillar population in the newly emerged leaves. Due to the avoidance of chemicals, the natural occurrence of few other parasitoids viz., *Apanteles sp.*, *Xanthopimpla sp.*, and *Brachymeria sp.*, predators viz., *Cardiastethus exigus*, *Parena nigrolenata* and grasshoppers were observed in the field.

The released parasitoids were able to self-perpetuate successfully and managed the pest population in all the black headed caterpillar-affected gardens in the villages of Tumkur district. The larval parasitoids *G. nephantidis* and *B.brevicornis* were found to be more efficient in reducing black

headed caterpillar population with higher per cent parasitization compared to other parasitoids. The process of biological control is a cost-effective and environment-friendly method that does not introduce pollutants into the environment and is the best alternative to the chemical or the mechanical control methods. The post release response showed the happiness among the farmers about the role of bio-agents in suppressing the pest without application of chemical pesticides.

The impact of biological control was clearly apparent in the pest infested villages after six months. The inoculative release of parasitoids effectively regulated the larval stage of pest and came down substantially in all the black headed caterpillar affected gardens. The self-perpetuating parasitoids prevented the further spread and the outbreak to other villages. The cost involved in bio-control was very less compared to cost of chemical insecticides. In the present days success of biological control as an alternate system of management of notorious insects like black headed caterpillar, which gives momentum to sustainable agriculture. ■