All India Network Project on Soil Arthropod Pests
Department of Entomology
University of Agricultural Sciences, GKVK, Bengaluru – 560 065

Management of white Grubs through Adult collection and larval removal

Rationale for non-chemical method of management

Several biological, ecological and socio-economic reasons are associated with insecticide/biological control failures. Size of the farm, degree of pest infestation, time of application, rate of application, placement of insecticide/bio-agent, availability of skilled labourers, cost and quality of the materials are the major factors among them. The resilient arecanut growers have realized that managing white grubs using chemicals is less remunerative on long term basis. Constraints associated with chemical applications have prompted them to adopt an efficient longstanding method recommended by the UAS, Bangalore i.e., adult collection during emergence period and removal of grown up grubs from field.

Previous observations revealed that systematic collection of adult beetles (wherever it is possible) and large-scale larval removal strategies have become hostile to white grub populations in some locations. The repercussion of removal of grubs from the affected palms brought a sudden improvement in the affected gardens both in terms of vigour and yield of the plants. The AINP, Bangalore centre has taken several steps to popularize the adoption of adult collection and larval removal methods. Intensive on-farm demonstrations were conducted in various locations**.** Some farmers have realized the advantage of these methods and resorted to either adult collection or removal of grubs or both depending upon local conditions.

Methodologies adopted for adult collection and larval removal

The adults of *L. lepidophora, L. burmesterei* and *L. coneophora* are not known to aggregate on tree canopies as *H. serrata*. Usually the beetles emerge around 6:40 pm and each beetle has to be virtually chased and collected using flash lights. Two farmers from Bhavane, Thirthahalli and Begane, Sringeri taluks are collecting beetles once in two years. Both *L. lepidophora* and *L. burmesterei* are very strong fliers. Therefore, managing their problems solely by adult collection is very much limited. However, their long larval duration offers larval removal as an additional efficient pest management strategy.

During July-August third instar grubs of the preceding generation occur at less than 15 cm depth from the surface, which makes it possible to collect them by digging the entire garden and not just around the base of the affected palms. Additionally, it facilitates removal of yet-to-emerge adults in case of *L. lepidophora*. Timing is once again critical. As the season progresses, the grubs move further down the soil column owing to moisture loss in the upper layers and also in search of roots of the palms that are generally present at lower layers. Therefore, water stagnation for 2 to 3 days prior to grub hunting is recommended to force the

grubs closer to the surface later in the season. Such grubs can be physically removed by digging the entire garden.

Removal of grown up grubs from the soil has an edge over sole adult collection. If the digging operation is done 10-15 days earlier to the adult emergence both grown up grubs as well as fully developed but yet-to emerge adults may also be removed. Depending upon the field saturation level at their respective farms, farmers resorted to digging operation at different months. Despite some socio-economic problems (like non-availability of labourers, large area etc.,) many farmers are satisfied with the efficiency of larval removal method.

Impact of adult collection and larval removal on the management of white grubs

Although larval removal is a time and labour consuming method, many farmers appreciated the advantage of digging and collecting grubs and ready to emerge adults. Four farmers (one with infestation by *L. lepidophora*, one with *L. burmeisteri* & two with *L. coneophora*) participated in larval removal method during 2013-14. Mr. Sheshadri, Kannangi village, Mr. Prasad Shetti, Iruvail village and Mr. Kalluraya from Marthady village, Mangalore taluk have continued digging operation during 2013-14. Mr. Kalluraya from Matrandy village, could collect and destroy ~9000 late instar *L. coneophora* grubs and ~100 adult beetles from 18 acres of land.

The survival of newly planted seedlings in white grub affected gardens indicated reduction of white grub population after adopting larval removal method. The positive impact of larval removal was evident in severely affected gardens wherein already affected plants started bearing inflorescence and substantial improvement in yield level.

The farmers of Biluve, Iruvail and Matrandy have adopted digging and removal of larvae as a major management strategy and have not applied any insecticide since 2010. They expressed their satisfaction as digging and removal of larvae is safe and economical compared to insecticides application.

Instead of targeting the emerged beetles, tracing and removal of yet- to- emerge adults along with grown up grubs would be an ideal alternate method. This requires proper knowledge about the adult emergence period and time of emergence within a day in the garden. One farmer from Sirsi taluk, Uttara Kannada district had adopted this ‘Non-Pesticide Management Strategy” against *L. lepidophora* and successfully managed the pest problem in his 2 acres of garden.

A Success Story on the management of populations of *Leucopholis lepidophora*

Like many other farmers in Sirsi taluka, Mr. Subramanya Manjunatha Hegde from Mundigesara village witnessed a drastic decline in yield and toppling of his arecanut palms during 1998. The next year, he learnt that the problem was caused by a species of white grub called *Leucopholis lepidophora*. Grubs of the species were eating away the roots of his arecanut palms. By then, 50% of his garden was affected. Unlike most other arecanut farmers of his area, Mr. Hegde was not interested in application of toxic insecticides to overcome the problem. Parallel thinking and discussions with the AINP team made Mr. Hegde do something that other farmers did not. He indigenously fabricated tools for digging and removal of white grubs. With his special tools and 12 farm women he started the operation of physical removal of white grubs in 2000.

Every year since then, his two acres of land is thoroughly combed for white grubs during September and October months. The number of grubs and yet-to- emerge adult beetles he has thus collected is presented in the Table 1. Consequent to his efforts, the roots of his palms were freed from the attack of white grubs. They re-established, and the weakened palms regained their vigour. Yields started improving each year and reached their true potential by the fourth year. The mechanical removal of white grubs is now a regular part of his schedule of cultural operations, which stands as an example for his skill and will. Mr. Hegde also published his experiences in local dailies and monthly magazines.

Despite the propaganda, it is unfortunate that none of the neighboring farmers have adopted this simple, efficient and safe method to combat the white grub problem. Almost all of them depend on insecticides. They target large-sized grubs which is least susceptible to insecticides. When queried, they quote their lack of knowledge about the pest and high labour costs as the reasons for not resorting to mechanical removal of grubs. One of our studies revealed that the expenditure incurred towards management of white grubs through insecticidal application and other practices ranged from Rs. 500 to over Rs. 20,000 per acre per year depending on the intensity of infestation and interventions.

But Mr. Hegde has spent between Rs. 1000 and Rs. 3500 per acre per year. This is a clear indication that larval removal method is effective and economical, especially to the farmers with small and medium landholdings.

Table 1: Details of the larva and adult beetle collection

Year	Number of third instar grubs collected	Adult beetles collected	Approximate Expenditure (Rs.)
2000	6000	2000	7000
2001	2200	800	4000
2002	1200	300	4000
2003	400	256	2000
2004	135	215	2000
2005	48	135	2000

2006	37	130	2500
2007	6	115	2500
2008	8	118	2500
2009	4	93	2500
2010	5	110	2800
2011	4	105	2800
2012	5	119	3000
2013	3	115	3000
2014	0	15	2500
2015	0	9	1500