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RESEARCH PAPER

Oil Palm Mesocarp Waste - A Potential Breeding Medium For Rhinoceros Beetle, *Oryctes rhinoceros* L.

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ABSTRACT

The rhinoceros beetle, *Oryctes rhinoceros,* is a ubiquitous pest of oil palm. A survey conducted in a heavily infested five-hectare plantation revealed that dumped heaps of oil palm mesocarp waste serve as ideal breeding sites for beetles. Within a year a total of 2303 grubs, 32 pupae and 126 adult beetles could be collected from the heaps. Hence mesocarp waste should be either spread in the plantation instead of being kept as heaps or should be kept after treatment with some eco-friendly insecticides. The *Baculovirus oryctus* being an important tool in IPM, which is disseminated by the release of inoculated beetles necessitated their mass rearing. A comparative evaluation of the various rearing materials revealed that oil palm mesocarp waste is the best media followed by cow dung. The percentage of adult emergence in mesocarp waste was 72 ± 8.36 compared to 50 ± 4.47 in cow dung; 6 ± 2.45 in coir dust and nil in oil palm bunch refuse. Cement rings (95 cm x 30 cm) covered with double-layered chicken wire mesh were used as rearing cages, which provided protection from predators, good aeration, easy watering and observation. This technique proved to be ideal for mass rearing under laboratory conditions.

Key words: Oil palm, Rhinoceros beetle, Mesocarp waste, Rearing technique

INTRODUCTION

In the recent years, the red oil palm, *Elaeis guineensis* is extensively cultivated in India and it has a vital role to play in the vegetable oil economy of the country in the years to come. Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, Orissa, Assam, Goa, Tripura and Maharashtra are the major oil palm growing states in India. The rhinoceros beetle, *Oryctes rhinoceros* is emerging as the major pest in all the oil palm growing states.

The adult beetles crawl down the axil of the youngest frond and then bore into the unopened fronds to chew the soft tissues. The fronds show "V" shaped cutting of the leaflets. In some cases, the wounds made by rhinoceros beetles provide entry points for red palm weevil and for infestation by fungi and bacteria. Adult beetles are brownish black and stout-built. Male beetles can be distinguished from the females by the presence of a longer cephalic horn. Decaying organic matters such as, farmyard manure, compost heaps, decaying vegetable matter and rotting palm logs and rubber stumps are the breeding sites of beetles (Wood, 1968). In addition to these, the beetles breed on decaying bunch heaps available within the oil palm plantations and also in persistent leaf axils filled with humid organic waste, rotting inflorescences and bunches (Dhileepan, 1987 and 1988). The lifecycle (egg to adult) is completed within 101-260 days (Nirula, 1955).

Recently it was noticed that oil palm mesocarp waste dumped as heaps in the oil palm plantation serve as an ideal breeding site for the beetles. The *Baculovirus* being an important tool in IPM, which is disseminated by the release of virus-inoculated beetles (Bedford, 1981) necessitated their mass rearing. The present studies highlight the consequences of dumping mesocarp waste in the oil palm plantations and also the utility of mesocarp waste as a medium for laboratory rearing of rhinoceros beetle for experimental purposes.

MATERIALS AND METHODS

A survey was conducted in five hectare area of the oil palm plantation (1972 planting) to assess the extent of damage by rhinoceros beetle based on leaf cut, petiole holes and spindle cut on 20% (50 Nos.) of the sample palms. Since there was heavy infestation by the beetles, search was made for the probable breeding sites in and around the plantation. On locating the breeding sites, a year- long study was undertaken during the year 2000 by collecting all the life stages (egg- adult) of the beetles from the breeding sites.

Taking into account the availability of various stages of the beetle all through the year inside the identified breeding sites, an intensive study was undertaken to find

out the most suitable medium for the laboratory rearing of rhinoceros beetles and to standardize the technique. A comparative evaluation of various breeding materials such as, semi decayed mesocarp waste, cow dung, coir dust and oil palm bunch refuse was done. Cement rings (95 cm x 30 cm) covered with double-layered chicken wire mesh were used as rearing cages (Fig.1). About 25 kg each of cow dung, coir dust, mesocarp waste and oil palm bunch refuse were filled in individual cages. The third instar grubs, 10 each, were kept in each medium. Five such replications were maintained for all the treatments. Adequate moisture was provided by watering through the wire net using a rose can. Rearing cages were kept undisturbed for adult emergence. The percentage of adult emergence in each medium was recorded.

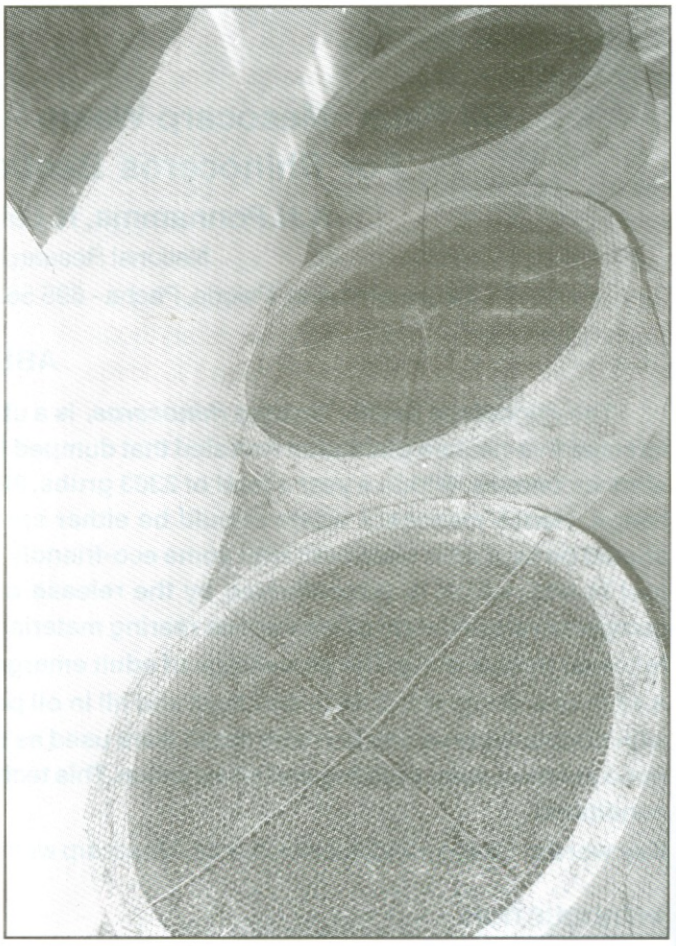

Fig.1. Cement ring- rearing cages for rhinoceros beetle

RESULTS AND DISCUSSION

Data collected on the incidence of rhinoceros beetles from the sample palms of a heavily infested plantation (1972 planting) are furnished in Table1. Percentage leaf cut, petiole hole and spindle cut were 20.74, 28.57 and 62.0 respectively. The breeding sites located were heaps of decaying mesocarp waste dumped inside the plantation. The semi-decayed mesocarp waste heaps served as an ideal breeding material and all stages of the beetles were available throughout the year. Month-wise data on the collection of various stages are furnished in Table 2. Within a year a total of 248 first instar, 994 second instar, 1061 third instar grubs, 32 pupae and 126 adult beetles were collected from the mesocarp heaps available inside the five shectare plantation. If the beetles are allowed to breed in this trend the plantation is expected to suffer a heavy economic loss. A comparative evaluation of the rearing materials revealed that oil palm mesocarp waste was the best media followed by cow dung (Table 3). Even though grubs were feeding on coir dust, mortality due to the fungal pathogen, *Metarhizium anisopliae* reduced adult emergence. Percentage adult emergence in mesocarp waste was 72 ± 8.36 compared to 50 ± 4.47 in cow dung, 6 ± 2.45 in coir dust and nil in oil palm bunch refuse. Cement rings covered with chicken wire mesh provided protection from predators, good aeration, easy watering and observation. Thus rearing of rhinoceros beetle in semi-decayed oil palm mesocarp waste filled in cement rings covered with chicken wire mesh proved to be an ideal technique for mass rearing of beetles under laboratory conditions.

On the other hand, decaying mesocarp heaps serve as ideal breeding sites within the plantation, which enhances the extent of damage on palms. Earlier studies,

Table 1. Rhinoceros beetle infestation in the oil palm plantation

Particulars	Total leaves	Damage by Rhinoceros beetle		
		Leaf cut	Petiole hole	Spindle cut
Total	1316	273	376	31
Mean + SE	34.68 ± 1.07	5.46 + 0.49	9.26 +0.79	0.66 + 0.18
Per cent		20.74	28.57	62.00

N= 50

Table 2. Monthly collection of Rhinoceros beetle grubs from Mesocarp waste heaps

Month	Stages of Rhinoceros beetles					
	I instar	II instar	III instar	Total grubs	Pupa	Adults
Jan	11	16	73	100	3	7
Feb	61	212	127	400	2	1
Mar	20	26	94	140	-	4
Apr	34	61	105	200	22	21
May	11	35	54	100	2	4
Jun	14	25	36	75	-	5
Jul	36	140	124	300	1	36
Aug	-	56	64	120	2	26
Sep	13	69	98	180	-	14
Oct	-	31	104	135	-	2
Nov	9	207	103	319	-	5
Dec	39	116	79	234	-	1
G.Total	**248**	**994**	**1061**	**2303**	**32**	**126**

Table 3. Evaluation of different feeding materials for the laboratory rearing of *Oryctes rhinoceros*

Rearing media	No. of replications	No. of grubs /replication	% Adult emergence	Range of emergence (%)
Coirdust	5	10	6 + 2.45	0-10
Cow dung	5	10	50 + 4.47	40-60
Mesocarp waste	5	10	72 + 8.36	60-80
Oil palm bunch refuse	5	10	-	-

(CD = 4.046)

(Ponnamma *et al.*, 2000) revealed that the loss in the weight of fresh fruit bunches due to the attack of rhinoceros beetles on female inflorescences and bunches of oil palm ranged from 14 to 56%, average being 27.7%. The infestation of rhinoceros beetle on female inflorescences paves way for secondary infestation by red palm weevil on the bunches. The larval period reported was 150-210 days in oil palm logs (Wood, 1968). Nirula (1955) and Desai *et al.* (1994) reported 130 days and 173 days respectively in cow dung. A mixture of coir pith and cow dung (ratio= 2:3) extended the larval period to an average of 160 days (Indiravathi *et al.*, 2001). The total larval period in mesocarp ranged from 80-120 days (Average-98.3 days). Moreover, several overlapping generations are completed in mesocarp heaps in an year since rhinoceros beetles takes only 126-160 days (Average 144.2 days) to complete the life cycle in mesocarp waste (Lalitha - Personal communication) compared to 101- 250 days (Average-180 days) in cow dung (Nirula, 1955). Hence mesocarp waste should be either spread in the plantation instead of keeping as heaps or treated with some eco-friendly insecticides.

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