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COIR WASTE: AN ALTERNATIVE FEED MATERIAL FOR MAINTENANCE OF *BACULOVIRUS* INOCULATED RHINOCEROS BEETLE, *ORYCTES RHINOCEROS* (L)*

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Coir waste is a locally available unwanted product of coir factories in Kerala. Chemically it is a lignocellulose having high water retention capacity and porosity. It was proved to be a good alternative feed material for rearing *Oryctes* grubs in laboratory for the maintenance of *Oryctes baculovirus* (OBV) culture *in vivo*. On inoculation with approximately 0.5 ml of OBV suspension, 48 per cent of grubs acquired this infection in sterilised coir waste whereas only 32 per cent did in sterilized cow dung. Moreover, loss of grubs due to secondary infection by bacterial septicemia was only 52 per cent as compared to 68 per cent in the same treatment.

INTRODUCTION

Rhinoceros beetles cause significant economic loss in coconut and oil palm. Homestead cattle dung manure pits are the breeding sites for the beetles. The eggs hatch in to grubs which complete their metamorphosis and emerge as beetles during June to August. Rhinoceros beetles are controlled by *Oryctes baculovirus* (OBV), one of the land mark biocontrol agents (Caltagirone, 1981). The OBV suppresses the population of the pest by killing the grubs in 15 to 20 days and drastically reducing the longevity and fecundity of the adults. At Central Plantation Crops Research Institute's Regional Station, Kayangulam the obligate pathogen is being maintained in healthy *Oryctes* grubs/beetles by inoculating the homogenised mid gut of OBV infected ones. The OBV inoculated grubs/beetles had been maintained on sterilised, moist cow dung powder (*Mohan* et al., 1983). Availability of cattle dung had decreased and this had prompted to find us a suitable alternative feed material for maintaining OBV inoculated rhinoceros beetles.

MATERIALS AND METHODS

Sterilized and unsterilized coir waste was used as feed material for maintaining OBV inoculated *Oryctes* grubs/beetles. Adequate moisture was maintained in all the treatments. Twenty five OBV inoculated third instar grubs per treatment (five replications of five grubs each) and parallel sets of uninoculated control were maintained. Expression of the characteristic symptoms of viral infection or mortality of the grubs was recorded for a period of 35 days at intervals of 24 h. Each dead grub was further

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examined for internal morphological and histopathological characters to confirm viral infection (Mohan *et al.*, 1983).

RESULTS AND DISCUSSION

Sterilized coir waste served as a superior feed material as it recorded 48 per cent *baculovirus* infected grubs followed by unsterilized coir waste and sterilized cow dung (Table 1). Unsterilized cow dung proved to be a poor substrate. Time taken for the development of symptoms and mortality due to this virus was also quicker in the sterilized and unsterilized coir waste as compared to other treatments. In all the treatments mortality was confined to second and third weeks and the difference was not statistically significant. Death due to secondary infection by opportunistic microorganisms, generally bacteria, was also observed in the grubs. Presumably the viral multiplication taking place in the mid gut results in a breakdown of the insect homeostatic system wherein mass invasion and multiplication of opportunistic bacteria results in the death of the host even before it could develop into a typical OBV infected sample.

In our experiment, mortality due to secondary infection was highest in case of unsterilized cow dung followed by sterilized cow dung and unsterilized coir waste (Table 2). Mortality rate of rhinoceros beetles achieved in response to OBV was statistically significant between the treatments (Table 3). Results on secondary infection were not statistically significant between the treatments. However, loss of even a single grub is important because several healthy grubs can be inoculated from the mid gut of a single OBV infected grub. Occurrence of

Table 1. Effect of feed material on acquisition of OBV infection by *Oryctes rhinoceros* grubs

Treatments*	Number of grubs dead due to OBV (in weeks)					Total	Per cent mortality
	1	2	3	4	5		
OBV - inoculated							
Sterilized coir waste	-	9	3	-	-	12	48
Sterilized cow dung	-	3	5	-	-	8	32
Unsterilized coir waste	-	6	3	-	-	9	36
Unsterilized cow dung	-	2	1	-	-	3	12

* No mortality was observed in control treatments with sterilized and unsterilized coir waste and cow dung, where no OBV - inoculation was done

Table 2. Effect of feed material on the occurrence of secondary infection in *O. rhinoceros* grubs

Treatments	Number of grubs dead due to OBV (in weeks)					Total	Per cent mortality
	1	2	3	4	5		
OBV - inoculated							
Sterilized coir waste	-	8	5	-	-	13	52
Sterilized cow dung	3	6	7	1	-	17	68
Unsterilized coir waster	3	9	2	1	-	15	60
Unsterilized cow dung	7	11	2	-	-	20	80
Control (uninoculated)							
Sterilized coir waste	-	-	2	1	-	3	12
Sterilized cow dung	-	4	2	3	2	11	44
Unsterilized coir waste	-	2	2	1	-	5	20
Unsterilized cow dung	3	3	3	3	2	14	56

Table 3. Interaction between the type of feed material and incubation period

Treatments	Number of grubs dead due to OBV	Sec. Infection
OBV inoculated		
Ster. coir waste	6.0 (2.46)	2.6 (1.48)
Ster. cow dung	4.0 (2.11)	3.4 (1.82)
Unster. coir waste	4.5(2.21)	3.0 (1.69)
Unster. cow dung	1.5 (1.40)	4.0 (1.83)
Control		
Ster. coir waste	0 (0.71)	3.6(0.98)
Ster. cow dung	0 (0.71)	2.2 (1.57)
Unster. coir waste	0 (0.71)	1.0 (1.16)
Unster.cow dung	0 (0.71)	2.8 (1.81)
Periods		
Week1	-	2.0 (1.40)
Week 2	2.5 (1.49)	5.4 (2.28)
Week 3	1.4 (1.23)	3.1 (1.82)
Week 4	-	1.3 (1.26)
Week 5	-	0.5 (0.93)
C.V. (%)	(31.33)	(39.17)
C.D. P= 0.05:		
treatment	(1.008)	(NS)
periods	(NS)	(0.621)

Figures within the parenthesis denote the transformed values

secondary infection was observed in all the five weeks and it was statistically significant between the periods. Highest mortality was observed in second week followed by third week coinciding with the development of the OBV disease.

In all the control treatments, grubs did not develop any natural viral disease however, few succumbed to bacterial infection which was more in sterilized and unsterilized cow dung than in coir waste. Rest of the grubs continued their life cycle normally. Coir pith is a highly porous lignocellulosic organic waste material with 500 per cent water retention capacity (Savithiri and Hameed Khan, 1994) and free of weeds and pathogens (Cresswell, 1997). All these characters make it a better substitute feed material for the maintenance of OBV *in vivo* in comparison to cow dung.

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