

EFFECT OF *CLERODENDRON INFORTUNATUM* ON GRUBS OF COCONUT RHINOCEROS BEETLE, *ORYCTES RHINOCEROS* L.*

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The weed plant, *Clerodendron infortunatum* Linn. (Verbenaceae) elicited mortality on grubs of *Oryctes rhinoceros* L. when administered through their natural food. When the third instar grubs were treated with sub lethal doses of the plant powder, varying degrees of insect growth regulator (IGR) activity including pupal mortality and deformation of adults were observed.

INTRODUCTION

Oryctes rhinoceros (Coleoptera: Dynastidae) is a ubiquitous pest of the coconut palm causing severe damage by boring into the unopened fronds and inflorescences. Chemical treatments involve prophylactic leaf axil filling and treatment of the breeding sites. Biological suppression of *Oryctes* is obtained by release of baculovirus; however, it is necessary to control the immature stages under certain situations in the breeding sites. Fungal pathogen, *Metarhizium anisopliae* is effective only during humid conditions of the monsoons. Insecticide treatment in the breeding sites could destroy the natural predators of the pest in addition to causing environmental hazards. Hence the present study was undertaken to search for plants with insecticidal properties as an alternative to persistent insecticides. Potential of a natural weed, *Clerodendron infortunatum* Linn. (Verbenaceae) available in the coconut

plantations was investigated against grubs of *Oryctes rhinoceros*.

MATERIALS AND METHODS

Investigations were carried out under laboratory conditions. The test plant, *C. infortunatum* before flowering was collected from the CPCRI campus (Krishnapuram, Kerala). Shade dried tender stem and leaves were tested against *O. rhinoceros* for its insecticidal properties. Fully grown second instar grubs were collected from the field and were maintained in the laboratory. Two kg of dried and powdered cow dung (unsterilised) was filled in glass troughs. Powdered *C. infortunatum* at 0.5, one, two, four and six per cent (w/w) was mixed thoroughly with cow dung while cow dung without *Clerodendron* powder served as control. Water was sprinkled over cow dung to provide adequate moisture for normal growth of grubs. There were six treatments and each treatment replicated four times. Ten uniform sized third instar *Oryctes* grubs with a mean weight of 8.5 g

*CPCRI Contribution No. 1014

were introduced into each glass trough. Observations were recorded daily for 20 days.

The experiment was repeated with sterilised cow dung as food. Test grubs were observed for morphological characters and were rated according to Dhondt *et al.* (1976). Beetle emerging from the pupa without any deformation was rated as zero while beetles with deformed/crumpled/unchitinised wings were given the score one. Adultoids (beetle does not completely emerge from the pupal skin which covers the abdomen) and larval-pupal intermediates were rated two and three, respectively.

RESULTS AND DISCUSSION

Larval mortality was higher when testing grubs fed with unsterilized food. Mortality increased linearly from zero to six per cent of *C. infortunatum*, both in sterilized and unsterilized cow dung (Table 1). Larval mortality was observed within 10 days of treatment. Higher mortality rate in unsterilized food may be due to the combined action of other pathogens which may be present in the unsterilised cow dung and *C. infortunatum*. When pupal mortality and abnormal adults were taken into consideration the total was as high as 95.0 per cent (Table 1).

Table 1. Effect of *C. infortunatum* on *O. rhinoceros* grubs

Per cent plant powder	Mortality of grubs		Mortality + IGR activity
	Unsterilised	Sterilised	
0.0	7.65 (2.5)	4.05 (0.0)	4.05 (0.0)
0.5	11.24 (5.0)	22.50 (15.0)	37.51 (37.5)
1.0	22.50 (15.0)	24.53 (17.5)	49.33 (57.5)
2.0	45.00 (50.0)	27.86 (22.5)	53.78 (65.0)
4.0	52.27 (60.5)	36.22 (35.0)	75.16 (92.5)
6.0	61.77 (77.5)	47.88 (55.0)	78.76 (95.0)
Mean	33.41	27.17	49.76
C.D.*	8.97	6.55	8.43
C.V. (%)	17.81	15.99	11.24

Figures in parenthesis denote actual value obtained in the study; * significant at five per cent level

Table 2 Insecticidal and IGR activity of *C. infortunatum* on *O. rhinoceros* fed with sterilised food

Treatment	Per cent mortality		Abnormal adults (%)	IGR rating
	Larva	Pupa		
0.0	00.0	00.0	00.0	0
0.5	10.0	12.5	15.0	1
1.0	17.5	25.0	15.0	2
2.0	22.5	27.5	15.0	2
4.0	35.0	25.0	30.0	2-3
6.0	55.0	32.5	07.5	2-3

Most of the grubs when fed on sterilised food were unable to moult properly and pupal mortality was up to 32.5 per cent (Table 2). *C. infortunatum* resulted in adultoids (pupal adult intermediates) characterised by adult head, thorax pupal wing pads and abdomen which lived for four to five days while malformed adults with crumpled/unchitinised wings had a longevity of seven to eight days. A dose dependent effect was observed in the formation of adultoids which was high in four per cent concentration. Results suggested that *C. infortunatum* appeared to influence juvenile hormone (JH) regulation during larval development. Dhondt *et al.* (1976) reported adultoids of rhino-ceros beetle against the synthetic JH, methoprene. Inhibition of development of male reproductive system has also been observed in methoprene treated *O. rhinoceros* pupae (Mariamma Jacob, 1989).

Secondary plant substances have been shown to possess a variety of insecticidal properties. These substances are specific to plant species and various insects respond differently to these substances. Srinath (1990) reported protection against pests of *Bhindi* and *Amaranthus* with extracts of *Thevetia nerifolia*, *Azadirachta indica* and *Clerodendron infortunatum*. *C. infortunatum* showed antifeedant activity against *Henosepilachna vigintioctopunctata* while they are safe to non-target organisms (Lily, 1995). Moulting inhibitory properties of *C. inermis* in castor semilooper,

C. infortunatum on grubs of rhinoceros beetles

Achaca janata was reported by Neetha *et al.* (1998). Results of the present investigations clearly indicate the possibility of utilising *Clerodendron infortunatum* as a potential, ecofriendly pesticide against rhinoceros beetle. *C. infortunatum* available in coconut plantations can be incorporated into the cow dung pits which are the main breeding sites of *O. rhinoceros*.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the help rendered by Shri. Jacob Mathew, Principal Scientist, CPCRI for statistical analysis and service of Mr.B. Anilkumar, Technical Assistant for word processing of this manuscript.

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