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Pathogenicity of *Oryctes* Baculovirus to Cashew Stem and Root Borers*

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Plocaederus ferrugineus L., *P.obesus* Gah and *Batocera rufomaculata* DE G are the stem and root boring pests of cashew. Among them, *P. ferrugineus* is the most dominant species. Rajapakse and Jeevaratnam (1982) reported that *P. ferrugineus* infestation could be effectively checked with *Oryctes* baculovirus in Sri Lanka. An attempt was made to study the efficacy of *Oryctes* baculovirus (OBV) in the control of *P. ferrugineus* and *P. obesus* in the field and laboratory conditions and the results are reported in this short paper.

The Kerala isolate of OBV (OBV-KI) was obtained from CPCRI Regional Station, Kayangulam, Kerala and the isolate PV 505 (OBV-PV505) was obtained from IIHR, Bangalore. The viral isolates were propagated in the third instar grubs of *Oryctes rhinoceros*.

The following methods of inoculation of OBV were attempted.

(i) The guts of infected *Oryctes* grubs were excised and homogenised in PO_4 buffer (pH 8.2) containing antibiotics (Streptomycin 250 mg/1, Penicillin 200 mg/1 and Oxytetracycline 100 mg/1) and clarified by centrifugation at 10000 rpm for 30 minutes. The homogenate was used to infect healthy grubs of *P. ferrugineus* and *P.obesus* by force feeding. The grubs were slightly anaesthetized with ether and 0.05 ml to 0.2 ml (depending on the size of the larvae) of the homogenate was administered into the foregut using a polyethylene cannula attached to a tuberculin syringe (Mohan *et al.*,1983). Different concentrations of the virus expressed as weight of infected tissue/100 ml tried were., 1, 4 and 8 per cent midgut tissue and 10 and 20 per cent whole larval tissue in four trials.

(ii) The bark of cashew were cut into pieces (6x4x1.5 cm) and soaked in virus inoculum (10 to 20 g of cadavers in 100 ml of distilled water). Twenty pieces of bark were soaked in 200 ml of virus inoculum for 30 minutes and shade dried. The remaining inoculum was mixed with 500 g of sawdust. The grubs were maintained individually with two virus-treated cashew bark pieces and 50 g of sawdust. Two trials were conducted using this method.

(iii) The grubs were force-fed with virus using the oral feeding method and then maintained on pieces of cashew bark contaminated with virus. Three trials were conducted using this method.

(iv) Laboratory-reared adult beetles were infected by allowing them to wade through a baculovirus suspension for 30 minutes (4g and 8g of grub tissue in 100 ml of phosphate buffer) containing 4% sucrose, kept in shallow container (Mohan *et al.*, 1986). Beetles were gently anaesthnetized and 0.2 ml of the midgut inoculum (containing 4 and 8 g infected tissue in 100 ml PO_4 buffer, pH 8.2) containing 4% sucrose was administered into its foregut using a polyethelene cannula attached to a tuberculin syringe.

Ten larvae/beetles were used for every treatment in each trial. Appropriate controls were maintained with distilled water /phosphate buffer/sucrose solutions.

(v) A Field trial was laid out as done by Rajapakse and Jeevaratnam (1982) with slight modification. One set (10 cashew trees) of stem and root borer infested galleries were drenched

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with viral inoculum containing antibiotics, which was not added in the earlier work (1 grub/250 ml of distilled water) and in another set virus contaminated sawdust (@ 1 grub/500 g of sawdust) was heaped around the infested area after drenching the galleries with the viral inoculum. Control was maintained with distilled water and sawdust containing antibiotics without viral inoculum.

The infected grubs were maintained up to 90 days for the development of morphological and histological symptoms of baculovirus infection. For histological studies, the insects were dissected and smears prepared from different tissues were stained with Giemsa following the method of Mohan *et al.* (1983) and observed under the microscope.

In the field experiment, the grubs were removed from the galleries 30 days posttreatment and maintained in the laboratory for observations on development of external symptoms. Finally, Giemsa stained tissue preparations were studied for histological symptoms.

Grubs and adults of *Plocaederus* spp. did not express any of the typical symptoms of OBV infection (Huger, 1966; Zelazny, 1972 and 1978; Mohan *et al.*, 1983) in any of the methods of inoculation described. It was confirmed by histological observations also.

The grubs treated through bark feeding method registered very low mortality while in oral feeding and combination of oral feeding and bark feeding, the mortality was comparatively more. However in control also more or less equal mortality was observed, The mortality was found mainly due to injury (while force feeding), bacterial infection and natural mortality at prepupal and pupal stages. No morphological symptoms of OBV infection were noticed.

Rajapakse and Jeevaratnam (1982) reported infection of cashew stem and root borer by OBV. However, our observations revealed that infection of *Plocaederus* spp. by OBV was doubtful with no symptoms of viral infection under field conditions.

Earlier studies indicated that OBV is very much host specific (Huger, 1968). However, the host range was increased to species such as *Heteronychus arator* and *Costelytra zealandica* (Crawford *et al.*, 1985), *Strategus aloeus,*

Table 1. Mortality of *P. ferrugineus* grubs and adults in various treatments with *Oryctes* baculovirus

Trial	No. of trials	Treatment	Mortality at 90 DAT
Oral feeding	4	i. oral feeding of viral inoculum	70.0
		ii. control	80.0
Oral feeding & bark feeding	3	i. oral feeding &bark feeding	100.0
		ii. control	75.0
Bark feeding	2	i. Bark feeding of inoculum	30.0
		ii control	20.0
Swimming and oral feeding of adults	3	i. Swimming treatment with inoculum	100.0
		ii. control	100.0
		iii. oral feeding	100.0
		iv. control	100.0
Field trial*	1	i. inoculum treated trees	0.0
		ii Control	0.0

DAT — days after treatment; * mortality recorded at 30DAT

Scapanes australis grossepunctatus (Lomer, 1987) and *Papuana uninodis* and *P.hubneri* (Zelazny, 1988) belonging to the family Scarabaeidae only and not on any other family. The present observations revealed that OBV-KI and OBV-PV505 were not infective to cashew stem and root borers.

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Key Words : *Oryctes* Baculovirus, *Plocaederus ferrugineus*, *P. obesus*, pathogenicity

REFERENCES

CRAWFORD,A.M., SHEEHAN,C., KING,P.D. and MEEKINGS,J. 1985. *Oryctes* baculovirus infectivity for Newzealand Scarabs. In "Proceedings of the 4 th Australasian Conference on Grassland Invertebrate Ecology". (R.B. Chapman ed.), pp. 224-227, Chirstchurch, Caxton press, Newzealand.

HUGER,A.M. 1966. A virus disease of Indian rhinoceros beetle, *Oryctes rhinoceros* (Linnaeus), caused by a new type of insect virus, *Rhabdionvirus oryctes*, gen.n., sp.n., *J. Invertebr. Pathol.*, **8**, 38-51.

HUGER,A.M. 1969. Diagonstic proof for successful introduction of *Rhabdionvirus oryctes* ecosystem in areas of Western Samoa. South Pacific Commission, UNDP (SF) SPC Rhinoceros beetle project, SemiAnnual report Nov. 1968-May 1969. pp 34-38 Noumea, New Caledonia.

LOMER,C.J. 1987. Infection of *Strategus aloeus* (L.) (Coleoptera : Scarabaeidae) and other Dynastinae with *Baculovirus oryctes*. *Bull. Ent. Res.*, **77**, 45-51.

MOHAN,K.S., JAYAPAL,S.P. and PILLAI,G.B. 1983. Baculovirus disease in *Oryctes rhinoceros* population in Kerala. *J. Plant. Crops*, **11**, 154-161.

MOHAN,K.S., JAYAPAL,S.P. and PILLAI,G.B. 1986. Diagnosis of baculovirus infection in coconut rhinoceros beetles by examination of excreta. *J.Plant dis. and Prot.*, **93**, 379-383.

RAJAPAKSE,H.S. ROHAN, and JEEVARATNAM, K. 1982. Use of a virus against the root and stem borer *Plocaederus ferrugineus* L. (Coleoptera : Cerambycidae) of the cashew. *Insect Sci. Applic.*, **3**, 49-51.