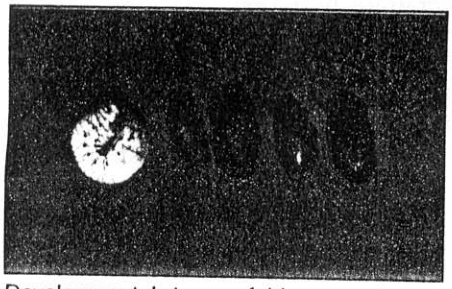
Baculovirus oryctes for controlling rhinoceros beetle of coconut palm

Murali Gopal and Alka Gupta

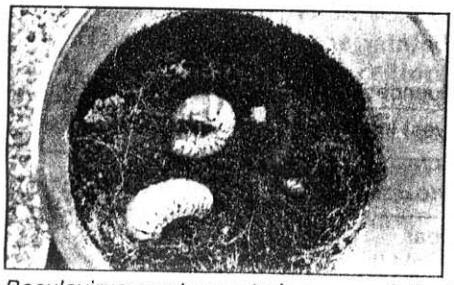
RHINOCEROS beetle *Oryctes rhinoceros* is one of the major pests of coconut palms of all ages. The adult beetle bores into the growing spear leaf, spathes and petioles and chews-off the soft tissue. The partly-eaten leaves, when open, show a geometric 'V'-shaped cut. The bore holes also serve as an entry point for red palm weevil, another menacing pest, and fungal pathogens. Yield reduction by 10% occurs due to rhinoceros beetle alone.



Developmental stages of rhinoceros beetle

The yield of coconut palm gets reduced by 10% due to rhinoceros beetle alone

The beetle breeds in decaying organic matter



Baculovirus oryctes controls successfully rhinoceros beetle infesting coconut palm

Infected grub shows translucent mid-gut line dorsally;healthy displays clear, dark mid-gut line

The pest breeds in decaying organic matter such as farmyard manure, cattle dung heaps, dying and dead palm trunks, decaying stumps, saw dust, coir waste and compost pits.

An effective microbial agent, *Baculovirus oryctes*, successfully combats the menace of rhinoceros beetle. This belong to the family Baculoviridae, sub-group Nudibaculovirineae.

Through contaminated food material, the *Oryctes* baculovirus (OBV) gains entry into the host body, where it multiplies in the nuclei of midgut epithelium and fat bodies of grubs and adults, and also ovarian sheath and inner walls of spermatheca.

Infected grubs become lethargic, stop feeding and die within 15–20 days of infection. All the 3 instars of grubs and adults succumb to the disease, however, pupae are not infected by the virus. The adults after taking up infection become lethargic, short-lived (25 days of 70) andy lay less number of eggs (1–2 eggs of 15 eggs). As the virus multiplies, the midgut gets filled with white mucoid fluid. In grubs, abdomen becomes turgid and glassy, fat bodies disintegrate and haemolymph content increases. The infected grubs when examined against light show a traslucent midgut line dorsally, whereas the healthy grubs display a clear dark midgut line. This is one of the major exopathological symptoms of the OBV infection. On dissection infected grubs show swollen midgut

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middle of May and when seedlings are 45 days old, they are planted in field 50 cm apart in rows spaced at 50 cm. Transplanting is done in July in a drizzling weather condition. For raising 1 ha of trisankar pasture, 10–12 nursery beds of 5 m x 1.2 m size are required. Rooted slips from the old plant tussocks are also used for raising pasture. In the first year, 2 weedings are required under rainfed conditions.

Table 3. Seed yield of trisankar grass as influenced by N level

N levels	Seed yield (tonnes/ha)	
	I Year	II Year
0	0.080	0.070
25	0.090	0.080
50	0.103	0.103
75	0.136	0.142

FORAGE PRODUCTION

A trial on trisankar with 4 levels of nitrogen (0, 25, 50, and 75 kg/ha) and 3 harvest dates (45, 75 and 120 days) was conducted at the Indian Grassland and Fodder Research Institute, Jhansi. The total dry-matter yield of trisankar at 45 days was significantly influenced by nitrogen levels on the second year. Highest total dry-matter yield (10.7 tonnes/ha) was recorded with the application of 50 kg N/ha as compared to 25 kg N and control but it was at a par with 75 kg N/ha (9.7 tonnes/ha). Harvest at 75 days yielded total dry-matter yield of 5.9 tonnes/ha in the first year and 11.1 tonnes/ha in the second year and at 120 days 5.1 tonnes/ha in the first year and 9.1 tonnes/ha in the second year (Table 1). Thus on the rainfed lands on the semi-arid region, application of 50 kg N/ha and first 2 cuts at every 45 days interval, followed by final harvest at 75 days interval is the proper production management for trisankar pasture.

FERTILIZER

Generally for grasses 25–75 kg N/ha and 20–30 kg P/ha are recommended for pasture. It is observed that trisankar shows a good response to fertilizers, specially N. The basal dose of phosphorus is required at the time of sowing or planting. Split application of nitrogen in 3 equal doses at 18–20 days interval is beneficial for good establishment.

GRAZING VALUE

Trisankar grass is palatable to cattle, sheep and goats. In a grazing experiment of grass-legume cafeteria comprising 18 grasses and 18 legumes, trisankar was preferred by cattle during the winter and spring (Table 2). It was not much liked by cattle in early monsoon. The maximum biomass of trisankar was utilized during the winter or during the lean period, when it remains greener than other fodder grasses. It was noted that grazing cattle preferred its succulent culms/stems over leaves. The same trend in preference was observed in grazing trials with sheep and goats. Both sheep and goats spent much of the grazing time in trisankar stands during spring. The soft juicy stems were much liked by sheep and goats. Thus trisankar grass is important for grazing animals during the lean period, i.e. from November onwards, as this grass has longer green period and the succulent stems as well.

Trisankar grass is much suitable to cut-and-carry systems as it has high proportion of stem over leaf after monsoon. In comparison to other grazing grasses, viz. Dinanath grass, thin napier grass, buffle grass etc. Like other cultivated fodders, viz. sorghum pearl millet etc. its best use is cut-and-carry and chaffing to avoid wastage during *in-situ* grazing by cattle which prefer it at the late stage of post-flowering.

Nutritionally, trisankar grass is rich in protein, viz. 8.4%, 4.6% and 4.2% in the monsoon, post-monsoon and winter respectively. The NDF content is 58.2%, 68.6% and 69.3% in the monsoon, post-monsoon and winter, respectively.

SEED YIELD

Seed production in trisankar grass ranges from 0.08 to 0.136 tonne/ha. There is no yearly variation in seed yield. High N level increases seed yield to a maximum of 0.142 tonnes/ha (Table 3). Seed germination test 2 months after harvest showed 25–30% germination.

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with white mucoid fluid while the healthy ones show a thin midgut filled with dark coloured food particles.

For field control, 10–15 virus-inoculated healthy beetles per ha are released, preferably during dusk. Viral transmission occurs in breeding sites and in palm crowns mainly through faecal matter excreted by the released beetles. The faeces excreted carry high virus load which can spread @ about 1 km/month in field. Release of OBV at Minicoy and Androth islands of Lakshadweep, Andaman islands and Chittilappily in Thrissur district of Kerala effectively controlled beetle infestation and maintained *O. rhinoceros* population below economic injury level.

This virus is specific to few Scarabaeids and does not cause harm to humanbeings, cattle and fish. Thus, it is a safe bio-agent with immense potential to control *O. rihinoceros*, an ubiquitous pest of coconut palm.