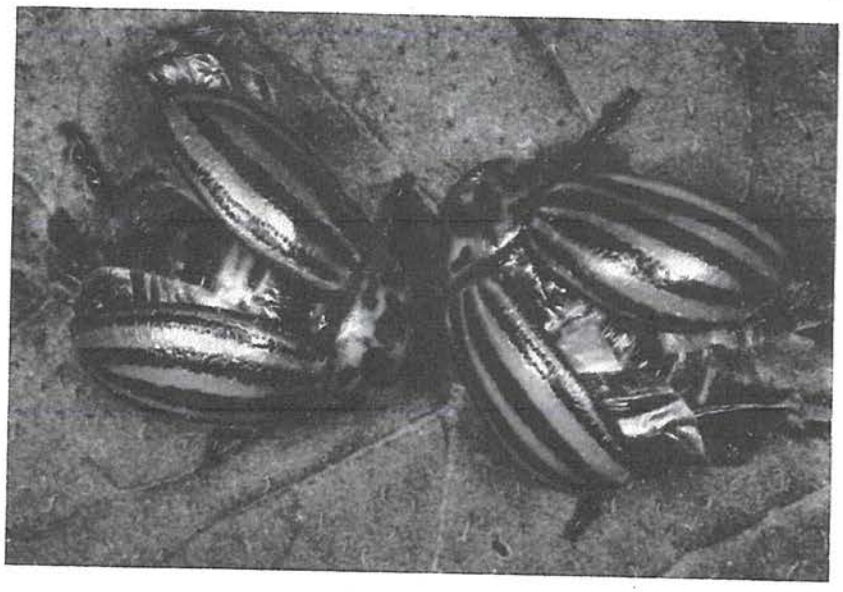
The Breakthrough

Although thousand-year-old Sanskrit medical writings mention neem's usefulness, the tree's exciting potential for controlling insects has only recently become clear.

Neem's ability to repel insects was first reported in the scientific literature in 1928 and 1929. Two Indian scientists, R.N. Chopra and M.A. Husain, used a 0.001-percent aqueous suspension of ground neem kernels to repel desert locusts. Not until 1962, however, was the real significance demonstrated. That year, in field tests in New Delhi, S. Pradhan ground up neem kernels in water and sprayed the resulting suspension over different crops. He found that, although locusts landed on the plants, they refused to eat anything, sometimes for up to 3 weeks after the treatment. Furthermore, he noted that neem kernels were even more potent than the conventional insecticides then available and that neem's repellency was as important as its toxicity. In neighboring insecticide-treated fields, for instance, the insects also died, but not before consuming the crops.

Neem's insect-growth-regulating (IGR) effects were independently observed in England and Kenya in 1972. In England, L.N.E. Ruscoe, at that time an employee of the ICI Company, tested azadirachtin on insect pests such as cabbage white butterfly (*Pieris brassicae*) and cotton stainer bug (*Dysdercus fasciatus*) and noted IGR effects in each case. The azadirachtin was provided by D. Morgan, a Keele University chemist who had been the first to isolate azadirachtin. In Kenya that same year, K. Leuschner, a German graduate student working at the Coffee Research Station in Upper Kiambu, observed that a methanolic neem-leaf extract controlled the coffee bug (*Antestiopsis orbitalis bechuana*) by growth-regulating effects. Most fifth-instar nymphs treated with the extract died during subsequent molts and the few that survived to adulthood had malformed wings and thoraxes.

Neem's fecundity-reducing effects were first recorded by R. Steets (another graduate student) and H. Schmutterer in Germany. Applying methanolic neem-kernel extract and azadirachtin to the Mexican bean beetle (*Epilachna varivestis*) and the Colorado potato beetle (*Leptinotarsa decemlineata*) they found that females almost stopped laying eggs. Some females had been completely sterilized, and the effect was irreversible.



NEEM PRODUCTS AGAINST COCONUT INSECT PESTS

By

S. Sadakathulla[1]

ABSTRACT

Three field experiments were conducted to find out the efficacy of neem products against the damage of rhinoceros beetle to coconut palm and termite damage to coconut palm and plaited leaves. The application of cither neem seed powder + sand (1:2) or neem seed kernel powder + sand (1:2) @ 150 g mixture per palm in the bases of three leaf axils in the crown, were found more effective against rhinoceros damage. Spraying of neem oil 5% or neem seed kernel extract 20% from the base and up to, 2 m height on the truck protected the palm from termites. Spraying with copper sulphate 1% and-then neem oil 5% or copper sulphate 1% and then neem seed kernel extract 20% on plaited coconut leaves was found efficacious in protecting plaited coconut leaves for more than six months even when the plaited leaves were kept on the bare ground having persistent live termite colony throughout the year.

INTRODUCTION

Among the major insect pests of coconut (*Cocos nucifera Lin*), rhinoceros beetle (*Otyctes rhinoceros* L.) was found attacking palms in serious proportion with persistent occurrence in ail countries where coconut is grown. Besides coconut, rhinoceros beetle attacks pineapple, sugarcane, palmyrah, date palm, red oil palm, tali pot palm and royal palm. But coconut has been found to be the most favored of ail palms by the beetle (Dhileepan, 1986. Sundara Babu, 1986).

The adult rhinoceros burrows and remains in leaf axils of the spindle leaves in the crown of the palm causing damage to, the developing leaves resulting in characteristic "V" or wedge shaped appearance in unfolded leaves. Though the damage was prevalent throughout the year to, varying degrees, significantly greater damage was recorded during May, June and August months as against the least in February (Sakadathulla and Ramachandran, 1991-b). The beetles also bore into the soft tissues of the bud/cabbage. More fronds; were attacked by a single beetle in older palms, since they have more compact crown. The beetle attacks the unopened spathes and can cause up to 10% reduction in yield. The injury and the bore h le made by this beetle also serve as points of entry of other equally important pest viz., the red palm weevil, *Rhynchophorus ferrugineus* F. The conventional control of the damage by HCH 10% + sand (1:1) mixture in three leaves axil bases found effective (David and Kumaraswami, 1982). The integrated management of this pest was reviewed by Sundarababu (1986), Sadakathulla and Ramachandran (1990-b; 1990-c) found the application of naphthalene balls or phorate 10% G + sand (1:2) equally effective as that of the conventional method.

The subterranean pest termite, *Odontotermes obesus Ramb*, is an important pest of coconut seedling in the nursery, newly planted, seedling, growing palms in the plantation and plaited coconut leaves. The incidence will be more in sandy loam soils and on soils other than sandy, this pest appears to be attracted by the husk of the seednut in the nursery and the dry under-composed organic wastes; applied to the main plantation. As early as 1958. Nirula *et al* estimated 20% loss of coconut seedlings due to termite attack. In older palms, the earthen gallery extends up to 3 to 4 m height of the trunk during summer. In young plantations, the termite galleries even reaches the leaf bases in the crown and damage them, resulting the premature shedding of functional leaves. The damage to the bark of the tree renders it prone to the infestation of bark borer beetle *Xyleborus sp.*, the worst enemy

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of grown up palms. The termites also attack the plaited leaves in the thatched roof and skeletonize them. The alternate hosts of termite are sugarcane, groundnut, chillies, guava (Prasad and Rao, 1988).

In view of the considerable loss caused to the palm by these insects pests three experiments were conducted at Coconut Research Station, Veppankulam during 1990-92 to find out the efficacy of neem products against the rhinoceros beetle and termite damage.

MATERLALS AND METHODS

a. Rhinoccros beetle (*O. rhinoceros*)

The field experiment was laid out at Coconut Research Station, Veppankulam in randomized block design, replicated four times with eight treatments; comprising four plant products and 3 chemicals viz., neem seed powder (NSP) + sand (1:2 ratio). Neem seed kernel powder (NSKP) + sand (1:2) (g- 150 g/palm, neem cake powder (NCP) + sand (1:2) 100 g/palm. neem cake powder (NCP) + sand (l:2) @ 150 g/palm, Klorocin (SBP = Standard Bleaching Powder) + sand (1:3) @ 200 g/palm, HCH 10% + sand (1:1) @150 g/palm, Napthalene balls @ 3 nos/palm and untreated control. The coconut palms which where constantly attacked by rhinoceros beetle where screened and selected for the experiment and recorded, total number of leaves in the crown and leaves attacked by the rhinoceros beetle prior to imposing the treatments. The individual chemical mixture was applied in the leaf bases of 3 innermost leaves in the crown. Three napthalene balls per palm were applied to the base of 3 innermost leaves in the crown @ each per leaf base. The treatment with naphthalene balls alone was repeated 45 days after the first round. Periodical observations on the damage of leaves in the crown by *O. rhinoceros* were continued for three months and the percent damage is different treatments assessed.

b. Termite (*O. obesus*)

Two field experiments Where conducted during 1991- 1992 summer season at Coconut Research Station. Veppankulam.

i) The experiment on palms was laid out in randomized block design, replicated thrice with seven treatments viz. 1) aldrin 30 EC @ 0.15%; 2) HCH 50% WP, 0.25%; 3) Chlordane 20 EC @ 0.1%. 4) Neem oil (NO) 5%, 5) Neem seed kernel extract (NSKE) 20%; 6) Cashewnut shell oil (CNSO) 80% and 7) untreated control. Each treatment consisted of 10 palms of 22 years old showing five carthen gallery of *O. obesus* both on the base and trunk of the palms to varying heights at the time of experiment layout. The spraying was done using a hand operated high volume rocker type of sprayer by drenching to the point of run off from the base of the palm and soil around and the trunk up to 2 m height from ground level. Periodical observations at fortnightly intervals after the treatment were recorded up to seven months.

The cashewnut shell oil cannot be sprayed as such with a sprayer; hence one part of kerosine was added to four parts of cashewnut shell oil for aiding smooth spraying as suggested by Pillai *et al* (1983). For other treatments, teepal was added @ 1 ml per l of spray fluid.

ii) The experiment on plaited leaves Was laid out in randomized block design replicated thrice with 11 treatments, viz. 1) aldrin 0.15%, 2) HCH 0.25%, 3) Chlordane 0.1%, 4) neem oil 5%, 5) neem seed kernel extract 20%, 6) cashewnut shell oil 80%, 7) copper sulphate ($CuSo_4$) 1%; 8) copper sulphate 1% and neem oil 5%; 9) copper sulphate 1% and neem seed kernel extract 20%, and 10) copper sulphate 1% and cashew nut shell oil 80% and 11) untreated check. For each treatment, five numbers of plaited coconut leaves (1 m length x 0.4 m width each) were used. The emulsion sprays for the treatments l to 7 were sprayed on both the sides of the plaited leaves. For the treatments 8-10, copper sulphate l % was sprayed first on the plaited leaves and air dried in shade for 30 minutes. The individual treatment (T8-T10) was sprayed. These plaited coconut leaves after treatments were

individually kept on the bare ground, where the live termite colony was persistent throughout the year. Periodical observations at fortnightly interval on the termite infestation on the plaited leaves under treatment were recorded.

RESULTS AND DISCUSSION

a) Rhinoceros:

All the chemical treatments were found significantly superior against rhinoceros damage. Among them, the treatment i0th the application of three naphihalene balls in three leaf bases in the crown was found more effective recording significantly lesser damage (8.6%). The results agree with the earlier findings of Gurmit Singh (1987) and Sadakaihulla and Ramachandran (1990-b: 1990-c). The next best treatment was the application of HCH 10% + sand mixture (9.9%). closely followed by the treatment with neem seed powder + sand (10.1%) and neem seed kernel powder + sand (10.7%) (Table 1). Since Klorocin + sand mixture (10.1%) caused phytotoxicity in the leaves at the points of contact of the chemical, this cannot be recommended though it is on par with neem seed powder + sand and neem seed kernel powder + sand and neem seed kernel powder + sand mixture application for the efficacy.

The mixture of neem seed powder or neem seed kernel powder + sand 91:2) can be well utilized as it is locally available and cheaper for the effective management of rhinoceros beetle in coconut palm.

b) For termite control both in the nursery and planted seedlings, cultural and chemical measures have been suggested (Beal and Smith 1964): Bees *et al.*, 1966). Application of 2-3 aluminium phosphidc tablets in the hole of the termitarium and plugging the hole air tight to kill the entire colony including, the queen also found effective (Rangajaran *et al*, 1985). Sirkar (1486) advised the painting, of the trunk up to l m height of older coconut palms with coal tar or lime. Sadakathulla and Ramachandran (1990a; 1991a) found out the efficacy of either aldrin 0.15% or HCH 0.25% or chlordane 0.1% spray against the termite both on the palm and plaited coconut leaves.

The results of the present studies indicated the best efficacy of spraying, with cither neem oil 5% or neem seed kernel extract 20% treatment as that of the spray with aldrin 0.15%, HCH 50% WP 0.25% and chlordane 0.1 % on the base and up to 2 m height of the trunk of the coconut palm and spraying cither with copper sulphate 1% and then cashew nut shell oil 80% or copper sulphate 1% and then neem oil 5% or copper sulphate 1% and neem seed kernel extract 20% on the plaited coconut leaves against *O. obesus* for more than 6 months even when the treated plaited leaves were kept on the bare ground having, the persistent live termite colony throughout the year (Table 2).

Spraying with $CuSo_4$ 1% and neem oil 5% or $CuSo_4$ and neem seed kernel extract 20% was found equal in efficacy as that of the treatment with $CuSo_4$ 1% and then cashewnut shell oil 80%. The neem products can be easily and cheaply substituted in the place of cashewnut shell oil for the protection of palm and preservation of plaited coconut leaves from the ravages of the termites,

CONCLUSION

The locally available cheaper plant product neem seed powder + sand 0:2) or neem seed kernel powder + sand (1:2) @ 150 g mixture in the leaf base of three inner most leaves in the crown was effective and may be well fitted in the integrated pest management programme of the rhinoceros beetle in coconut plantation.

Spray of neem oil 5% or neem seed kernel extract 20% on the base of up to 2 m height of the trunk of coconut palm was found as effective against termites as that of spraying with either aldrin 0.15% or HCH 0.25% or chlordane 0.1%.

Spraying with $CuSo_4$ 1% and neem oil 5%, or $CuSo_4$ 1% and neem seed kernel extract 20% on plaited coconut leaves was found equal in efficacy as that of the spraying with $CuSo_4$ 1% and then cashewnut shell oil 80% in the presentation of plaited coconut leaves.

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Table 1
Efficacy of neem seeds against Rhinoceros beetle

S. No.	Treatments	Pooled mean Damage (%)
1.	Neem seed powder (NSP) + sand (1:2)	10.2
2.	Neem seed kernel powder (NSKP) + sand (1:2)	10.7
3.	Neem cake powder alone	16.7
4.	Neem cake powder (NCP) + sand (1:2)	15.3
5.	Klorocin (SBP) + sand (1:3)	10.1
6.	HCH l0% + sand (1:1)	9.9
7.	Naphthalene balls @ 3 balls/palm	8.6
8.	Untreated control	19.4
	CD (P = 0.05)	1.2

Table 2
Efficacy of chemicals against termite damage

S.No.	Treatments	Mean Protection on (%)	
		Palm Trunks	Plaited leaves
1.	Aldrin 30% @ 0.15%	100.0	97.3
		(90.0)	(80.6)
2.	HCH 50% WP @ 0.25%	100.0	96.7
		(90.0)	(79.6)
3.	Chlordane 20% EC @ 0.1%	100.0	97.1
		(90.0)	(80.3)
4.	Neem Oil (NO) 5%	94.6	80.0
		(75.6)	(63.4)
5.	Neem seed kernel extract (NSKE) 20%	92.7	79.0
		(74.6)	(62.7)
6.	Cashew-nut shell oil (CNSO) 80%	68.6)	79.7
			(63.2)
7.	Copper Sulphate (CuSo4 1%)	-	75.6
			(60.4)
8.	$CuSoE_4$ 1%; NO 5%	-	99.7
			(87.3)
9.	$CuSo_4$ 1%; NSKE 20%	-	98.2
			(82.4)
10.	$CuSo_4$ 1 %; CNSO 80%	-	100.0
			(90.0)
11.	Untreated control	0	0
		(4.8)	(4.8)
	CD (P = 0.05)	2.72	5.46

- Treatment not included Figures in parenthesis are arc sine transformed values.