

Rodent Pest Management in the Coconut Plantations of India and its Islands

RANJAN ADVANI

Central Plantation Crops Research Institute, Kasaragod - 670 124 (Kerala).



Fig. 1 About 55 per cent of coconut crop is damaged by rodents (*Rattus rattus*) in Minicoy island

ABSTRACT

This communication deals with the results pertaining to eco-toxicological studies on rodents infesting coconut crop of South India, Minicoy island (Lakshadweep) and Car Nicobar. Extent of rodent damage and rodent species infesting coconut crop at its different growth stages are discussed. Mechanical, chemical and biological management of rodent pests of coconut has been suggested, keeping in view biological and behavioural patterns of rodents and cropping pattern

Rodents are serious pests of coconut in almost all the seventysix coconut growing countries of the world including India and its islands. About 24 per cent loss to tender coconuts is inflicted by rodents in the coconut fields of Kerala and Karnataka (Advani; 1982), whereas, the rodent damage to coconut crop in Minicoy Island (Lakshadweep) and Car Nicobar reaches even up to 55 and 35 per cent respectively. In 1975, in Lakshadweep islands alone, the estimated loss to coconut crop was about



Fig. 2 The hole made by rodents in coconuts is always in the centre. Damage is 100% in all bunches harvested from a coconut palm in Minicoy island

8 million nuts, costing about 35 lakh rupees (Shah and Subiah; 1975). Coconut being a perennial crop provides a regular and abundant food and water supply to rodents all through the year. Its protective crown environment facilitates rodents to maintain their higher level of populations as ideal habitat is available to them for reproduction, nesting and rearing the young ones. This fact is further supported by the trap indices of rodent populations (15.0-33.5; rodents

/100 traps/24 hrs.) which are much higher than rodent species infesting any other crop ecosystem or biome of India.

This communication deals with the results obtained for coconut-rodent species relationship and comparative efficacies of different types of trap and rodenticides used to minimise rodent pest problem in coconut crop of Kerala, Lakshadweep and Andaman and Nicobar islands.

RODENT SPECIES INVOLVED

In North Kerala and South Kanara District of Karnataka, the Black rat, *Rattus rattus wroughtoni* [Hinton] and the House rat *Rattus r. rufescens* [Gray] are the two major murid species which damage coconut at its tender stage. *R. r. wroughtoni* makes its nest in the coconut crowns itself where it performs all vital activities including breeding and rearing young ones. Whereas, *R. r. rufescens* which is a major pest of stored grains and other food stuffs throughout India, undertakes nocturnal migrations from houses to coconut crowns if plantations are in or around residential complexes. In Minicoy island [Lakshadweep] the Black rat, *Rattus rattus* [Linn.] which was reported first time from this island, is the major rodent species inflicting damage to coconut crop at a rate of 55 per cent [Advani; 1983a]. Whereas, in South Andamans [Port Blair] and Car Nicobar islands, three murids, viz. *Rattus rattus andamensis*, *R. r. holchu*, *R. pulliventer* and *R. rattus* inflict damage to coconut by about 35 per cent [Advani; Unpubl. data]. Bandicoot rats, *Bandicota bengalensis* and *B. indica* damage coconut in nursery and storage conditions respectively. The Western ghat squirrel, *Funambulus tristriatus* damages inflorescence of coconut trees. Other species of minor importance like Indian gerbil, *Tatera indica cuvieri*; Field mouse, *Rattus meltda* are also found to damage coconut nursery, if it is near to paddy fields.

RODENT PEST MANAGEMENT IN COCONUT PLANTATIONS

The bio-toxicological studies conducted in the coconut fields

of Kerala, Karnataka, Minicoy, South Andamans and Car Nicobar have yielded some information in principles and practices to be followed for effective management of rodents. Some of the results of practical implication are: (1) The rodent control or trapping should be done in a largest possible area of plantation; otherwise reinfestation of rodents from adjoining fields will reduce the impact of control in a shorter period. (2) Periodical [month-wise] trapping of rodents can reduce rodent populations as well as resultant damages considerably. However, during rodent control operation with rodenticides, the interval between two operations should be at least 3 to 4 months

to avoid resistance or bait shyness among rodents. (3) Poison baits or traps should be kept on the crowns of infested palms rather than at ground as usually done. (4) Trunk banding of palms may be effective only in the thinner plantations after thorough rodent control work. (5) For diurnal rodents like squirrels, *F. tristriatus* traps should be operated in early morning hours whereas, for nocturnal, *R. rattus* effective management would be achieved when traps or poison baits are established in the late evening hours. (6) Cleaning of crowns of rodent infested palms helps in bringing down rodent numbers.

RODENT CONTROL METHODS

a) *Mechanical methods*: Trapping of about 2500 rodents with ordinary wooden live traps could reduce the damage in the fields having coconut and cocoa crops by 76 and 92 per cent (Table 1), the cost benefit ratio of entire operation being 1 : 489 (in Rs., Table 2) (Advani; 1982), increasing production of coconut and cocoa by about 1/5th and 10 times respectively. However in case of coconut as monocrop, the rodent control operations with anti-coagulant rodenticide baits will be more cost worthy than the trapping due to the need of periodical/daily checking of traps for trapped rodents,



Fig. 3 In Kerala rodent damage to WCT variety of coconut is about 24 per cent. In heavily infested gardens, daily 3-4 damaged tender nuts can be seen under an infested palm



Fig. 4 Rodent damaged nuts (184) collected in a 1.5 acre coconut plantation in 4 days

labour charges for climbing and non-availability of the climbers. In Minicoy island, live wooden traps were found to be effective in trapping adult rats, whereas, metal sherman traps were efficient in capturing more sub-adult rat population (Table 3). Iron wire-mesh cages were relatively less effective due to difficulty in their placement and operation on crowns of palms.

Trunk banding of coconut palms with aluminium sheets (30 cm wide, 0.15 mm thick) fixed to the trunks of trees at a level of 2.5 metres from ground has given satisfactory results in some islands like Fiji (Williams; 1975) and Ponape (Storer; 1962). However, the

eco-toxicological studies conducted in Minicoy island show that trunk banding may be useful only in the fields where palm population is sparsely cultivated, that too after maximum possible reduction in rodent numbers either with rodenticidal treatment or trapping.

Removal of dried leaves and nests and young ones of rodents from the coconut crowns reduces harbourage and protective habitats for rodents and in turn lessens the chances of build up of rodent populations at high density.

b) *Chemical Control*: Application of Warfarin (0.25%) wax blocks reduced rodent populations and

nut damages by about 68.5 and 62.0 per cent respectively in the Minicoy island. Whereas, two new-generation single dose anti coagulant rodenticides, Bromadiolone (.005%) and Brodifacoum (.005%, .002%), could reduce the rodent populations by about 79.0, 74.5 and 73.6 per cent respectively, resulting in reduction in damages to coconuts by 78.2, 75.0 and 70.2 per cent respectively (Table 4) (Advani; 1983b). In most of the rodenticidal treatments, the effectiveness of bait followed the order of rice (*O. sativa*), ragi (*E. coracana*) and pulse (*V. radiata*) whereas among oils (as attractant), coconut oil was preferred to groundnut and palm oil. The ready-to-use anti coagu-

lant rodent wax cakes can be prepared by mixing Warfarin (0.025%), bait (rice/wheat) and oil in the ratio of 5:92:3. After mixing these components in a 2" deep metal tray, enough molten wax should be poured and mixed well to make a 2" thick slab of cake. Later on, the slab is cut into 2" x 2" x 2" pieces with the help of a knife. Such 4 pieces can be placed directly in the crowns of infested coconut palms. The application rate should be 30 palms/hectare.

The burrowing rodents like bandicoot rats, gerbils (*Tatera indica cuvieri*) and murids (*Mus spp.*, *Rattus meliada*) can be effectively killed by treating burrows with zinc phosphide baits having 2 parts of poison, 95 parts of grains and 3 parts

of edible oil (Prakash; 1977). However poison baiting of rodent burrows (5-10 gm/burrow) should always be done only after 2 days pre-baiting of active rodent burrows with ordinary bait material. Application of fumigant, aluminium phosphide (celphos tablets) at the rate of 3 gm tablet/burrow (for bandicoot rats) or 1.5 gm tablet/burrow (for small murid and gerbil species) would also effectively control the rodent populations in coconut growing gardens with high soil humidity.

c) *Biological Control*: Indiscriminate killing of natural predators of rodents like harmless species of snakes (like rat-snake, *Ptyus mucosus*), varanids, birds (vultures, eagles, kites, owls etc)

and mammals (mangoose, cat etc) should be discouraged as these predators help us to maintain rodent populations at low level to a certain extent. In oil palm plantations of Malaysia, Barn owls have been successfully introduced and established to control rodents (Lenton; 1983).

ACKNOWLEDGEMENTS

The author is grateful to Dr. K. V. Ahamed Bavappa, Director, C. P. C. R. I, Kasaragod for facilities and encouragement given. Thanks are also due to Mr. V. M. Shamsuddin, Plant Protection Officer, Lakshadweep Administration, Kavaratti, field staff of the C. P. C. R. I. and farmers of Kasaragod, South Kanara, Minicoy, Andamans and Car Nicobar for their support and cooperation.

References

- Advani, R. 1982. Ecology, status and post-natal development of *Rattus rattus wroughtoni* in plantation crops in Sahyadri tract. *Proc. Plant. Crops Symp. V* (in press).
- 1983 a. Studies on ecology and control of rodents in Minicoy island. Part I Age structure, sex ratios, population ecology, reproduction, trap effectiveness and food of *Rattus rattus* in field. *J. Plant. Crops* (in press).
- Advani, R. 1983 a. Studies on ecology and control of rodents in Minicoy island. Part II. Comparative efficacy of anti-coagulant rodenticides in coconut plantations. *J. Plant. Crops* (in press).
- Lenton, G. 1983. Wise owls flourish among oil palms. *New Scientist* (Feb. 1983): 436-437.
- Prakash, I. 1977. *Rodent Pest Management. Principles and Practices*. Monograph No. 4, Central Arid Zone Research Institute (ICAR), Jodhpur, 1-28.
- Shah, D. R. and Subiah, K. S. 1978. Notes on rodent control in Lakshadweep islands with Warfarin (Rodafarin) wax blocks. *Pestology* 2: 36-42.
- Storer, T. I. 1962. Pacific Island rat ecology. Report on a study made on Ponape and adjacent islands, 1955-1958. *B. P. Bishop Mus Publi Hawaii*, 274 pp.
- Williams, J. M. 1975. Rat damage to coconuts in Fiji. Part II. Efficiency and economics of damage reduction methods. *PANS* 21: 19-26

Table - 1

Reduction in Rodent Damage Through Trapping of Rodents in Farmers' Fields

Crop	Rodent damage		
	Before trapping	After trapping	% reduction
Cocoa	75.03	5.85	92.21
Coconut (West Coast)	24.70	5.88	76.20

Table - 2

Tentative Economics of Rodent Trapping in Coconut and Cocoa Crops in 550 ha Area

COST

Traps under operation	= 180
Cost of traps (Rs.6/trap)	= Rs.1080 - A

RODENT DAMAGE AND SAVINGS

Total number of rodents trapped	= 2423
Expected minimum number of cocoa and coconut eaten and damaged by rodent/day	= 2423
Cost of 1210 nuts and 1213 pods at Re. 1 per-nut and Re. 0.20 per pod	= 1452.60
Yearly savings : 1452.60X365	= 528199.00 - B
Cost : Benefit ratio	
A : B	
1080 : 528199.0	
1 : 489.07	

Table-3

Relative Trap Efficiency of Three Types of Traps Used in Coconut Plantations of Minicoy Island

Type of trap	Adult population (80 gm or more)	Sub-adult population (80 gm or less)
Wooden Sherman trap (Trap index)	30.23	4.53
Metal Sherman trap	20.35	15.32
Wire cages	10.23	1.24

Table-4

Comparative Efficacy of Anticoagulant Rodenticides in Coconut Crop of Minicoy Islands

Rodenticide	Concentration	Per cent Reduction in	
		Rodent Populations	Rodent damages
Brodifacoum	.005%	74.5	74.9
	.002%	73.58	70.26
Bromadiolone	.005%	79.1	78.24
	.002%	69.16	69.53
Warfarin	.025%	68.44	61.9

TO SUBSCRIBERS

THE INDIAN COCONUT JOURNAL is generally published in the last week of the month to which the issue relates. Complaints regarding non-receipt of copies should be sent during the third week of the subsequent month. Subscribers should intimate the change in their address two months in advance for us to make the necessary alteration in our register. For any correspondence regarding the Journal the subscription number should be quoted. This is printed on the top left-hand side of subscriber's address.

- Editor