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EFFECT OF SATURATION BAITING USING MULTIPLE DOSE ANTICOAGULANTS ON THE POPULATION OF BLACK RAT IN COCONUT FIELDS

S. KESHAVA BHAT and A. SUJATHA
Rodent Research Unit, Central Plantation Crops Research Institute, Kasaragod - 670 124, Kerala.

INTRODUCTION

The black rat, *Rattus rattus* Linn. is a predominant rodent pest of coconut in India (Guruprasad and Srihari, 1983; Jhala *et al.*, 1984; Koya *et al.*, 1975; Menon, 1972; Rao, 1982) and other countries (Gallego *et al.*, 1981; Reidinger and Libay, 1984; Smith 1967; Williams, 1974). The damage is mostly caused by various subspecies of *R. rattus*. The subspecies responsible for most of the damage to coconuts in Kerala is dentified as *R.r. wroughtoni* Hinton (Advani, 1984).

Warfarin (a phenyl compound) and fumarin (a furyl compound) are the two multiple dose anticoagulants available in India for rodent control operations. These poisons have several advantages over the acute poison, zinc phosphide (Dubock, 1978). Shah and Subiah (1978) have studied the effectiveness of warfarin against *R. rattus* that infests coconut in Lakshadweep. Studies were also carried out on the comparative efficacy of warfarin and some single dose anticoagulants against this pest in Indian peninsula (Jhala *et al.*, 1984) and Lakshadweep (Advani, 1984). In all these studies, the baits prepared from warfarin were exposed only once. But to achieve better success with multiple dose anticoagulants, the black rat should feed on the poisoned bait for a continuous period of 12-14 days. (Bhat and Sujatha, 1986). Hence, while using such poisons 'saturation baiting' was the recommended practice (Buckle *et al.*, 1984;Han and Bose, 1980; Lam, 1979; Wood, 1976). In this technique the bait points were to be replenished two to three times so that enough baits were available to the rodents to produce fatal symptoms.

In this communication, the studies carried out on the effectiveness of saturation baiting with warfarin and fumarin in reducing the populations of *R. r. wroughtoni* in coconut plantations are discussed.

MATERIALS AND METHOD

The study was carried out by exposing 0.025% poison baits in wax formulations and assessing the level of pest population and the intensity of damage before and after each application. The wax bound baits were prepared by mixing broken rice, jaggery, paraffin wax and poison * in the ratio of 8:5:6:1 (Shah and Subiah, 1978). Each bait block measured 4 x 4 x 2 cm and weighed 35g. The baits were exposed for different days. The frequencies of baiting adopted were 1. one time baiting 2. two times baiting and 3. three times baiting. In two times and three times baiting the poison baits were replenished once and twice respectively at intervals of three days between applications.

Each trial was conducted in a 0.4 ha of coconut garden having chronic rat damage. All the trials

* available in the market as 5% powder.

were repeated and the mean values were taken for analysis. In each plot, 12-13 palms were selected at random, and in them the number of rat damaged nuts were recorded for one week. Four wooden live traps were then set on the crown of each palm and the trapped animals were identified and released the following day. The total of successful trap nights was calculated by applying the correction procedure (Spillett, 1968), wherein one half of the traps sprung without animals inside or traps found open but without baits inside were subtracted from the total number of trap nights. The population level was then assessed by trap index method (Barnett and Prakash, 1975).

After releasing the trapped animals, three bait blocks (105g) were kept safely on the crown of each marked palm. In the trials involving two times baiting two bait blocks were kept again after three days of the initial application and in the trials involving three times baiting, the baits were kept three times at the rate of three, two and one bait block per palm, respectively at intervals of three days between applications. After 14 days of the first application the population level and the intensity of damage were assessed again. One plot was maintained as control without any control operations for assessing the natural fluctuations in damage.

RESULTS AND DISCUSSION

The study revealed that three times baiting with warfarin and fumarin reduced the rat population by 93—94% and the damage by cent per cent as against slight increase in the corresponding characters in the control plot (Table-1). One time and two times baiting respectively, yielded 50 per cent and 70 per cent success in the control operation. Thus, it was clear that the multiple dose poisons such as warfarin and fumarin were very effective in reducing rat damage in coconut gardens when exposed for 10-12 days continuously. Similar observations were made by Williams (1975) on rats in coconut plantations in Fiji. In Malaysia, Wood (1976) and Buckle *et al.* (1984) also adopted 'saturation baiting' technique with warfarin baits to achieve appreciable reduction (>90%) in the populations of *R. tiomanicus* and *R. argentiventer* in oil palm estates and rice fields, respectively. Contrary to this Advani (1984) and Jhala *et al.* (1984) have recorded only 61.9 per cent success with warfarin against *R. rattus* in coconut plantations in India. But they had exposed the poison baits only once and this single application of the poison could perhaps be the main reason for their poor success in the field.

In the present study three times application of warfarin and fumarin has completely reduced the rodent damage. But the population estimation recorded only 93-94 per cent reduction. This could be attributed to immigration of new animals from adjoining fields, which were not aware of the edible substance inside the coconut and hence no damage was done. It was established that in crops such as cacao where the husk of the pod is very thick, the rodents had to learn the act of breaching the pod by imitating other experienced animals feeding on it. (Everard, 1968; Williams, 1973; Bhat, 1982). This observation might hold good in coconut also where the husk is very thick.

The cost of baiting in the first, second and third treatments was calculated to be around Rs. 76.00, Rs. 135.00 and Rs. 182.00, respectively per ha. Though the cost for the third treatment was about 2.5 times higher than for the first treatment the increased cost in the third treatment will definitely be compensated within 2-3 weeks of post—control by the increase in yield. Further, by single baiting we could reduce the population by only 51-52 per cent whereas by three times baiting the reduction was upto 93-94 per cent. Consequently, the build up of the population in the first trial will be much faster than in the third trial and so also the recurrence of damage.

SUMMARY

The effect of sustained baiting with multiple dose anticoagulant such as warfarin and fumarin in reducing the populations of the black rat, *Rattus rattus wroughtoni* in coconut gardens was studied. One time and two times baiting have reduced the population and damage by nearly 50 per cent and 70 per cent respectively. Continuous baiting for three times has reduced the population by 94 per cent and damage by cent per cent. The cost involved for three times baiting was not much when compared to the returns from the operation.

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TABLE 1

REDUCTION IN THE POPULATION OF THE BLACK RAT AND THE NUMBER OF DAMAGED COCONUTS DUE TO POISON BAITING (PLOT SIZE, 0.4 Ha EACH)

Times of baiting	Poison used	Trap index and No. of damaged nuts		Percentage of reduction	cost involved per ha*
		Pre-control	Post-control		
Once	warfarin	22.52 (63.5)	10.78 (29.5)	52.13 (53.5)	Rs. 76.00
	fumarin	24.19 (48.0)	11.79 (23.0)	51.26 (52.1)	
	control	24.72 (21.0)	28.57 (18.0)	—15.57 (14.3)	
Twice	warfarin	23.48 (23.5)	6.86 (7.0)	70.78 (70.2)	Rs. 135.00
	fumarin	25.72 (22.5)	7.44 (7.0)	71.07 (68.9)	
	control	28.57 (18.0)	22.73 (20.0)	20.44 (—11.1)	
Thrice	warfarin	30.12 (21.5)	2.05 (Nil)	93.19 (100.0)	Rs. 182.00
	fumarin	34.35 (27.5)	2.04 (Nil)	94.06 (100.0)	
	control	22.73 (20.0)	27.27 (24.0)	—19.97 (—20.0)	

Figures in parenthesis are no. of damaged nuts.

* Including the labour charges @ Rs. 35.00 per day.