

THE NATURE AND EXTENT OF DAMAGE TO COCOA
PODS CAUSED BY THE STRIPED SQUIRREL
FUNAMBULUS TRISTRIATUS TRISTRIATUS
WROUGHTON (RODENTIA : SCIURIDAE) AND THE
RELATIVE EFFICIENCY OF DIFFERENT
MANAGEMENT METHODS.

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ABSTRACT

Studies on the influence of the stage of ripeness and frequency of harvesting of cocoa pods on the extent of damage by *Funambulus tristriatus tristriatus* showed that when fully mature and orange-yellow pods alone were harvested at intervals of 20-25 days in 1976-77, the mean percentage damage was 52.23. When the pods were harvested at intervals of 15-18 days, just as these developed bronzing in furrows, there was substantial reduction in damage the mean percentage being only 25.83. In another experiment, it was found that covering the pods with punched poly-bags (150 gauge) or gunny bags smeared with fish oil insecticidal soap was effective in protecting the pods against squirrel infestation.

INTRODUCTION

The striped squirrel *Funambulus tristriatus tristriatus* Wroughton is the most serious pest of cacao in Kerala. They cut large irregular holes on the ripe pods which have changed colour and scoop out the internal contents for feeding on the mucilaginous pulp surrounding the beans. Poison-baiting is the only known method of controlling the squirrels, but this method is risky for adoption in homestead gardens in view of the toxic hazards. Relatively cheap, effective and non-hazardous management methods against the pest are not known at present and studies were carried out with this objective in view.

MATERIALS AND METHODS

For evaluating the influence of the stage of ripeness and frequency of harvesting of pods on the extent of squirrel damage, one hundred and ninety two, seven year old trees in a compact block of the CPCRI sub-station, Kannara were selected. During the year 1976-77, the pods were harvested only after they have completely changed colour to bronze and altogether there were twelve harvests each at intervals of 20-25 days. In the year 1977-78, the pods were harvested as the bronzing was initiated in the furrows and there were a total of twentyone harvests. The number of pods harvested along with the number damaged by squirrels were recorded throughout the experimental period.

The experiment on the evaluation of the relative efficiency of different mechanical exclusion methods and spot application of fish oil insecticidal soap for the protection of cocoa pods was also carried out in the CPCRI sub-station, Kannara and 8-15 bronzed pods in each randomly selected trees comprised a particular treatment which was replicated four times. The treatments included covering the pods with different types of mechanical devises such as bare gunny cloth bags, bare polythene covers, gunny bags smeared with bitumen, polythene cover (150 guage) smeared with fish oil insecticidal soap manufactured by the Government Soap Factory, Calicut, Kerala. The gunny bags and poly-bags were of size 25 x 18 cm. Bitumen was extended in kerosene oil to suitable consistency for proper application. In another treatment, the pods were sprayed with 10% fish oil insecticidal soap using a rocking sprayer. The treated pods were left on the trees for a fortnight and the number of pods damaged by *F. tristriatus tristriatus* were recorded at the time of harvest.

The data on the percentage infestation were transformed using the relation $x = \sqrt{\frac{y}{n} - 1}$ where y/n is the observed proportion of damaged pods and x is the transformed variable.

Table 1. Extent of damage to cocoa pods by *F. tritriatus tritriatus* as influenced by periodicity of harvesting and stage of pod ripeness. ♀

Month	Total no. of pods harvested		No. of damaged pods		Percentage damage	
	*1976-77	1977-78**	1976-77	1977-78	1976-77	1977-78
Sept.	—	157	—	73	—	46.50
Oct.	1815	539	1114	179	61.37	33.21
Nov.	1413	2671	307	527	21.72	19.73
Dec.	872	581	526	123	60.32	21.18
Jan.	897	582	403	136	44.92	23.36
Feb.	858	716	356	204	41.49	28.49
March	710	381	303	74	42.67	19.42
April	632	2244	412	701	65.18	31.24
May	—	943	—	260	—	27.58
June	783	—	747	—	95.40	—
Total	7980	8814	4168	2277	52.23	25.83

* Fully bronzed pods were harvested at intervals of 20-25 days.

Total no. of harvests : 12

** Pods were harvested as they changed colour in furrows at intervals of 15-18 days.

Total no. of harvests : 21

RESULTS AND DISCUSSION

The extent of damage to cocoa pods by striped squirrel as influenced by the periodicity of harvesting and the stage of pod ripeness is furnished in Table 1.

In 1976-77, when fully mature pods which have uniformly changed colour to orange-yellow were harvested, the mean percentage damage by squirrels was 52.23 (n=7980 pods : range 21.72 to 95.40%). Substantial reduction in squirrel damage was recorded in the year 1977-78, when the pods were harvested just as these developed orange-yellow colour in furrows, the percentage infestation being 25.83 (n = 8814 pods : range 19.42 to 46.50%).

When fully mature pods alone are harvested at longer intervals of 20-25 days it is quite likely that some of the pods will be remaining on the trees at this stage prior to harvesting. The present studies clearly reveal that the squirrels prefer fully mature pods which have uniformly become orange-yellow in colour. Since ripe cocoa fruits do not open to scatter the seeds nor fall from the tree, dissemination in nature is normally by monkeys, rats and squirrels (Murray, 1975). The relative attractiveness of fully mature orange-yellow pods to squirrels is perhaps explicable on the basis of the sugar content of the mucilaginous pulp surrounding the beans which are mature for dissemination.

The time of harvest of cocoa pods is not critical and those pods which are not fully ripe will ferment as properly as fully ripe pods (Wood, 1973). Therefore, harvesting of pods just as the furrows change colour to orange-yellow will not adversely affect the process of fermentation and hence this method may be recommended for reducing squirrel damage.

The data on the percentage infestation of pods under different treatments is presented in Table 2. The mean percentage damage ranged from zero in the case of pods covered with gunny and poly-bags smeared with bitumen to 65.00% in pods covered with poly-bags, the damage in control

being 41.87%. The transformed values ranged from 2.88 to 208.17. Analysis of variance of the transformed data reveal that the different mechanical exclusion methods and spot application of 10% fish oil insecticidal soap were equally effective in the protection of pods. The pods covered with gunny bags and poly-bags painted with bitumen afforded complete protection from the squirrels, but those pods which were covered with gunny bags painted with bitumen developed external blemishes.

Table 2. Percentage of cocoa pods damaged by the striped squirrel *Funambulus tristriatus tristriatus*.

Sl. No:	Treatments	Mean % damage	Mean transformed values
T ₁	Covering the pods with bare gunny bags	28.39	82.79
T ₂	Covering the pods with polythene covers (150 gauge)	65.00	102.14
T ₃	Covering the pods with gunny bags smeared with bitumen	0.0	2.88
T ₄	Covering with polythene covers (150 gauge) painted with bitumen	0.0	2.88
T ₅	Covering with polythene covers (150 gauge) smeared with fish oil insecticidal soap	10.24	81.06
T ₆	Spraying of the pods with 10% fish oil insecticidal soap emulsion	28.10	107.01
T ₇	Control	41.84	208.17
CD (0.05)			102.28

Among the different methods, covering of the pods with punched poly-bags of suitable size painted either with bitumen or with 10% fish oil insecticidal soap appears to be more

suitable for ensuring better protection without causing any external blemishes.

ACKNOWLEDGEMENTS

The authors are grateful to the Associate Dean, College of Horticulture, Vellanikkara for providing necessary facilities and to the Director, Central Plantation Crops Research Institute, Kasaragod for granting permission for conducting the experiments at the Kannara Sub-centre of the Institute. They are also thankful to Dr. P. U. Surendran, Professor of Statistics and to Shri. P. V. Prabhakaran, Associate Professor, Kerala Agricultural University for the statistical analysis of the data.

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