RODENT PEST MANAGEMENT IN COCOA - PRINCIPLES AND PRACTICES

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Introduction

Rodents are the major pests of cocoa in almost all cocoa growing countries of the world (Everard, 1968; Stapley, 1972; Taylor, 1972; Williams, 1973; Gratz and Arata, 1975). In India, Abraham and Padmanabhan had reported rodent damage to cocoa as early as in 1967. The species involved are: the black rat, *Rattus rattus* Linn., the Western Ghats squirrel, *Funambulus tristriatus* Waterhouse and the South Indian palm squirrel, *F. palmarum* Linn. (Bhat, 1978; Abraham and Remamony, 1979; Advani, 1984).

Nature and intensity of damage

Rodents damage the crop directly by feeding on cocoa pods. They were observed to gnaw holes on pods, extract beans, consume the mucilage coverings of the beans and discard the beans. In rodent infested gardens, lots of such scattered beans along with the chewed up pieces of husk, about 0.75 cm square in size, were found scattered around the bases of cocoa trees (Bhat *et al.*,1981). As the depredation of these animals to cocoa is mainly to the standing crop, that too to the mature pods, the loss was direct. It was assessed to be 29 to 52% in different areas of South India (Abraham and Padmanabhan, 1967; Bhat, 1978; Abraham *et al.,* 1979; Bhat *et al.,* 1981).

While feeding on the cocoa pods, rats mostly made holes near the stalk portion, whereas squirrels generally made holes in the centre of the pod (Bhat, 1980). This criterion can be used to find out the actual culprit and assess the intensity of damage caused by each species separately in a given area. The squirrels were observed to feed on mature pods only, whereas the rats damaged even immature pods when mature pods were not available. Further, rats were observed to revisit the damaged pod until the contents were completely finished. Squirrels are not like that, they don't revisit the damaged pod even if it is partially eaten, but go for the fresh pod.

Development of cocoa feeding behaviour in rodents

The cocoa feeding behaviour in most of the rodents was an acquired character developed either by trial and error gnawings on cocoa pods or learned by imitating other animals feeding on it (Williams, 1973; Jackson, 1979). This contention was amply substantiated by Bhat (1982), who, while studying the cocoa feeding behaviour in squirrels, found that nearly 97% of the animals collected from non cocoa growing areas did not feed on cocoa pods when they were provided with ripe pods in captivity, whereas most of the squirrels collected from cocoa growing areas readily opened the cocoa pods and removed the contents with ease. The squirrels collected from non cocoa growing areas had to be given partially opened pods for 6-12 days before they learned the habit of breaching the cocoa pod. Further, during a survey in Kerala and Tamil Nadu in the year 1977 it was noticed that younger cocoa plantations (3-5 year old) were free from rodent damage whereas older plantations were not (Bhat, 1982).

Unlike most other fruits, in cocoa, the pericarp is very thick (12-18 mm) and non edible. Hence, it is most unlikely that a rodent gnawed a cocoa pod persistently in search of food unless it had previous experience of feeding on such pods or had seen conspecifics feeding on it. The incisor tooth of rodents, unlike in most other animals, are very sharp and grows throughout the life of the animal. In order to maintain the size of such ever growing incisors to a convenient length, the rodents have to gnaw on any hard objects coming on their way, whether they are edible or not. Hence, there is also a possibility that a rodent gnawed persistently on a pod with the intension of sharpening and shortening its incisors. While doing so it might have, accidentally, opened up the pod and got the taste of the sweet mucilage inside. Once the animal knew that something edible is there inside the cocoa pod, then they readily opened the pod with ease. This also helped other animals to follow.

Management

Rats

The control of rats is usually done either by poison baiting or by trapping. Both the methods were equally successful against these animals in cocoa (Bhat, 1982). Two types of rat poisons are available in the market. In the first type we have acute poisons such as zinc phosphide powder or phosphorous paste. Acute poisons are more effective if used after pre-baiting (keeping baits without poison) for atleast three days. After pre-baiting poison baiting should be carried out immediately for another three days. If the damage is distributed evenly in almost all the trees, one bait point for every 5-6 trees should be selected for baiting. In case the damage is confined to some trees alone, only such trees need to be baited. As the movement of black rats is mostly confined to the canopy of cocoa trees (Bhat and Sujatha, 1986), it was suggested to keep the baits on the branches or jorquette region.

Rats can also be effectively controlled by the use of slow poisons. While using slow poison such as bromadiolone pre-baiting is not required as rats don't develop bait shyness with such poisons. Hence, while using slow poison, the poison baits can be used on the first day itself. However, baiting with such poisons may be done two times with a gap of eight to ten days between two applications. If the damage is not fully controlled, another round of poison baiting may be done after a gap of another eight to ten days (Bhat and Sujatha, 1991). Trapping, using single catch live traps with mature coconut kernel as the bait, is also very effective in the control of rats infesting cocoa (Bhat and Sujatha, 1987). As rats are nocturnal, traps may be set in the evening hours and inspected next day morning. For better results, the set traps should be inspected daily, trapped animals removed and reset again with fresh baits inside.

Squirrels

Abraham *et al.* (1979) had noticed that covering the cocoa pods with gunny bags or polythene covers smeared with bitumen were very effective in reducing squirrel damage in cocoa. But by such methods the pods had developed external blemishes affecting the quality of pods. Further, the process itself was very cumbersome. Poison baiting was not a success against squirrels in cocoa as these animals did not show any interest to artificial baits and developed bait shyness to acute poisons on the very first day of their exposure (Bhat, 1981). However, squirrels infesting cocoa can be controlled effectively by trapping (Bhat, 1982).

Among the several types of traps available, single catch wire mesh or wooden live traps were most effective (Bhat and Mathew, 1983). Baits such as carpels of ripe jack fruit, paddy grains, ripe cashew apple or mature fresh coconut kernel are ideal to attract squirrels (Bhat and Mathew, 1985). The activity of squirrels is more during morning and evening hours (Bhat and Mathew, 1984a). Hence, it was suggested to set traps before that time. As squirrels move in an area of nearly one hectare (Bhat and Mathew 1984b), traps need not be set in cocoa gardens alone, but can also be set in nearby trees where the movements of squirrels are generally seen. About five traps are enough to control squirrels in one ha area. After setting the traps in the morning, they should be inspected every day in the evening hours, the trapped animals removed and traps reset after keeping fresh baits in them. If traps are inspected during morning and evening hours every day it will take care of both rats and squirrels in one stretch as rats are active during night and squirrels in the day time. Traps should be washed before setting traps again. Trapping was very effective in the control of squirrels in other countries also (Han and Bose, 1980).

Frequency of harvest

As the cocoa feeding behaviour in rodents is an acquired character it is suggested to harvest cocoa pods as and when they are mature. This will definitely delay the development of cocoa feeding behaviour in rodents especially in areas where cocoa is introduced for the first time. Even in older plantations where the damage was persistent, Abraham *et al.* (1979) had suggested timely harvest of mature pods to

minimize squirrel damage. They could reduce the squirrel damage in cocoa from 52 to 25% just by increasing the number of harvests from 12 to 21 per year. Hence, it is suggested to harvest mature pods regularly when the furrows turn yellow.

Conclusion

Among rodents that damage cocoa, the black rat, *Rattus rattus* Linn., the Western Ghats squirrel, *Funambulus tristriatus* Waterhouse and the South Indian palm squirrel, *F. palmarum* Linn. are considered to be the major pests of this crop in South India. Together they caused 29 to 52% damage to the standing crop in different areas. The rats usually damage cocoa pods near the stalk portion, whereas squirrels generally damage in the centre. The cocoa feeding behaviour in rodents is an acquired character developed by trial and error gnawings or by imitating others feeding on cocoa pods. To minimize rodent damage, timely harvest of mature cocoa pods is very essential. The damage caused by rats can be reduced either by poison baiting or by trapping. For the control of squirrels, trapping using single catch 'live' traps is suggested.

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