

MAGNITUDE OF THE RAT PROBLEM AND POSSIBLE SOLUTION

By K. M. Abdulla Koya⁽¹⁾ P. Natarajan⁽²⁾ and Chandy Kurian⁽³⁾

Introduction

Rats and mice have been unwelcome associates of man from time immemorial. They are competitors with man for their food and shelter. There is a clear warning to the people in the *puranic* scriptures to desert their dwellings as soon as the rats start appearing. This may be due to the fact that dead rats found in dwellings have often been fore-runners of the outbreak of bubonic plague. Obviously the rats and mice have had thousands of years to adapt themselves to the ways of man.

The losses in agricultural produce in India due to rat population, which is estimated to be 2500 to 5000 million, is about 3 million tonnes of grains, valued at over Rs. 100 crores per year. Loss of stored produce by rodent attack occurs more from spoilage and contamination than from actual consumption. It is therefore necessary that steps be taken for effective control of this rodent.

The average population of field rats throughout India comes to 15 per acre in the cultivated land. With this population of rat, the net loss caused by them by way of consumption alone comes to about 75 kg. per acre per annum.

The most common species of rats and mice found in India are the following:—(1) Bandicoot rat, (2) Indian mole rat, (3) Short tailed mole rat, (4) Soft

furred field rat, (5) Field mouse, (6) Gerbil rat, (7) Indian desert Gerbil, (8) Brown spiny mouse, (9) Indian bush rat, (10) House rat, (11) Brown rat, and (12) House mouse.

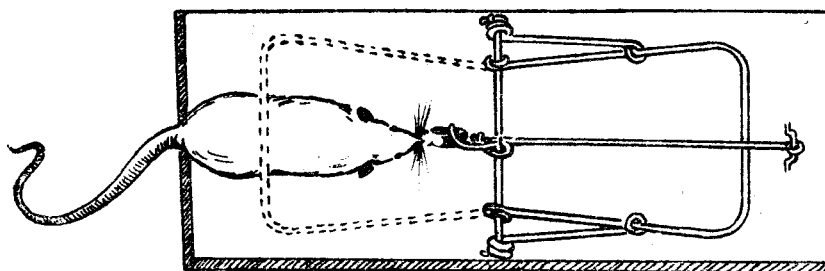
Habits and habitats

The Indian mole rat is a burrowing form found living in burrows made in the soil, while the house rat *Rattus rattus* and *Rattus exulans* are arboreal forms, living on trees, inside dwellings, godowns or main buildings. The Indian mole rat burrows towards the bole portions of coconut seedlings and eat away the bole region, causing mortality. The latter two arboreal forms, burrow tender nuts and cause nut fall.

Nature and extent of damage

They eat seeds, seedlings and damage crops like wheat, gram, rice, sugarcane, groundnut, coconut, peas and vegetables. They destroy much more than they actually consume. They also destroy household goods. They burrow into foundation of buildings, field bunds, channels and canal embankments. Many carry harmful parasites like fleas which cause deadly diseases in human beings.

The paddy crops are subjected to extensive damage by field rats from transplanting upto the harvesting stages. In many places in South India the average loss of paddy grains due to field rats varies from 42 to 54 per cent and the straw upto 24 per cent. In the case of wheat the damage is 13.5 per cent gram. In barley crop the damage varies from 5.4 to 12.4 per cent at the tillering stage. The total loss caused by field rats to barley crop is about 1.47 quintal per hectare i.e. 5.8 per cent of the yield lost due to field rats alone.

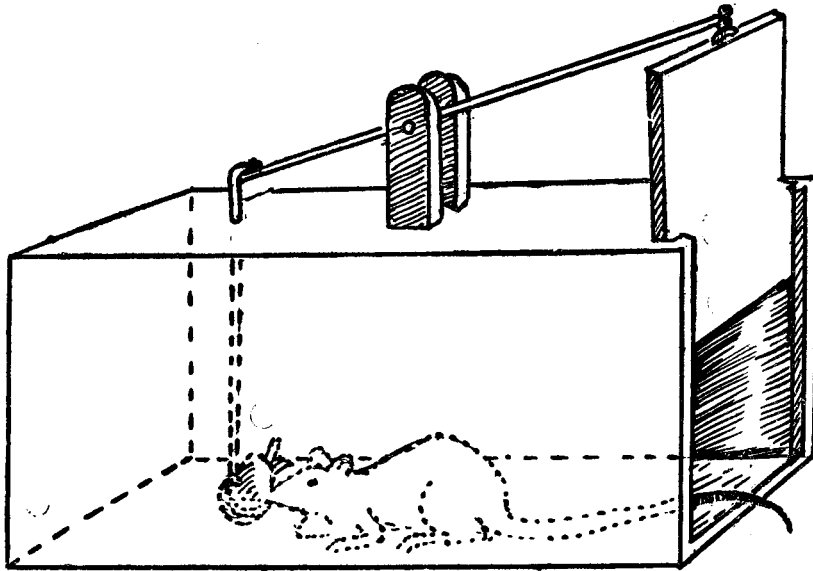


Guillotine trap

⁽¹⁾ Research Assistant

⁽²⁾ Assistant Entomologist

⁽³⁾ Entomologist, Central Plantation Crops Research Institute, Regional Station, Kayangulam, Kerala.



Box trap

Groundnut and coconut are also damaged by rats considerably and the damage in groundnut is 4.2 per cent during maturing stage and the loss in coconut ranges from 5 to 15 per cent. An enlightened and enthusiastic farmer in the Phillippines could get an increase in coconut yield by 270 per cent a few months after initiation of rodent control measures which clearly shows the extent of damage caused by this pest.

Rat damage to coconut has been studied in several parts of the world in the last 40 years. Damage is mostly caused by several species of *Rattus*. Damage mostly consists of a single hole bored in the husk of the immature fruit. Most of the damage occurs after the fourth month of development and before the maturity of the fruit.

Control Methods

I. Preventive control

(a) General cleanliness and sanitation

General cleanliness and sanitation are essential prerequisites for rat control. Garbage and sweeping should be promptly disposed of. Food materials should not be kept in the open. The stored materials or gunny bags are to be kept in rack about 1½ feet above the ground and should never be piled on the floor.

(b) Rodent proofing

Rodents may be excluded from an area of product storage in a relatively absolute manner, which is referred to as rodent proofing or rodent stoppage.

The banding or sheathing of trees is resorted to to prevent rodent access to them. In coconut a metal band having a width of 30 cm. can be fixed at the height of 2 metres from ground level to prevent rat attack to nuts.

(c) Flooding

It is practised in paddy fields where adequate water is available but not a very fool-proof method since many of them can swim in small stretches of water.

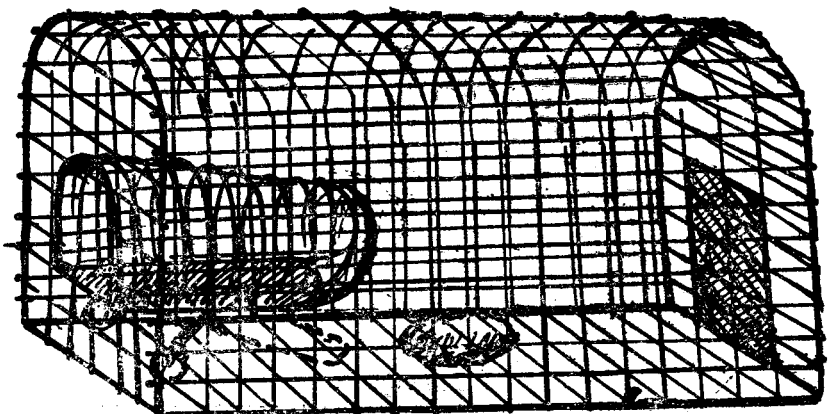
(d) Electric fencing

The electric fence is a very useful device for protecting experimental crops or other agricultural products of high value, but necessary precautions are to be taken against accidents.

II. Curative control

(a) Trapping

Trapping is resorted to in godowns dwellings and field as well. In coconut plantations, against burrowing rats the bamboo snapback-cum-nose trap can be effectively used, while in paddy fields Tanjore bow trap is found useful. Trapping is mostly recommended for areas where chemical control is impracticable. There are many types of traps of which cage trap, guillotine trap and snap trap are the main ones.



Wire-cage trap



Rat preventive slopes

(b) Chemical methods

Stomach poisons.—Control using rodenticides is the most efficient method of destruction of rats in houses, godowns and fields. The poisons employed in this are also deadly to human beings, livestock and poultry, hence utmost care should be exercised in handling these poisons. There are many rodenticides available in the market and they are zinc phosphide, sodium fluoroacetate, barium carbonate, thallium sulphate etc.

Zinc phosphide is to be used at 2.5 per cent strength. The baiting material consists of 1 part of zinc phosphide, 49 parts of food bait and required quantity of vegetable oil, to increase the palatability and efficacy of the chemical. When the poisoned food is ingested by the animal it reacts with the hydrochloric acid of rodent stomach to release phosphine gas which is highly lethal. A zinc phosphide treated vegetable cube of $1\frac{1}{2}$ to 2 cm. sq. ($\frac{1}{2}$ to $\frac{3}{4}$ "') will be sufficient to kill a small colony. Death will

follow within a few hours of ingestion of the lethal dose.

Sodium fluoroacetate is used at 7.5 per cent strength. Barium carbonate is generally used at 20 per cent strength. The baiting components are barium carbonate 1500 g, wheat flour 4000 g and added to this a little amount of water. This is made into a paste for 7000 balls. The balls are then placed in the visiting places of the animal. Death may occur in 2 hours if sufficient dose is imbibed.

Thallium sulphate is generally used at 1 to 1.5 per cent strength in baits. The baiting components are thallium sulphate 30 g, sugar syrup 75cc and water 1395 cc. Death is very slow occurring between 36 hours and 8 days as the result of respiratory paralysis.

Anticoagulants (Coumarin compounds).—These are chemicals which always, require repeated feeding by the rodents to bring chemicals level in the blood to lethal amount. They inhibit vitamin K which is the main component for the synthesis of prothrombin which leads to clotting. With the removal of the power to clot haemorrhage takes place leading to slow but sure death.

Warfarin.—This is a slow acting anticoagulant and is the widely used one. Death usually occurs after the third day. The dosage for male rat is 323 mg per kg (LD50 value) and that for female 58 mg per kg (LD50 value). The warfarin is used as blocks having the dose of 5 per cent and the components are warfarin 75 g, paraffin wax 350 g, dried fish powder 100 g and wheat bran 475 g. The wax is melted first and the components added to wax. Then the hardened material is cut into 1 cm cube blocks which may again be dipped in wax. Then the blocks are placed in the visiting places of the rats. As there is a thin coating of wax, it can withstand the climatic changes and moreover the hazard of the chemical to other animals is reduced.

Unlike the stomach poison anticoagulants do not produce any bait shyness. The trade names of anticoagulant presently manufactured and available in India are Rodeth, Ratafin, Rodafarin and Warfarin.

(c) Fumigation

Rodents can be killed with poisonous gases in the burrows effectively as baiting and trapping have very limited possibilities in the field. Many fumigants are available in the market and each fumigant has got its own advantages and disadvantages. Calcium cyanide



Rat preventive bands

(cyanogas) and sodium cyanide (cyanomag) are good fumigants and both are available in dust or granular forms. The dust is applied with a foot pump duster

or the "spoon method". Before launching fumigation work in a particular area, all the open burrows should be detected and closed. On the following day live burrows should be cleared by removing the soil at the outlet and then the spout of the rubber hose of the fumigation pump should be inserted into the burrows and fumigant pumped into the burrow. Usually 10-20 g of the cyanide dust should be used per burrow. As only 1.5 to 2 g fumigant comes out in one stroke, 6 to 10 strokes should be given to get the required quantity of fumigant inside the burrow. Aluminium phosphide (Phostoxin) tablets are also used to fumigate rat burrows.

(d) *Biological control*

Owls, cats, rat snake, dogs etc. predate on rats. In France efforts have been made to breed better rodent hunting cats and a further modification of this technique was observed in Thailand.

(e) *Chemosterilants*

The modern trend in rodent control is the use of chemosterilants like furadantia and colchicine. The chemosterilants make the male or female rat completely sterile. A group of British scientists now has come up with a new technique for controlling, if not eliminating rat colonies through a contraceptive chemical modelled on the human birth control pill. The new chemical developed by the researchers at British Drug Research Ltd. is an estrogen known as BDH 101-31. In one field trial the chemical decimated a colony of 500-1000 rats in a year and six months later the researchers could not find even one pregnant rat

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among the survivors. The BDH researchers have also discovered that the product reduces egg laying among pigeons by 80 per cent.

Campaign against rats

Rats are "a national menace". So the most important job is to educate the masses on the need for control of rats and ways and means of doing it. Systematic and proper planning of the campaign takes us a long way in getting maximum mortality of rats in different environmental conditions. For this instructions should be given to farmers and public to locate and heavily infested areas and the breeding sites. The method of preparation and serving of bait material should be demonstrated in detail. Details of finding out the live and dead burrows in the field and other infested areas in houses and godowns should be worked out. Then plans for baiting with non-poisonous material followed by poisonous ones should be taken up.

Persistent rat control by a single householder will always produce some benefits, but the effect can be greatly increased with the added participation of neighbours or the whole communities. The larger the

area subjected to control, the longer the results last and the "unit cost" will be much reduced for larger control areas.

Rats are perhaps the cunningest of all pests in avoiding/thwarting man's efforts to kill them. They learn quickly to avoid most poisons. And when rat catchers manage to kill most of the rats in a colony, the survivors proceed to step up their rate of reproduction so rapidly that they replace their lost fellows in no time.

Conclusion

The ideal has been outlined in the foregoing; but in order to achieve integrated rodent control in the tropics, it is necessary to improve on our knowledge and this particularly includes quantified information on rodent damage and an increase in the efficiency of the organisational structures concerned. The training of sufficient members of personnel to function within these organisations and the utilization of organisations to effectively spread the messages of the need for and possibility of rodent control are also essential prerequisites. This creative utilization of the available knowledge will definitely bring about significant reduction in rodent damage.

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Mr. Cheriyan Thomas said that this project had given importance to the development of the cultivation of pulses as it was protein food. The cultivation of 'pusa bisakhi', was found very suitable for the areas in Central Travancore as a subsidiary crop as it needed only 65 days' growth for taking the crop. The trails made in some other places had found that green manure crop like 'sunnhemp' and groundnut were successful.

He said that these centres were also giving technical guidance and financial assistance to the farmers to improve their cultivation.

This project, which is at present giving incentives to the farmers in the form of inputs has prepared another scheme for the free supply of pumpsets to the panchayats. Recently the centre has also started a survey and study to improve the minor irrigation facilities mainly in the paddy growing areas, he added.

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