

## Integrated Rodent Pest Management

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### Introduction

The largest and most fascinating mammal group is the rat. Since they belong to the class Mammalia and order Rodentia, they are also frequently referred to as rodents. Rodents are characterized by a single pair of continuously growing incisors in each of the upper and lower jaws which must be kept short by gnawing. Forty percent of mammal species are rodents, and they are found in vast numbers on all continents other than Antarctica. The subfamilies murinae and gerbillinae represent the order's Muridae family. Great economic pests of various commodities in the field and during storage are rats. Due to their variable role in human food and health issues, rats are extremely important. Throughout the world, rats are a constant and widespread issue with grain storage and preservation. Due to their voracious appetites, contamination, and structural destruction, these furry, adaptable animals can quickly infest grain silos, warehouses, and other storage facilities, causing enormous damage. Rodents are one of the important vertebrate pests (Advani and Mathur, 1982) directly related to destruction of crops utilized by man and livestock. Their habitat, distribution, abundance and economic significance varies in different crops, seasons and geographical regions of the country (Anusha et.al., 2018). They show a wide range of adaptation, enabling them to successfully colonise and inhabit almost any type of habitat (De Graaf 1981). Ecological distribution of rodent species and their damages were reviewed by (Parshad, 1999). In Andhra Pradesh, *Bandicota bengalensis* and *Mus booduga* on rice, *B. bengalensis* on Bengal gram (Ranga Reddy, 1994), *Rattus rattus* on coconut (Rao and Subiah, 1982) were observed as predominant species. With changes in agro climatic conditions and cropping patterns, rodents are showing changes in the distribution and abundance of different species (Parshad and Ahmad, 1996). Developing efficient management strategies to safeguard this essential food source requires an understanding of the common rodent species linked to stored grains, the different kinds of damage they

can cause, and the factors that contribute to their infestations.

### Major rodent pest species

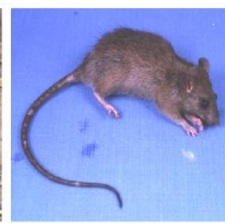
The rodentia are the biggest order of mammals, with over 2000 species spread across 34 families and 389 genera worldwide, accounting for nearly 40% of all mammal species. In India, rodents are represented by 43 genera, 104 species, and 4 families: Sciuridae, Dipodidae, Muridae, and Hystricidae. Of them, roughly 14 species are economically significant. Rodents having one pair of Chisel shaped 'incisors' on upper and lower jaws characterizes their dentition (Rodere: to grow, dent: teeth (0.4mm/day). Rodents are problem in agriculture, storage and homes.



Lesser Bandicoot Rat,  
*Bandicota bengalensis*

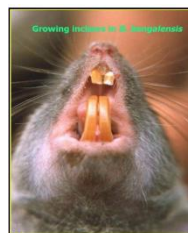


Field Mouse,  
*Mus booduga*



Coconut Rat,  
*Rattus rattus*

They nibble or feed on variety of goods, causing direct harm as well as indirect damage through spoiling. Because of their remarkable degree of flexibility to survive in artificial habitats, they are the most significant vertebrate pest. Bandicoots, rats, gerbils, voles, and mice are the main rodent groups that are economically significant in India.



Incisor teeth



Rice crop damage



Coconut fruit damage

### Losses due to rodent damage

### Signs of rodent infestation

Live animals, droppings, runs and tracks, footprints and trail marks, burrows and nest, and urine and faeces.

- ❖ **Bearing damage:** Rats consume 7% or 15% of their body weight daily as food. In particular, they impair the nutritional value and seed germination.
- ❖ **Storage Contamination and Corruption:** The value of rodent contamination and spoilage loss is 20 percent higher than the value of the stored storage consumed. They contaminate stored goods with urinary feces, hair, and pathogens. Infected storage items often need to be declared unsuitable for human consumption.
- ❖ **Disease transmission:** There are about 50 diseases that can be transmitted from rodents to humans, such as leptospirosis, typhoons, trichinella, scabies, epidemics, and Ebola hemorrhagic fever. Up to 30% of brown rats carry Leptospirosis and excrete it in the urine.

### Management

The management program should be knowledgeable about the biology and ecology of rodent populations, which is referred to as the fundamental technique that should correspond with each species characteristics.

### Prevention

The cornerstone of an integrated pest management (IPM) strategy for rodent control in stored grains is the application of efficient preventative measures, such as appropriate sanitation, exclusion tactics, and environmental management.

### Monitoring

Early identification of rodent activity and the evaluation of the efficacy of control measures, ongoing monitoring and documentation are essential. Timely and focused interventions are made possible by this data-driven strategy.

### Integrated Rodent Pest Management

A combination of physical, cultural, biological, and chemical control methods, tailored to the specific situation, can effectively manage rodent populations in stored grains. This integrated approach helps minimize the risk of resistance and environmental impact.

- 1) **Cultural Control:** Rats can be controlled by deep plowing up to 45 cm, reducing the size and trimming field bunds during land preparation, and removing burrows and managing weeds,

which reduces the availability of alternative food and shelter.

In our agricultural fields, a large number of rodents inhabit the bunds and the mud fences covered with thorns. If the height of bunds is reduced and the fences replaced by *Opuntia* plantings, rodent numbers may be reduced due to lack of sites for shelter. Often growing a crop which is left vulnerable to field rodents, around the main cash crop, pays dividends. A 20-30 metres strip of an unpalatable crop like guar (*Cyamopsis tetragonoloba*) or that of an unpalatable grass sown around the wheat crop, may act as an impenetrable barrier to the immigrating rodents, and the main cash crop will be saved from rodent pests.

- 2) **Mechanical Control:** Hunting is the activity in which groups of people dig out rat burrows and kill the rats.

**Trapping** is an economical and effective way of reducing rodent populations. Also one of the oldest methods of rat control. Good results of trapping the rats depend upon the use of a sufficient number of traps and their proper placement. They should be placed at the right angle along walls or between objects. Flooding of burrows is used to force the rats out during the day when they can be killed mechanically. Plastering storage buildings and preventing rat attacks using rodent-proof containers aid in preventing rodent infestation. Particularly in fruit crops such as coconuts, etc. In recent years, ultrasonic sounds have been used for repelling rats and mice from godown. Sound frequencies of 20 kHz prevent rats from feeding and reproducing.

- 3) **Biological Control:** A number of predators like cats, dogs, snakes, owls, birds - eagles, mongoose, etc. contribute to the natural regulation of rodent populations. Keeping cats in houses also checks the rat population.
- 4) **Chemical control:** Poison baits and Fumigation  
Rodenticides are chemicals used to control rodent populations. When incorporated into an integrated pest management plan, rodenticides can be a useful tool for managing rodent populations in grains that have been stored. It is essential to choose and use these items carefully, taking into account their effects on the environment and safety.
  - a) **Acute poison:** Acute poison is a poison that is administered in a single dose. The rat can be killed

with just one dosage. Rats that are exposed to this toxin on a regular basis become bat shy, necessitating pre-baiting (without the poison). Examples: sodium fluoroacetate, zinc phosphide, strychnine chloride, thallium sulphate, etc. **Zinc phosphide:** In India, this rodenticide is most frequently used. It is pulverized powder with a dull, black color. When it reaches the stomach, it combines with the acidic juices and releases a phosphine (PH<sub>3</sub>) gas odor that is absorbed by the body and kills the rat due to its toxicity.

- b) **Chronic poison:** Multiple dosages of blood anticoagulants are used to treat chronic poisoning. These consist of indandions (Pivol, Radione and Valone) and hydroxycoumarins (Warfarin, Fumarin and Recumin). It is sold as Rodafann "C" in the market. Anticoagulants work by affecting two bodily mechanisms: (a) causing hemorrhage; and (b) preventing blood clotting by preventing the synthesis of pro-thrombin, which damages capillaries and causes bleeding. Absence of prothombin, the rat dies gradually and the bleeding persists. The benefit is that pre-baiting is not necessary because rats do not become suspicious of the meal or develop bait shyness.
- c) **Fumigation:** High infestations in sealed storage facilities may occasionally require fumigation using specialist gaseous pesticides. For this method to be safe and effective, specific tools and skilled workers are needed. Rat tunnels were fumigated with aluminum phosphide (two 0.6 g tablets or one half tablet of 3 g each burrow), and the holes were sealed with wet earth. Rats in burrows are killed by the phosphine gas released by the tablets when they come into contact with moisture. It should be used with caution because it is extremely dangerous and combustible. It is a very successful rat control strategy. It is marketed as pills called celphos.
- d) **Repellents:** Rodents can be prevented from entering or staying in the grain storage area by using certain chemical or natural repellents. These products can be used in conjunction with other control strategies.
- e) **Indigenous technical knowledge:** To control the rat problem, plant erukku (*Calotropis gigantea*) and notch (i) (*Vitex negundo*) densely around the fields as a fence. Channampoo (*Cycas cercinalis*)

flowers are chopped into bits and positioned throughout paddy fields to deter rats due to their unpleasant odor. The poles affixed to the field are tied with pieces of palmyra (*Borassus flabellifei*) leaves. The rodents are scared off by the sound the leaves make. Rat damage can be decreased by placing owl stands close to the rat holes. Use soaked rice as bait; it attracts more rats. Putting fresh cow dung on both the fields and bunds to reduce rat problems. Conclusion Despite tremendous advancements in agricultural science and rodent biology, field and godown management still occurs and can occasionally have disastrous results. The issue has been significantly lessened by financial assistance in the form of subsidies for both metallic and non-metal murine-resistant storage facilities as well as a free supply of rodenticide. Effective rodent control measures include intervention, monitoring and prevention.



Trapping



Burrow fumigation

### Rodent Pest Management in Horticultural crops

- ❖ **Field sanitation:** Removal of infested nuts and fruits. Clean cultivation by removing of weeds inside the orchards
- ❖ Removal of overlapping leaves
- ❖ Polythene (1 ft.) trunk banding 3-4" above the base
- ❖ Placement of bromadiolone 0.005% cakes @ 2-3 pieces in crown region of coconut twice per year (before & after monsoon season) in coconut.
- ❖ Placement of bromadiolone 0.005% cakes @ 4-5 pieces in the shoots of cocoa at 10 days interval in cocoa.

### Conclusion

Despite tremendous advancements in agricultural science and rodent biology, field and godown management still occur and can occasionally have disastrous results. The issue has been significantly lessened by financial assistance in the form of subsidies for both metallic and non-metal murine-resistant storage facilities as well as a free



supply of rodenticide. Effective rodent control measures include intervention, monitoring and prevention.

The stored food in the godowns and storage structures suffer from the rodents mainly with *Rattus rattus* species that cause economic losses to the farmers. Therefore, it is quite essential to create awareness among the farmers and motivate them to take up rodent control in an integral way Integrating the preventive measures with cleanliness and structural improvements coupled with trapping and baiting with different rodenticides are the important tool for the management of rodents. The control of rodents can only be successfully done with the close cooperation and understanding of the public.

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