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CENTRAL ARID ZONE RESEARCH INSTITUTE, JODHPUR

Perceptions of rodent control problems by the tribal community

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Studies were undertaken (while organising rodent control compaigns) in villages around Udaipur on the extent of knowledge possessed by the tribal farming community in respect of ecological, biological and control aspects of rodent control. In addition to this a thorough survey was undertaken to understand the traditional and indigenous methods of rodent control and grain storage. In the opinion of the tribal farmers wheat (63%), sugarcane (34%), richka (2%) and maize in threshing stage (1%) were highly attacked by rodents. Whereas, maize (67%), cheena (*P. miliaceum* (18%), rice (3%) and guar (2%) were opined as less vulnerable to rodent attacks.

Indigenous traps namely 'Ghantara' (57%) and 'Kunda' (13%) were used by farmers respectively besides other traps like wonder (17%) and snap (18%). Storage structures were mainly built of cowdung, cement and stones with small variations. Very few people knew about the use of anticoagulants and aluminium phosphide, while most of them were acquainted with the rodenticide, zinc phosphide. About 59% of the farmers told that rodent population increases enormously during low rainfall and drought years. Interestingly, only 3% farmers (over 50 years of age) could tell about occurence of 'plague'.

Exploratory aptitude of *Bandicota bengalensis* (Gray)

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The Indian mole rats, *Bandicota bengalensis* (Gray) are recognised as serious and predominent pests in our country. Two experiments were conducted to study their exploratory drive.

In the first experiment, ten adult males (body weight = 331.67 ± 56.6g) were trapped from the PAU fields and were randomly divided into two groups. After acclimatisation to the laboratory conditions, the exploratory responses of rats were observed in two different artificial environments, the + and I mazes. Each individual was put in the central box and visits to the arms were observed

daily for a 5 minute period. Groups 1 and 2 were observed for 10 days in + and I Mazes respectively. There after, group I was observed in I and + mazes successively each for 10 days. The visits in + and I mazes between two groups and even in the same group (group I maze $\bar{x}$ = 7.2, SE = 0.28 and + maze $\bar{x}$=10.75, SE=0.50. P<0.01) were significantly different. It appears that the exploratory response of these rodents is greater in complex mazes than that in simple ones.

In second experiment, eight adult individuals, (5 males, 3 females) were observed in L maze, having arms A and B. After few days of exploration (both visits and duration, 10 min/day/rat), the bandicoots were subjected to a novel object in arm A. They explored it significantly (P<0.05) for a longer duration. The experiments throw some light on the exploratory behaviour of *B. bengalensis*.

Burrowing behaviour of soft-furred field rat, *Rattus meltada* (Gray)

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Study of burrowing pattern of *R. meltada* (Gray) in various crops at different stages i.e. seedling, growth and maturing and also after harvesting in the fields of Punjab Agricultural University, revealed that length, breadth, depth as well as number of surface openings increased with the maturity of the crop. Complex burrows with maximum dimension, few bolt-runs and distinct food chambers were recorded at maturity stage in the wheat, sugarcane, groundnut and rice crops. No separate brood chamber was observed. After harvesting, grains were found only in rice crop in the food chamber and were systematically arranged. From one burrow, in groundnut crop, both male and female individual with three young ones (of about one month age) were recorded.

Comparative efficacy of three anticoagulant rodenticides on desert rodents

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Experiments to evaluate the efficacy of warfarin, fumarin and chlorophacinone for the control of five field rodents viz. *Tatera indica, Meriones hurrianae, Funambulus pennanti, Golunda ellioti* and *Rattus meltada* and two commensal rodents viz. *Rattus rattus* and *Mus musculus* by seven-days feeding trial revealed that indandione based chlorophacinone is more effective for the field rodents and warfarin for commensal rodents (Table 1). However, acceptability of fumarin bait was highest followed by warfarin and chlorophacinone. Time to death of the rodents due to poisoning by first two chemicals was similar but chlorophacinone was rather slow.

Table 1. Relative efficacy of three anticoagulants against desert rodents.

Species	Warfarin		Fumarin		Chlorophacinone	
	Mean lethal dose ingested (mg/kg)	% Mortality	Mean lethal dose ingested (mg/kg)	% Mortality	Mean lethal dose ingested (mg/kg)	% Mortality
T. indica	106.5	50	65.9	66.6	34.8	100
M. hurrianae	111.4	66.6	72.1	75	44.6	100
F. pennanti	65.0	58.3	124.3	75	24.8	100
G. ellioti	42.1	83.3	66.9	25	20.7	75
R. meltada	—	Nil	—	Nil	19.7	50
R. rattus	89.1	91.6	128.3	100	19.2	91.6
M. musculus	226.7	66.6	194.3	41.6	61.4	58.3

Laboratory tests of the repellent activity of selected chemicals for protecting corn from damage by cotton rats (*Sigmodon hispidus*)*

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In parts of Latin America, cotton rats *(S. hispidus)* often cause extensive damage to young corn plants by direct cutting of the stalk or digging the roots from the base of the plant. Damage is sometimes so severe that fields must be replanted several times before adequate corn stands can be raised. Our laboratory research on this problem has been aimed toward development of repellent chemicals that will alleviate rat damage to young plants. Four chemical formulations were evaluted using topical (surface) treatments on growing corn plants (15 cm high). The only treatment that produced a consistent decrease in damage was a 1-per cent solution of red squill, a commercial rodenticide. This effect is shown in Table, with comparative results for R-55 (Commercial rodent repellent) and acetone extracted tannins from a bird-resistant variety of sorghum.

Additional tests with 5 per cent red squill and an experimental rodenticide are in progress. Closed circuit videotaped sessions of the treatment periods (4 p.m.—8 a.m. each night) should allow a more refined analysis of the repellency effects.

Numbers (Mean ±SD) of corn plants damaged by small groups (n = 3) of cotton rats. Plants (n=10-15) offered each day for 5 days during the baseline and treatment sessions.

Treatment	Baseline		Treatment	
	No. plants cut	No. plants cut and eaten	No. plants cut	No. plants cut and eaten
1% R-55	8.0±0.0	4.0±1.4	8.2±2.2	5.4±4.2
1% Red squill	10.0±0.0	10.0±0.0	5.8±2.9	5.8±2.9
1% Tanin	10.5±7.8	5.5±3.5	7.6±4.8	4.6±2.1
5% Tannin	10.5±7.8	5.5±3.5	10.0±0.0	6.2±0.8

*Reprinted from Vertebrate Damage Control Research in Agriculture. Annual Report, 1978 Denver wildlife Research Center U S. Fish and Wildlife Service/Agency for International Development.

The first field report of Bromadiolone in India

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In order to find a suitable and safe rodenticide for North Eastern region conditions, where *Rattus rattus* are posing a great menace in the Jhum fields and other cultivation fields adjoining Bamboo forests, the Department of Agriculture, Govt. of Arunachal Pradesh in collaboration with PCI carried out a field trial in Apatani Plateau in Zero-II area in August 1979 with the latest rodenticide 'Bromadiolone'.

According to the manufacturers of Bromadiolone in France, it is a single dose anticoagulant. It is in liquid form, red in colour and easy to mix. It has all the good qualities of an anticoagulant but it is reported to be sensitive to poultry. Single feeding is said to be sufficient to bring the mortality in rats. There would be no marked difference in the mortality rate, if the rats feed continuously on this single dose anticoagulant. The recommended dose is 0.005% terminal concentration of Bromadiolone in any bait.

50 ml. of Bromadiolone 0.25% conc. was added to 2.5 kgs. of bait containing 1:1 mixture of broken wheat and broken maize. To this mixture, 500 gms. of hot molten wax was added and spread on a flat zinc tray. Likewise another 2.5 kgs. of broken rice alone was taken and Bromadiolone wax cakes were prepared in the same manner as mentioned earlier in order to find the bait preference between the two formulations.

This mixture was then cut into cakes of 5 cm. x 1.75 cm. Each cake weighed 35-40 gms. Each rat baiting point made of bamboo had 3-4 cakes. These were placed in four different fields and also in two tribal huts.

Both the bait formulations were well accepted by *Rattus rattus* on the first day itself. The first report of dead rats received was 6 days after baiting and the maximum died on the 7th day.

At one trial-field adjacent to a tribal hut; where there were several burrow openigs, two dead rats were found on the 6th day and 9 dead rats were found on the 7th day of

poisoning. All the dead rats were found almost in front of their burrows. Similar reports were received from other places as well.

Following are the interesting points we have observed :

1. As Bromadiolone is in liquid form, mixing was very simple and the red colour makes it simpler to indicate the uniformity of the mixture.
2. There was no need to add any sticking agent or attractant like oil or jaggery to the bait.
3. There was no bait aversion or any left overs of bait in the bait containers. Rats seemed to be attracted towards Bromadiolone cakes.
4. The dead rats were found close by the burrows-just 1-2 metres away.
5. Since Bromadiolone is an effective single dose anticoagulant, it has good potential for North Eastern region conditions in India.

Markers for toxic grease formulations*

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Experiments are underway to find an adequate marking agent to use in evaluating the delivery of acute toxicants to rats via grease formulations. These markers are needed to gain information on the percentage of rats that come in contact with toxic grease under field conditions. Preliminary tests have been conducted in the laboratory with three markers: rhodamine B, tetracycline, and calcuflour. Each was prepared at a concentration of 10 per cent in a multipurpose ultra-lube grease. About 500 mg of each was applied to the mid-line surface of each of three abdominal individually caged rice-field rats *(R. r. mindanensis)*, Rhodamine B was the better marker under these conditions. Seven days after application it could still be readily seen on the tail, feet, lips, and abdominal fur without the aid of fluorescent light. Additional laboratory tests with closed rat colonies are planned and, if these are successful, a rhodamine B-grease formulation will be field tested.

*Reprinted from Vertebrate Damage Control Research in Agriculture. Annual Report, 1978 Denver wildlife Research Center U.S. Fish and Wildlife Service/Agency for International Development.

Effect of conspecific urine odour on food consumption and shyness behaviour in Desert gerbil, *M. hurrianae*

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Recent finding on the role of odouriferous pheromones in the urine of the Desert gerbil, *Meriones hurrianae*, have yielded new information which is of great practical significance in enhancing the efficacy of control of this field rodent which is a serious pest of grasses, crops and plantations in the arid zones.

In a choice test, when pearl millet was provided separately in two containers, in one container urine of a female *M. hurrianae* was added at the rate of 0.4 per cent, to individually lodged desert gerbils. Urine mixed millet was consumed significantly $<$ (P 0.001) almost in double the quantity as compared to ordinary bajra ($P < 0.001$). Thereafter, the phago-stimulant property of female urine was investigated to assess if it affects the poison aversion and bait shyness behaviour of this destructive rodent.

Earlier studies had clearly shown that the merion gerbils not only develop aversion to the acute rodenticide, zinc phosphide, after a single exposure to sub-lethal dose but also exhibit a well marked shyness towards the poison carrier even when it is offered without the the poison.

The persent experiments revealed that after the first day of feeding on poison food, if 0.4 per cent conspecific female urine is added to it, the food intake is significantly ($P < 0.001$) enhanced. These observations clearly suggest that addition of urine inhibits the poison avoidance behaviour of rodents and masks the bait shyness.

These findings have a practical significance in the sense that zinc phosphide can be used consequently on a second day in the same field-control sequence after mixing urine. This would increase the cost effective of the operation.

Notes and News

Dr. Ishwar Prakash, Coordinator and Principal Animal Ecologist has been awarded the Professorial Chair-Professor of Eminence, by the Indian Council of Agricultural Research, New Delhi, for a period of three years. During his tenure as Professor of Eminence, he will carry out research work on "Biochemical Investigation into chemical communication through mid-ventral scent marking gland in three rodent species".

Recent Literature (Contd. from Page 8, Vol. 4, No. 1)

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The next issue will appear in Aug , 1980. Contributions for inclusion in the Newsletter may please be forwarded to :

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