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RODENT NEWSLETTER

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ALL INDIA COORDINATED RESEARCH PROJECT
ON RODENT CONTROL

Central Arid Zone Research Institute, Jodhpur

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ON
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CENTRAL ARID ZONE RESEARCH INSTITUTE
JODHPUR-342 003

CONTENTS

Species composition of Rodents in different ecological regions of Gujarat

RINA CHAKRABORTY

Zoological Survey of India, Calcutta-700 016

Attempts have been made to collect rodent species from six districts of Gujarat viz., Amreli, The Dangs, Junagadh, Surat, Vadodara and Varuch. Systematic trappings have been conducted with Sherman, break-back and wonder traps in crop fields, shops, godowns, barren lands and weeds to find out the species composition.

The following rodent species composition has been observed :

(i) Crop fields : *Tatera indica, Meriones hurrianae, Rattus rattus, Rattus cutchicus, Mus booduga, Mus dunni, Mus cervicolor, Mus platythrix, Millardia meltada, Bandicota bengalensis, Bandicota indica.*

(ii) Godowns, Residential areas and Orchards : *Tatera indica, Rattus rattus, Mus musculus, Mus cervicolor, Bandicota bengalensis, Bandicota indica, Funambulus pennanti.*

(iii) Weeds and Barren lands : *Gerbillus gleadowi, Tatera indica, Meriones hurrianae, Golunda ellioti, Mus dunni, Mus cervicolor, Mus platythrix, Bandicota bengalensis.*

Rodents of Orissa

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Orissa, having divergent habitats, abounds with rodents belonging to family Scui ridae, Hystricidae and Muridae. Among Scuirids, *Funambulus palmarum* and *F. pennanti* (Striped squirrels) abound in houses, gardens, groves, roadside trees etc. *Ratufa indica* (Indian giant squirrel) occupies deciduous, mixed deciduous and moist evergreen forest zone, and *Petaurista petaurista* (flying squirrel) also commonly occurs in jungles (Fig. 1). The only Hystricid (*Hystrix indica*, crested porcupine) abounds in the rocky-hill sides. However, a number of murids are found in fields of which *Bandicota bengalensis, Tatera indica, Mus booduga, Rattus rattus, R. norvegicus* and *Mus musculus* are quite common species.

Besides crop lands some murids infest poultry farms, kitchen gardens, store houses and houses.

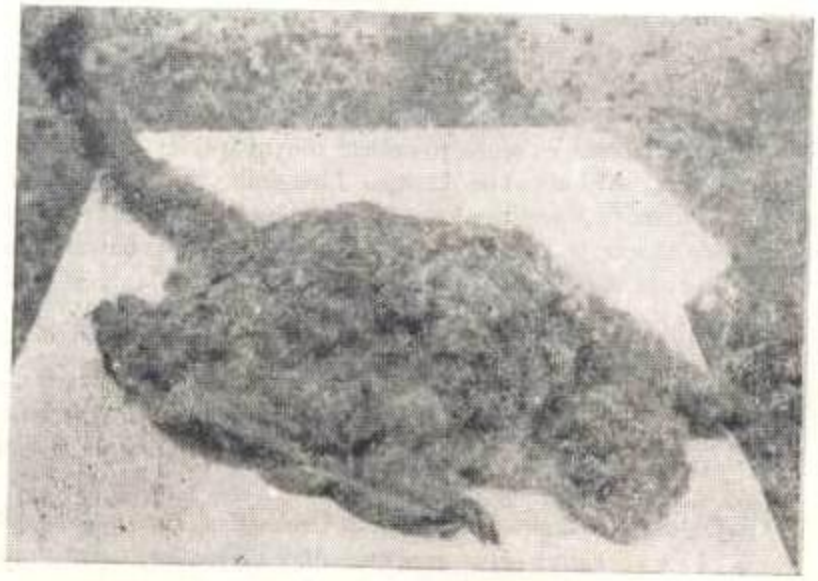

Fig. 1. The flying squirrel, *Petaurista petaurista*

Efficacy of conspecific urine in trapping of desert gerbils, *Meriones hurrianae*

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It is established that conspecific urine functions as an additive for enhancing the food intake, its role was further investigated in trapping. A group of 6 male and 6 female desert gerbils, *Meriones hurrianae* were released in rattery (13 x 7 m). After acclimatisation, 24 hour trapping was carried out with 24 sherman traps. Of these, 16 traps were smeared with female conspecific urine. The smeared and plain traps were placed side by side. The experiment was repeated with freshly caught rodents. The results indicate that 24 animals were trapped in the female urine smeared traps whereas 11 in plain traps. Thus rodents preferred female urine smeared traps significantly ($Chi^2 = 4.81$, P 0.02). It indicated that female urine can be effective in increasing the trappability of *Meriones hurrianae*.

Further analysis of sex wise data indicated that male and female rodents were more attracted towards female urine smeared traps as compared to plain traps. However, when the traps were smeared with the urine of male *Meriones hurrianae*, there was no significant difference in trapping indices of two types of traps. It is worth mentioning that male desert gerbils were repeatedly trapped in higher numbers than their counterparts irrespective of treatment.

Variation in the preference of rodents to bamboo species

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Two species of bamboo saplings viz. Magger bamboo, *Dendrocalamus hamiltoni* Munro (vegetatively propagated) and *Bamboosa tulda* (tissue culture raised) were planted in an area of 0.5 ha of each species (300 saplings). Survey carried on the rodedt damage to the two bamboo species revealed that 158 saplings of *B. tulda* were cut leaving the stems at 10-15 cm above ground level. Percent of plants damaged was worked out to be 52.6. Whereas, in case of *D. hamiltoni* no damage was recorded. The variation in the damage can be attributed either to the succulency or to the higher sugar content or combination of both in the tissue culture raised saplings in comparison to the vegetatively propagated saplings. However, none of these factors were quantified.

Preference for moist food by rodents

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Bandicota bengalensis, *Rattus meltada* and *Mus booduga* are common field rodents infesting wheat and gram crops. To check the performance of bait in the standing crops of wheat and gram, a study was planned first in the laboratory. Rodents were exposed to dry and moist grains of wheat and gram. Results indicated that moist grains were preferred over dry baits (mean consumption (g)/bait point - Dry wheat 0.0, moist wheat 4.63; dry

gram 0.75, moist gram 4.28). The same experiment was repeated in crop fields. The baits were exposed in *Donas* (cups made of leaves of Palas, *Butea monosperma*). Both the baits, i.e., dry and moist were kept in separate containers but very close to each other. Here again moist baits were preferred. This was further confirmed at farmers field where in the presence of natural food, i.e. wheat crop, field rodents preferred moist grains. Thus, moist baits can prove to be effective poison carriers in the standing crops.

Existence of *Bandicota bengalensis* in flour mills in district Kurukshetra (Haryana)

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Indian mole rat, *Bandicota bengalensis* was the surprise catch from mills in district Kurukshetra (Haryana). A random survey of 80 kiryana stores and 16 flour mills in 8 towns in district Kurukshetra revealed the existence of three rodent species namely, the house rat, *Rattus rattus*, the house mouse, *Mus musculus* and the Indian mole rat, *Bandicota bengalensis* (Table 1).Though *B. bengalensis* accounted for only 2.29% of the total rodents captured from flour mills located in the heart of the urban localities, yet its occurrence in flour mills in the present study or its presenee in grain markets and godowns as reported earlier elsewhere poses a querry whether this field species, having habit of forming complex burrows, is fast adapting to new environments.

Table 1. Percent occurrence of different rodent species in kiryana stores and flour mills.

Rodent species	Per cent occurrence	
	Kiryana stores	Flour mills
Rattus rattus	74.9	80.92
Mus musculus	25.1	16.79
Bandicota bengalensis	—	2.29

Abnormal development of incisors in *Rattus r. arboreus*

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While studying the ecology of *Rattus rattus arboreus*, six specimens were found to be with abnormal incisors. In one case the upper left incisor forms a complete circle penetrating into the left maxilla near the ventral margin of the infraorbital foramen and coming out through the premaxilla of that side in front of the infraorbital foramen (Fig. 1). The upper right incisor is shorter than the upper left incisor but longer than the normal upper incisor and more curved towards the palate. Both the lower incisors are broken at the proximal part of the crown. In the other five specimens of the house rat the incisors are partly/wholly lacking or with distorted position and having malformation. This malformation of incisors is associated with loss of corresponding incisors partly/wholly or with its distorted position. Due to lack of or distorted position of incisors other incisors do not get usual attrition against its opposite one and, therefore, grow unabated.

Fig. 1. Abnormal incisor (upper left) of *Rattus rattus arboreus* (Z.S.I. Reg. No. 19787)

Rodent damage in paddy in Tamil Nadu

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During a survey conducted for the rodent damage assessment for paddy crops (*Thaladi* season) in March, 1923, severe damage was noticed near Thillaiyadi, Negapattinam Quaid-e-Milleth district, Tamil Nadu. The paddy crop variety was of ADT-36. Two ha area was taken for the rodent damage assessment and the diagonal method was used. One sq. ft quadrat was laid in the diagonal line of each plot at every 10 m interval and in such quadrats the damaged and undamaged tillers were enumerated and with which the percentage of damage was computed.

A damage of 60.99% (2 ha) was observed and the damage to this extent to this paddy variety might be due to the high palatability of the tillers. Hence, this variety can be regarded as a non-resistant variety for the rodents. There were 128 active rodent burrows of *Bandicota bengalensis* and was no incidence of other field rodent species. Rodent activity inside the fields could be witnessed at many places i.e., their runways arising from the inner parts of the fields to their burrow entrances. Patches of cut ear heads around the standing tillers could also be seen in many places of these fields. Most of the ear heads might have been cut for hoarding by *B. bengalensis*.

Vertebrate Pest Damage to Pomegranate in Arid Horticulture

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Regular observations conducted during fruiting and ripening season of pomegranate in orchards at CRF, CAZRI, Jodhpur revealed that a major part of the yield of pomegranate is being lost to vertebrate pests, consisting of both birds and rodents. Among birds, parakeets (*Psittacula krameri*) and the red vented bulbuls *Pycnonotus cafer*, caused most of the damage. Rodents, both diurnal and nocturnal, also cause heavy losses. The five striped palm squirrel *Funambulus pennanti* is the chief rodent pest of pomegranate fruits. The partially damaged and fallen fruits and fruits hanging close to the ground level are further damaged by other species of rodents, which although did not inhabit the orchards, live in the

areas surrounding the orchards. The species are, *Meriones hurrianae*, *Tatera indica* and *Rattus meltada*. Fruits opened up by vertebrate pests are sometime further infested by certain fungi.

Two orchards in this study were covered completely by nylon nets to estimate the damage caused only by rodents. Squirrels were found to cause most of the damage during mornings and evenings. A clear preference for ripe fruits, specially for cracked ones was observed. Of the total fruits 4.6 per cent were damaged by rodents. Among the total damaged fruits 21.5% were unripe and 78.5% ripe. The chances of ripe fruits being damaged were high as, out of total ripe fruits on an average 20.4% were found to be damaged whereas from the total unripe only 0.75-1.7% (av: 1.24%) were damaged. The preference ratio of unripe : ripe varied from 1:2.4 to 1:7.5.

Preference of *Tatera indica* for summer vegetable seeds

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Seeds of eight summer vegetables were tested for evaluating their preference by *Tatera indica*. The seeds evaluated were musk melon (*Cucumis melo*), bitter gourd (*Citrullus vulgaris* var. *fistulosus*), *Kachra* (*Cucumis melo* var. *momordica*), water melon (*Citrullus vulgaris*), okra (*Abelmoschus exculentus*), and Carpet bean (*Dolichos lablab*). These seeds were exposed to the gerbils in two sets having four type of seeds each in the free choice four armed plus mazes. In the first set, preference was shown to musk melon seeds (5.14 ± 0.015 gm/day). The consumption of bitter gourd and round gourd was 0.84 ± 0.07 and 0.89 ± 0.09 gm/day, respectively. Ridge gourd seeds were not eaten at all by gerbils.

In the second set, the *kachra* seeds were preferred most (4.77 ± 0.35 gm/day) followed by water melon (0.96 ± 0.03 gm/day) and okra seeds (0.69 ± 0.01 gm/day). However, seeds of carpet beans were not touched.

The thin seed coat loosely attached with the endosperm could be possible reason for the higher preference of *Kachra* and musk melon seeds. Two distinct type of feeding patterns were observed. In the most preferred seeds, i.e., *Kachra* and musk melon, these gerbils make a cut at the top (hilum) and then the cotyledons were taken out. In other type of seeds small circular cut was made in the centre which was then enlarged and cotyledons exposed for feeding. In such type of seeds the seed coat

is loosely attached with the cotyledon in the centre than at the top. The pattern of seed preference established on the first day appeared to be maintained during the subsequent days by experimental gerbils despite daily rotation of seeds in four different arms of plus mazes.

Hoarding of Soybean pods by *Bandicota bengalensis*

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A study was made to know the hoarding of soybean pods and its magnitude by the field rodents in their burrows in April 1993 near Kanjanagaram and Pillur villages of Nagapattinam Quaid-e-Milleth district, Tamilnadu. For the present study, the burrows of three species of field rodents viz., *Bandicota bengalensis*, *Millardia meltada* and *Mus booduga* were excavated in just harvested soybean fields.

Invariably, all the 26 burrows of *B. bengalensis* had the hoarded soybean pods, whereas 7 burrows of *M. meltada* and 5 burrows of *M. booduga* had no hoarded soybean pods. The magnitude of hoarded soybean pods from all the 26 burrows of *B. bengalensis* were to the tune of 7900 g, which ranged from 160-1500 g per burrow. The mean value of hoarded soybean pods was 303.8 g/burrow. Soybean pods had been stored by both sexes of *B. bengalensis* Among the 26 burrows excavated, 19 were occupied by the *B. bengalensis* whereas the remaining 7 were unoccupied. The non-occupancy of the burrows might be attributed to the pods stored in almost all parts of the burrow system, making entry and exit out of the burrows difficult for the rodent. Soybean leaves were also observed in the burrows of *B. bengalensis* and were probably used for bedding.

Mus sp. damage to greenhouse grown carnations

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A survey on *Mus. sp.* damage to carnation was done on 1068 carnation plants. Of these 779 plants were staked and 289 unstaked. Staked plants had a total of 316 flowers. Number of flower/plant ranged from 0-69. Out of 316 flowers 17 flowers were found to be damaged. Number of flowers damaged/plant ranged from (0-2) and the percentage of damage ranged between (0-9-52). Whereas, unstaked plants had a total of 97 flowers. Number of flowers/ plants ranged from 4-46. Out of 97 flowers 47 flowers were found to be damaged. Number of flowers damaged per plant ranged from 1-27 and the percentage of flowers damaged ranged between 9-100. Less damage to flowers of staked plants maybe due to inability of *Mus* to climb up to damage the flowers located at some height. This study clearly suggests that the staking of plants may reduce the flower damage by the mice considerably.

Infection of flatworms (*Cysticereus fasciolaris* and *Hymeolepis diminuta*) in *Rattus rattus*

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In laboratory, a male albino rat was allowed to pair with 3 wild female *Rattus rattus*. Thus 22 youngones were born (55.5% males and 44.5% females). Youngones were fed on mothers milk upto 20th day. Then two individuals were sacrificed and examined. None were infected, Rest individuals were fed with a mixture of boiled corn flour, dust rice and milk for 10 days. Again 2 individuals were sacrificed and no helminth or protozoan infection was observed. Now animals were maintained on half dust rice, and all other cereals, vegetables and milk along with vitamins and calcium.

The animals were regularly sacrificed and first helminth infection was recorded from 45 day onwards. However, only 10% sub-adults were found infected as against 92% adult rats. The helminths, *Cysticereus fasciolaris* and *Hymeolepis diminuta* were identified from the liver and intestine of rats, respectively (Fig. 1). Symptom of infection was oozing of blood from nasal passage, sneezing, laziness, enlargement of belly and death of the rat. Of various drugs tested Dichlorophen was quite effective.

To conclude, boiled food keeps laboratory born animals infection free and if need be Dichlorophen can be given to ensure infestation free experimental rodents.

Fig. 1. Natural Infection Helminth (*C. fasciolaris*) in cagetd rat (Fig. showing infeeted liver with cysts

Laboratory evaluation of flocoumafen wax cake (0.005%) against *Bandicota bengalensis*

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Flocoumafen wax cake (0.005%) was evaluated against *Bandicota bengalensis*. Both choice and no-choice feeding tests were conducted following standard methodologies. In choice feeding tests, cereal mixture consisting of broken rice, Jowar and Ragi in equal proportion with 5% groundnut oil was also made available along with test poison bait.

The results of feeding tests are detailed in Table 1. Flocoumafen registered 100% mortality both in no-choice and choice tests against *B. bengalensis*. The duration of death of *B. bengalensis* was mean 7.6 days and the range 3-10 days in no-choice tests and the same was mean 12 days (range 7-18) in choice feeding tests. Further the feeding studies have

indicated that in 'no choice' tests the acceptance of storm blocks was complete cent per cent by over night compared to 45%(over 3 day period) in choice feeding tests. The intake of active ingredient of flocoumafen in choice tests was mean 15.31 mg/kg (range 3 to 41 mg/kg) which was above the acute LD50 value of this poison (0.25 to 1.21 mg/kg body weight).

Table 1. Laboratory evaluation of (Flocoumafen (0.005%) wax blocks against *B. Bengalensis*.

a) *No Choice* :

Sex Male & Female 10 : 10	Mean body weight (g)	Intake of active ingredient mg/kg body weight Mean (range)	Mortality	Duration of death (days) Mean (range)
Group I	57.85	87.41 (76-111)	100%	7.6 (3-10)
Group II	131.87	49.86 (23-90)	100%	6.8 (4-9)

b) *Choice* : Storm (Flocoumafen 0.005%) Wax Blocks Vs Rice, Ragi & Jowar Mixture Over 3 Day Period feeding in the laboratory

Male/Female	Mean body weight (g)	Intake of Cereal Mixture Mean, range (2)	Storm Block (g) Mean, range	Intake of active ingredient mg/kg	Mortality	Duration of death (days) Mean & range
10 : 10	198	37.72 (22.2-59.2)	6.8 (2-6-7.5)	15.31 (3.8-41.8)	100%	12 (7-18)

Rodent control measures in ICRISAT buildings

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Rodent problem in the ICRISAT buildings is mainly damage done to the germ plasm and hygiene aspects in the canteens and stores. The house rat, *Rattus rattus* has been identified as the predominent pest species, although little infestation of the house mouse, *Mus musculus* could also be traced. Based on the technical advise extended by Central Plant Protection Training Institute, Rajendranagar, Hyderabad, rodent control opera-

tions in buildings were initiated in 1991 and are being pursued mostly by trapping the rodents. Maximum number of house rats were trapped in canteens (22%), where food is abundantly available for the rodents, crop works area (30%) where germplasm samples are processed providing plenty of food for the rodents and adjacent buildings (19%), by virtue of proximity to crop works area. The seasonal trend of trapping indicated more rodent population during post-monsoon period (48% of rodents) and second peak in *Rabi* season (32% of rodents trapped). The number of rodents trapped during July 1991 to June 1992 is given below :

Locations	Period			Total
	Jul-Oct 91	Oct 91-Jan 92	Feb-Jun 92	
Canteens	78	08	50	136
Crop work areas	92	38	54	184
Adjascent to crop work areas	84	20	12	116
All other buildings	42	53	80	175

The above data thus suggest that *R. rattus* is associated mostly with the availability of food and as such rodent proofing measures supplemented with present trapping measures can tackle the problem to a large extent.

Evaluation of some rodenticides in tomato

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Rodents constitute an important pest Complex in tomato crops causing severe damage to plants and fruits. They mostly prefer the mature fruits. During a survey conducted in *rabi* season of 1988-89, heavy damage of rodents in tomato crop-ranging from 2.62 to 35.58 per cent was recorded in several viliages of Junagadh district. *Millardia meltada meltada* Gray was found to be the predominant species followed by *Bandicota bengalensis kok* (Gray) and *Taiera indica indica* (Hardwicke) forming 60.00 to 72.22; 27.78 to 37.14 and 0.00 to 2.86 per cent of total population, respectively. The present study was, therefore, carried out to find out the suitable rodenticide for rodent control in tomato. The experiment was conducted on farmar's fields of village Palasva during *rabi* season of 1988-89.

Three different rodenticides viz, bromadiolone (0.005% wax ca and loosebait); cholecalciferol (0.075%) and Zinc phosphide (2%) @0 1 live burrow, were applied in two hectares area (0.5 ha/treatment) at fru ing stage of the crop. Observations on plant and fruit damages we recorded from $2m^2$ area of 10 randomly selected places. Post conti observations in respect of crop damages and live burrows were record after 10 days of rodenticidal application.

Results summarized in Table-1 indicated that the maximum redu tion in plant as well as fruit damage (55.73 and 82.17%.) respectively) w recorded in the treatment of bromadiolone (0.005%) wax cake followed bromadiolone (0.005%) loose bait (47.19 and 80.96%, respectively), chol caiciferol (0.075%) wax cake (45.71 and 80.50%, respectively) and zi phosphide (2%) poison bait (30.46 and 78.77%, respectively). Similarl dats on burrow count yielded maximum control success of (84.22%) wi bromadiolone (0.005 %) wax cake while !t was minimum (64.71% with zinc phosphide treatment.

Table 1 : Comparative efficacy of different rodenticides in tomato crop.

Sr. No.	Rodenticide treatments	*Mean per cent damage*				*Per cent control success*		*Burrow census*		Per cent control success
		Pre control		*Post control*				Pre control	Post control	
		Plant	Fruit	Plant	Fruit	Plant	Fruit			
1.	Bromadiolone 0.005% wax cake.	7.68	5.72	3.40	1.02	55.73	82.17	25	4	84.62
2.	Bromadiolone 0.005% loose bait.	6.23	4.99	3.29	0.95	47.19	80.96	22	5	77.27
3.	Cholecalciferol 0.075% wax block.	7.35	6.05	3.99	1.18	45.71	80.50	19	5	73.68
4.	Zinc phosphide 2% poison bait.	5.52	6.17	3.63	1.31	30.46	78.77	34	12	64.71

Contributions for inclusion in the Newsletter may please be forwarded along with 1-2 good black and white photographs to :

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AICRP on Rodent Control,
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