RODENT
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ALL INDIA COORDINATED
RESEARCH PROJECT ON
RODENT CONTROL

CENTRAL ARID ZONE
RESEARCH INSTITUTE,
JODHPUR 342 003

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Dr. A.S. Faroda Takes Over as Director, Central Arid Zone Research Institute, Jodhpur

Dr. A.S. Faroda, born on 18th November 1939 in village Katyasani, District Nagaur (Rajasthan), got his early education from Merta City and graduated in Agriculture from Dayanand College, Ajmer. He did his M.Sc. (Ag.) in the field of Agronomy from Rajasthan College of Agriculture, University of Udaipur, in 1964.

Dr. Faroda started his scientific career in November 1964 at Government farm, Kota. After being in teaching for a short period between 1965-67 at College of Agriculture, Jobner, he joined as Junior Scientist (Agronomy) at Central Sheep and Wool Research Institute, Avikanagar (Rajasthan) in July 1967 and remained there upto December 1974. During this period, he obtained his Ph.D. degree from Haryana Agricultural University, Hisar, in the year 1973. Dr. Faroda had a long inning of 21 years at HAU, Hisar, and worked in various capacities starting as Agronomist in December 1974 and reached to the post of Director, Extension Education (1992-95).

Dr. Faroda has 119 research papers to his credit, including 7 books/bulletins. His contribution to the field of Agronomy was recognized by Indian Society of Agronomy by awarding him the fellowship of the Society.

Dr. Faroda joined the Central Arid Zone Research Institute on 28th September 1995 as its Director and has shown a great interest in various research and extension activities of AICRP on Rodent Control.

Dr. Faroda, son of desert soils, with his vast stretch of experience and expertise, will definitely lead the Central Arid Zone Research Institute to newer heights.

Rodent Newsletter family wishes him all success in his endeavour.

Activities of the Northern Palm Squirrel, *Funambulus pennanti* Wroughton in and around Residence

AJOY KUMAR MANDAL

Zoological Survey of India, Calcutta – 700 053

Some interesting activities of the *Funambulus pennanti* were observed during 1994 in and around my residence at Beledanga Road, Biren Roy Road (West), Calcutta 700 061, which are worth reporting and are as follows:

The residence in question, is situated at the South-west fringe of Calcutta Municipal Corporation area and is surrounded by large trees (Mango, Guava, Tamarind, Coconut, Betel-nut, Gulmohar, etc.), open spaces and some ponds. The squirrels' activities were more pronounced from 8 a.m. to 3 p.m. especially during April-June, when their calls and running activities were more on the roof, boundary walls, nearby trees and near a poultry farm adjacent to my house. The squirrels were 8-10 in numbers and used to live in the holes of the trees and near the leaf-bases at the crown of coconut and betel-nut trees.

The squirrels often entered into the rooms at 8.30 a.m. and their hide and seek activities continued till 3 p.m. They were seen taking rice and wheat by opening the lids of the containers by their paired lower large incisors. Mustard oil was often found to be consumed by leaking from the bowl by these squirrels. They were very clever and used to see inside the room from the carnish or sun-sheds of the windows or from below the window curtains whether there was any one inside the room. If there was none, then they entered into the room and started searching for food items on the floor, dinning and kitchen tables. When some one entered into the room, they hurriedly ran out of the room and again entered when the situation was safe. Besides, they were seen stealing poultry feed from a nearby poultry farm.

A drey (nest) was found inside unused rolled papers kept on the landing of the staircase on 23.10.94. On opening the rolled papers, two young ones were found with eyelids not yet opened and with scanty hairs on the body. The drey was made up of fibres from the gunny bags used in the poultry as curtains and fibres from the old leaf-bases of betel-nut and coconut trees. Some pieces of paper were also found inside the puffy central portion of the drey where the mother kept its two young ones. These pieces of papers were torn by the mother from the rolled papers kept on the landing of the staircase. The drey was oval shaped (length 24 cm, breadth 18 cm) and puffy in appearance. The young ones were kept on the roof by me and were watched from a distance and it was seen that within 20 minutes they were taken away by their mother one by one and were kept at the leaf-bases of the crown of a coconut tree. During transportation, the young ones were held by mouth of the mother near the middle of the body of the young ones horizontally up to the leaf bases.

Association of Cutch Rock Rat with Other Rodents and the Vegetation of Rocky Habitats in Thar Desert

B.D. RANA, A.P. JAIN & R.S. TRIPATHI

Central Arid Zone Research Institute, Jodhpur 342 003

The Cutch Rock Rat, *Rattus cutchicus* (renamed as *Cremnomys cutchicus*) is a native of Cutch region but it is distributed almost throughout the northern and peninsular India. In the Thar desert it is well distributed in the rocky habitats. Survey of rodents in different districts of western Rajasthan revealed its associations with other rodent species and vegetations of the region.

Among the other members of order Rodentia, Cutch rock rat is associated mainly with porcupine, *Hystrix indica* and field mouse, *Mus platythrix sadhu* in the rocky areas of Indian desert biome. It has also been reported to share its habitat with Indian gerbil *Tatera indica indica* and soft furred field rat, *Rattus meltada pallidior* in the foot hills of the Pali district. The Cutch rock rat has also been recorded along with fawn coloured mouse *Mus cervicolor phillipsi* from Aravallis adjoining Ajmer, Jaipur, Bharatpur and Mahendragarh districts bordering the north eastern limits of the Thar desert.

Although Thar desert is quite rich in floral diversity, the rocky regions are comparatively poor in vegetational cover. The Cutch rock rat, a denizen of rocky habitat, is found in association with some plant species in different desert districts.

In Barmer district the trapping was done in granite hills covered with drifted sands. It supported the typical floral population of *Cumiphora wightii*

- *Eleucine compressa* type. More than 60% of the total rodents trapped in this area were *R. cutchicus cutchicus*. Similarly in the rocky outcrops of Jaisalmer district having sand deposition, harboured very poor population of *R. cutchicus cutchicus*. Major plant community of this zone were *Cymbopogon jawarancusa - E. compressa - Orpetium thomaeum* type. The poor representation of Cutch rock rat in this area may be due to absence of large boulders and stones in the hillocks which provide ideal habitat for *R. cutchicus* revailing extreme drought conditions and thin veneer of soil moisture during the study periods may be another reason for its poor reperesentation in Jaisalmer District.

The rock crevices in the foothills of Jhunjhunu district harboured cent percent population of *R. cutchicus cutchicus* near the vegetational cover of *Tephrosia purpurea - Lycium barbarum - Aerva tomentosa*. The Cutch rock rats represented about 87.5% of total trappings on the malani rhylite and sand stone rocks of Jodhpur district. These rats inhabited the cracks and crevices. The habitat supported the vegetations of *Euphorbia caducifolia - C. wightii*; in association with *Tephrosia purpurea, Barberia acenthoides* and *Aerva persica.*

Trapping on the hillocks of Pali district revealed 26.6% representation of *R. cutchicus cutchicus* whereas in Sirohi district it was 25.0% of the total rodent species. Main floral composition at the study site in Pali district was *E. caducifolia - Tephrosia purpurea - Lepidagathis trinervis - Oropetium thomaeum* whereas in Sirohi district the vegetation was composed of *Anogeissus pendula - Acacia senegal - E. caducifolia* and *Cassia auriculata*.

Cutch rock rats constituted more than 80% of total rodent catches in the granite hills of Jalore District. The study area was having vegetational covers of *O. thomaeum - Cenchrus biflorus - Cenchrus setigerus. The typical* hill type trees viz., *A. senegal* and *A. pendula* were also present in the area.

Rock crevices and voids between boulders were found to be most ideal habitat of these rats followed by voids between the stones in all the study sites in the arid tract.

Reproduction in *Rattus cutchicus cutchicus* in Arid Zone

ISHWAR PRAKASH*, B.D. RANA, A.P. JAIN & R.S. TRIPATHI

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The rock rat is a rocky element and has wide distribution in the Aravalli ranges. Some aspect of reproduction are detailed below.

Male Fecundity : Male *R.c. cutchicus* remains fecund, as determined by the presence of sperms in the cauda epididymis, throughout the year, though at a reduced rate from October to December (from 33.3 to 77.7 per cent) of the total adults collected in the monthly sample. However, the fecundity index is higher (83.8 to 100 per cent) from March to August.

Female Fertiltiy : The pregnant Rock-rats were maximum during the month of August and then declined to zero during December. Interestingly, a peak was observed in March and the female fertility again decreased to 5.9 per cent in July. Apparently, these two cycles coincided with the weights of ovaries of adult females.

Litter size : It varied from 2 to 8 as evidenced by visibly implanted embryos. The annual average was 4.03 per pregnant female and 1.73 per sexually mature female. The occurrence of litters having 3 and 4 embroys was maximum (64.6%).

Embryonic mortality : Observations on the pre-implantation losses are based upon the differences in the number of corpora lutea and the number of implanted embryos. During the year the number of implanted embryos was singificantly less as compared to the number of corpora lutea. Thus losses ranged from 34.6 to 57.1 per cent on monthly counts and 44.2 per cent on annual basis. However, pre-implantation loss was observed to be at the peak during March and July. The single embryo in the right side of the uterus was recorded to be a mummified structure whereas the three others on the left side were found healthy (crown rump length was 13.15 and 16.0 mm, respectively). No other case of post- implantation loss was observed. As such out of 125 embryos, only one (0.8 per cent) was being lost.

* Desert Regional Station, Zoological Survey of India, Jodhpur

Annual Productivity : The presence of pregnant and lactating females in the collections suggest the possibility of occurrence of post-partum oestrus in these rats and as such we can expect a continuous littering throughout the breeding season. Using following formula, the number of litters produced by every adult female annually can be calculated :

$N = \frac{L}{G}$ where , N = Number of litters produced, L = Length of breeding season in days, G = Gestation period in days.

Considering that the gestation period in *R.c. cutchicus* is similar to that in *Rattus rattus* (22 days) and applying the data from this study we find that $\frac{244}{22}$ = 11.09 litters can be expected by a female in a breeding season. Correcting this figure by multiplying it by the average annual prevalence of pregnancy (11.09 x 0.45 = 4.99), the figure is reduced to 4.99 litters female/breeding season. The average number of embryos per pregnant female during the breeding season is 4.03. Thus, 4.99 x 4.03 = 20.11 young ones can be produced annually. Considering the post-implantation losses, this number is further reduced to 11.96 young/female/breeding season.

Effects of Rice Variety and Germination on the Feeding Preferences of the Lesser Bandicoot Rat, *Bandicota bengalensis*

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Rodents are sensitive in food selection and are able to discriminate among foods with subtle changes in their composition. Knowledge of sensitivities of rodents in food selection is important for determining the susceptibility of different crops and stored foods to rodent damage under fieled conditions and also for improving the baits for their control. Pen and cage trials of multi-choice feeding showed that the feeding preference of the lesser bandicoot rat, *Bandicota bengalensis*, are affected by the variety and germination of rice grains. Of the rice grains of four varieties namely IR 8, PR 106, PR 103 and basmati 370 in their three forms that is whole non-germinated and germinated grains and rice (shelled grains), *B. bengalensis* showed preference for non germinated and rice forms of IR 8 variety over the same forms of PR 106, PR 103 and basmati 370 varieties. The pattern of preference among different varieties changed considerably when germinated grains were presented to the rat. Instead of rice grains of IR 8, rats ate more amount of germinated grains of PR 103. When three forms of the same variety (IR 8 or PR 106) were offered, the rats exhibited significantly ($p < 0.05$) more preference for the germinated grains over the non-germinated and rice forms of both the varieties. These studies clearly reveal that the variety and germination of rice grains affect the feeding preferences of *B. bengalensis*.

Rodent Damage to Coconut Plantations in Gujarat

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House rats, *Rattus rattus* and Long tailed tree mouse, *Vandeleuria* sp. usually cause damage to the tender nuts of coconut in the Coconut Plantations Mahuva (Gujarat). The burrowing lesser mole rat, *Bandicota bengalensis* was found damaging 2-3 years old coconut orchard (T X D) at Talaja place (Bhavnagar district) 10 Km. away from sea shore during the survey on coconut pests. The orchard was surrounded by seasonal cultivated fileds from three sides. Rodents damaged the boarder palms seriously by making holes inside the collar portion and then burrowed upward the central crown shoot which ultimately dried up. The vegetative growth of the damaged palm was entirely arrested. Damage to the palm was to the tune of 20 per cent. The literature shows that earlier workers have reported the rat damage to leafstalks and seedlings of coconut in Southern India.

Rodent Damage to Cabbage Crop in Meghalaya

Y.P. Singh

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Rodent damage to cabbage was observed in winter crop at ICAR Research Complex Farm, Barapani in 1993. The crop was transplanted in August in 36 Plots (3 x 3 m^2) under terraced land. The damage was firs; noticed

in the first week of November and reached a peak by the end of Novmeber. The average damage was found to be 7.81% (range 0.37-37.8%). The species responsible was identified as *Bandicota bengalensis* (Gray) and *Rattus nitidus* (Hodgson). The cabbage heads near the bunds suffered more damage in comparison to the middle portion of the field. Possibly the rodents had migrated from nearby harvested paddy fileds and attacked the cabbage as there was no other crop for them to eat. Bromadiolone wax blocks (0.005%) was applied at 5x5 m^2 distance which gave 67.8% control success and reduced the damage otherwise the damage would have been much higher.

Tanjore Bow Trap : An eco-friendly tool for rodent management

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Tanjore bow trap is a traditional mechanical tool used for combating rodent menace in the Cauvery delta. This trap is made from bamboo and is simple, economic and quite effective. Field trials to check the efficacy of these traps in large scale operations were done in Nagai Quide-e-Milleth district, Tamilnadu situated in the Cauvery delta. The studies were conducted in rice crops of three seasons viz., Kuruvai (June to August 1994), Samba (September 1994 to January 1995) and Thaladi (October 1994 to January 1995).

Three hundred traps were placed every day in rice crops by a traditional rodent trapper, in a grid pattern at 2-5 m interval. Parched paddy and raw rice with coconut oil was used as bait material. The traps were placed on a tilted hill and the hills around the trap were allowed to stand. A little bait material was spread near the trap. The traditional trapper charges Rs. 120/- per day for placing 300 traps.

All three species of rodents viz., *Bandicota bengalensis, Millardia meltada and Mus booduga* which inhabit rice fields of this area were successfully trapped and filled with this trap. Performance and economics of this tool is also detailed in (Table 1). *B. bengalensis* formed the maximum percentage of rodents trapped followed by *M. meltada*. All rodents except *M. booduga* are eaten by local men. Besides, dried rodent meat is used as livestock,

poultry and fish food. The skin of rodents is also used for making leather products on a small scale. As the traditional Tanjore trap is simple, safe, and effective way of trapping rodents, its use should be encouraged and popularised.

These traps can be prepared locally in the following manner :

3 feet Bamboo pieces should be cut and soaked in water for 10 days, and then dried for 2 days. This procedure should be repeated once. From these pieces of bamboo, smaller pieces should be cut as shown in the Fig. 1 and assembled as shown in the photograph. Care chould be taken in nailing these pieces. The cost of a single trap comes to around Rs. 5.00 to 5.50.

Table 1 performance of Tanjore Bow Trap in rice fields.

Trapping details	Rice crop seasons	
	Kuruvai	Samba & Thaladi
Area covered	68.4 ha	70 ha
No. of trapping days	53	58
Total number of trap set (300 traps/day)	15,900	17,400
Total number of rodents trapped.	4,029 (27–120)*	4,176 (28–112)*
% of trapping success /day/ 300 traps	25.33	24
Mean number of rodents trapped/ day/300 traps	76.01	72
No. of rodents trapped/ha	58.9	59.65
Rodent species composition (in Nos)		
Bandicota bengalensis	2,640 (65.52)**	3,051 (74.06)**
Millardia meltada	1,170 (29.04)**	828 (19.83)**
Mus booduga	192 (4.76)**	252 (6.03)**
Tatera indica	27 (0.67)**	45 (1.07)**
Total amount spent by the ryots (Rs. 120/day / 300 traps)	Rs. 6,360-00	Rs. 6,960-00
Trapping cost/rodent	Rs. 1.57P	Rs. 1.66

* Range Values of the tapped rodents,/ day
** Values within the parenthesis indicate the per cent composition.

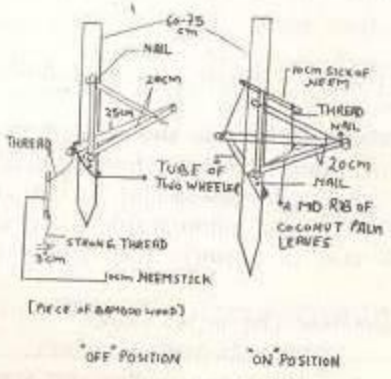

Fig 1. Tanjore bow-traps

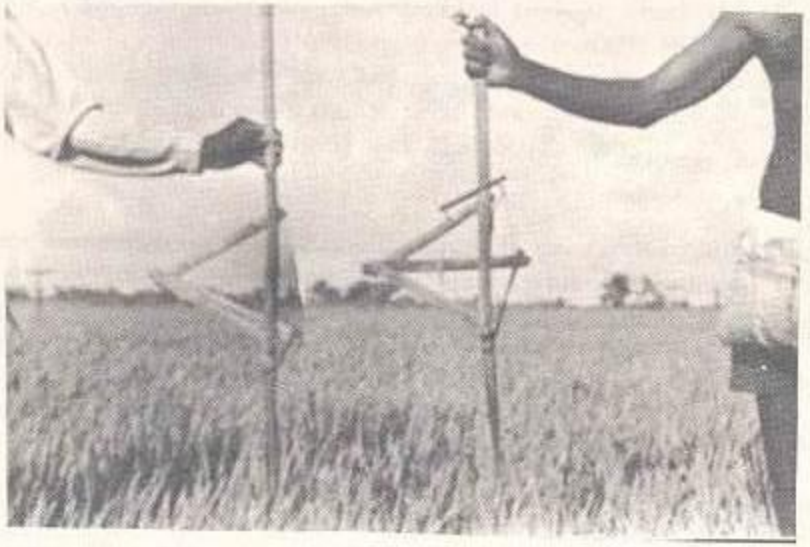

Fig. 2 Tanjore bow-traps in "on" (left) and "off" (right) position.

Fig 3 Mr. T. Chelladurai does not use poison or chemicals, all he needs is only bow-traps.

Ecology and Management of Rodents in Some Vegetable Crops in and Around Hisar

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Four summer vegetable crops viz. Bottlegourd, Muskmelon, Spongegrounrd and Cucumber were explored in and around Hisar. The population analysis revealed the co-existence of *B. bengalensis, T. indica, R. meltada, M.booduga, R. rattus and M. musculus*. Of these *B. bengalensis, T. indica and R. meltada* were found to be major pest species constiting 83.75-90.00 per cent of the total rodent population in different vegetable fields.

Trap index and burrow intensity were recorded minimum at seedling stage of the crops which increased gradually during vegetative growth and flowering stage and reached to their maximum at maturity stage. Thus, it revealed a gradual build up of rodent population with the advancement in developmental stages of the crops. The bait intake by rodents registered maximum at the flowring stage which, thus, marked it to be the proper stage for implementing poison baiting to manage the population.

There was hardly any visible damage done by rodents at early stages of the crop development. It, however, became clearly perceptible at the maturity stage. The extent of rodent damage to vegetable crops undertaken was estimated in the following order :

Bottlegourd (14.56%)	>	Muskmelon (11.83%)	>	Spongegourd (9.75%)	>	Cucumber (8.76%)

Simple trapping of rodents in the vegetable fields curtailed the rodent population in the range of 47.88 - 52.12%. The double baiting treatments comprising rodenticides - zinc phosphide and bromadiolone in different combinations resulted in significantly higher ($P < 0.05$) reduction of rodent population as well as damage to the vegetable crops than those achieved with single baiting treatments conducted either with zinc phosphide or bromadiolone. Amongst double baiting treatments, the combination of bromadiolone followed by bromadiolone was proved to be the most effective.

The burrow intensity and rodent damage were recorded comparatively higher in unweeded vegetable fields than in deweeded ones. A direct relationship between the rodent infestation and the bund dimensions in the all four vegetable crops was observed.

The application of various rodenticidal treatments accomplished a cost : benefit ratios falling between 1:88 and 1: 159. The deployment of double baiting treatments, however, resulted in higher cost : benefit ratio as compared to that with single baiting treatments. Hence the use of double baiting treatments was more economical, of which the combination of bromadiolone followed by bromadiolone proved to be the most profitable.

Rodent Control with Racumin Poison Baiting and Tracking Powder

V.R. PARSHAD AND C.S. MALHI

Department of Zoology, Punjab Agricultural University, Ludhiana - 141 004

Baiting is the common practice for the field application of rodenticides. Criticial factor in the success of this technique is bait acceptance, which depends upon the composition of the bait, behaviour of the species and availability of the alternative food material in the habitat of rodents. In situations where plenty of food exists, bait acceptance by rodents is often a problem. Under such conditions, tracking powders may provide an alternative for rodent control. During the present studies laboratory and field experiments were carried out to determine the susceptibility of different species of rodents, *Bandicota bengalensis, Tatera indica and Rattus rattus*, and their control with racumin (coumatetrale). Species specific differences occurred in the efficacy of 0.75% Racumin tracking power (RTP) used for contact poisoning and of 0.0187%, 0.0375% and 0.075% Racumin baits (RB), prepared by mixing it in a mixture of cracked wheat, sugar powder and peanut oil (96:2:2), used for poison baiting. *B bengalensis* was most susceptible to the toxic effects of Racumin as both RTP and RB cuased its 80-100% mortality after short period (15 minutes and 3 hours) exposures to treated floor/runway with 1 g/rat of RTP in forced contact and simulated runway techniques and 1 to 2 days of choice feeding of 0.0187% and 0.0375% RB in feeding

tests. These treatments were less effective against *T. indica* and least against *R. rattus*. In pen experiments, in which the runway was treated with 2 g of RTP, 100% and 60% mortality from groups of 5 rats each of *B. bengalensis* and *T. indica* occurred, respectively.

Dusting of 0.075% RTP on runways and within burrow of rodents with a puff duster resulted in 62.7% control in maturing wheat fields, 56.1% in waste land area and 38.6% in bunds/dykes between crop fields. Application of 0.0375% RB within burrows resulted in 66.1% and 67.9% rodent control in maturing wheat fields and filled bunds, respectively, and the corresponding values with 2% zinc phosphide bait were 52.9% and 80.6%.

From these laboratory and field studies it is evident that 0.75% tracking powder and 0.037% bait of Racumin are suitable for the control of *B. bengalensis*, although efficacies vary under different field conditions.

NOTES AND NEWS

Principal Investigators of the AICRP on Rodent Control met in Department of Zoology, Punjab Agricultural University, Ludhiana on 14.9.1995 and decided to launch a new association named as "Association of Indian Rodentologist" (AIRO). The Annual membership of AIRO is Rs. 100/- (Rupees One hundred only). All the members of RNL family are requested to kindly enroll as members of AIRO by sending a Bank Draft of Rs. 100/- in the name of Dr. Nafis Ahmad, Finance Secretary (AIRO), Department of Zoology, Punjab Agricultural University, Ludhiana 141 001.

Dr. G.S. Thakur has taken over the charge of Principal Investigator of cooperating Centre, AICRP on Rodent Control, JNKVV, Jabalpur.

Mr. Pratap Singh submitted his Ph.D. thesis entitled "Ecology, population structure and behaviour of Cutch Rock-rat, *Cremnomys (Rattus) cutchicus* in the Aravallis" to the faculty of Science, Jai Narain Vyas University, Jodhpur, under the supervision of Dr. Ishwar Prakash, Emeritus Professor of Eminence, INSA Senior Scientist, Desert Regional Station, Zoological Survey of India, Jodhpur.

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

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