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RODENT
Newsletter

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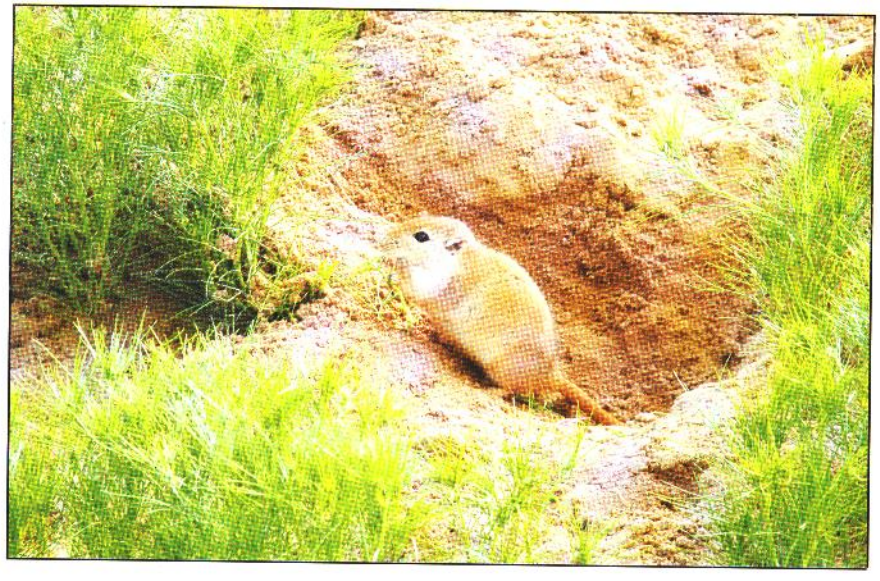
All India Network Project On Rodent Control
Central Arid Zone Research Institute
Jodhpur - 342 003, India



Indian desert gerbil, *Meriones hurriane* in cumin fields in Rajasthan

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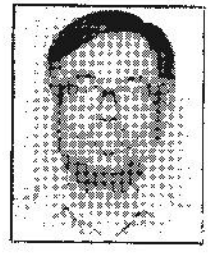
Dr. M.M. Roy takes over as Director, Central Arid Zone Research Institute, Jodhpur



Dr. M.M. Roy, born on December 1, 1956 graduated from University of Lucknow in 1974 and completed Master's degree in Botany from the same University in 1976, receiving the Birbal Sahni Gold Medal for achieving first position. He worked as CSIR Research Fellow at National Botanical Research Institute (NBRI) Lucknow during 1976-78. On August 8, 1978 he joined Agricultural Research Service of ICAR at Indian Grasslands and Fodder Research Institute (IGFRI), Jhansi.

Dr Roy served IGFRI in various capacities: Scientist (S-1) during 1978-1985; Scientist (S-2)/ Senior Scientist during 1985-1998; Principal Scientist during 1998-2000 and 2006-2010; Head of Division during 2000-2006. During 1990-1991, he was awarded Winrock Fellowship under Indo-US Project of ICAR and completed his doctoral course work in agro-forestry from Yale University, New Haven (USA) and University of Florida, Granvelle (USA). After completion of course work he completed his PhD in 1996 through research work in the area of silvipasture management at IGFRI.

During his research career at IGFRI, he handled many research projects at Institute level, and inter-institutional and externally funded projects in the field of forestry, agro-forestry, multipurpose trees and shrubs (MPTS), grassland and silvipasture management, ecology and soil biology. He was also involved in several major activities viz., Principal Investigator of a NATP (as lead centre) during 2000-2005; Coordinator of Regional Research Centre, Palampur (2003-2010); Coordinator, Network Project on grassland inventory and improvement in hilly regions (2006-2010).

His major research achievements include: participatory identification of grasses, legumes and trees for fodder use in five rain fed agro- ecological regions; introduction of local primary successional grass species and MPTS like *Leucaena* in tribal areas for enhancing livelihood options; designing of 11 silvi-pasture systems across five rain fed agro-ecological regions ; long term analysis for three silvipasture models for different land holdings in Bundelkhand region etc.

Dr Roy has served on 16 advisory committees constituted by Planning Commission, University Grants Commission, State Government, Department of Science & Technology, ICAR, Indian Council of Forestry Research and Education. He has over 200 publications, including research papers, book chapters, conference proceedings, books/ bulletins etc.

Dr. Roy took over as Director, Central Arid Zone Research Institute, Jodhpur on February, 20, 2010. He has shown keen interest in various research and extension activities of AINP on Rodent Control.

Rodent News letter wishes him success in all his endeavors.

Why Rodents can't vomit?

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Vomiting is a defense mechanism to rid the body of unwanted or toxic substances ingested by the higher animals. It is a type of reflex act where the gut muscles contract in coordinated manner and the gut contents are forcefully thrown out through mouth. The toxins may get detected in the gut or in circulation by the central nervous system which results in nausea and then vomiting or directly vomiting. Thus, during vomiting the muscles of the abdomen and chest contract and the diaphragm spasms downward and inward, which all put pressure on the stomach. In the next phase, the part of the diaphragm that surrounds the oesophagus relaxes, thus helping to open the oesophagus. The longitudinal muscle of the oesophagus contracts further opening the junction between the stomach and oesophagus. The pressure forces the contents of the stomach up into the oesophagus and out of the mouth.

Rodents are regarded as one of the the most successful mammals on earth. There are over 2000 species of rodents world over, however only a few are regarded as pests in agriculture and storage causing 5-15 % losses to food production. In India out of 101 rodent species, about a dozen species are categorized as pests. These tiny vertebrates are well adapted to different conditions and are equipped with many physiological and behavioural specialties in overcoming various odds including mans' endeavour to control them. Non vomiting nature of rodents proves a weak link which is being exploited by rodentologists in developing poison baiting technology for managing these pests in fields, houses, godowns etc. Now the big question is why they can not vomit?

Because of a peculiar anatomy of their stomach rodents can not vomit in response to cues that cause vomiting in other animals, like emetic drugs, poison, motion-sickness etc. They do not burp also and therefore experience hardly any heartburn. In fact rodent's stomach has two parts (i) thin-walled, non-glandular fore stomach, joining oesophagus and serving as a holding chamber for food and (ii) thick-walled, glandular section or corpus, producing digestive enzymes and mucus. The pyloric sphincter controls the movement of food from the corpus to the intestines. The fore stomach and the corpus are separated by a low fold of tissue called the limiting ridge. The course of the limiting ridge bends into a U-shape and almost surrounds the oesophageal opening.

The esophagus has two layers of striated muscle, which become smooth at the attachment point with the stomach. The oesophagus is closed off from the stomach by the gastro-oesophageal barrier, which consists of the crural sling (a part of diaphragm), the lower oesophageal sphincter (made of circular muscles surrounding the base of the oesophagus) and intra-abdominal oesophagus. These are present in humans also but they are placed right on top of one another, whereas in rodents they are separated by intra abdominal oesophagus that lies between them.

The strength and pressure of this barrier is very strong and in order to vomit the animal has to overcome this barrier, which is not possible in case of rodents because it can not open the crural sling, while contracting the rest of diaphragm. Similarly they have only a thin and too weak unstriated longitudinal muscle to open the sphincter and permit the evacuation of stomach contents. Besides there is no neural connections to coordinate the muscles involved in vomiting.

As stated earlier vomiting is very strong defense mechanism against toxic food. Since rodents can not vomit, do they have any other options of defense against such food? Actually, avoidance of such food is the first line of defense in case of rodents which is detected by them through various cues which normally induces vomiting in other species. Because of strong sense of smell and taste, most of the rodents go for initial sample bites of any new food in their environment for its palatability. If the food is toxic, ingestion through sample bite makes them ill and such food is avoided subsequently. Bait/poison shyness behaviour in rodents is one such phenomenon of defense against toxic baits. Since it is a learned behaviour, it persists for varying periods (15-170 days) depending upon the species.

Vomiting would have benefited the rodents in case of ingestion of toxic food. Since they do not have such anatomical option, rodents have developed a hyper-sensitive food avoidance behaviour which may compensate for its inability to vomit. It is also reported by many workers that rodents when feel nausea after ingesting sub lethal dosage of toxic food, they feed on non nutritive substances like clay, dirt etc. Experts believe that the consumption of non-nutritive substances may be an adaptive response to nausea to dilute the toxin's effect.

From the management view point, one has to consider such behavioural manifestations in pest rodents in developing baiting technologies. The acute poisons when consumed at sub lethal dosages results in avoidance/shyness behaviour towards bait as well as the toxicant. The management strategy with acute poisons should therefore be planned accordingly so that residual population surviving due to sub lethal intake is minimized and/or alternate strategy may be adopted accordingly. Rodents have not being able to avoid the anticoagulant poison baits, probably due to their chronic mode of action and smaller requirements in baits (0.0025-0.005%). Earlier studies have revealed that these anticoagulants are very effective even against bait shy rodents.

Commensalization of the field rat, *Bandicota bengalensis* in Ludhiana, Punjab

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The lesser bandicoot rat, *Bandicota bengalensis* Gray and Hardwicke which is the most predominant rodent pest in irrigated agriculture in Punjab, is also been reported from commensal situations in Ludhiana, Punjab. Its first occurrence in such situations was reported from a grocery shop located in a market. An extensive burrow system inside the store house of the shop was observed and rats were damaging various grocery items. Live trapping for 8 consecutive days with single rat catch traps during August,2008 revealed presence of *B. bengalensis* along with *R. rattus*. The Trap index (number of rats trapped/100 traps/night) for *B. bengalensis* was maximum (42.86) as compared to 14.28 for *R. rattus*. Out of the total catch in 8 days, 91.43% were *B. bengalensis* of both the sexes. *R. rattus* was trapped only twice out of the eight days trapping. Second trapping carried out in the month of September, 2008, for 4 days with single rat catch traps (12-14 in number) revealed a highest trap index of 71.43 for *B. bengalensis* (Table 1). On the last two days one multi catch rat trap was also placed along with the single rat catch traps and one *R. rattus* was trapped along with one *B. bengalensis* in the same multi catch trap.

Rodent trapping in the fish market at Ludhiana with single rat traps also revealed the incidence of *B. bengalensis*. They were found damaging fishes kept for sale purposes. The market is located near the Sidwan canal and railway lines which may be the potential source of their infiltration in the commensal situations.

Table 1. Trap index of different rodent species trapped from a grocery shop at Ludhiana

Month	Trapping on	Trap index (no. of rats trapped/100 traps/night)		
		B. bengalensis	*R. rattus*	Total
August. 08	First day	42.86	-	42.86
	Second day	35.71	14.28	49.99
	Third day	42.67	8.33	51.00
	Fourth day	14.28	-	14.28
	Fifth day	14.28	-	14.28
	Sixth day	42.86	-	42.86
	Seventh day	28.57	-	28.57
	Eighth day	14.28	-	14.28
September. 08	First day	71.43	-	71.43
	Second day	16.67	-	16.67
	Third day	7.69	7.69	15.38
	Fourth day	30.77	-	30.77

Observations on feeding behaviour of palm squirrel (*Funambulus palmarum* L.) in coconut ecosystems in Karnataka

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Coconut (*Cocos nucifera* L.) palm exhibits interesting character of male: female flower ratio within the inflorescence. Each inflorescence has 25-30 spikelets (n=30) and each spikelet has 3-5 female to 340-380 male flowers (n=50). Based on pollination agent, flowers are categorized into four groups: a) strict cross- pollination, b) self pollination c) Direct self pollination and d) semi-direct self pollination. Strict cross pollinated flowers are mainly pollinated by bees, wasps and small vertebrates like rodents and birds. There will be > 2-2 ½ thousand male flowers against 40-50 female flowers in an inflorescence (n=50). Squirrel feeding on male flowers may not have any impact on fruit set and thus on fruit yields. However, field study revealed that squirrels nibble the female flowers (buttons) and lick the oozing sweetish liquids. Open flowers were preferred over unopened flowers due to the availability of matured pollen grains in opened flowers (n=200).

Why squirrels feed on male flowers? This is because it is a part of their rich diet as the pollen grains consist of proteins, carbohydrates and lauric acid and this was confirmed in laboratory. Incidentally feeding on male flowers does not lead to yield loss as > 4000 male flowers are produced in an inflorescence. Field observations from 2006-08 in South Karnataka revealed that squirrels did not cause either immature nut drop or damage to tender coconuts, as is the widespread belief.

Laboratory studies indicated that when squirrels were offered 25 different food items like reproductive parts of Ficus *Ficus religosa*, Latex (Ficus Leaves) Ficus *elastic*, Michalia, *Michalia champaka*, Terminalia, *Terminalia arjuna*, Artocarpus, *Artocarpus hirsutus*, Cassia green pods, *Cassia fistula*, Avacado, *Perisea gratissima*, Sapota, *Manilkara zapota*, Pomegranate *Punica granatum*, Banana, *Musa paradisica*, Papaya, *Carica papaya*, Gauva, *Psidium gujava*, Cocoa, *The iobroma cacao*, Cashew, *Anacardium occidentale*, Sorghum, *Sorghum vulgare* the animals showed no specific preference in choice feeding tests. These 25 items also included coconuts of 10, 30 and 50 days old, coconut peduncle, leaf axils, flower sheath, male flower and female flower – all from coconut palm. Of all the parts of the coconut palm, squirrels fed only on male flowers. This was further confirmed by no choice feeding test in laboratory. This kind of feeding habit is the key for their successful living in diversified habitats.

Field observations revealed that squirrels are active throughout the day on palm trees, feeding on flowers during morning (6.00 to 10.30 am) and evening (4.30 to 6.00 pm) hours, rest of the time the animals used the palms for activities like mating, preening, cleaning, resting, etc. (n=200). Squirrels were also found licking latex from the leaves of banyan trees (*Ficus bengalensis* Linn.). The latex is procured from the furcating point of basal veins at the abaxial surface of leaves. Therefore, squirrels were actively found foraging in and around coconut gardens in search of mature *Ficus* leaves. Gut content analyses in laboratory showed that the diet of squirrels included seeds of wild plants, flower buds of *Prima*, *Michaelia*, *Terminalia*, *Artocarpus*, etc. termites, root grubs, undigested insect parts, etc. Pollen grains are probably digested and absorbed (n=20).

Bamboo flowering and rodent situation in Mizoram

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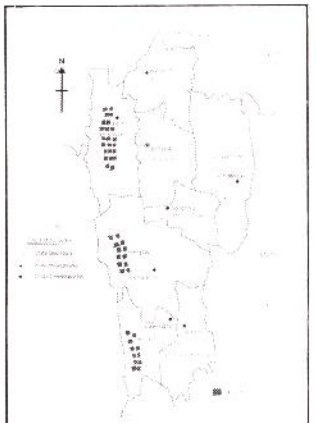
The rodent situation was reviewed with the Director of Agriculture and other senior officers during my visit to Mizoram from 24th to 27th May, 2009. As per the reports of the Department, gregarious flowering of both

Melocana baccifera and *Dendrocalamus hamiltonii* continued during 2008 also and rodent damage in *jhum* fields was also increased. The total area under gregarious bamboo flowering in the State was 97,245 ha and the crop wise areas affected by rodents during 2008 are detailed in Table 1.

Table 1: Bamboo flowering and rodent problem in different crops in Mizoram (2008)

Crop/Commodity	Total Area (ha)	Affected Area (ha)	Rodent damage (%)
Jhum rice	46,500	13.642.79	5 – 59
WRC rice	9.148	1.220.79	0 – 23
Maize	5.717	5.619.35	60 – 99
Sugarcane	853	455.10	7 – 70
Oilpalm	68,098 plants	26.483 plants	38.8

The Department of Agriculture, Mizoram extended know-how to the farming community for rodent management. Rodenticides were distributed to the farmers free of cost and the anti-rat campaigns have been organized throughout Mizoram in order to save the late paddy under the guidance of technical experts from Agriculture Department. The Department distributed 1250 kg zinc phosphide, 100 kg bromadiolone CB, 1000 kg bromadiolone RB and 152 kg aluminium phosphide during the cropping season. In addition, Linear Trap Barrier System was also adopted in 50 ha at a cost of Rs. 7,500 /ha. It was informed that one farmer adopted this system at his own cost and could harvest full without rodent damage, while all other fields around suffered severe rodent damage.



Bamboo Flowering Areas in Mizoram in 2009

Interactions with officers of Agriculture and Forest Departments revealed that sporadic to gregarious bamboo flowering is in progress covering the western part of Mizoram state during 2009. Reports exist on the bamboo flowering covering 18,517 hectares of *Melocanna baccifera* and 16 hectares of *Dendrocalamus hamiltonii* in Kowrtha forest division in Mamit district bordering Tripura. Similarly, Serte, Sertlangpui and adjoining areas Lunglei district also have reports on gregarious bamboo flowering. Parba area of Lawngtlai district also have reports of sporadic bamboo flowering. The Agriculture department initiated measures to monitor the

situation in these forest divisions. In view of large scale rodent menace in eastern parts of the state during 2007-08, the state has to gear up the anti rodent activities based on the surveillance observations.

One day workshop on the impact of rodent outbreak in context with the bamboo flowering in Mizoram was also organized on 26th May, 2009 which was attended by 75 officers from all the concerned Departments. The workshop traced the history of rodent outbreaks in the state in context with the flowering of the bamboo species – *Melocanna baccifera* and *Dendrocalamus hamiltonii*. The participants were also forewarned about the Thingtam, likely to come during 2024-26 due to gregarious flowering of *Bambusa tulda* and *Dendrocalamus longispathus* in parts of the state.

The workshop recommended some urgent actions from the Department of Agriculture, Mizoram; (i) Immediate survey of bamboo flowering areas in collaboration with Forest Departments in Mamit, Lunglie and Longtlei districts (ii) Rodent surveillance may be done in agricultural areas of bamboo flowering areas and monitor the situation and (iii) Undertake pilot research projects for which already funds are received by the Department from Government of India.

Population dynamics of *Rattus rattus* in Poultry Farms

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The population dynamics and breeding activity of the roof rat, *Rattus rattus* inhabiting poultry farm at, Linganahally village (Doddaballapura Taluk, Bangalore Rural District was studied. The poultry farm was spread over 2 acre and housed 6 sheds (30 m x 12 m). The sheds 14m apart in agricultural land and for the present study four sheds were selected, housing 2000 birds each. The trapping was carried out for 4 days every month over a period of 12 months beginning July 2005. Multiple catch traps known as wonder traps were used to sample and estimate rodent population. A fried preparation of black gram flour, locally called *udina vada* was used as bait in the traps. The trapped rodents were collected and their age, sex and reproductive status were recorded.

Rattus rattus was the only species trapped inside the poultry shed although burrows of *Bandicota bengalensis* and *Bandicota indica* were also seen outside around the poultry sheds. The highest numbers of adult *R. rattus* were trapped in March (40) followed by June (36) and April 2006 (30). The juveniler were trapped in the months of July, August, November 2005 and January 2006. Sex ratio was 1 :1 except during July and November when females slightly out numbered the males. Pregnant females were trapped throughout the year (11-80%), however the period from October to January, showed peak breeding activity as the percent pregnant females in the collections were more than 50% (Table 1)

Table 1. Sex, age and breeding condition of *R. rattus* in Poultry Farm

Months	Adult			Juvenile			Pregnant females (%)
	Male	Female	Ratio	Male	Female	Ratio	
July, 2005	6	8	1:1.33	-	1	0:1	37.5
August, 2005	10	9	1:0.9	2	2	1:1	44.4
September, 2005	12	12	1:1.0	-	-	-	41.6
October, 2005	6	6	1:1.0	-	-	-	50.0
November, 2005	5	5	1:1.0	1	1	1:1	60.0
December, 2005	7	8	1:1.14	1	-		75.0
January, 2006	5	5	1:10	-	1	-	80.0
February, 2006	6	6	1:1.0	-	-	-	33.0
March, 2006	20	20	1:1.0	-	-	-	25.0
April, 2006	15	15	1:1.0	-	-	-	40.0
May, 2006	9	9	1:1.0	-	-	-	44.4
June, 2006	18	18	1:1.0	-	-	-	11.1
Total	119	121	1:1.01	4	5	1:1.25	

Bio-efficacy of Aluminium phosphide tablets against *Bandicota bengalensis* in rice fields around Hyderabad

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Field evaluation of Aluminium phosphide (1.5 g) formulation was done against major field rodent pest species, *Bandicota bengalensis* in the rice fields of Cherlapatel Guda village of Ibrahimpatnam Mandal under Ranga Reddy district of Andhra Pradesh during *Rabi* season of 2002. All the Lesser bandicoot burrows were treated with single tablet of 1.5 g formulation of Aluminium phosphide. The field performance was compared with Aluminium phosphide formulation of 0.6 g pellets applied in the active burrows at 2 pellets per burrow. The fumigant formulations were supplied by M/S United Phoshorus Limited, Bombay. Observations were also made in the untreated fields. RBD was followed while laying out the field trial. Live burrow count and Census baiting methods were used to compare the control success achieved for each formulation. Burrow count method after fumigating the burrows with 1.5 g tablets indicated a control success of 86 per cent while census baiting method showed 85.6 per cent. While fumigation of burrows with 2 pellets each indicated a rodent control success of 75.3 per cent with burrow count method, census baiting method exhibited a control success of 74.6 per cent (Table 1). The control plots showed increase in census bait consumption of 50 per cent, while treatment plots with 1.5 g aluminium phosphide formulation exhibited decrease in census bait consumption by 5 times and with 2 pellets exhibited decrease in bait consumption by 3.4 times. There were no reports on non target species mortality. These results suggested superior performance of 1.5 g formulation of Aluminium phosphide over 0.6 g pellet formulation.

Table 1. Bio-efficacy of Aluminium phosphide (1.5g) tablets against *Bandicota bengalensis* in rice fields around Hyderabad

Sl No	Treatments	Control success (%) on the basis of		Increase/decrease in census bait intake
		Burrow count	Census baiting	
(a)	Tablets @1.5g/burrow	86.0	85.6	decreased 5 times
(b)	Pellets 0.6 g (@ two pellets/burrow	75.3	74.6	decreased 3.4 times

Socio-religious perspectives of Rodent Control in Punjab: A case study

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Rodents cause severe damages and economic losses at every stage of food production, transport and storage, besides being carriers/ vectors of many zoonotic diseases. In spite of the huge economic losses caused by them, rodent management has not yet become an integral component of our production and storage strategies due to lack of awareness and moti-

vation among farmers. Prevalence of social/religious taboos associated with rats is also a major road block in popularization of rodent management technologies among a section of rural masses. Taboos represent unwritten social rules deep rooted in the traditional belief system that regulate human behavior. Some people do not prefer to kill a rat, due to its relation with Lord *Ganesha* while some think that if killed, rats will increase their population manifolds.

During village surveys in different parts of Punjab in connection with rodent research, a few farmers informed us that they regularly visit a place for worshiping where they are told by the priest not to use rodenticides in the fields as otherwise rats will ruin their crops. The place is situated in village Bakhlor, district Nawanshahr (Punjab). It is a religious place called Baradari. It has a large building spread in an area of around 1000 square yards. Tracing the history of the place, the Mahant, who is looking after Baradari for last 40 years, told that the place was established by a saint named Baba Govind Das in the times of Mughal Emperor Akbar and Shahjahan during sixteenth century. According to Dr H.N. Sinha, sixteenth century is regarded as the period of religious revival in the world history. Dr. R.P. Tripathi writes, "It was Akbar, who, from the very beginning of his reign, gradually accepted a policy of dynamic toleration and active sympathy for religious and spiritual movements." In his times people of all faiths were allowed to construct buildings for the purpose of their worship to propagate their faith peacefully and celebrate their religious faiths and festivals.

Story about rodent control relates to a phakir named Baba Daryai Shah living near river Sutlej. He used to grow vegetables at the bank of river, but rats were always destroying his crop. One day he met Baba Govind Das and requested to solve his problem. Baba Govind Das asked the phakir, "Whenever you grow vegetables, offer some part of the crop to God at Baradari and in return I will take away your rats with me". Baba Daryai Shah used to do the same every season and in return he was relieved of rodent problem. This ritual went on like this. Later on other people also started following the same.

Even now people have faith in that place and visit here twice a year after the harvest of kharif and rabi crops. They offer food grains ranging from 5-25 Kg per person in the name of God. By taking the names of individual farmers, Mahant recites a prayer to the God for saving their

crops from rats and bringing health and prosperity to their families. People from all around the villages of Nawan Shahr, Jalandhar, Kapurthala and Ludhiana districts visit the place regularly. People who come here are advised by the Mahant not to use any rodenticide in the fields otherwise, he says that God will be unhappy and they can be in a severe problem. In addition to the rat problem, people also visit this place for problems due to other animals like snakes, termites, ants etc. During our visit we interacted with five farmers belonging to Lidran, Chahlan and Dalewal villages of district Jalandhar and Kaler and Mahlan villages of district Nawan Shahar, who informed us that they are regular visitors to the shrine and are doing this practice to protect their crops from rats.

NOTES AND NEWS

Reports of In-State Trainings on Rodent Pest Management

(I) Gujarat: South Gujarat has history of rodent menace in Sugarcane based cropping systems. The reported damage range from 10 to 30 percent, especially during August and September months, and Sugar factories are also serously affected and various control measures are being taken with little success. The rodent damage has also spread in rice and wheat crops in these cropping systems limiting the productivity of these major cereal crops. The districts affected include Navsari, Surat, Tapi and Valsad in the South Gujarat.

On the other hand, reports exist on spread of human zoonoses transmitted by rodents in these districts. The human diseases include plague and leptospirosis. During 2008 the region reported 563 cases of Leptospirosis with 122 human deaths. Its incidence is found to increase in all the four South Gujarat districts for the last 8 years. This human disease is caused by bacterium, *Leptospira interogans* and transmitted through the urine of two major rodent vector species prevalent in these three districts. The spread of the disease is found to be linked with cultivation of sugarcane crop and the farm workers were found to be highly vulnerable to this disease. Because of the debility caused by the disease, Government of Gujarat has initiated various measures, both medical and agriculture related to control the disease. It is in this context, the officers of Health department were associated in the human resource development as well as in collaborating actions on anti rodent campaigns in these districts.

The NIPHM and Directorate of Agriculture, Government of Gujarat organized a State level Workshop cum training on 5-6 January, 2009 for planning anti rodent campaigns in the state involving both Agriculture and Health departments. *(Rodent Newletter, 2009, 33 (1-2) 9-13 pp)*. It was decided in the workshop to organize two workshop-cum-training programs covering South Gujarat state for Micro level planning of the anti rodent campaigns before the onset of the monsoon for taking up campaigns in an attempt to prevent leptospirosis spread in these districts.

Therefore two Workshops cum Training programmes on Rodent Pest Management were organized by Department of Agriculture, Gujarat with the technical support and guidance from National Institute of Plant Health Management (NIPHM), Hyderabad and All India Network Project on Rodent Control (ICAR), Jodhpur. It was specifically planned for the officers of both Agriculture and Health Departments of four southern Districts of State viz., Surat, Vapi, Navsari and Valsad for effective implementation of anti rodent campaigns before the onset of monsoon during 2009. First training program was conducted at Vyara on 9-10 June, 09 for 61 officers of Tapi and Surat Districts. The second training was conducted at Navsari on 12-13 June, 09 for 58 officers of Navsari and Valsad districts. In addition to the officers of Agriculture and Health Department, identified farmers from these districts also participated in this programme.

These training programs had both in-house discussion sessions and field activities on anti rodent campaigns. The participants include officers of both Agriculture and Health departments. Senior officers from the Directorates of Agriculture and Health were also present in addition to the Joint Director of Agriculture (in charge of 5 South Gujarat districts) and Regional Deputy Director of Health, Surat. The resource persons included Dr. A.M.K.Mohan Rao, Rodent Specialist, NIPHM, Hyderabad and Dr. R.S.Tripathi, Project Coordinator, ICAR All India Network Project on Rodent Control, Central Arid Zone Research Institute, Jodhpur.

Prior to the trainings, Rodent Specialist (NIPHM) and Project Coordinator (Rodent Control) made a survey of nearby villages of Vyara and Navsari and held discussions with farmers about rodent problem. Sugarcane crop was infested by two rodent species viz. *Bandicota bengalensis and Millardia meltada*. Their live burrows were noticed on bunds and also deep inside the fields. Rice nurseries were infested with *B. bengalensis* on bunds. It was further observed that the sugarcane crop is

mostly inaccessible for application of rodenticides inside the fields. The discussion components included (i) Rodent problem in sugarcane based ecosystems of South Gujarat (ii)Major rodent pest species (iii) Rodent borne human diseases in South Gujarat and their management (iv) Rodent pest/ vector management for the region (v) Safe and judicious use of rodenticides and (vi) Selection of villages for taking up anti rodent campaigns.

The practical component (in sugarcane fields) included (i) Rodenticides and their selection (ii) Nature of rodent infestation in sugarcane based ecosystems (iii) Identification of rodent infestation (iv)Preparation of bait material with anticoagulant poison (v)Application of the poison baits in the cropping systems and (vi) Evaluation of anti rodent operations. During the interactive sessions community based rodent control actions were stressed for effective results.

Villages with reported recent incidence of Leptospirosis as well as having history for the past 5-6 years were selected jointly by the participants of Health and Agriculture department. Some villages were also selected for close monitoring data analysis and to understand relationship with leptospirosis incidence. *(R.S.Tripathi, CAZRI, Jodhpur & A.M.K. Mohan Rao, NIPHM, Hyderabad)*

(II)Tamil Nadu: In-State training on Rodent Pest management was organized by NIPHM, Hyderabad from June 24-26, 2009 at Sakottai, Kumbakonam, Thanjavur (TN) for the agriculture officers of Thanjavur and Nagapattinam districts. The Resource Persons were Dr. A. M. K. Mohan Rao, Rodent Specialist, NIPHM, Hyderabad and Dr.P. Neelanarayanan, Nehru Memorial College, Puthanampatti (Tiruchchirappalli District). Feedback on rodent problem and its management in both the participating districts was obtained from the representatives of each district. In Thanjavur district rice is cultivated in 1.75 lakh ha in three seasons, i.e., Kuruvai (0.4 lakh ha.), Samba (1.05 lakh ha) and Thaladi (0.3 lakh ha). In Nagapattinam district also rice is cultivated in all the three seasons in an area of 35,000 ha (Kuruvai), 1,02,000 ha (Samba) and 32,500 ha under (Thaladi).Among other crops, groundnut occupies 4000 ha each in both the district, whereas sugarcane occupies an area of area 10000 ha in Thanjavur and 7000 ha in Nagapattinam districts. The methods adopted for rodent control in Tanjavur includes (i) poison baiting during non-croping season, (ii) burrow digging, (iii) employing Tanjore kitty traps and (iv) providing bird perches to attract owl predation. Baiting with bromadiolone

CB (283 kg) was undertaken in 400 hamlets in 14 blocks covering 40,000 ha area. In addition, zinc phosphide baiting was also done with 2 day-pre-baiting period. Bait material was voluntarily contributed by the farmers. In case of Nagapattinam district, 60 revenue villages were covered under rodent control during 2008. Zinc phosphide baiting (at 2%) is adopted as control method with a 2- day period of pre-baiting. Major rodent pest species of Tamil Nadu included *Bandicota bengalensis, Millardia meltada, Tatera indica, Rattus rattus and Mus musculus.* The training programme was interactive, participatory with emphasis on skill development in rodent management under different situations. The participants were exposed to major rodent pest species, their habit, habitat and behaviour, breeding biology, management techniques etc, rodenticides and role of rodents in public health, through lectures. Skill development exercises were conducted on rodent seasonal calendar, surveillance, and infestation measurement, damage appraisal in rice and coconut and baiting techniques. Methodology of campaign/rodent control evaluation was also explained to the participants. The important observations emanating during the training were: (i) rodent problem is more in the years of scanty rainfall and field area is not inundated by Cauvery water (ii) coconut orchard exhibited an average damage of 11% nuts per tree (iii) besides the Cauvery delta region, other districts of Tamil Nadu also experiences rodent damage and therefore the capacity building of extension personnel of other districts is also required.*(Dr AMK Mohan Rao, NIPHM, Hyderabad)*

Squirrel damage to grape fruits (A) and drip pipes (B) in Karnataka

Smoked Rodents on sale in a vegetable market in Arunachal Pradesh

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

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