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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

Capacity Enhancement Program on Rodent Pest Management at Raipur (Chhattisgarh)

Training on Rodent Pest Management at Leh (J&K)

Training on Rodent Pest Management at Jorhat (Assam)

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Occurrence of Himalayan Marmots, *Marmota himalayana* in Leh

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Marmots belong to family Sciuridae of order Rodentia and Class Mammalia. They have robust body and bushy tail. Survey of cold arid zone of Leh, ladakh (Jammu and Kashmir) revealed the presence of Himalayan Marmots (*Marmota himalayana*) from altitude 14,000 to 17,700 ft. Marmots encountered near road side were tourist friendly and readily accepted the offerings of passerby. It was very fascinating to see tourists rolling their hands on the back and marmots are taking eatables from their hands. Marmots near foothills i.e away from roads were very secretive and peep out of their burrows for a while before coming out for foraging and basking. At danger, they produce alarm calls by making whistling sound to alert other mates and then vanish into nearby burrows for safety. Marmots prefer pebbly terrain at the foothills for digging their burrows. The burrow system of marmots was very extensive spread in an area of 15-20 meters with 4-5 burrow openings of 20-25 cms diameter. We noticed that a burrow system was occupied by a single marmot, however young ones with mother sharing the same burrow system were also observed. Many a time marmot entered from one opening and came out from other opening indicating that all the openings in burrow systems are interlinked. It was further confirmed by digging a few burrows. They dug very deep burrow which was evident from the presence of heap of sand near main burrow opening. This is essential also as marmot hoard food material inside burrow as a reserve for winter season. The Himalayan marmots (*Marmota himalayana*) weigh around 5-6 kg with stout feet and bushy tail. Body measurements of the Himalayan marmot was; Head: Body (HB): 450 mm, Hind foot (HF): 100 mm, Tail (T):125 mm, Ear (E):50 mm. The marmots prefer to move on the hilly outcrops and many times climb the small rocks for basking. Though heavily bodied, they run very fast and remain active throughout the day. Their skin is thick and leathery due to deposition of fat which is essential to overcome acute winters.

The marmots are protected under Schedule II of the Indian Wildlife Protection Act (1972). We were informed that it is essential for marmots

to eat local vegetation which facilitate the accumulation of fat in the body and help in overcoming the winters. Baiting by passerby deprived the marmots to feed on native vegetation and thereby accumulation of fat is affected. The local people informed that many marmots died during preceding years in winters as offering from passerby deprived them from taking local vegetation and thereby accumulation of fat was not enough to sustain acute winters. The marmots were observed near crop fields also near Kargil in the Mataian village at an altitude of 11125 ft. They inflict damage in these crop fields to fulfill their feeding and hoarding requirements.

Existence of short tailed mole rat, *Nesokia indica* in Kandi area of Punjab

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Most of the agricultural land in Kandi area of Punjab is Barani i.e. rainfed. Due to poor rainfall, the requirement of irrigation water for Kharif as well Rabi crops is not sufficient. Further Kandi area being very undulating and sub mountainous, about 40% of this rain water gets wasted in floods, which causes considerable damages to the crops and makes the land less productive. Average agricultural yield in this area has been only 700 kg/ha against State's average of 4500 kg/ha.

The short-tailed mole rat, *Nesokia indica* is one of the relatively few members of the large subfamily Murinae that has become adapted to life in the desert. Trapping of rodents was carried out in the month of January, 2014 in crop field area of Krishi Vigyan Kendra (KVK), Bhallowal Saunkri in Kandi area of distt Hoshiarpur of Punjab using single catch rat traps for one week. Trapping revealed the presence of Indian gerbil, *Tatera indica* (trap index = 20.0) followed by *N. indica* and Indian field mice, *Mus booduga* (trap index = 10.0 each). The *N. indica* had a proportionally large head, big claws and large and round ears. Eye balls were round and sunken. The incisor teeth were stout and broad and the tail was very short.

Large burrow complexes of *N. indica* were found in wheat crop. The digging of burrows revealed complicated structure. Burrows were found spread in the area of about 12-15 m with more than 5 surface

openings and large heaps of soil near the burrow opening. The burrow comprised of several tunnels and chambers, including one brood chamber each for nesting and breeding (Fig. 1).

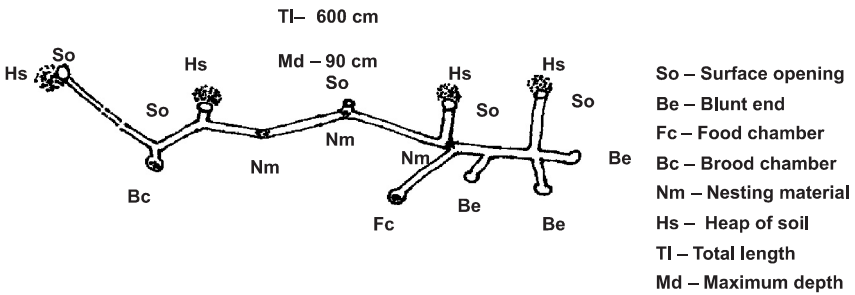

Fig. 1: Burrow structure of *Nesokia indica*

Digging of burrows in a kinnow orchard of village Baryana in distt Hoshiarpur also revealed the presence of *N. indica*. A single rat occupied each burrow. The rats had damaged roots of kinnow trees leading to drying up of plants. They also had damaged irrigation channels while digging extensive burrows.

Observations on reduction of Leptospirosis incidence with anti-rodent campaigns in Gujarat during 2012

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Leptospirosis is a bacterial disease endemic in several parts of India viz., Andaman and Nicobar islands, Kerala, parts of Gujarat, Orissa and Maharashtra. Rodents are the recognized reservoirs of leptospiral infection (WHO, 2003). Several incidences of human and animal leptospirosis in over forty countries were traced to rodent origin. Humans are dead end hosts and do not transmit the infection. The interventions to prevent this disease could be through (i) rodent vector control and (ii) improved hygiene, preventing rodents in the surroundings. Due to yearly recurrence

of this disease in South Gujarat districts having *Bandicota bengalensis* as major rodent species and majority of patients (83.4%) are agriculture workers, an attempt was made during 2009 to prevent the disease through the control of this vector species of the disease and obtained a reduction of per cent in the disease incidence. During 2012 also similar effort was made in four South Gujarat districts - Navsari, Valsad, Surat and Tapi. Departments of Agriculture and Public Health of Gujarat State got the scientific support of National Institute of Plant Health Management, (Ministry of Agriculture, Government of India) in planning the anti-rodent campaigns. The management planning included the villages with the prior disease incidence, timely procurement of inputs for control operations and community participation for effective prevention of the infection to humans as well as animals. The anti-rodent campaigns were organized before monsoon season of 2012. The anticoagulant - bromadiolone was procured through the Sugar Factory Federations to carry out the community involved rodent control campaigns covering both sugarcane fields and residential premises.

The reduction in the leptospirosis cases was 83 per cent in the campaign implemented 1822 villages. The number of leptospirosis cases was 897 during 2011 and after anti rodent campaigns in 2012, the incidence was reduced to 152 in 2012, suggesting the impact of anti-rodent campaigns organized over 4.7 lakh hectares (Table 1). There is a need to analyze these results to arrive at the impact of anti-rodent campaigns in preventing leptospirosis incidence.

Table1. Reduction in leptospirosis incidence with anti-rodent campaign in Gujarat

Name of District	Total villages	No of Village Covered	Area Treated with Bromodiolone (ha)	Leptospirosis Cases in		Reduction Of Lepto indices (%)
				2011	2012	
Surat	720	595	176748	329	33	296 (89.96%)
Tapi	513	372	87595	293	73	220 (75.08%)
Navasari	391	391	94239	156	28	128 (82.05%)
Valsad	470	464	112200	119	18	101 (84.87%)
Total	**2094**	**1822**	**470782**	**897**	**152**	**745 (83.06%)**

Evaluation of triptolide as an antifertilty agent against *Bandicota bengalensis*

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For rodents, fertility control has been recognized as a more appropriate, environmentally benign, humane and long term strategy. Triptolide, a diterpenetriepoxide, is one of the major biologically active component purified from the Chinese herbal plant, *Tripterygium wilfordii* having antifertility effects. The antifertility effects of different parts of this plant came into light from studies on rats and mice and retrospective studies on men taking *T. wilfordii* preparations for some other medical reason. Most of the antifertility effects of triptolide have been evaluated against laboratory rats and mice keeping in view the development of a human contraceptive. Studied were made on antifertility potential of oral doses of extracts of *T. hypoglaucum* containing triptolide against Mongolian gerbils keeping in view their management. However, treating wild rodents orally is a difficult approach under field conditions. The present studies were hence undertaken to evaluate the effects of triptolide fed in bait on reproduction of male and female lesser bandicoot rat, *Bandicota bengalensisso* that triptolide treatment can be integrated as a follow up of chemical control for regulating post control resiliency in rodent population under field conditions.

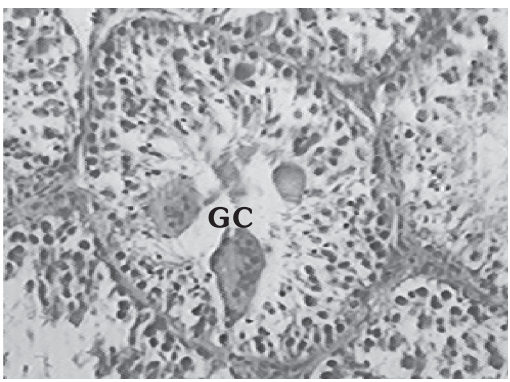

Fig.1. Section of testis showing giant cells containing several round nuclei within a single cytoplasmic boundary observed in treated rats

Feeding of different concentrations of triptolide i.e. 0.15, 0.20 and 0.25% in bait to male and 0.10, 0.15 and 0.20% to female *B. bengalensis* for 15 days duration in choice with plain bait revealed low consumption of treatment bait from that of untreated bait. Autopsy of male rats immediately and after 30 and 60 days of treatment withdrawal revealed significant reduction in weights of reproductive organs; decrease in sperm motility, viability and density and increase in sperm abnormality in rats of treated groups. Histomorphology of testis revealed a significant decrease in diameter of seminiferous tubules and number of different germ cells indicating effect of triptolide on spermatogenesis and spermeiogenesis. Giant cells containing several round nuclei within a single cytoplasmic boundary were also observed in treated rats (Fig. 1). The cell stages affected did not recover fully within 60 days period following treatment withdrawal. No pregnancy was observed in female rats paired with male rats treated with 0.25% triptolide.

Autopsy of female rats after 15 and 30 days of treatment withdrawal revealed significant reduction in weights of ovary and uterus and increase in duration of estrous cycle in rats of treated groups. Histomorphology of uterus and ovary revealed significant antifertility effects of triptolide. A dose dependent decrease was found in the number of primary, secondary, tertiary, pre-antral and antral follicles. The number of atretic follicles at all stages except primordial and secondary follicles, increased significantly (Fig. 2). Atresia varied from 44 to 77.2% in treated groups of rats compared to 29.8% in untreated group of rats.

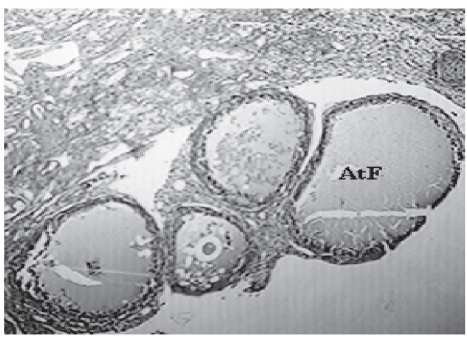

Fig.2. Section of ovary showing increased number of atretic follicles observed in treated rats

The plasma levels of total proteins and enzymes (ALP, ACP, ALT and AST) were found increased significantly in all the treated groups of male and female rats. No effect of treatment was observed on weights of

vital organs and plasma levels of testosterone, estradiol and progesterone. No significant effect of treatment was observed on histomorphology of liver. Rodent control experiment conducted in sugarcane crop by integrating 0.25% triptolide treatment with 0.005% bromadiolone treatment at the interval of 15 days revealed significant antifertility effects in male rats trapped after 60 days of triptolide treatment. The study suggests use of triptolide in integration with chemical control for management of post control rodent population rebuild up in crop fields.

Rodent management in poultry farms

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The poultry industry which is one of the major source of our food requirements throughout the world, often suffers heavy economic losses due to rodents which inflict damage to poultry house structure, poultry feeds, chicks, and eggs and indirect damage by contamination and deterioration of poultry house environment and by spreading several diseases to poultry as well as farmers. The poultry farm premises provide the most favorable and stable habitat because of availability of abundant food and safe shelter. Most of the poultry farms in Assam are located in rural and semi urban environments which are poorly built and managed and are without proper rodent proof structures for storages of feed and eggs. The farms are often severely infested with house rats, *Rattus rattus* and house mouse, *Mus musculus*. The lesser bandicoot rat, *Bandicota bengalensis* which dig burrows in the foundation and floor and the some of the burrows may have opening on both inside and outside the poultry houses. Accumulation of garbage and waste material around the premises provide good nesting and feeding ground to rodents.

In Assam, rodent control has not yet become a regular practice of poultry farmers as a result they frequently suffer severe losses due to rodents. Usually farmers do not risk carrying out rodent control operations when the birds are in the premises. The most appropriate time to implement rodent control operations in the poultry house would be when the birds are vacated at the end of the flock cycle.

In order to know the incidence of different rodent species and to minimize the losses, the studies were conducted in poultry farms in the

rural environment of Jorhat district of Assam. The data recorded on rodent incidence revealed, the highest rodent activity with a live burrow count (LBC) of 46.2 and Trap index (TI) of 14.67in the poultry farms with kaccha floor and foundation in comparison to farms with pucca floor and foundations (LBC: 26.6 and TI: 8.62). The highest population of *B bengalensis* have been recorded in the poultry farms with kaccha floor whereas the incidence of *Rattus rattus* was more in poultry farms with pucca foundation (Table 1).The data further revealed that the poultry farm located away from human habitat recorded more incidence of rodents (LBC: 28.8 and TI: 12.21) than those near human habitat (LBC: 30.4 and TI: 6.60).

An attempt was made to control rodents in poultry farms by application of chemical rodenticides as well as a castor based botanical repellent (Ecodon).The pre- treatment level of rodent infestation was estimated by adopting the burrow count methods. The re-opened burrows were pre baited with 10 g plain bait. The following day, the burrows were treated with bromadiolone (0.005%) and ecodon (1:50). Numbers of live burrows were counted daily after the treatments.

The results revealed that treatment of bromadiolone (0.005%) in poultry farms recorded 66.67 and 80.00% control success on 7th and 10th day of treatment. Likewise, application of ecodon @ 1:50 yielded 73.33 and 82.22 % control success after 7th and 10th day of application (Table 2).

Table 1. Rodent incidence in poultry farms

Locations	Species composition (%)	Trap Index	Live burrow counts	Remarks
Potiagaon	*B.bengalensis*(21) *Rattusrattus* (66) *Musmusculus*(13)	8.62	26.6	Puccafloor & foundation
New Baligaon	*B.bengalensis*(67) *Rattusrattus* (20) *Musmusculus*(13)	14.67	46.2	Kaccha floor& foundation
Sorupathar	*B.bengalensis*(51) *Rattusrattus* (36) *Musmusculus*(13)	12.21	28.8	Isolated area (Away from human habitat)
Nowboicha	*B.bengalensis*(21) *Rattusrattus* (56) *Musmusculus*(23)	6.60	30.4	Near human habitat

Table 2. Effect of rodenticides and botanicals on the rodent incidence in the poultry farms

Treatment	Pretreatment Burrow count	Post treatment Burrow count		% Control success
		Live	Dead	
Bromadiolone (0.005%)	60			
7th Day		20	40	66.67
10th Day		12	48	80.00
Ecodon	45			
7th Day		12	33	73.33
10th Day		8	37	82.22

Rodent Management in Indigenous Storage Structures

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Rodents cause immense damage to crops right from sowing till harvest and even during storage. The losses due to rodents in storage, where rodents not only cause damage to stored commodities and storage structures but also contaminate the storage environment by their fecal and urine droppings and hair fall is increasing and information on species composition and their damage potential and management practices is lacking at farmers level. Trapping rodents in stores and godowns and premises is most common and effective method of migratory rodent control. Poison baiting with rodenticides in godowns results in decreased populations and checks further infestation. The studywas designed to develop rodent management strategy using different rodenticides (bromadiolone and zinc phosphide at recommended dosages) along with and various traps (Sherman, wonder and glue traps) under rural storage conditions. The Experimental design (RBD) with 10 treatments including untreated control in 2 replications were used (Table 1).

The Tracking Index was worked out on the basis of tracking incidents before and after treatments. Based on the tracking (pre- testament) the infestation rate was almost similar ranging between 60-85 which was

reduced to 10.5 to 55 with different treatments, whereas it increased from 85 to 90 in control. The rodent control success as assessed through Tracking Index (TI) was highest (85%) with bromodiolone (0.005%) as wax cakes baiting + use of Sherman traps (T1) followed by T3 i.e., bromodiolone(0.005%) as wax cakes baiting + use of glue traps (65%). Zinc phosphide baiting along with wonder and glue traps yielded least control success (40.5%), however with Sherman traps the success increased to 60.6%. The control success with other treatment ranged from 48-58.6% (Table 1).

Table 1: The treatments undertaken as management module

Treatments	Management Modules	Tracking Index (%)		
		Pre treatment	Post treatment	Control Success (%)
T1	Bromodiolone wax cake (0.005%) baiting +Sherman traps	60	10.5	85.0
T2	Bromodiolone wax cake (0.005%) baiting +Wonder traps	80	44.0	54.8
T3	Bromodiolone wax cake (0.005%) baiting + Glue traps	75	33.5	65.0
T4	Bromodiolone (0.25% BC) at 0.005% (loose bait)+ Sherman traps	85	42.0	50.2
T5	Bromodiolone (0.25% BC) at 0.005% (loose bait)+Wonder traps	80	52.5	48.0
T6	Bromodiolone (0.25% BC) at 0.005% (loose bait)+ Glue traps	85	55.0	58.6
T7	Zinc phosphide (2.0%) poison baiting + Sherman traps	85	45.0	60.6
T8	Zinc phosphide (2.0%) poison baiting + Wonder traps	80	57.0	40.4
T9	Zinc phosphide (2.0%) poison baiting + Gluetraps	70	50.0	40.5
T10	Control	85	90.0	-

Capacity Enhancement Programs on Rodent Vector and Zoonotic Disease Management for Chhattisgarh State

The National Institute of Biotic Stress Management (NIBSM), Raipur, Chhattisgarh State organized three Capacity Enhancement Programmes (CEPs) in collaboration with All India Network Project on Rodent Control (AINP on RC) for the officials of Agriculture and Animal Husbandry Departments and Scientists of KVKS of Chhattisgarh State and Scientists of IG Krishi Vishwa Vidyalaya, Raipur during July and August, 2014.

Prior to this, a Planning Workshop was organized at Raipur on 12.06.2015 under the chairmanship of Dr T.P. Rajendran, Officer on Special Duty, NIBSM, Raipur. The meeting was attended by Dr R.S. Tripathi, Network coordinator, AINP on Rodent Control, Dr A.M.K. Mohan Rao, Consultant, NIBSM and Former Joint Director, Vertebrate Pest Management, National Institute of Plant Health Management, Ministry of Agriculture, Hyderabad; Dr P.R. Kridutta, Director Agriculture, Chhattisgarh; senior officials of Deptt of Animal Husbandry and Deptt of Horticulture (Govt of Chhatisgarh), SAMETI, IGKVV, Raipur, KVKs and scientists of NIBSM, Raipur. Dr. T.P. Rajendran conceived the pilot project on Rodent Vector Management and Zoonotic Diseases in Chhattisgarh State. The objectives of the Capacity Enhancement Programmes (CEPs) was (i) sensitizing the department officers on the role of rodents as vectors as well as reservoirs of several diseases transmitted to animals as well as human beings, (ii) acquainting them on basic principles of rodent vector management and (iii) developing work plan on survey on the incidence/ damage in rice and wheat crops and prevalence of rodent borne zoonoses among farm animals and (iv) management of rodent pest/vectors initially as a pilot project in identified villages. Officers from Department of Agriculture, Animal Husbandry (Chhattisgarh), Scientists of KVKs, IGKVV and National Institute of Biotic Stress Management, Raipur have participated in these programs.

The resource persons for the CEPs were drawn from AINP on Rodent Control - Dr. Neena Singla, Punjab Agricultural university, Dr. Mohan I. Naik, UAS, Bangalore, Dr. Ch. Narasimha Rao, Acharya NG Ranga Agricultural University, Maruteru apart from Dr R.S. Tripathi, the Network Coordinator and Dr A.M.K. Mohan Rao, Dr. N. Balakrishnan and Dr. S. Biswas from Plague Surveillance Unit, NCDC, Bangalore and Dr. S.B. Barbuddhe, Principal Scientist from NIBSM, Raipur.

Each program has 3 day duration. In the introductory session, the resource persons dealt with the information on the economic importance of rodent pests in agriculture and horticultural sectors. The presentations include precise estimate of crop losses due to rodents at National level in major crops and also commodities in general. In addition, their menace in Indian Railways, infra-structure industry, urban sectors viz., hospitals, hospitality industry and domestic/storage situations was highlighted.

The scientists of Plague Surveillance Unit, Bangalore gave presentations on the role of rodents as vector species for the diseases viz., viral (Yellow fever, Crimean Congo Hemorrhagic fever, Hanta virus, Lass fever etc.), bacterial (Plague, Leptospirosis, Relapsing fever, Salmonellosis, Tularemia, Compylobacter etc.), trematodes (Liver fluke, Schistosomiasis), rickettsial diseases (scrub typhus, rickettsial pox, typhus fever, Q fever, rocky mountain spotted fever etc.), fungal (coccidiodis, sporotrichosis, dermatomycosisetc), protozoan (Bebesiosis, Toxoplasmosis, Trypanosomiasis), nematode (Trichinosis) and cestode (dwarf tapework, Echinococcosis). They gave detailed account of the measures adopted by National Center for Disease Control under the Ministry of Health and Family Welfare, Government of India to conduct surveillance on plague and leptospirosis.

Dr. Barbuddhe gave exhaustive presentation on rodent borne zoonoses among farm animals. He informed that out of 1415 human pathogens traced, 868 (61%) have zoonotic origin and among 177 emerging and reemerging pathogens, 130 (73%) are zoonotic. 13 zoonoses were identified as most important to poor livestock keepers. Rodents on farms can be a link between wild fauna and domestic animals used for consumption, and in the case of intensively reared animals kept indoors, rodents pose a danger of introducing new infections into herds.

In the later technical sessions, presentations were made on diagnosis of rodents, different groups under Order Rodentia, group specific and genus specific characters of major rodents of public health, their general distribution and key for their identification. Other topics dealt included factors of population dynamics of rodents, viz., birth rate, death rate and dispersal, types of breeding patterns among rodents, the relationship of the crop and season with rodent incidence for timely management measures. The participants were also exposed with various rodent management measures viz., rodenticides, repellents, physical methods and use of predators. Tips for planning and organizing community level rodent control campaigns were given to all the participants. The Consultant,

NIBSM, in addition to emphasizing the need for planning for community based rodent control campaigns, stressed the need of identifying suitable motivational media.

Planning for Chhatisgarh State

During the last session, discussions were held among the resource persons and the participants on future actions for the State as a follow up of these training programs. While briefing the participants in the preparation of action schedules, the participants were informed of the need for inter departmental integration for coordination, implementation and monitoring of the program. Dr. Tripathi felt the imperative need to bring together the Departments of Agriculture, Animal Husbandry and Public Health together with Rrural development / Panchayati Raj for sustained, coordinated and integrated actions.

All the participants had interactions among themselves and with resource persons during the closing sessions and spelled out the needed actions for the State. They expressed their involvement, cooperation and assistance in taking up any activity with respect to zoonotic diseases among farm animals. The Directors of Agriculture and Animal Husbandry Departments informed that all out support will be extended to NIBSM to take up such activities. The Director, SAMETI has expressed his gratitude to use their premises for the training program and offered future help also in lending the facilities for such activities. (*Inputs by: Dr A.M.K. Mohan Rao*)

Training on the Rodent Pest Management at Leh

A field based training on 'Rodent Pest Management" was organized for the framers by All India Network Project on Vertebrate Pest Management (Rodent Control) in collaboration with Regional Research Station (RRS), Central Arid Zone Research Institute, Leh, on 27.07.2014 at Ladakh Organic Farmers' Foundation (LOFF), Chuchot, Leh-Ladakh (J&K). Shri Akbar Ali, Block Development Officer, Leh and Chuchot graced the occasion as Chief Guest. About 60 farmers participated in the training. At the outset, Dr. M.S. Raghuvanshi, Officer In charge, RRS Leh presented an overview of the training and said that rodents and weeds alone reduce the productivity up to 30% and urged the farmers to adopt rodent and weed management technologies. Before starting the technical session, feedback of farmers on their knowledge about rodent pests and their management was obtained through structured schedule. Later, Dr Vipin Chaudhary, Sr. Scientist, AINP Rodent Control, CAZRI, Jodhpur in an

interactive lecture described the role of rodents in affecting the food production as pests in fields and storage and also to public health as vectors. Details of economically important rodents, their behaviour and rodent control methods viz., non-chemical and chemical methods were explained to the farmers. Information on acute and chronic poison used in rodent control was also imparted along with precautions to be taken while their use in various conditions. Sh R.C. Meena, STO (Rodent Control) CAZRI, Jodhpur assisted in the practical demonstrations on techniques of poison bait preparation and bait placement along with correct use of rodent traps. Majority of farmers were highly receptive which was evident from the discussion on various possible problems encountered by them in field. Sh Ali Akbar, Chief Guest of the function thanked CAZRI Jodhpur for this initiative and appealed to the farmers to follow the various rodent control technologies for increased crop productivity. Sh Zubir Ahmed, Chairman, LOFF coordinated the programme and proposed the vote of thanks (*Inputs by: Dr Vipin Chaudhary*).

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(*Compiled by: Dr Vipin Chaudhary, CAZRI, Jodhpur and Dr Neena Singla, PAU, Ludhiana*)

Turkestan Rat, *Rattus turkestanicus*

Indian Field Mice, *Mus booduga*

Himalayan Marmot, *Marmota himalayana*

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

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AINP on Rodent Control,
Central Arid Zone Research Institute,
Jodhpur - 342 003, India

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