

## Dissemination of Rodent Management Technologies in Arid Zone

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### ABSTRACT

The study was conducted in Bheenjwadia village of Osian Panchyat Samiti of Jodhpur district to disseminate the rodent management technology through demonstrations, trainings, group discussions, field day etc. Rodent control success (mean of 4 years) with zinc phosphide bait (2% in bajra grain + 2% groundnut oil) was 50 to 66.33 percent in bajra, mung bean, moth bean, and cluster bean and groundnut crops at 4th days after treatment. The yield of these increased 6 to 10 percent due to adoption of the technology. Knowledge about the technology was also increased by 26.77 percent after conducting training programme. The net returns due to adoption of rodenticide baiting technology was of Rs. 275, Rs. 1837.50, Rs. 1260, Rs. 1675 and Rs. 2400 per ha in bajra, mung bean, moth bean, cluster bean and groundnut respectively as compared to control.

**Key words:** Rodent management; Dissemination; Kharif crops;

Arid region in India is spread over in 38.7 million hectare area. Out of the total, 31.7 m ha lies in hot region occupying major part of northwestern India (28.7 m ha) and remaining 3.13 m ha is in southern India. About 62 per cent area of arid region falls in western Rajasthan followed by 20 per cent in Gujarat and 7% in Haryana and Punjab. The main crops grown in the area are bajra, mung bean, moth bean, cluster bean sesame and groundnut in *Kharif* season. The productivity of these crops is low as compared to its potentiality. There is a considerable scope for increasing the production of *Kharif* crops. Among various biotic factors, rodents are one of the main problems affecting productivity of arid zone.

Rodents cause 5-10 per cent loss of food grains annually during production, processing, storage and transport (Singleton, 2003; Hussain et al., 2006; Fayenuwo et al., 2007; Palis et al., 2007; Meerburg and Kijlstra, 2008). They have been reported to cause a loss of 6-8 per cent in paddy, 10-12 per cent in wheat and 20-25 per cent in sugarcane in India at pre-harvest stage (Singla et al., 2010 and 2012; Singla and Parshad, 2010). Rodent loss can be saved through adoption of rodent management technologies. However, farmers of arid zone are not much aware about this technology. Keeping this in view, Beenjwadia village of

Jodhpur district was selected for dissemination of rodent management technology and its impact on *kharif* crops.

### METHODOLOGY

The study was conducted in Beenjwadia village of Jodhpur District. Farmers of the village grow bajra, mung bean, moth bean, cluster bean and groundnut in *kharif* season. The productivity of these crops is low. Among the biotic factors, rodents are one of the main problems in this village. Farmers are not much aware about rodent control technology. Keeping this in view the village was selected under the transfer of technology programme of CAZRI, Jodhpur in the year 2010 for dissemination of the rodent management technology to farmers. The various extension tools like demonstrations, training, group discussion, field days etc were used for dissemination of the technology.

Rodent surveys and 15 Rodenticidal demonstrations on rodent management technologies along with evaluations were conducted at farmer's field on bajra, mung bean, moth bean, cluster bean and groundnut during last 4 years. The treatments comprising zinc phosphide (2%) and control were taken in bajra, mung bean, moth bean and cluster bean and four treatments i.e. zinc phosphide (2%) bromodiolone (.005%), zinc phosphide

(2%) +bromadiolone (.005%) and control were taken in groundnut crop. For preparing the baits, pearl millet grain and groundnut oil was used. For one kg poison bait, 960g pearl millet, 20g of oil and 20g of rodenticides was used. Control success was calculated based on live burrow count before and after the treatment.

Impact of training was also assessed through structured schedule by interviewing 45 farmers before and after the training programme. Besides these, group discussion and field days were also organized for creating awareness about the rodent problem and its management.

## RESULTS AND DISCUSSION

*Field Demonstrations:* Besides rodenticidal bait preparation and applications, the field demonstrations included practical exposure of the farmers about identification of rodent burrows of the rodent species in and around crop fields and also the live pest rodents. Assessment of rodent infestation and efficacy of poison bait treatments (based on live burrow count) was also demonstrated. The demonstrations were conducted for four years (2010-13).

*Effect of rodenticidal treatments on control success:* Rodents survey, and fifteen demonstration on kharif crops on rodent management technologies and rodenticidal evaluations were conducted during kharif 2010-13 at farmers' fields in Bheenjawadia village of Jodhpur District. The studies revealed infestation of two major rodent species viz., Indian Desert gerbil, *Meriones hurrianae* and Indian gerbil, *Tatera indica* in the crop fields. The level of infestation was 52-66 burrow / ha in Kharif crops. Before undertaking field demonstrations, on farm training on rodent management on extent of rodent problem, the rodent species of the region, techniques for preparation and application of poison baits and precautions in their use was organized. More than 73 farmers were exposed to rodent management technologies.

The results of the field demonstrations on Kharif crops (on the basis of burrow count) indicated that rodent control success with zinc phosphide was 66.03, 64.16, 64.49 and 64.95 % in bajra, mung bean, moth bean and cluster bean respectively on 4th day after treatment. The mean success rate in these crops achieved after 15 DAT was 58.49, 62.96, 54.55 and 55.36 % respectively (Table 1). Due to typical phenology of crop,

ground nut registered least control success (49.15%) on 4 DAT and 40.68% on 15 DAT with single treatment of zinc phosphide. However with a follow up treatment of bromadiolone after zinc phosphide baiting, the rodent control success was increased to 80.65% on 15 DAT. It indicated that ground nut crop, due to its longer duration and typical phenology, integration of acute (zinc phosphide) and chronic rodenticide (bromadiolone) is more effective than the solo treatment with zinc phosphide. The untreated fields recorded increased rodent infestation to the tune of 12-18% during this period.

The rodent pest population showed increasing trends in the untreated control fields of all the crops due to immigration from surrounding areas. In the treated fields the immigrating pest populations were also managed due to sustained effects of anticoagulant rodenticide baiting.

*Effect of rodenticidal treatments on seed yield:* The mean yield of bajra, mung bean, moth bean and cluster bean was 830.00, 468.75, 376.25 and 471.75 kg/ha in treated fields as compared to 775.00, 427.50, 342.50 and 433.75 kg/ha in respective control fields. The percent seed yield increased to 7.09, 9.65, 9.85 and 8.76 percent in bajra, mung bean, moth bean and cluster bean crops respectively due to rodenticidal treatment. The crop yield of groundnut was 1572.50 kg/ha in the treated fields as compared to 1485.00 kg /ha in control fields indicating 5.89 percent increase in groundnut yield due to rodenticidal treatment (Table 2).

*Net returns :* The data presented in Table 3 indicated that application of rodenticides in bajra, mungbean, moth bean and cluster bean resulted in a net returns of Rs. 275,1837.50, 1260 and 1675 per ha as compared to control, while in groundnut the net returns obtained was Rs. 2400/ha due to application of rodenticides as compared to control (Table-3).

*Farmers training:* As part of capacity building and awareness creation, on-farm trainings on 'Rodent Management' were organized in adopted village during 2010-2013 in participatory and interactive modes. Around 75 farmers were exposed about, the rodent pest species of the region; rodent problem in agriculture, storage and public health; diagnostics of the problem; non-chemical rodent control techniques; rodenticides their bait preparation and applications and precautions in handling rodenticides.

**Table 1. Effect of rodenticidal treatment on rodent control success at Bheenjawadia village**

Crop	Treatment	No of treatment (ha <sup>-1</sup> )	Control success (%)				Mean (4yrs ) (%) 4 DAT
			2010 4 DAT	2011 4 DAT	2012 4 DAT	2013 4 DAT	
Pearl millet	Zinc phosphide	53.75	66.0	67.27	64.81	66.04	66.03
	Control	48.00	-11.1	-8.33	-4.08	-2.04	-6.38
Mungbean	Zinc phosphide	55.75	62.1	64.28	65.45	64.81	64.16
	Control	53.00	0.0	0.0	0.0	-4.0	-1.00
Mothben	Zinc phosphide	57.75	65.0	64.44	64.91	63.63	64.49
	Control	51.75	-13.2	-13.2	-9.43	-10.42	-11.56
Clusterbean	Zinc phosphide	53.50	64.0	66.66	66.66	62.50	64.95
	Control	49.25	-8.33	-8.16	-6.12	-5.88	-7.12
Groundnut	Zinc phosphide	61.50	49.2	50.00	48.33	49.15	49.17
	Zinc phosphide+ Bromadiolone	62.00	-	-	-	43.55	43.44
	Control	50.25	-4.1	-1	-8.0	-5.77	-4.72

DAT= Days after treatment

**Table 2. Effect of rodenticidal treatment on seed yield of kharif crops**

Crop	Treatment	No of burrows treated (ha <sup>-1</sup> )	Increase in yield (%)				Mean (4yrs ) (%)
			2010	2011	2012	2013	
Pearl millet	Zinc phosphide	53.75	9.73	9.71	5.40	4.35	7.09
	Control	48.00	-	-	-	-	-
Mungbean	Zinc phosphide	55.75	11.45	15.94	4.05	7.02	9.65
	Control	53.00	-	-	-	-	-
Mothben	Zinc phosphide	57.75	10.8	11.53	6.45	8.33	9.85
	Control	51.75	-	-	-	-	-
Clusterbean	Zinc phosphide	53.50	9.57	14.28	5.71	5.45	8.76
	Control	49.25	-	-	-	-	-
Groundnut	Zinc phosphide	61.50	8.05	7.58	4.16	4.44	5.89
	Control	50.25	-	-	-	-	-

**Table 3. Effect of rodenticides treatment on the net returns in kharif crops (2010-2013)- 4 years**

Crop	Treatment	Seed yield Kg/ha	Yield increased (kg/ha)	Cost of treatment (Rs.)	Gross return (Rs.)	Net profit (Rs.)
Bajra	Zinc phosphide	830.00	55.00	225	500.00	275.00
	Control	775.00	-			
Mung	Zinc phosphide	468.75	41.25	225	2062.50	1837.50
	Control	427.50	-			
Moth	Zinc phosphide	376.25	33.75	225	1485	1260.00
	Control	342.50	-			
Cluster bean	Zinc phosphide	471.75	38	225	1900	1675.00
	Control	433.75	-			
Groundnut	Zinc phosphide	1572.50	87.50	225	2625	2400.00
	Control	1485.00				

Note:—Rate of bajra Rs.10/kg, mung Rs.50/kg, moth Rs.45/kg, cluster bean, Rs.50/kg and groundnut Rs.30/kg

**Table 4. Knowledge level of farmers regarding rodent control in Bheenjwadia village**

Knowledge level	Before training		After training	
	No.	%	No.	%
Low (Below 33%)	22	48.89	8	17.78
Medium (34 to 66%)	21	46.67	26	57.78
High (Above 66%)	2	4.44	11	24.44
Total	45	100.00	45	100.00
Mean		41.58		68.35

Impact of three training on rodent management was also assessed. Data presented in Table 4 revealed that before training programme, 48.89, 46.67 and 4.44 per cent farmers possessed low, medium and high knowledge category respectively, whereas after training programme, maximum farmers belonged to medium (57.78%) knowledge category followed by 24.44 per cent high and 17.78 per cent low knowledge category. Before conducting training programme, mean knowledge was 41.58 per cent which increased up to 68.35 per cent after conducting the training (Table 4).

*Group Discussion:* Nine group discussions were organized on rodent control strategies in a group of 5-8 farmers. Under this programme, the farmers were given

practical exposures about diagnosis of rodent damage to crops and identification of live burrows. Importance of community action for sustainable rodent management was explained to the farmers. Farmers were motivated to prepare the poison baits themselves and apply in the burrows of selected field under our supervision. In all 90 farmers were benefited through this exercise.

## CONCLUSION

On the basis of 4 year long study it may concluded that the treatments with zinc phosphide (2%) in baits prepared in pearl millet using ground nut oil as additive may be recommended for management of rodent pest in Kharif crops. However, for groundnut crop a follow up treatment with bromadiolone (0.005%) is also required after zinc phosphide baiting. Therefore, based on the findings the farmers may be motivated to adopt rodent management technologies to enhance crop yields. Extension approaches, viz demonstration, training, group discussion and field day provide effective for dissemination of the rodent management technologies.

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