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Evaluation of Rodenticidal Baits Against Rodent Population in Long melon (*Cucumis melos* var. Utlissimus) Crop Fields

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Abstract : Single dose anticoagulant, bromadiolone (0.005%) and acute rodenticide, zinc phosphide (2%) were evaluated in long melon fields during summer 1994 in and around Hisar. Double baiting treatments comprising zinc phosphide and bromadiolone in different combinations accomplished significantly ($P < 0.05$) higher reduction of rodent population as well as crop damage than that with single baiting treatments conducted with either of the above rodenticides. The deployment of different rodenticidal baits resulted in cost-benefit ratio declining between 1:118 and 1:157. The use of bromadiolone followed by bromadiolone treatment was the most economical.

Key words : Long melon, rodent, zinc phosphide, bromadiolone.

Rodents, besides insects and nematodes, are one of the major pests causing considerable and multifarious damage to vegetable and fruit crops (Advani and Mathur, 1982; Malhi and Parshad, 1990). But unfortunately, very little endeavour has been put to procure quantified information on the losses inflicted to these crops and rodent management vis-a-vis increase in productivity. The present studies were, therefore, conducted to evaluate the potential of different rodenticidal baits against rodent population in long melon (*Cucumis melos* var. utlissimus) fields. Reduction in crop damage preceding rodent management and economics of various rodenticidal treatments have been estimated.

Materials and Methods

Zinc phosphide (2%) and bromadiolone (0.005%) were evaluated with five treatments: (1) 1 day zinc phosphide baiting preceded by 2 days prebaiting, (2) 1 day zinc phosphide treatment followed by 3 days baiting with bromadiolone at an interval of 3 days, (3) 3 days baiting with bromadiolone followed by 1 day baiting with zinc phosphide at an interval of 7 days, (4) 3 days baiting with bromadiolone at an interval of 7 days, and (5) 3 days baiting with bromadiolone. For every rodenticidal treatment three plots of the crop measuring one acre area each and equal numbers of reference plots were adopted randomly in and around Hisar. Based upon our earlier observations that bait consumption by rodents was maximum at the flowering stage and the pests started damaging the crop at the fruiting stage, the rodenticidal baitings were carried out at the flowering stage of the crop only.

The bait was offered to rodents by placing 10 g of it on a piece of paper close to each of live burrow opening. However, residual poison bait was removed at the end of each operation. The efficacy of the treatment was evaluated by obtaining pre- and post-treatment bait census (BT), live burrow census (BC) and track barking census (TM) following Buckle *et al.* (1984) and Parshad *et al.* (1987). The post-treatment census was carried out 3 days after zinc phosphide and 7 days after

Table 1. Efficacy of different rodenticidal baits in long melon crop

Treatment	BC reduction (%) Mean±S.E. (a)	BT reduction (%) Mean ± S.E (b).	TM reduction (%) Mean ± S.E. (c)	Estimted % mortality Mean ± S.E. (a+b+c)/3	Ranks
Zn	62.18±1.59	68.31±2.28	65.87±1.32	65.65±2.80	de
Zn-Br	80.28±2.90	82.58±3.43	78.04±3.43	80.30±3.23	bc
Br-Zn	83.26±2.90	85.00±3.26	79.25±3.35	82.50±3.16	b
Br-Br	90.61±3.00	91.77±3.05	94.71±2.53	92.36±2.86	a
Br	66.40±3.02	70.08±2.78	68.48±2.55	68.32±2.55	d

Ranks a to de are given on the basis of critical difference (8.81) at 5% level of significance; BC, burrow census; BT, bait census; TM, track marking census; Zn, zinc phosphide; Br, bromadiolone.

bromadiolone treatment irrespective of the poison combination.

The yield loss due to rodents was computed in the treated as well as in the reference plots that gave the amount of produce saved, following rodenticidal treatment. The number of plants per hectare was obtained by counting the total number of plants in 5 randomly selected plots of 4 x 4 m in each replication. Further, in each replicate 25 plants were marked randomly and the number of damaged and undamaged fruits were recorded during subsequent pickings of the crop and the yield loss was calculated following Srivasta and Pandya (1968). The data were statistically analysed following Snedcor and Cochran (1967). The cost-benefit ratio was evaluated by taking into account the cost of various inputs in the control operation and cash return from the produce saved due to rodenticidal treatment.

Results and Discussion

The double baiting treatments comprising zinc phosphide (2%) and bromadiolone (0.005%) in different combinations revealed rodent mortality in the range of 80.30% to 92.36% in long melon crop (Table 1). This range was found to be significantly ($P<0.05$) higher than that obtained with single baiting treatments conducted either with zinc phosphide (65.65%) or bromadiolone (68.32%). The above analysis, therefore, depicted an apparent edge of double baiting treatment over single baiting treatment in reducing rodent population. Similar observations have already been reported by various other workers in different crop fields (Buckle *et al.*, 1984; Ahmad and Parshad, 1987; Sheikher *et al.*, 1988; Ahmad and Parshad, 1991). The control of rodents with double poison treatment is remarkably advantageous because the residual, and to some extent, the nomadic populations are also poisoned. Since the double baiting treatment brings down the density of rodent population sufficiently low, it, thus requires no immediate follow up treatment.

Amongst different rodenticidal combinations tried in the present crop, bromadiolone preceding by bromadiolone was found the most potent combination in respect of reduction in rodent activity (Malhi *et al.*, 1986; Mittal and Vyas, 1992).

In reference fields of long melon, rodents were recorded damaging 17.8% of the produce, thereby, resulting in a yield loss of 3026 kg ha^{-1} (Table 2). There was, however, significant ($P<0.05$) difference in the reduction of yield loss when the crop was subjected to various rodenticidal treatments. The max-

Table 2. Damage reduction in long melon crop preceding rodenticidal treatments

Treatment	Damage (%) Mean ± S.E.	Yield loss (q ha^{-1}) Mean ± S.E.	Reduction in yield loss (q ha^{-1}) Mean ± SE	Ranks
Zn	7.12±1.12	12.05±1.26	18.21±0.77	de
Zn-Br	3.60±0.48	6.12±1.01	24.14±1.07	bc
Br-Zn	2.67±0.52	4.48±0.62	25.78±0.87	b
Br-Br	0.72±0.12	1.22±0.33	29.04±0.70	a
Br	6.4.0±0.67	11.21±1.21	19.05±1.25	d
Reference	17.80±1.12	30.26±1.63		

Ranks a to de are given on the basis of critical difference (3.01) at 5% level of significance.
Zn, zinc phosphide; Br, bromadiolone.

imum reduction in yield loss (2904 kg ha^{-1}) was achieved in the fields treated with bromadiolone followed by bromadiolone combination and it was found significantly higher than that accomplished with any other treatment. The other two double baiting treatments, viz., zinc phosphide followed by bromadiolone and bromadiolone followed by zinc phosphide showed non-significant ($P > 0.05$) difference with regard to reduction in yield loss. These results were, however, depicted better than those obtained with single baiting treatments conducted either with zinc phosphide (1821 kg ha^{-1}) or bromadiolone (1905 kg ha^{-1}).

The cost-benefit ratio of different rodenticidal baits was computed to be 1:118 to 1:157 (Table 3). This range obviously appeared to be quite encouraging when compared to some of the earlier reports published by various other workers (Ahmad and Parshad, 1987; Sheikher *et al.*, 1988; Ahmad *et al.*, 1989; Ahmad and Parshad, 1991; Mittal and Vyas, 1992). The overall high cost-benefit ratio assessed by various vegetable crops might be attributed to their higher yield and thus lays stress on the effective management of rodents (Advani and Mathur, 1982).

The use of double baiting treatments proved to be more economical than single baiting treatments for rodent management. Similarly, various other workers have advocated pulse baiting technique to be quite beneficial in saving the bait and labour (Dubock, 1982; Rao, 1986; Ahmad and Par-

Table 3. Economics of various rodenticidal treatments in longmelon crop

Treatment	Cost of treatment (Rs.)	Gain by saving the crop (Rs. ha^{-1})	Net benefit (Rs. ha^{-1})	Cost:benefit
Zn	38.50	4552.50	4514.00	1:118
Zn-Br	48.25	6035.00	5986.75	1:124
Br-Zn	47.20	6445.00	6397.80	1:136
Br-Br	46.00	7260.00	7214.00	1:157
Br	38.50	4762.50	4724.00	1:123

Cost and benefit are calculated at present rates of various inputs, i.e., bait carrier, Rs. 2.10/kg; groundnut oil, Rs. 58/kg; Zinc phosphide concentrate, Rs. 198/kg; Bromadiolone concentrate, Rs. 900/kg; man-hours, Rs. 5.10/h; Longmelon, Rs. 250/quintal; Zn, Zinc phosphide; Br, bromadiolone.

shad, 1987; Ahmad and Parshad, 1991). Of various double baiting treatments, bromadiolone followed by bromadiolone proved to be the most economical because it required no pre-baiting and hence saved the cost of input.

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