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Migration of field rodents under stress I. Removal of wild vegetation.

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Studies on migration behaviour of three predominant rodent species *Tatera indica*, *Meriones hurrianae* and *Mus hooduga* were carried out in the fields of Gangwa village of Hisar (Haryana). When subjected to physical stresses like graded removal of wild vegetation in the region of their inhabitation, the rodents migrated to other favourable locales, commencement of migration occurred only when 20% of the stress was initiated. Migration intensity augmented both population as well as species wise with the increase in intensity of the physical

stress employed. *T. indica* and *M. hurrianae* moved unidirectionally under induced stress and joined a fresh population. They covered an average distance ranging between 65 m and 78 m, adopting zigzag pattern. However, *M. hooduga* invariably migrated individually. The most apparent changes were found occurring in the soil moisture and temperature of their burrows. The average percentage of the former decreased whereas that of the latter increased with the increase in intensity of the external stress induced.

Migration of field rodents under stress 2. Application of rodenticides.

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In a country like India, there is always felt a need to screen more safe and effective rodenticides to augmenting rodent pest control under different agroclimatic conditions. Failure of known methods of control is, however, attributed mainly to their migratory behaviour. The application of acute rodenticides like

Zinc phosphide, aluminium phosphide and Silmurin under semicontrolled conditions in the fields of Gangwa village of Hisar (Haryana) revealed almost complete desertion of the pristine burrows and the average percentage obtained were as follows :

Table Bait intake pattern of calciferol and calciferol + warfarin poison baiting.

Poison with Concentration	Feeding days	Average bait intake per 100gm body weight (gm)						
		1st day	2nd day	3rd day	4th day	5th day	6th day	7th day
Calciferol 0.05%	2	14.404 (P.B.)	8.531 (P.B.)	1.357 (N.B.)	2.160 (N.B.)	2.160 (N.B.)	3.628 (N.B.)	2.105 (N.B.)
—do—	3	14.592 (P.B.)	5.00 (P.B.)	Nil	1.534 (N.B.)	1.450 (N.B.)	3.005 (N.B.)	3.108 (N.B.)
—do—	7	13.414 (P.B.)	11.533 (P.B.)	4.042 (P.B.)	2.090 (N.B.)	2.435 (P.B.)	1.533 (N.B.)	0.975 (P.B.)
Warfarin 0.025% + Calciferol 0.05%	3	12.500 (P.B.)	3.026 (P.B.)	0.526 (P.B.)	0.157 (N.B.)	0.0 (N.B.)	0.0 (N.B.)	0.0 (N.B.)
—do—	7	14.855 (P.B.)	9.528 (P.B.)	1.811 (P.B.)	0.543 (P.B.)	0.978 (P.B.)	0.0 (P.B.)	0.0 (P.B.)
Warfarin 0.05% + calciferol 0.05%	7	16.202 (P.B.)	5.516 (P.B.)	2.439 (P.B.)	2.090 (P.B.)	1.211 (P.B.)	0.0 (P.B.)	0.0 (P.B.)
Warfarin 0.05%	7	13.344 (P.B.)	14.355 (P.B.)	11.358 (P.B.)	13.728 (P.B.)	10.766 (P.B.)	9.930 (P.B.)	8.083 (P.B.)

P.B. = Poison Bait N.B. = Normal Bait

It is apparent from the results that poison baiting with calciferol alone as well as its combination with warfarin affected severely the bait intake pattern and after 3 days of exposure the quantum of bait intake was noted to be abruptly ceased while in the case of warfarin (0.05%) alone bait intake did not affect significantly.

Acute rodenticide used	Average Percentage		
	dead animals	animals migrated	unaccounted animals
Zinc phosphide (2%)	24.1	34.8	41.1
Aluminium phosphide (1.5g/living burrow)	47.9	21.5	30.6
Silmurin (1%)	27.8	45.6	26.6

Contrarily, single exposures of Bromadiolone and Brodifacoum (0.005% conc.) have obviously kept the 'single feed' anticoagulant rodenticides at an edge over the acute ones in so far as rodent control levels are concerned. The various average percentage obtained were as follows :

Anticoagulant rodenticide used	Average Percentage		
	Dead animals	Animals migrated	Unaccounted animals
Bromadiolone (Wax blocks)	63.4	22.8	13.8
Bromadiolone (Powder)	68.3	21.8	9.9
Brodifacoum (Wax blocks)	66.6	5.6	27.8
Brodifacoum (Liquid)	63.1	15.9	21.0

Majority of dead rats were found quite close to their burrows and only a few were excavated. Rodent migration under stress has revealed the animals to join with a fresh population inhabited in a peripheral average area ranging between 45.5 m and 68.5 m. This evidently depicts that the period over which the cleared area may remain rodent free will depend largely on the depth of the surrounding area which is initially cleared. Therefore, as a general rule, a strip of 40-100 m wide should be treated around the area to be protected.

Studies on bait intake pattern of calciferol and calciferol + warfarin poison baiting to house rat *Rattus rattus*

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Studies were conducted in the laboratory on bait intake pattern of calciferol 0.05% and its combination with warfarin 0.025% and 0.05% against house rat *Rattus rattus* in 'no-choice' feeding test. Poison baiting with 0.05% concentration of warfarin alone run simultaneously for comparing the results. Feeding days varied from 2 to 7 days.

Rodents from Thane District, Maharashtra State

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Thane Dist., one of the districts in Western Ghats, Maharashtra State, remained partly unexplored till 1984, when an intensive survey tour to most of the interior, parts of the district was undertaken to study the general fauna, including rodents. Thane Dist. lies between the Western Ghats and the Arabian sea presenting a varied habitat and fauna. Attempts were made to collect rodent specimens in ten different localities during the 15 day's survey in March 1984. Methods of trapping near the residential areas, excavating the live burrows, unturning heavy boulders in the field and even employing local tribal people for rodent collections were used for the purpose. Following species of rodents were collected.

<i>Rattus rattus rufescens</i>	Trapped near the residential areas.
<i>Bandicota bengalensis kok</i>	Caught by excavating the burrows
<i>Mus. booduga</i>	Caught alive from below the boulder
<i>Mus. platythrix</i>	Caught from paddy field
<i>Tatera indica</i>	Caught from paddy fields
<i>Golunda ellioti gujerati</i>	Caught from nursery for raistyre sapling
<i>Hystrix indica</i>	A live porcupine was seen moving in the forested area
<i>Funambulus palmarum</i>	Number of squirrels were noticed moving on the trees in the village

Estimation of rodent damage in a hybrid rice trial

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The damage to the rice crop by rodent pests has been reported to vary from 0.44 to 100 per cent in different conditions. In a hybrid rice trial which was conducted at the Main Research, Station, Hebbal, University of Agricultural Sciences, Bangalore, planted in early *kharif*, 1983 involving seven hybrids and five check varieties in three replications, damage by the rodent (*Bandicota bengalensis*) was noticed. The size of each plot was one square meter and the plots were completely randomised in three replications. The area of severe rodent damage was concentrated in the centre of the trial. The rodent damage started at

the time of flowering in most of the entries. This damage occurred despite the application of zinc phosphide bait kept inside the burrows as per recommendations. The rodent damage varied from 36.72 to 79.72 per cent in the centre of the trial. The tillers were out at approximately four inches from the ground and the damaged tillers were randomly scattered in the plots. We made efforts to take the ratoon crop from damaged and undamaged tillers soon after the damage was noticed. However, the establishment of ratoon crop was poor. Eventhough some ratoons flowered early, maximum spikelet sterility was noticed at the time of maturity. It seems that there is no preferential rodent damage between varieties and hybrids since four varieties and three hybrids were severely damaged by rodents in the centre of the layout.

Efficacy of Flocoumafen (WL-108366) against some desest rodents.

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The experiments conducted on *R. rattus* and *T. indica* indicated that 0.005% conc. of flocoumafen is much effective than 0.01% conc. in no choice test. Only 1 day exposure killed 100% *R.rattus* but for *T.indica*, such results could be obtained only after 2 days exposure (Table 1).

Table : 1. Efficacy of Flocoumafen in No Choice Tests

Species	Exposure period	Poison bait consumed $g \pm S.E.$	Mg/kg ingested $(mg \pm S.E.)$	Percent mortality	Days to death	
					Mean	Range
<i>Rattus rattus</i>	1 day	5.23 ± 0.81	2.69 ± 0.43	100	8.4	3-17
<i>Tatera indica</i>	1 day	3.33 ± 0.39	1.63 ± 0.18	90	8.2	6-15
<i>Tatera indica</i>	2 days	8.1 ± 0.69	3.88 ± 0.21	100	8.2	4-12

In choice test, 80 per cent *R. rattus* died, whereas all experimental *Tatera indica* died in 2 days choice test. Interestingly, no significant difference was observed in the consumption of plain bait and the poison bait which indicated that the poison is palatable at this concentration (Table 2).

Table : 2. Efficacy of Flocoumafen in Choice Tests

Species	Exposure period in days	Poison bait consumption (g, mean \pm SE)	Plain bait consumption (G, Mean \pm SE)	Poison ingested (Mean \pm SE)	Percent mortality	Days to Death
<i>Rattus rattus</i>	1	*4.61 \pm 0.40	*4.58 \pm 1.28	2.28 \pm 0.20	80	5-16
<i>Tatera indica</i>	2	*5.60 \pm 0.65	*4.70 \pm 1.18	2.50 \pm 0.29	100	4-11

* 't' = not significant between 1 & 2

Efficacy of bromadiolone against house rat *Rattus rattus* Linn.

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Indian Grain Storage Institute, P.A.U. Campus, Ludhiana.

Efficacy of bromadiolone (0.25% dry concentrate) was evaluated in the laboratory against house rat *Rattus rattus* Linn. at 0.005% concentration as no-choice feeding. The former concentration (0.005%) of poison bait was offered to rats for 1, 2, 3 & 4 days while the latter (0.01%) for 1, 2 & 3 day. The rats caged individually were kept on normal bait for one week before poison baiting.

It was observed that lower concentration of the anticoagulant (0.005%) could yield cent percent kill when it was exposed for 4 days,

while the higher concentration (0.01%) yielded cent percent kill even in 1 day of exposure. Average days to death was less (5 days) in 0.01% concentration when it was exposed continuously for 3 days. The study reveals that bromadiolone may be offered at 0.01% concentration to house rat in the field conditions instead of 0.005% and in addition to this its exposure period may not be less than three days because in the fields there may be several choice of foods to rats.

Table 1 : Efficacy of bromadiolone against house rat *Rattus rattus* Linn.

Concentration (a.i. tested (%)	Poison baiting period (days)	Average weight of the rats (gm)	Mortality (%)	Average poison ingested (mg/kg)	Average days to death Mean (range)
0.005	1	113.1	70	5.013	8.8 (4-17)
0.005	2	95.1	70	11.577	9.1 (5-13)
0.005	2	115.0	90	11.782	6.4 (3-10)
0.005	4	106.2	100	22.834	6.4 (3-11)
0.01	1	127.0	100	10.992	7.0 (4-12)
0.01	2	127.0	100	25.779	6.8 (4-9)
0.01	3	127.0	100	31.477	5.0 (3-6)

Efficacy of Calciferol (vitamin D₂) and warfarin + calciferol against house rat *Rattus rattus*.

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Efficacy of calciferol (Vitamin D₂), calciferol 0.05% + warfarin 0.05% and calciferol 0.05% + warfarin 0.025% was tested in the laboratory against house rat *Rattus rattus*. The rats caged individually were kept on normal food for one week before exposing to poison bait. Various groups of rats were offered calciferol 0.05% bait for 2,3 & 7 days; warfarin 0.25% + calciferol 0.05% bait for 3 & 7 days; warfarin 0.05% + calciferol 7 0.05% bait for 7 days and warfarin 0.05% bait for 7 days in 'no-choice' feeding test.

Table :- Efficacy of calciferol and its combination with warfarin against house rat *Rattus rattus*.

Poison with concentration	Feeding period (days)	Average weight of each rat (gm)	Mortality (%)	Poison ingested (mg/kg)		Av. days to death Mean (Range)
				warfarin	Calciferol	
Calciferol						
0.05%	2	90.25	75	—	64.559	6.30 (5-7)
-do-	3	96.50	100	—	114.681	6.25 (4-8)
-do-	6	71.75	100	—	180.139	6.00 (5-8)
Warfarin						
0.025% + Calciferol 0.05%	3	95.00	100	40.131	80.263	3.75 (3-5)
-do-	7	69.00	100	69.293	138.586	5.00 (4-6)
Warfarin 0.05% + Calciferol 0.05%	7	71.75	100	118.118	118.118	4.50 (3-6)
Warfarin 0.05%	7	71.75	25	407.834	—	7.00 (7)

It is apparent from the results that even 3 days poison baiting with calciferol cent per cent kill was achieved. However, mixed baiting of calciferol 0.05% + warfarin 0.025% and calciferol 0.05% + warfarin 0.05% in 3 and 7 days of exposure took less average days to death (3.75-5 days) in comparison

with calciferol 0.05% baiting in the similar period of exposure. Warfarin 0.05% concentration alone did not produce effective results (25% kill) even in 7 days of continuous poison baiting while 2 days of calciferol 0.05% alone yielded 75% kill in the house rat *Rattus rattus*.

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