

## Bait preferences of rodents in their natural habitat

NAFIS AHMAD and V R PARSHAD

Department of Zoology, Punjab Agricultural University, Ludhiana 141 004, India

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**Abstract.** Preferences of rodents toward cereal baits have been studied in relation to the availability of food from their natural habitat in crop fields of groundnut (*Arachis hypogaea*) and lentil (*Lens culinaris*). The experimental area was infested by three rodent species—*Bandicota bengalensis*, *Tatera indica* and *Mus* sp. At the podding stage of groundnut crop they showed a poor response towards plain bait of whole wheat grains, the consumption of which increased significantly after addition of arachis oil at 1% concentration. The withdrawal of oil from the bait had no significant effect on its daily consumption by the rodents. In paired bait tests in podding groundnut crop, the addition of oil significantly increased the bait consumption of wheat and millet grains. The differences between daily consumption of millet grains became more significant when the bait station pairs were shifted to growing lentil crop which reflect the effect of environment on the feeding responses of rodents. Laboratory tests with *B. bengalensis* and *T. indica* trapped from the experimental fields confirmed the results of field studies that addition of oil in the cereal bait enhance bait consumption.

**Keywords.** Arachis oil; bait; crop fields; groundnut; lentil; millet; rodents; wheat.

### 1. Introduction

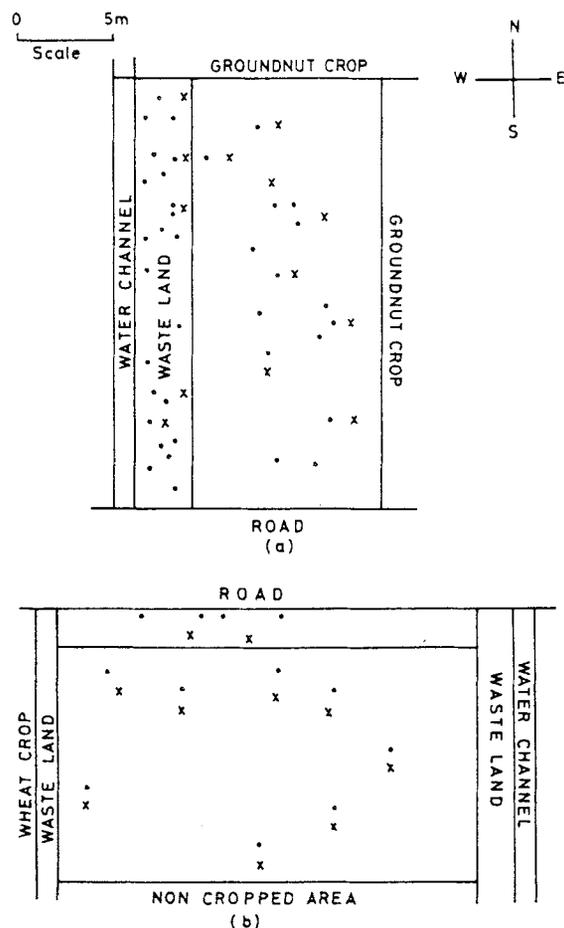
Previous laboratory studies have revealed that quality of the oil in the cereal baits significantly affect the bait preferences of rodents (Barnett 1966; Durairaj and Rao 1975; Kamal and Khan 1977; Kumari and Khan 1978; Ramana and Sood 1982). But no information is available about the effects of oil on the bait consumption by wild rodents in their natural environments in relation to the availability of food from the crops. Therefore, the same have been studied in groundnut and lentil crop fields. Such information would be useful in improving poison baiting programmes by attracting larger number of rats to the baits and increasing poison bait consumption.

### 2. Materials and methods

#### 2.1 Experimental fields

The field experiments were conducted in the following fields of Punjab Agricultural University, Ludhiana (30°56' N, 75°52' E).

2.1a *Field A* (figure 1a): Groundnut (*Arachis hypogaea*) crop field (podding stage) including a 3 m broad strip of non-cropped land full of weeds was selected. It was surrounded by groundnut crop fields on the North and East, a brick-walled water channel on the west and a field road on the south. A heterogeneous and almost stable population was observed in the experimental fields by weekly live burrow counts (see



**Figure 1.** Diagrammatic plans of the a. groundnut crop field and b. lentil crop field showing the locations of burrow holes (●) of rodents and of bait stations (x).

figure 1). Trapping of rodents in this area showed the occurrence of three species namely *Bandicota bengalensis*, *Tatera indica* and *Mus platythrix*.

2.1b *Field B (figure 1b)*: This field was adopted to study the effects of change of crop and availability of food material on the bait preferences of rodents. Here, lentil (*Lens culinaris*) was sown after harvesting of groundnut crop. This field was almost similar to field A (figure 1b) and the same three species of rodents occurred here.

## 2.2 Field trials

In the above fields six trials were carried out one after the other, the details of which are given below. The number and duration of placement of bait stations during each trial are given in tables 1 and 2. At each baiting point 50 g bait was placed in wooden boxes (26 × 10 × 11 cm) near the burrow openings (figure 1).

**Table 1.** Mean daily bait consumption (g per bait station) of rodents in single bait tests in the podding stage of groundnut crop<sup>a</sup>.

Trial No.	Bait	Number of bait stations		Days	Mean consumption ( $\pm$ SE)
		Total	Showing consumption (Mean $\pm$ SE)		
1.	Wheat grains	13	2.2 $\pm$ 0.66	5	0.48 $\pm$ 0.13*
2.	Wheat grains and oil (99:1)	13	10.3 $\pm$ 1.06	7	2.46 $\pm$ 0.6 <sup>b</sup>
3.	Wheat grains	10	9.4 $\pm$ 0.6	5	2.64 $\pm$ 0.54

<sup>a</sup>Though no marked change in burrow counts has been observed during the single bait test but slight changes in rodent population during different trials can not be excluded.

<sup>b</sup>The differences between mean daily consumption of wheat grain bait (\*) with other baits are significant ( $P < 0.05$ ).

**Table 2.** Mean daily bait consumption (g per bait station) of rodents in paired bait tests in maturing groundnut and growing lentil crops.

Trial Crop No.	Number of bait station pairs <sup>a</sup>		Days	Mean consumption ( $\pm$ SE)	
	Total	Showing consumption (Mean $\pm$ SE)		Wheat	Wheat and Oil
4. Maturing groundnut	10	9.5 $\pm$ 0.29	4	1.095 $\pm$ 0.21 Millet	3.46 $\pm$ 0.15 <sup>b</sup> Millet and Oil
5. Maturing groundnut	10	7.57 $\pm$ 1.51	7	2.5 $\pm$ 0.62	3.39 $\pm$ 0.88 <sup>b</sup>
6. Growing lentil	10	7.29 $\pm$ 1.04	7	3.14 $\pm$ 0.15	7.05 $\pm$ 0.20 <sup>b</sup>

<sup>a</sup>The bait stations were exposed to the same population.

<sup>b</sup>The differences between mean consumption within a pair are significant ( $P < 0.05$ ).

*Trial 1:* To determine the initial response of rodents towards the plain cereal bait without oil, wheat grains were placed at 13 baiting points in field A for 5 days. The bait consumption per 24 hr was recorded.

*Trial 2:* To study the effect of oil on bait consumption, whole wheat grains smeared with 1% arachis oil were offered to rodents as in 'trial 1'.

*Trial 3:* After enhancing bait consumption with oil in trial 2, 'trial 1' was repeated to study the effect of withdrawal of oil on plain bait consumption.

*Trial 4:* Assuming that baits placed at two adjoining baiting points would be available to the same population of rodents, the box pairs with plain wheat grains and wheat with

arachis oil (99:1) separately were placed in fields as shown in figures 1 a, b. The distance between the two boxes of the pair was about 15 cm. The position of the bait boxes was altered after an interval of 24 hr to eliminate any side preference.

*Trial 5:* To study the effects of change of cereal on the preference behaviour of rodents towards the oily bait, this trial was carried out as 'trial 4' by replacing wheat with millet (*Pennisetum typhoides*) grains.

*Trial 6:* This trial was carried out in lentil crop (*L. culinaris*) similar to trials 4 and 5 using millet as the cereal.

### 2.3 Laboratory experiments

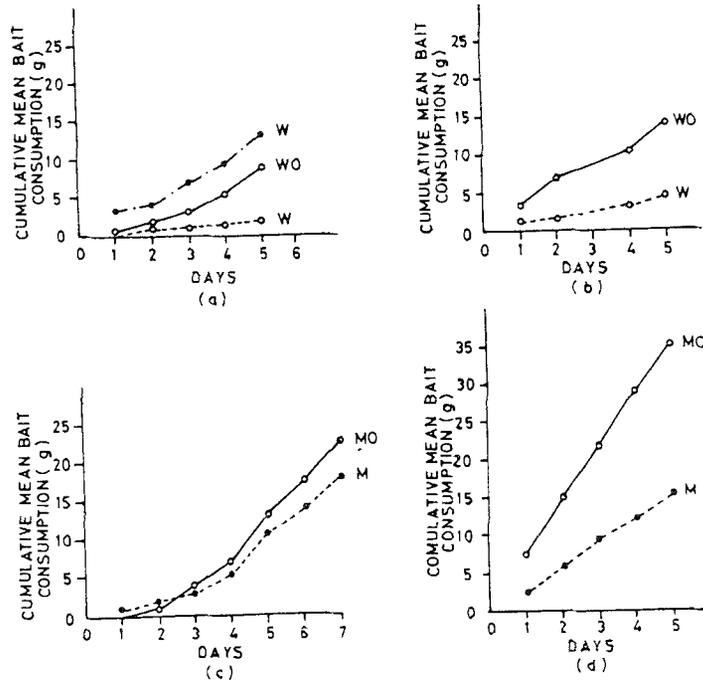
For the laboratory test, specimens of *B. bengalensis* and *T. indica* were trapped from the experimental fields and caged individually in 92 × 30 × 25 cm size cages. After acclimatization for 15 days in the laboratory they were offered in choice, 50 g each of wheat grains with and without 1% arachis oil in separate food cups. The side of the food cup was altered daily to eliminate effects of site preferences of rodents on food consumption.

For comparing the bait consumption between the trials and between two baits within the same trial, *t*-test of the difference between means was applied (Sokal and Rohlf 1973).

## 3. Results

Comparisons of mean bait consumption between the baits with and without oil are given in tables 1 and 2 and the daily pattern of the mean cumulative bait consumption is illustrated in figure 2. The rodents showed a poor response (trial 1, table 1) towards plain wheat grain bait at the podding stage of the groundnut crop in which signs of considerable damage of developing pods by rodents were also observed. Addition of 1% arachis oil increased the feeding of wheat grain bait in more number of bait boxes and resulted in a significant increase in bait consumption (trial 2). After enhancing bait consumption with oil its withdrawal had no significant effect on the bait consumption by rodents during the subsequent five days (cf trials 2 and 3). The damage to groundnut pods continued to occur during trials 2 and 3, as well as during subsequent trials.

When the bait stations were placed in pairs, one containing cereal grains without oil and the other with oil, the rodents preferred the oily bait (trials 4 and 6, table 2). The nature of cereal had no effect on the preference of rodents for oily baits as in both cases they preferred oily cereals over the respective plain cereals. However, more millet grains were consumed than wheat indicating its preference by rodents. Preference of rodents for millet with oil over grains without oil (trial 6, table 2) continued in the lentil crop which was sown after groundnut harvesting. These results indicate that the crop had no effect on the choice of rodents for cereals containing the oil. However, the differences between the mean daily consumption of millet grains with and without oil were more significant in lentil fields than in groundnut fields indicating the effects of the crop on the feeding responses of rodents. Though rodent damage occurred in lentil crop but no sign of nibbling or eating of any part of the plant was observed.



**Figure 2.** Comparisons of daily bait consumption of rodents in experimental fields between the cereal baits without oil (W, wheat; M, millet) and with oil (WO and MO, indicates wheat and millet grains with 1% arachis oil) **a.** cumulative bait consumption in single bait trials in groundnut crop fields, **b.** in paired bait trial (trial 4) in groundnut crop field where wheat grains were used as the bait, **c.** in paired bait trial (trial 5) in groundnut crop where millet was used as the bait, and **d.** in paired bait trial in lentil crop field where millet was used as a cereal bait.

**Table 3.** Mean daily bait consumption (per 100 g body weight) of rodents in bi-choice test in laboratory.

No. of test	Species	No. of individuals	Days	Mean consumption $\pm$ (SE)	
				Wheat	Wheat and Oil (99:1)
1.	<i>B. bengalensis</i>	4	6	3.30 $\pm$ 0.13	4.20 $\pm$ 0.15
2.	<i>T. indica</i>	6	6	3.96 $\pm$ 0.16	5.15 $\pm$ 0.18*

\*The differences between mean consumption within a pair are significant ( $P < 0.05$ ).

Specimens of two species *B. bengalensis* and *T. indica* captured from the experimental fields showed preference (table 3) for wheat grains containing arachis oil over the grains without oil in a laboratory experiment; thus confirming the results of the field trials.

#### 4. Discussion

The results of the present field studies have shown that addition of 1% arachis oil in the bait significantly increases bait consumption of two cereal baits (wheat and millet) by

rodents in field situations of groundnut and lentil crops. Similar response of rodents (*B. bengalensis* and *T. indica*) toward oily grains was observed in laboratory experiments in the present as well as in previous studies (Kamal and Khan 1977; Ramana and Sood 1982). The possibility cannot be excluded that the increased consumption of cereal grains containing oil in single bait tests may be due to some population change in the crop fields but the results of feeding during paired bait tests confirm that arachis oil enhances bait consumption.

Poor response of rodents towards the wheat bait during initial trial at the podding stage of the crop may be due to their preference for juicy and sweet pods of groundnut, as field observations showed high damage of developing pods. In spite of the availability of the preferred food material from the groundnut crop, the addition of oil in the dry grains, both in single and paired bait tests, enhanced the consumption of wheat grains. This response may also be related to the familiarity of the odour or taste of arachis oil from the bait with that of groundnut pods from the field. Food flavour familiarity forms an important factor controlling the food preference behaviour of wild rodents (Barnett 1975; Shumake 1978). No significant change in bait consumption after withdrawal of the oil (cf. trials 2 and 3), further indicate that the rodents continue to eat the familiar food material.

In lentil crop also the rodents preferred the oily bait and the total bait consumption was significantly higher than in the groundnut crop in the same field. This may be due to the absence of preferred food material from the crop as no sign of its nibbling and eating by rodents was noticed.

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