PN-AAM-087 ISN: 15495

Off-print

BANGLADESH JOURNAL OF AGRICULTURAL RESEARCH

Vol. VI July, 1981 No. 2

Comparing food preference evaluation techniques for lesser bandicoot rats, (*Bandicota bengalensis* Gray).

Parvin Sultana

Bangladesh J. Agri. Res. 6(2) : 51-57, 1981.

COMPARING FOOD PREFERENCE EVALUATION TECHNIQUES FOR LESSER BANDICOOT RATS, (*BANDICOTA BENGALENSIS* GRAY)

PARVIN SULTANA[1]

Abstract

The effect of different food cup combinations in comparing different food preferences was studied. Double-cup feeding trials showed higher food consumption over two other combinations. Wheat was less preferred in all the combinations over polished and unpolished rice.

Introduction

The lesser bandicoot rat (*Bandicota bengalensis* Gray), is a serious pest to most food crops, both in the field and storage. According to Barnett and Prakash (1975), *B. bengalensis* predominantly inhabits rice fields in south India and causes severe damage by consuming and storing large quantities of grain. Similar observations on substantial wheat losses by this species was reported from Bangladesh (Poche *et al.* 1979). In other parts of south Asia the lesser bandicoot rat is reported to destroy a variety of food grains (Batra 1966; Sridhara and Krishnamoorthy 1978).

An important aspect of developing adequate rodent control techniques involves the use of bait carriers (foods which contain a rodenticide) that are palatable and familiar to rodents. If, for example, a cereal grain is treated with zinc phosphide and the grain is disliked by rats, the effectiveness of control can be greatly reduced. From the economic viewpoint, development of efficient bait carriers is of extreme importance in maximizing field and urban rodent control efforts.

As with most animals, rodents have individual tastes and preferences for many food items (Fitzwater and Prakash 1966). Leon *et al.* (1977) established that rodents select foods based upon pre-exposed experiences with the odors. Essentially this means that rats will consume food-stuffs having familiar odors.

Bait acceptance is a common problem in most rodent control programmes. According to Bullard and Shumake (1977), food preference behaviour of wild rodents is very complex. Responses to familiar foods are more predictable and rats consistently prefer familiar foods over infamiliar ones.

1. Senior Scientific Officer, Vertebrate Pest Section, Bangladesh Agricultural Research Institute, Joydebpur, Dacca.

Since rodent control research in Bangladesh in a relatively new science and little is known about food preferences of the lesser bandicoot rat, a major pest species, an investigation was initiated on this aspect. The objectives of this study were to: (1) determine preferences of the lesser bandicoot rat for three cereal grains, and (2) compare the preference results utilizing three types of food-presentation to rats.

Materials and Methods

Three male and three female lesser bandicoot rats (260 ± 10g) were selected for study. Rats were trapped from government grain storage godowns in Dacca and transported to the Vertebrate Pest Research Laboratory at Joydebpur. The animals were maintained in individual cages (17×24×42 cm) for a minimum of 15 days before testing. Water was provided *ad libitum* from glass or plastic bottles.

Preference testing : The three cereal grains used for preference testing were whole polished rice, unpolished (unhusked) rice, and wheat. For all testing methods used, 30 g of grain was provided in individual food cups and consumption recorded to the nearest g on a daily basis for each rat and for each food type presented. Preference was measured as the percentage that the consumption of test food contributed to the total amount of food eaten.

Food-presentation : Three types of food-presentation to rats were used: (1) single-cup-only one food item was given at a time over two consecutive days and all three grains provided in sequence over 6 days, (2) double-cup—two food grains were provided in two cups, approximately 10 cm apart, and all possible grain combinations were provided for two days each and (3) triple or multiple-cup—three cereal grains were placed in individual cups and offered to each rat at the same time over a 2-day period. In the double and multiple-cup trials, the position of each of the cups was changed daily in the cage to avoid bias from position preference.

Newspaper was placed under each cage to recover spilled grain and to ensure accurate measurements of consumption. Daily food intake was determined by subtracting the spilled grain and the food remaining in the cup (s) from the quantity originally given to each rat.

Data analysis: Food consumption data from the single-cup and triple-cup preference tests were compared using a 1-way analysis of variance (ANOVA). Paired t-tests were used to examine for differences between consumption rates in all three tests. Duncan's Multiple Range Test was used to compare means in the single and multiple-cup tests.

Results and Discussion

Preference tests: By combining data of the double and triple-cup tests, the consumption rates of test foods were 46.1% (391.1 g), 38.8% (329.6 g) and 15.1% (128.3 g) for polished rice, unpolished rice and wheat, respectively. The results of the three tests are shown in Tables 1, 2 and 3.

Table 1. Results of food preference tests in lesser bandicoot rats using a single cup per cage over a two-day period. Data are given in grams of food consumed.

	Rice (Unpolished)	Rice (Polished)	Wheat	Σ	$\bar{X}$
	35.5	27.9	26.6	90.0	30.00
	37.2	29.0	28.0	94.2	31.40
	34.0	27.1	25.9	87.0	29.00
	35.6	27.5	26.9	90.0	30.00
	36.6	28.2	27.8	92.6	30.87
	36.3	28.1	27.7	92.1	30.70
Σ	215.2	167.8	162.9		
$\bar{X}$	35.87[a]	27.97[b]	27.15[b]		

[a-b] Mean followed by the letter *a* is significantly different from other means having *b* ($P<0.05$) by Duncan's multiple-range test.

Table 2. Results of the double cup preference test conducted over a 2-day period with 3 male and 3 female lesser bandicoot rats.

	Rice (Polished)	Rice (Unpolished)	Rice (Polished)	Wheat	Rice (Unpolished)	Wheat
	19.8	18.9	30.5	8.0	24.5	7.0
	20.7	16.7	29.0	6.0	23.5	8.2
	19.3	17.6	28.9	8.8	21.5	10.5
	18.9	17.9	29.5	8.0	21.0	10.8
	20.2	16.8	30.1	7.9	22.7	7.9
	20.6	18.2	29.4	8.1	25.0	6.5
Σ	119.5	106.1	177.6	46.8	138.2	50.9
$\bar{X}$	19.92	17.68	29.6	7.8	23.03	8.48

Table 3. Results of food preference tests using 3 (multiple food) cups per cage over a two-day period.

Rice (Polished)	Rice (Unpolished)	Wheat		X
14.5	13.3	5.5	33.3	33.3
17.5	15.4	4.3	37.2	37.2
16.5	14.9	5.1	36.5	36.5
14.7	13.4	5.7	33.8	33.8
13.9	12.7	5.9	32.5	32.5
16.9	15.6	4.1	36.6	36.5
Σ94.0	85.3	30.6		
X 15.67[a]	14.22[b]	5.1[b]		

[a-b] Mean followed by the letter *a* is significantly different from other means having *b* ($P<.05$) by Duncan's multiple-range test.

Table 4. Average Daily Consumption

Rat No	Single Cup	Double Cup	Multiple Cup
R_1	15.00	18.11	15.65
R_2	15.70	17.35	18.60
R_3	14.50	17.76	18.25
R_4	15.00	17.70	16.90
R_5	15.44	17.60	16.25
R_6	15.35	17.97	18.25
Total	90.99	106.49	104.90
$\bar{X}$	15.16	17.75	17.50

Food Presentation Test: When only a single food item was presented daily, consumption ranged from 27.1 to 35.9 g during the test period for each rat (Table 1). Food preference studies using the single cup indicated that the lesser bandicoot rat prefers unpolished rice over polished rice and wheat. The ANOVA showed a significant difference in consumption rates among the three grains ($F= 57.32$, $P<.001$). Paired t-tests showed significant differences in consumption ($P<.001$) between polished rice and unpolished rice and wheat. However, no significant differences were noted between polished rice and wheat ($P>.1$).

A disadvantage of using the single-cup test is that a rat is rather forced to eat only a single food item. There is no choice, unlike most field and storage conditions where a variety of grains are usually available. Other factors, such as temperature and humidity in the laboratory, also affect the consumption rates of test rats.

The findings of the double-cup tests differed from the single-cup trial. The lesser bandicoot rats showed significant differences in terms of feeding preference when they were offered various combinations of three grains. They preferred polished rice to unpolished rich. ($P<.005$), polished rice to wheat ($p<.001$) and unpolished rice to wheat ($P<.001$, (Fig. 1).

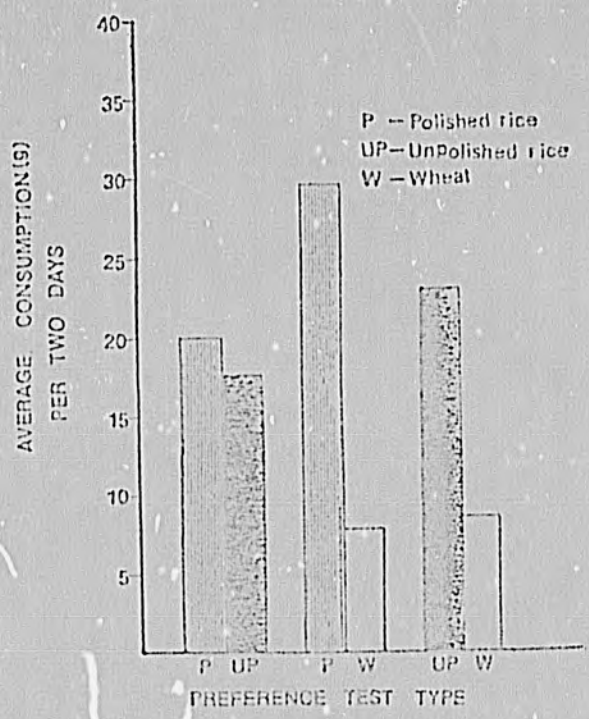

Figure 1. Results of a double-cup food preference test in the lesser bandicoot rat using 3 common cereal grains.

Findings of the multiple-cup tests were similar to those of the doublecup trial. In order of preference by total amount of grains consumed were polished rice, unpolished rice and wheat. The consumption rates differed significantly ($F=138.6$, $P<.001$). Paired t-tests showed a highly significant difference between polished rice and wheat ($T=14.24$, $P<.001$), and between unpolished rice and wheat ($T=14.17$, $P<.001$). There was no significant difference ($T=1.66$, $p>.1$)

between consumption of polished and unpolished rice. Duncan's Multiple Range Test showed no significant difference among the means of both types of rice consumption rates. However, both differed from wheat consumption rates ($P<.05$).

In the single-cup test, though it showed unpolished rice preferred to the other two cereals, in the double and multiple-cup tests, polished rice was eaten in larger quantity. In all three tests, wheat was least preferred by the lesser bandicoot rats. In a similar study, Batra (1966) reported the lesser bandicoot rat preferring unhusked rice to green gram, peanuts and all types of rice over wheat. The results presented in this study (Fig. 2) showed similar findings for rice and wheat.

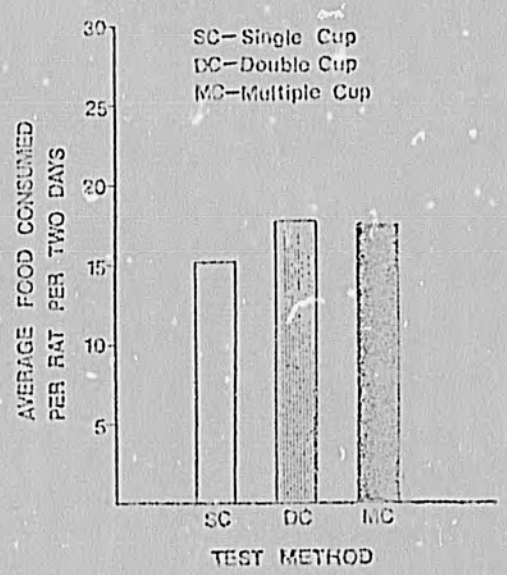

Figure 2. Total food consumption for 3 cereal grains in each of three food presentation types examined.

The variance (S^2) in food consumption over two days per test-type was: for single-cup: 0.774; multiple-cup: 1.425; and double-cup: 2.76.

Using a choice of food items approaches a system that is more natural than offering a single item. Although multiple-cup food presentation appears to have some potential, the element of position-bias in feeding may inject too much error into the study.

References

Barnett, S. A. and I. Prakash. 1975. *Rodents of Economic Importance in India.* Arnold-Heinemann. New Delhi.

Batra, H. N. 1966. Feeding and general habits of commons species of Indian rats. *Proc. Indian Rodent Symp.* Calcutta.

Bullard, R. W. and Shumake, S. A. 1977. Food-base flavor additive improves bait acceptance by ricefield rats. *J. of Wild I. Manage.*, 41 : 290-297.

Fitzwater, W. D. and I. Prakash. 1966. *Handbook of Vertebrate Pest Control.* Central ariz Zone Res. Inst. Jodhpur, India.

Khan, J. A. 1978. Food preferences of *Bandicota bengalensis.* In press.

Majumdar, S. K. Krishnakumari, M. K. and L. Yashoda. 1966. Some observations of food preferences and intake of rats under different ecological conditions. *Proc. Indian Rodent Symp. Calcutta.*

Poche, R.M., Mian, M.Y., Haque, M.E. and P. Sultana. 1980. Rodent damage to Bangladesh wheat. *J. Wild Manage* (submitted)

Spillet, J. J. 1968. *The ecology of the lesser bandicoot rat in Calcutta.* Bombay Natural History Society and Johns Hopkins University Centre for Medical Research and Training. Calcutta, 223 pp.

Sridhara, S. and R. V. Krishnamorthy. 1978. Cereal preferences and intake of four species of field rodents. *J, Bombay Nat. Hist. Soc.* In press.