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Efficacy of Sodium Chloride as a Taste Additive for Improvement in Bait Acceptance by Rodents

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Abstract: Sodium chloride (common salt) at 0.5, 1.0 and 2.0% concentrations was tested for its efficacy as a taste additive in two kinds of bait base i.e. WSO (cracked wheat, powdered sugar and groundnut oil in 96:2:2) and WO (creacked wheat and groundnut oil in 98:2) in bichoice with plain WSO bait for improvement in bait acceptance by lesser bandicoot rat, *Bandicota bengalensis* and two body weight groups of house rat, *Rattus rattus*. Mean daily consumption of both WSO and WO bait bases containing different concentrations of sodium chloride was found to be lower than plain WSO bait. Also the mean daily consumption of WSO bait base containing sodium chloride was more than WO bait base containing sodium chloride at all the concentrations tested except by *R. rattus* of higher body weight group at 1.0% and *B. bengalensis* at 1.0 and 2.0% sodium chloride. Present results suggest lower acceptance of baits containing sodium chloride as compared to those containing sugar by *B. benegalensis* and *R. rattus* with some species specific and age specific variations.

Key words: Sodium chloride, taste additive, *Bandicota bengalensis*, *Rattus rattus*.

The lesser bandicoot rat, *Bandicota bengalensis* and the house rat, *Rattus rattus* are the two most predominant rodent pests in agricultural and commensal situations in Punjab, India (Parshad, 1999). Control of these species relies mainly on the use of rodenticide baits. The success of any rodent control operation is dependent on acceptance of poison bait by pest, as poor bait acceptance results in poor rodent kill (Klemann and Pelz, 2005). The rodenticide bait should be consumed in significant quantities in the presence of other food sources. Foods mixed with poisons are discriminated by rodents through their tastes, odor and textural cues (Suliman *et al.*, 1984). Taste of food with poison becomes the basis of food elimination (Salmon and Dochtermann, 2006). The present studies were thus conducted to evaluate the efficacy of sodium chloride (common salt) as a taste additive to improve poison bait acceptance by *B. bengalensis* and *R. rattus*.

Materials and Methods

Bandicota bengalensis and *Rattus rattus* were live trapped with multicatch rat traps from crop fields and poultry farms, respectively, in and around Ludhiana and acclimatized to laboratory conditions for about 15 days with food and water provided *ad libitum*. *R. rattus* were divided into two groups, i.e., small (body weight <100 g) and large (body weight >100 g). In each group ten rats (five of either sex) were used. Before treatment, daily consumption of WSO (cracked wheat, powdered sugar and groundnut oil in 96:2:2) bait by all the rats was recorded after every 24 hrs. for 5 days and converted as g 100 g^{-1} body weight for computation of mean daily intakes.

During treatment, test baits prepared by mixing 0.5, 1.0 and 2.0% sodium chloride in WSO and WO (cracked wheat and groundnut oil in 98:2) bait bases were offered in bi-choice with plain WSO without sodium chloride for 4-6 days and bait consumption was recorded after every 24 hrs. Each rat was provided with two food bowls kept in two cages of size 36x23x23 cm joined to each other so that the animal had an access to both the food types along with sufficient area for exploration and development of choice feeding. Spatial position habits were minimized by presenting the food bowls with positions reversed after every 24 hr. The preference for particular bait was established on the basis of quantity of food consumed (g per 100 g body weight) by the test animal. Proper hygienic conditions were maintained as per the guidelines of Institutional Animal Ethics Committee, Punjab Agricultural University, Ludhiana.

All the values were calculated as mean±SE. Student's t-test was used to know the significance of differences between different baits at $P<0.01$ and $P<0.05$. Per cent acceptance values were calculated as per the method described by Singla and Parshad (2002).

Results and Discussion

In feeding tests against *R. rattus* of small age group, the mean daily consumption and per cent acceptance of both kinds of test baits (WSO and WO-based) was found to be significantly ($P<0.01$ and 0.05) lower than that of plain WSO bait at all the concentrations tested except for WSO containing 1.0% sodium chloride whose consumption was non-significantly low (Table 1). In feeding tests against *R. rattus* of large age group (Table 1), the mean daily consumption and per cent acceptance of both WSO and WO-based test baits containing 1.0 and 2.0% sodium chloride was lower than plain WSO whereas, at 0.5% concentration the consumption of both kinds of test baits was non-significantly higher than that of plain WSO. In *R. rattus* of both groups, the consumption and per cent acceptance of WO bait was lower than that of WSO bait except by rats of large age group who consumed significantly ($P<0.01$) more WO-based than WSO-based test bait at 1.0% concentration. In feeding tests against *B. bengalensis* the consumption of test baits containing all the three concentrations of sodium chloride in both the bait bases was found to be non- significantly lower than that of plain WSO. In these rats also the consumption of WO-based test baits containing 1.0 and 2.0% sodium chloride was non-significantly more than WSO-based test baits. These differences in consumption and per cent acceptance of test baits among *R. rattus* of two age groups and *B. bengalensis* may be due to the species specific (Malhi and Sheikher, 1988) and intra-specific variations in their gustatory systems (Shumake *et al.*, 1971).

As observed in the present study, Malhi and Sheikher (1988) in *B. bengalensis* reported low

Table 1. Acceptance of bait containing different concentrations of sodium chloride by Rattus rattus of small and large age groups

Per cent bait conc. of base NaCl	Bait base	Body wt. (g) (n=10) (5M+5F)	Mean daily bait consumption (g per 100 g b wt)			Calculated t-value$ (d.f.)	Calculated t-value$$ (d.f.)	Per cent acceptance of test bait over plain bait
			Pre-treatment	During treatment				
			WSO	WSO	Bait base + NaCl			
Rattus rattus of small age group								
0.5	WSO	60.50±3.20	6.85±0.19	6.97±0.57	3.16±0.63	4.09 (10)*		31.19
	WO	61.50±3.58	7.80±0.38	6.26±0.82	2.29±0.35	4.06 (10)*	1.10 (10)	26.78
1.0	WSO	76.00±3.71	10.39±0.03	5.40±0.26	4.86±0.79	0.58 (8)		47.37
	WO	73.50±3.50	10.58±1.04	9.39±1.83	4.05±1.71	2.11 (6)**	0.51 (7)	30.13
2.0	WSO	61.00±4.40	8.22±0.22	5.81±0.28	2.54±0.13	9.61 (10)*		30.42
	WO	61.50±3.58	10.05±0.06	7.11±0.73	1.51±0.19	6.65 (8)*	4.17 (9)*	17.52
Rattus rattus of large age group								
0.5	WSO	129.50±5.29	6.94±0.22	2.62±0.41	3.49±0.47	1.28 (10)		57.12
	WO	134.50±6.85	5.41±0.09	3.43±0.44	3.60±0.09	0.35 (10)	0.21 (10)	51.21
1.0	WSO	132.50±6.85	5.41±0.05	4.62±0.22	1.07±0.12	27.28 (10)*		18.88
	WO	137.20±8.60	8.33±1.89	3.90±0.75	3.74±0.49#	0.15 (6)	5.61 (8)*	48.95
2.0	WSO	128.20±14.93	3.61±0.93	3.99±0.25	3.18±0.31	1.86 (10)**		44.35
	WO	134.50±6.85	4.71±0.66	4.41±0.66	2.57±0.28	6.67 (8)*	129 (9)	36.82
Bandicota bengalensis								
0.5	WSO	250.50±28.52	5.28±0.27	5.06±0.71	4.15±0.53	0.92 (8)		45.06
	WO	237.00±28.32	6.99±1.60	5.20±0.82	3.39±0.36	1.81 (8)	1.107(8)	39.46
1.0	WSO	252.00±22.12	5.39±0.59	2.12±0.53	1.18±0.34	1.29 (6)		35.76
	WO	254.70±22.23	5.00±0.39	5.14±1.34	2.52±0.62#	1.54 (6)	1.64 (6)	32.90
2.0	WSO	255.00±22.14	5.31±0.27	5.06±1.65	3.61±0.74	0.69 (6)		41.64
	WO	211.50±20.67	6.82±0.00	4.81±0.71	4.07±1.06#	0.57 (6)	0.31 (6)	45.83

Values are mean±SE; WSO= Wheat, Sugar, Oil (96:2:2), WO= Wheat, Oil (98:2), M= Male, F= Female, $ Between WSO and bait base + NaCl, $$ Between WSO + NaCl and WO + NaCl, * ** significant differences at $P<0.01^{*}$ and $P<0.05^{**}$, respectively, # Significantly consumption of WO + NaCl.

average daily intake of coconut oil smeared grains containing 5% salt than those containing 5% sugar. Mathur *et al.* (1992) reported variable acceptance of flococumafen bait containing sugar and salt by *R. rattus*. Thus it may be concluded that addition of sodium chloride does not improve the acceptance and palatability of baits by *B. bengalensis* and *R. rattus*.

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