Turk J Zool
24 (2000) 333-335
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Laboratory Evaluation of Bromethalin Against Lesser Bandicoot Rat, *Bandicota bengalensis*

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Received: 24.05.1999

Abstract: Results of no-choice and choice feeding tests against *Bandicota bengalensis* showed that bromethalin is highly toxic and efficacious rodenticide. However, its susceptibility differed between sexes. In no-choice test minimum time of cent-percent mortality was 1.2 days (range 1-2). The amount of toxicant consumed per rat resulting in complete mortality was 4.92±0.78 and 5.09±0.22 mg/kg in female and male rats respectively. In choice tests, mean days to death was 2.1 (range 1-4 days) and the amount of toxicant consumed per rat averaged 5.56±0.30 mg/kg. The latency period exceeded 210 minutes of the poisoning.

Key Words: Bromethalin, efficacy, latency period, *Bandicota bengalensis*.

Bromethalinin *Bandicota bengalensis*'e Karşı Etkisinin Laboratuvarda Değerlendirilmesi

Özet: Seçenekli ve seçeneksiz beslemenin Bandicota bengalensis'e karşı etkisinin değerlendirilmesinin sonuçları, bromethalinin oldukça toksik ve etkili bir kemirgen zehri olduğunu göstermiştir. Ancak cisnsiyetler arasında duyarlılık farkı gözlenmiştir. Seçeneksiz deneylerde %100 ölüm oranına en düşük 1,2 günde ulaşıldı (1 ile 2 arasında değişmiştir). Hayvan başına tüketilen, % 100 ölümle sonuçlanan toksikant miktarı dişiler için 4,92±0,78 mg/kg, erkeler için 5,09±0,22mg/kg idi. Seçenekli deneylerde ölüme kadar ortalama gün sayısı 2,1 idi (1 ile 4 gün arasına değişmiştir). Hayvan başına tüketilen toksikant miktarının ortalaması 5,56±0,30 mg/kg idi. Gizillik dönemi, zehirlenmenin 210. dakikasını geçmiştir.

Anahtar Sözcükler: Bromethalin, etki, gizlilik dönemi, *Bandicota bengalensis*.

Introduction

Of the murid fauna of Pakistan, *Bandicota bengalensis* is the most important species. Widespread in distribution, it causes serious economic losses to growing crops such as rice, wheat, sugarcane and groundnut (1, 2, 3, 4, 5, 6,). In Pakistan, rodent pest management methods have not been much studied, and practices regarding the use of acute rodenticide baits are poorly understood by the farmers, except that of zinc phosphide, which is traditionally used because of its low cost and quick kill action. The results of some field studies have indicated that damage to crops by bandicoot rats, *B. bengalensis*, can be prevented by the use of acute and anticoagulant poison baits with higher cost-effectiveness (7, 8).

In Pakistan, toxicity data on the use of rodenticides, acute poison in particular for various species have not been collected. Shafi *et al*. (9) have undertaken laboratory evaluation of priminyl against the soft-furred field rat, *Millardia meltada*. Because technology for the use of anticoagulants in developing countries is not being adopted widely, and because of the inherent phenomenon of bait shyness development with zinc phosphide, there is a need to search for potential alternative acute poisons for rodent control. In 1979, bromethalin was announced, with a different mode of action to that of zinc phosphide and other acute rodenticides (10, 11).

This paper gives the results of laboratory tests of the efficacy of bromethalin against the bandicoot rat.

Materials and Methods

Rats (*B. bengalensis)* trapped from rice fields were acclimatized for two weeks before being subjected to efficacy tests. They were sexed, caged singly and fed a laboratory diet. Water was provided *ad libitum*. They were also pre-baited for one week with cornflour (without poison), which was used for making different concentrations of bromethalin from the technical concentrate (0.1%). Bromethalin bait at concentrations of 0.001%, 0.002%, 0.005% and 0.01% was used for the efficacy tests.

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No-choice feeding test

The no-choice tests were conducted according to standard methods for testing of acute rodenticide (12). For each concentration, a group of ten animals with an equal sex ratio was established. Before being offered poison bait, the animals were weighed and starved for three hours. Animals of each group were allowed to feed on a weighed amount (50 gm) of cornflour containing 0.001%, 0.002%, 0.005% and 0.01% of bromethalin. Each test was run for 4 days, and thereafter the animals were observed for two weeks, during which time the amount of bait eaten and mortality, if any were recorded.

Choice feeding test

For choice feeding tests 10 rats (5 of each sex) were singly-caged. They were provided plain cornflour (without poison) as pre-bait, in order to familiarize them with the bait base. After pre-baiting, the rats were offered 50 g of 0.01% bromethalin and 50 g of plain cornflour bait as control. These baits were offered for 4 days in specially designed feeding cups. The positions of the cups were interchanged daily in order to nullify the position preference effect. After 4 days, the rats again reverted to normal poultry feed as a diet. The daily intake of both baits was recorded. After taking the feeding data, the results were observed and mortality, if any was recorded.

Results and Discussion

No-choice test

The results of the no-choice tests are summarized in Table 1. In both sexes of *B. bengalensis*, cent-percent mortality was observed at 0.01% bromethalin. This percentage of mortality occurred from 1-2 days after feeding on poison bait. The mortality rate ranged from 20-80% at 0.001%, 0.002% and 0.005% respectively. This kind of mortality pattern at lower concentrations has also been reported by Dreikorn *et al*. (10) and Meehan (13). It was observed that due to the increase in concentration of poison, the bait acceptance was lowered. This poor acceptability of bromethalin (an acute poison) at higher doses was also observed by Shafi *et al*. (9) using priminyl (also an acute poison) against *Millardia meltada*.

The data on consumption of the active ingredient suggest that females were more susceptible to the poison than males.

Choice tests

Four-day choice tests were carried out on *B. bengalensis* using 0.01% bromethalin. The results of these tests are summarized in Table 2. The consumption of treated and plain bait was found to be non-significant ($P>0.05$). Similar patterns of consumption were noted by Meehan (13) in Wister rats and mice. The consumption of the active ingredient suggests that female *B.bengalensis* are more susceptible to bromethalin than males.

Bromethalin in bait was readily accepted by this rodent species, and no indication of bait shyness was observed.

Poisoning symptoms, pathology and latency period

The primary symptoms of bromethalin poisoning in *B. bengalensis* were closely observed after they were given

Table 1. Results of 4-day no-choice feeding of Bromethalin to *Bandicota bengalensis*.

Concentration %	No./ sex	Mean body weight (gm±SE)	Bait eaten (gm±SE)	Active ingredient ingested (mg/kg±SE)	Mortality (Days)	Time to death Mean (range) (Days)
0.001	5 F	199.16±5.19	32.62±4.44	1.62±0.72	1/5	10.0
	5 M	235.66±6.73	42.62±6.06	1.81±0.25	2/5	9.0 (8-10)
0.002	5 F	219.14±2.51	32.86±2.88	2.98±0.24	3/5	6.6 (4-10)
	5 M	238.40±4.44	32.32±3.71	2.70±0.31	2/5	3.5 (2-5)
0.005	5 F	227.12±6.82	23.88±2.75	5.28±0.65	4/5	2.7 (2-4)
	5 M	234.44±5.96	22.10±0.55	4.72±0.19	4/5	3.0 (2-4)
0.01	5 F	231.42±2.94	11.42±0.78	4.92±0.78	5/5	1.4 (1-2)
	5 M	225.20±1.66	13.42±0.62	5.09±0.22	5/5	1.2 (1-2)

Table 2. Results of choice test of bait containing 0.01% bromethalin and plain bait against *Bandicota bengalensis*.

Sex/ No.	Mean body weight (gm±SE)	Mortality (Days)	Mean bait intake (gm±SE)		Mean active ingredient ingested (mg/kg±SE)	Days to death	
			Treated	Plain		Mean	Range
Female (5)	232.06±11.75	5/5	13.92±1.64	9.62±2.76	5.87±0.50	2.4	1-4
Male (5)	293.10±28.30	5/5	15.16±2.58	13.56±2.45	5.26±0.41	1.8	1-3
F/M (10)	262.58±30.61	10/10	14.54±0.62*	11.59±1.97*	5.56±0.30	2.1	(1-4)

* Non-significant difference in consumption of treated and plain bait (P>0.05).

poisoned bait in different concentrations. It was noted that 18-48 hours after poisoning the animals became lethargic, their hind legs were weakened, muscle tone was lost and ultimately severe paralysis ensued. Poisoning symptoms of this nature were also observed by Van Lier and Ottosen (14). Due to these symptoms, the feeding was stopped, the animals lost their appetite and death occurred after they remained in this condition for a few days. The acute effects of this poison included one or two episodes of chronic convulsions, prostration and death, which usually occurred within 18 hours of poisoning.

Observations of the time period from the beginning of feeding to its termination due to the onset of poisoning symptoms were made in 10 (5 male; 5 female) bandicoot rats. These animals were fed with cornflour containing 0.01% bromethalin, and their feeding behaviour was observed under red lamp for 210 minutes (mean time period). It was concluded that the latency period of this poison exceeded this time, as the test animals were still feeding normally.

Acknowledgement

The authors gratefully acknowledge the supply of bromethalin concentrate from Eli-Lilly Research Laboratories, USA, which made this research possible.

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