

Toxicity of Two Anticoagulant Rodenticides to Rodent Species under Laboratory Conditions

Abd El-Aleem S. S. Desoky¹ and Saudi A.S Baghdadi²

¹ Plant Protection Dept., Faculty of Agric., Sohag University

² Agric. Zoology and Nematology Dept., Faculty of Agric., Al-Azhar University.

abdaleem2011@yahoo.com

Abstract: A laboratory evaluated of 2 anticoagulant rodenticides, Kelerat super (Brodifacoum 0.005%) and Caid (Chlorophacinone 0.005%) against three rodent species, *Rattus rattus frugivorus*, *Rattus rattus alexandrinus* and Nile grass rat, *A. niloticus* fed on poison bait for 3 days, 4 days and 5 days. Results indicated that Kelerat was the most effective ones followed by Caid. The dead period for Caid was longer than in the case of Kelerat. It was found that there was a significant difference in the animal consumption of the tested rodenticide baits for rodent species. Also, significant difference in rodenticides consumed by males and females.

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1. Introduction

Since the early 1950s, anticoagulant rodenticides have been used to control commensal rodents worldwide. They are also used in field treatments against crop pests, these pesticides, with a relatively slow mode of action; interfere with vitamin K-mediated synthesis of liver blood clotting factors (**Buckle and Smith, 1994**). Animals die from haemorrhages hastened by minor trauma. Second-generation anticoagulant rodenticides generally present significant physiological persistence and are defined as single-feeding rodenticides (**Kolf-Clauw et al., 1995**). In any case, exposed animals will not die for 5–10 days and may continue feeding on bait. The consumption of exposed prey by predators can cause secondary poisoning with important effects on the mortality of non target species. (For instance, risks to predators and scavengers appear to be especially high for owls and diurnal raptors when brodifacoum is used (**Eason et al., 2002; Joermann, 1998; Stone et al., 2003**).) Bromadiolone, the focus of the current study, was patented in 1968 and introduced to the market as a rodenticide in 1976. Its risk to non target species is only considered as moderate (birds) to high (mammals), but there is a definite lack of field or laboratory data to support these assumptions (**USEPA, 1998, 2002**). The present work was initiated to evaluate of two rodenticides under laboratory conditions for used in a large scale in Egypt.

2. Materials and Methods

Rodents were trapped and picked up to the laboratory. Healthy mature males and females of *R. r. frugivorus* (120-160gm), *R. r. alexandrinus* (110-150gm) and *A. niloticus* (120-140gm) were chosen for this experiment. Animals were singly caged and kept

under ventilated laboratory conditions (temperature 25-35, R.H 60-70%) for two weeks and provided with enough bruised maize bait and water. Thirty males and 30 females were selected and divided into three groups according to the exposure period to Kelerat 0.005% carried on crushed maize and Caid 0.005% carried on crushed maize as follows: group (1) fed on poison bait for 3 days, group (2) fed for 4 days and group (3) fed for 5 days. The daily poisoned bait consumption pre animal was recorded in three groups. After exposure period assigned for each group of animals, the poisoned bait was replace by unpoisoned free bait in new cages. Moreover, unpoisoned 5 males and 5 females of each species were observed under the same condition as control .the day of death of each animal were recorded. **Baghdadi (2006)**.

Data were analyzed using analyses of variance (**MSTAT-C 1988**) and means were separated using the least significant differences method (LSD) at 5% probability level (**Steel and Torrie, 1984**), only when a significant "F" test was obtained.

Rodenticides :

The common names, chemical group and chemical structures of the rodenticides used in the toxicological and control studies are:

1. Kelerat 0.005% (trade name)

Common name (Brodifacoum 0.005%)

Chemical group: hydroxyl Coumarin

Used method: Bait (Crushed maize)

2. Caid 0.005% (trade name)

Common name (Chlorophacinone 0.005%)

Chemical group: Indandione

Used method: Bait (Crushed maize)

3. Results and Discussion

Data in Table (1) illustrated the food consumption of rodent (*R.r.frugivorus*) when used two rodenticide baits (Kelerat 0.005% and Caid 0.005%) under laboratory conditions for 3, 4 and 5 days. According to the mean consumption during 3 days, in males, the consumption was scarce in Kelerat bait (11.80 gm) as compared with Caid (15 gm), but in females 10.40gm, 13.20gm were counted for the two rodenticide baits. The dead period for Caid was longer than in the case of Kelerat. It was found that there was a significant difference in the animal consumption of the tested rodenticide baits for *R.r.frugivorus*. Also, insignificant difference in rodenticides consumed by males and females the results are as similar as **Abdel-Gawad et al. (2001)**.

Data in table (2) According to the mean consumption during 3 days in *R.r. alexandrines* male, the consumption was scarce in Kelerat bait (13 gm) as compared with Caid (15.40 gm), but in females (11.60gm, 14.80gm) were observed. The dead period for Caid was longer than in Kelerat. It was found that there was a significant difference in the animal consumption of the tested rodenticide baits for *R.r. alexandrines*. Also, no significant difference was

observed between males and females, the results are as similar as **Abazaid (1990)**, **Littin et al. (2000)** and **Shooba, (2003)**.

Data in table (3) According to the mean consumption during 3 days In *Arvicanthis niloticus*, it was observed that the consumption of males was scarce in Kelerat bait (10.20 gm) as compared with Caid (3.20 gm), but in females 11.80gm, 12.40gm were recorded. The dead period for Caid was longer than Kelerat. It was found that there was a significant difference in the animal consumption of the rodenticide baits tested for *Arvicanthis niloticus*. Also, a significant difference was found in rodenticides consumed by males and females, in agreement with **Ali (1991)**, **Abazaid (1997)**, **Abd El-Galil (2005)**, **Baghdadi (2006)** and **Desoky (2011)**. In conclusion, the recommended procedure for rodent control applying Kelerat as rodenticide, seems to be satisfactory being applied within areas holding different culture i.e. farms, buildings, open areas. However, it is rather important to give all possible attention to environmental sanitation. At the same time, type of applied anticoagulant should be changed upon appearance signs of resistance of rodents under control to such product.

Table (1) Means of daily consumption and time to death of two rodenticides on *R.r. frugivorus* under laboratory conditions

Sex species	Males						Females					
	Kelerat 0.005%			Caid 0.005%			Kelerat 0.005%			Caid 0.005%		
Anticoagulants												
Feeding period in (days)	3	4	5	3	4	5	3	4	5	3	4	5
Mean of Consumption (gm) to death	11.80±0.37bc	10.80±0.86cd	9.00±0.71d	15.00±1.30a	13.20±0.37ab	10.60±0.51cd	10.40±0.51c	9.20±0.58cd	8.00±0.45d	13.20±0.86a	12.60±1.08ab	11.00±0.71bc
Time to death (day)	Range	5-11	4-9	4-8	5-12	5-11	4-10	4-10	4-9	5-12	4-10	4-9
	Mean	7	6.8	6.4	7.8	7.2	7	6.6	6.2	6	7.2	6.8

Table (2) Means of daily consumption and time to death of two rodenticides on *R.r. alexandrinus* under laboratory conditions

Sex species	Males						Females						
	Kelerat 0.005%			Caid 0.005%			Kelerat 0.005%			Caid 0.005%			
Anticoagulants													
Feeding period in (day)	3	4	5	3	4	5	3	4	5	3	4	5	
Mean of Consumption (gm) to death	13±0.84c	9.40±0.51d	7.60±0.51e	17.20±0.58a	15.40±0.51b	12.60±0.87c	11.60±0.81b	10±0.71bc	8.80±0.58c	14.80±0.66a	11.60±0.75b	10±0.55bc	
Time to death (day)	Range	5-10	4-8	4-7	5-11	5-9	4-9	4-10	4-8	4-7	5-10	5-8	4-8
	Mean	6.2	5.8	5.4	6.8	6.4	6.2	5.8	5.4	5	6.2	6	5.8

Table (3) Means of daily consumption and time to death of two rodenticides on *A. niloticus* under laboratory conditions

Sex species		Males						Females							
Anticoagulants		Kelerat 0.005%			Caid 0.005%			Kelerat 0.005%			Caid 0.005%				
Feeding period in (day)		3	4	5	3	4	5	3	4	5	3	4	5		
Mean of Consumption (gm) to death		10.20± 0.37b	9.80± 0.66b	7.60 ±0.5 1c	13.20 ±0.66 a	12.8 0±0. 37a	10.80± 0.73b	11.80± 0.86a	9.60 ± 0.93 bc	8.40± 0.51c	12.4 0 ±0.5 1a	11.4 0 ±0.5 1ab	10.60 ±0.4 0ab		
Time to death (day)		Range		4-9	4-8	3-9	5-10	4-9	4-9	4-8	4-8	4-7	4-10	4-8	4-8
		Mean		6	5.8	5.2	6.6	6.4	6.2	5.6	5.2	5	6.4	6.2	5.8

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