COMPARATIVE STUDIES BETWEEN EFFECT OF CHEMICAL AND MECHANICAL MEANS ON THE CLIMBING RAT, *Rattus rattus frugivorous*

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Abstract

This manuscript was designed to spot a light on the role of each of chemical and mechanical methods against the population of the climbing rat, *Rattus rattus frugivorous*, in Tase village, Sahel Sliem district, Assiut Governorate, during summer season of 2007. The gained results proved that Super Caid (Bromadiolone 0.005%) was the most effective one against the climbing rat, *Rattus rattus frugivorous*. Fallowed by Sorexa (Warfarin 0.5%) and Zinc phosphide (1.5%) was the lowest one. Also, the data proved that clossing barrows by mud using trucks (61.93%) was more effective in reducing rat population than manually method (54.23%). Finally, the results cleared that chemical means were more effective in reducing the climbing rat, *Rattus rattus frugivorous* population than mechanical means.

INTRODUCTION

In recent years, the significance of rodents in agriculture, food storage and public health had received increasing attention by governments, international agencies and commercial organizations. Of the most important developments in rodent control in the last decade, the chemical control of rodents has been practised for more than 200 years (Bentley and Larthe, 1959). There is a little doubt that the introduction of anticoagulant rodenticides in early 1950 was a major advance in rodent control. These compounds have two main advantages over the acute poisons, firstly, they do not induce bait or poison shyness and secondly, they are safer to use. If anticoagulants have any disadvantage it is that death of rats and mice generally takes at least six or seven days. Therefore treatment must be carried out for currently available are of two chemical types hydrocycomarins or indan-dione derivatives. Several control techniques which do not use toxic chemicals have been developed over the years, although most of them were unsuccessful, the use of traps and sticky boards is the most common alternative to chemicals. However, the correct use of both traps and sticky boards requires a certain amount of skill, and they can be recommended on certain occasions (Wood and Chan, 1974, Schuyler and Sun, 1974). In Egypt, Asran *et al.* (1985) used aluminum and tin sheets to protect dates from rat damage.

The aim of this study was to spot a light on the role of each of acute and chronic rodenticides and some mechanical means in reducing the population of the climbing rat, *Rattus rattus frugivorous*.

MATERIALS AND METHODS

1. Tested chemicals:

Two types of rodenticides were used i.e. Zinc phosphide as an acute poison and anticoagulants as chronic poison (single dose and multi dose).

1.1. Acute poison (Zinc phosphide):

The acute poison rodenticides, Zinc phosphide, $Zn_3 P_2$ (94% active ingredient) obtained from KZ Company, Egypt, was mixed with crushed maize at 1.5% concentration.

1.2. Anticoagulant rodenticides:

1.2.1. Single dose anticoagulant:

Trade name: Super Caid obtained from KZ Company, Egypt.

Common name: Bromadiolone.

Chemical name: 3- (3- (4-Brome 1,1-biphenyl-4-yl) -3- hydroxyl 1-1- pheny 1 propy 1) -4- hydroxyl – 2H -1- benzopyran -2- one.

Formulation: Bromadiolone 0.005% ready-made bait on sound wheat.

1.2.2. Multi dose anticoagulant:

Trade name: Sorexa (produced by Sorex, London,Ltd), Tandridge Rd: MAIDS TONE, KENT.

Common name: Warfarin.

Chemical name: 4-hydroxyl -3-(3-oxo-1- phenyl butul) coumarin, 3- (a -a- acetobenzyl) -4- hydroxycoumarin.

Formulation: Warfarin 0.5% ready – made bait on crushed maize.

This study was carried out in 12 locations of about one fadden for each. The locations were cultivated with wheat. The climbing rat, *Rattus rattus frugivorous* was the dominant species in these locations. The locations were separated with the natural barriers such as roads and irrigation canals. The rodent population was estimated in each location using two means. The first depends on estimating the consumed amount of the crushed maize in each location throughout for three successive nights before and after the

rodenticides application while the second, depends on calculating the number of the caught rats, in 25 baited life traps at each location for three successive nights before and after the treatments. The efficiency percentage was calculated by suing the following equation:

$$\% \text{ Efficiency} = \frac{B - A}{B} \times 100$$

B = The consumed amount of crushed maize before treatment,
or the caught number of the rats before treatment.

A = The consumed amount of crushed maize after treatment,
or the caught number of the rats after treatment.

2. Chemical methods:

Three locations for each treatment and the control were used to carry out the chemical control mean. The efficacy of acute poison, Zinc phosphide 1.5% bait with crushed maize was evaluated against the rodent species under field conditions of the Tasa Village, Sahel Sliem district, at Assuit Governorate.

An infested location was chosen and divided into four plots each of one fadden. Three plots for applying the tested compounds while the fourth left without any treatment as a control. The toxic baits was packaged in plastic sacks (20 gm in each sack). Sacks were placed in front of the burrows and left for two days. The population density of rodents was determined before and after treatment, using the food consumption (crushed maize method). Two kgs of crushed maize were divided and distributed inside 10 plastic bait stations (12 cm diameter and 50 cm length) in every treated and untreated plots for 4 days before and after treatment, food consumption was calculated. The average of crushed maize consumption in the last two days was estimated. The pulse baiting technique was used for single dose anticoagulant rodenticides Super Caid according to Dubock (1982), Twenty-five grams of the rodenticides in plastic sack were placed inside each bait station, the consumed amount of anticoagulant rodenticides was replaced weekly for three time. On the other hand, surplus baiting technique was used with the multi dose anticoagulant, Sorexa 0.5% Warfarin with crushed maize (Palmateer, 1974). An amount of 250 gm of rodenticides were put in each bait station. The consumed amount of anticoagulant was calculated and replaced every three days until no more bait was taken. The reduction in rodent population was calculated by the same formula mentioned before.

3. Mechanical method:

The applied technique depended on clossing the rat burrows with mud. This technique used in two phases, in the first, the climbing rat burrows were closed by trucks, while in the second the burrows were closed manually with mud. Every phase was repeated three times beside the control one. The experimental plots were clossing as mentioned before, also efficiency of the two phases were estimated as mentioned in case of chemical means previously.

RESULTS AND DISCUSSION

The recorded data in tables 1 and 2 show the effect of chemical and mechanical means on the climbing rat, *Rattus rattus frugivorous* under field conditions of Tasa village, Sahel Sliem District at Assiut Governorate during summer of 2007.

The tabulated results in tables. Illustrated that Super Caid, (Bromadiolone 0.005%), Zinc phosphide 1.5% and Sorexa (Warfarin 0.5%) gave a good efficiency 83.2%, 56.45% and 62.75% in average respectively. The gained figures proved that Supra Caid was the most effective one against the climbing rat under field conditions. Meanwhile, Sorexa was the lowest one. Also, the results cleared that Warfarin compound gave a bad effect against the climbing rat and insufficient protection for the standing plants (maize, sorghum and sugar can).

The presented data in table 2 show the effect of two mechanical phases on the climbing rat population. The compiled data cleared that efficiency of the first phase (by trucks) was more effective (86.36% population reduction in case of crushed maize measurement) than the second phase manually (83.47%). Also, in case of traps the results went on the same trend, the final result as an average for both evaluating method proved that clossing burrows by mud using trucks (61.93%) was more effective against rat population reduction than manually method (54.23%).

In general the tabulated data in tables 1 and 2 proved that chemical means were more effective in reducing the population of the climbing rat than mechanical means. These findings were agreement with the next authors, Lam (1990), reported that chemical methods and mechanical control have profound effects on rodent population rice fields. In Egypt, Asran (1993), stated that aluminum sheets were most effective technique for protecting fruit trees from *Rattus rattus* damage.

Abd El-Gawad (2001) recorded that the mechanical control for rodents under the field condition was more effective than the chemical methods. The mechanical methods may be arranged according to their effectiveness leaser land treatment, deep irrigation treatment, hand agreement with data proved by Asran *et al.* (1985), Abazaid (1997), Villa and Velasco (1994) and El-Eraky *et al.* (2000), mechanical control gives a good results for controlling rodents under the field conditions without environmental pollution.

Table 1. Efficiency of certain rodenticides against the climbing rat, *Rattus rattus frugivorous* under field condition of Tasa Village, Sahel Sliem District at Assiut Governorate.

Rodenticides	Avg. consumed crushed maize baits (kg)		Avg. of entrapped rodents/3 nights / 25 traps		The consumed amounts of rodenticides/ Fadden (kg)	Efficiency (%)		
	Before	After	Before	After		Crushed maize	Traps	Avg.
Super Caid Bromadiolone 0.005%	2.266	0.193	40.0	10.0	0.415	91.4	75	83.2
Zinc Phosphide 1.5%	0.583	0.216	40.0	20.0	0.516	65.9	50	56.45
Sorexa Warfarin 0.5%	1.633	0.400	40.0	20.0	5.100	75.5	50	62.75

Table 2. Effect of clossing climbing rat, *Rattus rattus frugivorous* borrows on their population density in plantation of Tasa village, Sahel Sliem District at Assiut Governorate.

Mechanical phase	Avg. consumed crushed maize baits (kg)		Avg. of entrapped rodents/3 nights/25 traps		Efficiency (%)		
	Before	After	Before	After	Crushed maize	Traps	Avg.
Trucks	2.200	0.300	40.0	25.0	86.36	37.5	61.93
Manually	2.300	0.380	40.0	30.0	83.47	25.0	54.23

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دراسات مقارنة بين تأثير الطرق الكيماوية والميكانيكية علي الفأر المتسلق *Rattus rattus frugivorous*

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معهد بحوث وقاية النباتات ــ مركز البحوث الزراعية ــ الدقي ــ جيزة

إن الهدف من هذا البحث هو إلقاء الضوء علي دور كل من الطرق الكيماوية والميكانيكية علي اختزال تعداد الفأر المتسلق *Rattus rattus frugivorous* وذلك في قرية تاسا مركز ساحل سليم ــ محافظة أسيوط خلال صيف عام ٢٠٠٧ وأوضحت النتائج المتحصل عليها ما يلي:

١- إن مبيد السوبر كاييد (بروما ديلون ٠,٠٠٥%) كان أكثر كفاءة في اختزال تعداد الفأر المتسلق *Rattus rattus frugivorous* ويليه مبيد السوركسا (وارفارين ٠,٥%) وكان مبيد فوسفيد الزنك (١,٥٠%) أقلها كفاءة .

٢- إن طريقة سد الجحور بالطين بواسطة الكراكات (٦١,٩٣%) كان أكثر كفاءة من سدها يدويا بالطين (٥٤,٢٣%) .

٣- بوجه عام فإن الطرق الكيماوية كانت أكثر كفاءة من الطرق الميكانيكية.