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Evaluation of Chemical and Mechanical Control to Reduce Active Burrows for Arvicanthis Niloticus in Sohag Governorate, Egypt

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Abstract:

Two rodenticides, Supercaid %0.004 and Zinc phosphide %3 and three mechanical control methods including handing destroy, deep irrigation and traps were evaluated for their efficacy for rodent control under field conditions. In the chemical control the high efficacy of rodenticides bait was obtained when applied inside burrow method, the percent of reduce in active rodent population by using Supercaid %66.60 and %83.20 for Zinc phosphide. Mechanical control methods achieved great success in rodent control as compared to chemical control. the percent of reduction in rodent active burrows population by using mechanical control methods ranged between %93.20 in deep irrigation , %87.20 in handing destroy and %52.60 in trap methods. This method is safe to the environment and higher than reduced rodent population density**.**

Keywords: handing destroy, deep irrigation, traps, mechanical control, Supercaid, Zinc Phosphide

1. Introduction

Rodents are considered as one of the most important pests in Egypt. They cause great economic loss to farmers (damage the growing crops, stored products, poultry and animals farm); and to food manufactures by damaging the structure and fabric of buildings. Beside, they gnaw through almost any object in their ways to obtain food and shelter [1].

Farmers often use inappropriate methods to reduce the impacts of rodents, and rely heavily on chemicals, causing risks to non target species and to the environment, and generally providing poor return on investment [2]. Nevertheless, rodenticides are likely to remain the central management tool for controlling rodent damage in tropical agriculture [3, 4]. Thus great efforts should be done to develop rodent control programs. Control methods must not fulfill the requirement of protecting crops, but also in a safe efficient and economic manner.

In this study two common used rodenticides as chemical control methods and three different mechanical control methods were evaluated for their efficiency to reduce rodent population in the wheat crops.

2. Materials and Methods

2.1. Chemical control

Two rodentcides were used evaluated against field rat under field conditions, the first anticoagulant viz; Supercaid 0.004% and acute rodenticide, Zinc phosphide 3%. This study was carried out in 7 areas about 2 feddans for each. Three areas for Supercaid, 3 areas for zinc phoshide and the seven areas untreated as control. In each rodenticde, area (1) poison was used baits in directly in the rat burrows, 10g for bait, area (2) beside active burrows and area (3) was distributed

circles shape of active burrows. Five replicates for each area, the percentage of reduction in rodent active burrow was estimated two time for week, the period of the treatment was one month.

The areas were cultivated with the wintry crops wheat and broad bean during 2013 year. The Nile grass rat, *Arvicanthus niloticus* was the dominant species in study period. The areas were separated with the natural barriers such as roads and irrigation canals. The rodent population was estimated in each area as active burrows after harvest of the wintry crops and before the maize cultivation .In each area the percent of reduce in rodent population was estimated as active burrows percent during the study period.

2.2. Mechanical control

This study was carried out in 4 areas about 2 feddans for each. One area was each method from mechanical control. The first method was used with Handing destroying of the burrows and killing the rodents was done weekly during one month., in the second method was treated with Deep irrigation to destroy the rodent burrows and kill the rodents with deep water, in the third methods was trapped using 100 traps distributed two time at week and captured rodent were killed after classification. The four area untreated as a control. Five replicates for each area, the percentage of reduction in rodent active burrow was estimated, the period of the treatment was one month. The reduction of the active burrows in every area was evaluated as percent from the initial active burrows. The different of the various treatments was statistical analysis as the percentages of reduction in the population density of active burrows were computed according to the formula given by Henderson and Tilton (1955).

$$\% \text{ Reduction} = 1-[(C1/T1) \times (T2/C2)] \times 100$$

Where,

C1= pre-treatment population density in control habitat.

C2= post treatment population density in control habitat.

T1= pre-treatment population density in treated units.

T2= post treatment population density in treated units.

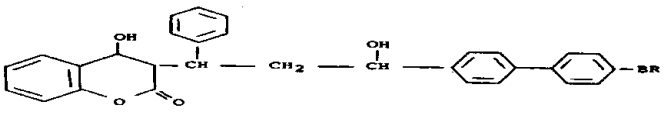
All percent reduction data were arcsin transformed to suit the analysis. Data were analyzed using analyses of variance [5] and means were separated using the least significant differences method (LSD) at 5% probability level, only when a significant "F" test was obtained [6].

2.2.1. Pesticides:

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

a. Supercaid 0.004%

Common name (bromodialone)
Chemical group: Coumarine
Used method: Bait
Chemical structure:



b. **Zinc phosphide 33%**

Used method: bait.
Chemical group: Inorganic compound.
Chemical structure: Zn3 p2.

3. Results and Discussion

Data in table (1) showed that the reduction of rodent active burrows by using Supercaid bait was obtained when applied inside burrow (66.60%), followed by beside burrows 26%. the lowest efficacy was recorded when the circle shape, 15.20%. while, Zinc phoshide indicated that the superior efficacy was obtained when applied inside burrow, 83.20% followed by beside burrow method 56.80%. the lowest efficacy was recorded when the circle shape , 43%. The average of reduction in rodent active burrow was 35.93 and 61 % Supercaid and Zinc phosphide treatments. It was found that there was a significant difference in the reduction of rodent active burrow when used the two rodenticide baits tested, the results are as similar as Abdel-Gawad (2001) in chemical control methods the reduction of active burrow was 85.6% in anticoagulant treatment and 88.3% in Zinc phosphide treatment [7].
Generally, this finding is agreement with that obtained by El-Deeb *et al*., (1992), Ahmed (2006) and Baghdadi (2006) reported that the highest efficacy of Zinc phosphide bait differed according to the method of application [8, 9, 10].

Table (1): Mean of reduction ratios for active burrows after control with rodenticides under field conditions.

Rodenticides / Treatment methods	Supercaid	Zinc phoshide	Mean
Inside burrow (A)	66.60 b	83.20a	74.9A
Beside burrow (B)	26 d	56.80b	41.40B
Circle shape (C)	15.20 e	43c	29.10C
Mean	35.93 B	61A	

(1) Mean followed by the same small letter (s) do not significantly different at 0.05 level of probability.
(2) Mean followed by the same capital letter within the same column, do not significantly different at 0.05 level of probability.
(3) Mean followed by the same capital letter within the same rows, do not significantly different at 0.05 level of probability.

Data in table (2) show the reduction in rodent active burrows after the used of various mechanical control methods, results showed that the highest reduction of active burrow was deep irrigation followed by handing destroy 87.20. The lowest was trap method was 52.60. It was found that there was a significant difference in the reduction of rodent active burrow when used the mechanical control methods tested the results are as similar as Abde-Gawad (2001) in mechanical control methods the reduction of active burrow was 94.8 in deep irrigation, 94.6 in handing destroy method, while it was 74.5 in the trap treatment [7].

Table (2) Mean of reduction ratios for after using mechanical control under field conditions.

Handing destroy	Deep irrigation	Traps
87.20a	93.20a	52.60b

Data in table (3) illustrates that as it was compared for two methods chemical and mechanical control for reduction of activity under field conditions, the decrease in rodent population as percent of active burrows after harvest season was high in the mechanical methods as compared with chemical method except in the trap where the reduction was less than chemical control in agreement with the present results; Lam (1990) reported that cultural methods and mechanical control have profound effects on rodent population rice field [11].

Table (3) Compared for two methods chemical and mechanical control for reduction of rodent active burrows under field conditions

Chemical control		Mechanical control		
Supercaid	Zinc phoshide	Handing destroy	Deep irrigation	Traps
66.60 b	83.20a	87.20a	93.20a	52.60b

- In the same method, means followed by the same letter are insignificantly different

In conclusion, the recommended procedure for rodent control is applying mechanical control followed by rodenticdes, this method is safe to the environment, and higher than for effective of rodent population density. At the same time, type of applied rodenticides should be changed upon appearance signs of resistance of rodents under control to such product.) [12]

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