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Rodenticide Use in Rodent Control in Upper Egypt: An Overview

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Abstract

Rodenticides, in many situations, are the most practical and effective way to reduce a large, widespread rodent population. There are two general classes of oral rodenticides. (1) Acute rodenticides including (zinc phosphide and ……) usually kill with a single feeding. In contrast, (2) chronic or multiple-feeding rodenticides (including warfarin, diphacinone, and chlorophacinone) usually require a period (days) of feeding before killing. The distinction has become somewhat blurred because the anticoagulant group includes first generation (examples given) and second generation (bromadiolone, brodifacoum, difethialone) anticoagulants. Second generation anticoagulants are very toxic and can usually kill within several days of a single feeding. These materials are generally available for field application. Use patterns generally allow rodents to feed continuously at bait stations, however, so that second generation materials offer practical advantage in many situations. An additional group of rodent toxicants includes the fumigants (e.g., gas cartridges, aluminum phosphide, and methyl bromide) which are used in building fumigation or in burrow systems that are closed after application.

***Key words**: Rodenticides, zinc phosphide, warfarin, bromadiolone, brodifacoum, difethialone.*

Introduction

Rodents occur worldwide and have adapted to most types of ecosystems. Rodents provide many important ecosystem functions and while most rodent species do not cause serious damage problems, a small number of species do. Rodent-caused damage includes crop and stored food consumption and contamination, forestry and nursery damage, rangeland damage, ornamental plant damage, property damage, cable and irrigation pipe damage, disease transmission, and, when introduced to islands, damage and even extinction of native flora and fauna. Many tools are used to reduce rodent populations and damage.

Rodenticides are an especially important tool in rodent management. Many types of active ingredients and formulations are available for different species and situations. Rodenticides and their use are regulated by the United States Environmental Protection Agency (EPA) and authorized State agencies. Following regulatory review, the approved label dictates how the product must be used and who has authority to use the product. All labels contain mitigation measures to reduce the risk to workers, consumers, pets, livestock, non-target animals, and the environment. Recently, the EPA has been re-evaluating many of the major rodenticides as part of the periodic re-registration process. To reduce the number of accidental exposures by children and impacts to non-target wildlife, the EPA has proposed new mitigation measures to reduce the hazards of certain rodenticides that are used in and around homes and other buildings. If implemented as proposed, these mitigation measures may affect the availability of some of the most common rodenticides (EAP, 2007).

The study comprised gathering and analysis of literature and publications on rodent chemical control in Upper Egypt by several authors such as:

Abdel-Gawad and Farghal (1982) in the central hospital in Assiut of Egypt, found that *A. niloticus* was more susceptible to Warfarin (0.04%) than *R. norvegicus* in all maturity stages (early, medium and mature). Helal and Zedan (1982) in Assiut Governorate of Egypt, used Difenacoum at 0.005% against *R. norvegicus* and *R.r. alexandrinus*. They found that the LT_{50} and LT_{95} and values were 5.5 days and 21 days.

Ali (1991) in Sohag Governorate of Egypt, studied efficacy of anticoagulant rodenticides using multiple feeding for 6 days under field condition. He found in multiple dose that Racumin and Matikus the highest percentage of rodents control success 98.5% and 95% consequently.

Abazaid, (1997) and Farghal *et al*.(2000) in Qena Governorate studied the toxicity of three anticoagulant i.e. Farobaid, Caid and Supercaid against *A. niloticus* under field conditions, Farobaid gave complete control to *A. niloticus* inhabited tomato field after 20 days of treatment. The LT50 and LT95 values were 3.1 and 21 days. Supercaid reduced 77.3% of *A. niloticus* population in sugarcane field after 21days of treatment, with LT50 and LT95 values of 8.2 and 43 days. Caid gave 59% reduction in *A. niloticus* inhabited sugarcane after 20 days of treatment. The LT50 and LT95 values were 16 and 100 days. The acute rodenticides, Quintox reduced 70% of *A. niloticus* population in corn field after 20 days of treatment. The LT50 and LT95 values of 10 and 82 days. Storm completely eradicated *R. norvegicus* after 6 days of offering poisoned baits. The LT50 and LT95 values were 4.4 – 6.0 days in 1995 and 4.0 – 5.8 days in 1996. Abdel-Gawad (2001) in Assiut Governorate of Egypt, studied the rodent control in the student buildings of Assiut University during ten successive years from 1991 to 2000. Zinc phosphide 3% was used through July as quick acting poison outside the buildings one time during the first year to reduce the high density of rodents and avoid to the bait shyness. The anticoagulant rodenticide, Retak (Difenacoum0.005%) followed the treatment of Zinc phosphide twice a year one during February and the other through July month, outside and inside the building. The results revealed that there were three species of rodent outside and inside the student buildings of Assiut University. The most prevalent rodents were *Rattus rattus alexandrinus* (Linn.) 42.6%, *Arvicanthis niloticus* (Desm.) 36.2%, *Rattus norvegicus* Berk.,21.2% .The reduction in rodent population after the treatment with Zinc phosphide was 76.8% from the initial population. The decrease in rodent density during the years of study which treated with anticoagulant rodentcide was about 69.8% during 1994 ,80.7% in 1995 and 1998. Using Zinc phosphide treatment for one time followed by anticoagulant rodenticide twice a year and removing the garbage daily showed great effect on rodent population reduction in the university cities, and it may be useful in closed places such as hospitals and animal production farms . Ahmed (2006) in Assiut Governorate of Egypt, found that the application of phosphide zinc singly was the superior in controlling rodents, while supercaid only had lowest effect. Whereas, using both rodenticide together achieved a moderate effect. Baghdadi (2006) in Assiut Governorate of Egypt, observed that the females of *A .niloticus* were more tolerant to all rodenticides than males at different poisoned baits under laboratory conditions. The acceptance of rats to the poisoned bait considerably differed according to the type of bait. The Bromadilone carried on crushed maize has the most acceptance to rats, While Brodifacoum carried with sunflower was the lowest. On the other hand, time required to death differed according to the type of rodenticide and bait carrier. Brodifacoum carried with wheat was the most effective, while the lowest effective was recorded when Chlorophacinone with sorghum. Also, the effectiveness of rodenticides for mortality time was related to the concentration of the rodenticide. The Bromadilone 0.005% was more effective than Brodifacoum 0.004%.

Desoky (2011) Found that Aluminum phosphide is a new burrowing rodent fumigant in Upper Egypt. It reacts with water vapor to produce hydrogen phosphide gas. Hydrogen phosphide is a very toxic gas, however, several characteristics of the product and use pattern give most commercial formulations a low user hazard when used by trained applicators in accordance with label instructions. It is efficacious when used in many situations against several burrowing rodent species, but will not be effective in all situations.

Several factors to consider are burrow temperature, burrow humidity, burrow length and configuration, soil porosity, wind speed and direction, and species specific behavior characteristics. It is particularly desirable to use as a clean-up after a baiting program. Also, it can be used throughout most of the year. The user should read the label carefully to determine all endangered species precautions. Hydrogen phosphide has no secondary hazard although burrow dwelling non-target animals will probably be killed.

In conclusion, the recommended procedure for rodent control is applying aluminum phosphate followed by anticoagulants twice annually seems to be satisfactory to apply within active burrows. 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.

(Saudi and Desoky, 2013) This project was aimed to use three concentrations (1,2 and 3%) of neem seed extracts adding to 4% Paraphenylenediamine (PPD), the previously recommended dose (Saudi, 2012) in order to improve PPD against three rodent species: white billed rat, *Rattus rattus frugivorus*, nile grass rat, *Arvicanthis niloticus* and house mice, *Mus musculus* under laboratory conditions. The results showed a high rate of consumption of the bait when using with the low concentrations of neem seed extract compared with the lowest one. While the %4 PPD without additions were the first in bait consumption. Rodent females increased high rate of baits as compared with males. The consumption were (53.40 and 39.35), (80.90 and 57.15), (32.70 and 21.55 g/animal) for females and males of white billed rat, *R. r. frugivorus*, nile grass rat, *Arvicanthis niloticus* and house mice, *Mus musculus* respectively. Mean of consumed baits were: 69.03, 46.37 and 27.13 g/animal Nile grass rat, *Arvicanthis niloticus*, white billed rat, *R. r. frugivorus*, and house mice, *Mus musculus* respectively. The results also indicated that the period of stay alive of tasted animals increases gradually with an increasing of neem seed extract (carried on crushed maize) compared to using also control bait. Females were most durable and lasted the longest life span of males for all rodent species tested. These periods were (9.0 and 14.35), (9.50 and 15.10), (7.75 and 13.05 day) for white billed rat, *R. r. frugivorus*, Nile grass rat, *A. niloticus* and house mice, *M. musculus*, respectively. Also the Nile grass rat, *A. niloticus* showed a longer period of survival than the other two species(i.e. the Norway rat, *R. norvegicus* and the house mouse, *M. musculus*). On the other hand, the reduction in weight in the males of the three tasted rodent species, was less than the reduction in weight of females were using neem seed extract concentrations carried on crushed maize.

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مبيدات القوارض التي تستخدم لمكافحة القوارض في صعيد مصر

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الملخص

تعتبر مبيدات القوارض في كثير من الحالات هي الطريقة الشائعة علي نطاق واسع والأكثر فاعلية لخفض الكثافة العددية للقوارض، هناك نوعان من مبيدات القوارض ألتي تستخدم عن طريق ألفم.(1) مبيدات حاده أو سريعة المفعول مثل (فوسفيد الذنك و ..... الخ) عادتا تستخدم مره واحدة لقتل القوارض. (2) مبيدات مزمنة أو بطيئة المفعول أو مبيدات مانعه لتجلط الدم مثل الوارفارين ، الداي فاثينون، الكلوروفاثينون تستخدم في التغذية لعددة أيام حتي يقتل الفار، و تعتبر هذه المبيدات الجيل الأول من مانعات تجلط الدم ، أما الجيل الثاني منها مثل البرومودايلون، البرديفاكيوم ، الداي فيثالون يعتبر سام جدا يقتل في عدة ايام من تغذية واحدة و تعتبر مبيدات الجيل الثاني لها مميزات في كثير من الحالات عن الجيل الاول. مبيدات مانعات التجلط هي عموما متاحة للتطبيق الميداني، وأستخدام أنواع منها يسمح عموما للقوارض إلى تغذية مستمرة في محطات الطعم . بالاضافة أنه يوجد مجموعات إضافية من المواد السامة للقوارض مثل التبخير على سبيل المثال (اقراص الغاز، فوسفيد الألمنيوم، بروميد الميثيل) والتي تستخدم في تبخير المباني أو في نظم الجحور التي تغلق بعد عملية التطبيق.