THE EFFICIENCY OF POTASSUIM TARTRAT ADDING TO BROMADIOLONE BAIT BY SURVIVAL ROOF RATS *RATTUS RATTUS*

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Abstract

The present work aimed to increase the safety of anticoagulant rodenticide Bromadiolone 0.005% by using potassium tartrat(PT) 8% in order to produce naval and safety rodenticide at lower cost. The current results revealed that the addition of PT slightly increased the acceptability of bromadiolone bait Complete killing or 100% death of survival rats has occurred after free choice application. Acceptability and percent mortality was 1.8 time than bromadiolone alone. This chemical poison present decreased the length of the time that poison act. that bromadiolone alone in free choice test rats take two monthes of treatment to reach 100%mortality percent while in case of adding PT rats take one month of treatment.

INTRODUCTION

In human resdential areas and animal dwelling requires the use of safe and less toxic rodenticides (Valchev, *et al*. 2008). So Comemsal rodents, especially house rat; *Rattus rattus* (Linnaeus, 1758), causes extensive losses by feeding and contaminating the food products and also plays a role in spreading several diseases of health importance such as Leptospirosis, Salmonellosis, rat Bite fever and Plagus (Kocher and Nvjot, 2013).

Hydroxy coumarin compound were discovered in the 1940s and have been in continuous use since then. This compound of the second generation anticoagulant has been found an effect effective chemical control of commensal rodents. It is more toxic compound than first one which proved commonly employed rodenticides. The second generation anticoagulant rodenticide bromadiolone, (,C30H23BrO4) in bait which has broad spectrum in activity and effective at low doses. Several studies have been done on control of rodents in different fields by different investigators (Patel 1991; Mathur and Bhadauria 1999; Dubey *et al*. 2000; Endepols and Klemann 2004). Kocher and Nvjot, 2013, Synergistic effect studies of bromadiolone (Br) and cholecalciferol (Cc) (vitamin d3) against house rat, *Rattus rattus* revealed that the combination (0.001Br+ 0.01Cc) formulation was found to have potent rodenticidal efficiency as well as cost effective bait for control of house rats under commensal situations

Nackagawa,l. *et al.* 2014 studied palatability and efficacy of bromadiolone rodenticide block bait previously exposed to environmental conditions. Their results revealed that the level of mortality was cosedered to be satisfactory, showing 75% in the two choice food trial and 100 in no-choice food trial. . Pelz and Klemmann 2004, Studied rat control strategies in organic pig and poultry production with special reference to rodenticide resistance and feeding behavior achieved that if the choice of bait base and active ingrediant as well as the methods of bait positioning are adapted to the behavioral peculiarities of the rats and the specific structural condition on each farm. The combined results of the two monitoring techniques applied demonstrate the significance of resistance and bait uptake behaviour for the efficacy of rat control measures.

Second generation rodenticides are more potent than first one, with greater affinity to binding sites in the liver and consequently greater accumulation and persistence. Second generation rodenticides represented the greatest secondary poisoning hazard to predators such as mustelids and raptors, with elimination half- life of >100 days in the liver of rats and quails (Brakes and Smith 2005).

Second-generation anticoagulant rodenticides, which include brodifacoum, bromadiolone, difenacoum, and difethialone, are acutely toxic and have a high risk of severe unintended poisoning for children, pets, and other non-target wildlife. This is due to the fact that second-generation anticoagulants remain in the body for long time after consumption, with half-lives up to 170 days. As a result, predatory birds and mammals that feed on poisoned rodents or live rodents that have received a sub lethal dose are especially vulnerable to secondary poisoning from second-generation anticoagulants (Prichard. Ann M.,2014).

Potasium tartrate, PT (16.6) used in the present study proved to be a good repellent for quails, but not for roof rats as well as to be environmentally safe (Soliman *et al*. 2009).

To success of rodent control operation, it need to formulate compounds which have efficient rodenticide potential, low or no resistance, good susceptibility, safe against non- target species and cost effective (Kocher and Nvjot,2013).

The present work wase carried out to study the efficiency of potassium tartrate adding bromadiolone bait by survival roof rats, *Rattus rattus.*

MATERIALS AND METHODS

1- **Materials Utilizations**:

1.1- **Bromadiolone** is a second generation anticoagulant. It has a trade name of Super Caid. It has an emperical formula of $C_{30}H_{23}Br\ O_4$, with a chemical name of 3{3 – (4-bromobiphenyl – 4- yl} -3 hydroxy – 1 coumarin.

1.2- Potassium Tartrate (PT):

The material has the following empirical formula: $K_2C_4H_5O_6.2H_2O$ with a molecular weight of 262. The pure PT is in the form of white pure crystal. PT was mixed with the bait to protect non-target species from rodenticide hazards.

2- Tested animals

Healthy animals elected climbing rats *Rattus rattus* (Linnaeus, 1758), from Abou-Rawash District, giza governorate. Rats were individually caged in wire cages (50 x 30 x 20 cm), acclimatized for at least 2 weeks. Food (dried bread) and water were provided *ad libitum.* Inactive (unhealthy) rats were excluded. The choice of 20 rats has been selected to start trial in free choice test. Ten animals were used for anticoagulant treatment group one (G_1) and the ♀ number, for potassium tartrate plus anticoagulant treatment group two(G_2) in free choice test. Five rats for potassium tartrate bait only (G_3).

The survivals of experimental animals from G1 and G2 experiment period (resistant rats) were essential for the study, treated also the same above in step one as mention and repeated until reaching 100% mortality.

2.1 Study the effect of 0.005% bromadiolone for rats in free choice feeding tests:

A known amount (40g) of crushed maize was placed in a buttery dish, and a known amount (40g) of 0.005% bromadiolone were provided daily to each of caged rats for 4 days. Water was provided to rats *ad libitum*. Consumption have been, number of died rats were daily recorded. The acceptability and mortality of rats were calculated. Finally observation to period 28 days with plain baits (bread) *ad libitum.*

2.2 Study the effect of 0.005% bromadiolone mixed with PT 8% for rats in free choice feeding tests:

A known amount (40g) of 0.005% bromadiolone bait mixed with 8%PT crushed maize bait and a known amount of crushed maize (40g) were presented daily to each caged roof rats for 4 days. Water was provided to rats *ad libitum*. Consumption have been, number of died rats were daily recorded. The acceptability and mortality of rats were calculated. Rats were noticed for 28 days after treatment.

A known amount (40g) crushed maize mixed with 8%PT and a known amount of crushed maize (40g) were presented daily to each caged roof rats for 4 days as contruol. Water was provided to rats *ad libitum*. Consumption have been estimated, number of died rats were daily recorded. The acceptability and mortality of rats were calculated. Rats were noticed for 28 days after treatment.

After one month, the survived rats divided with the same steps above mentioned. survives for 0.005% bromadiolone bait after one month from the study as mention in the above steps. Rats were noticed for 28days after treatment. The

acceptability and mortality of rats were calculated. using the following equation (Mason *et al.*, 1989):

$$Acceptability\ \% = \frac{Average\ daily\ \ consumption\ \ of\ treated\ food\ (g)}{Total\ average\ daily\ \ consumption\ \ of\ (treated + untreated)\ food\ (g)} X\ 100$$

Statistical analysis:

The results were statistically analyses using the standard statistical methods LSD- test was applied in the analyzed by SAS (2006).

RESULTS AND DISCUSSION

Data in Table (1) showed that bromadiolone alone in free choice test rats take three steps of treatment to 100% death percent while in case of adding potassium tartrate (PT) rats it take two steps of treatment. The acceptability ratio was higher than that of bromadiulon alone.

In case of bromadiolone alone in the 1st step, the average daily consumption was 1.79, 7.68g/rat of treated and untreated, respectively. The acceptability and mortality ratio was 20% and 8%, respectively. In the2 nd average daily consumption in treated and untreated rats it show 0.95 and 8.05 g/rat, respectively. Acceptability and percent was 10.55 and no mortality have been. Efficacy of control measures may be lost by physiological resistance to anticoagulant rodenticides and by behavioural reactions of the target rat population., (Pelz and klemann 2004)

The3rd steps average daily consumption in treated and untreated reached 2.16 and 5.95 g/rat, respectively. Acceptability and mortality was 26.63and 100%, respectively.

Adding PT + bromadiolone in the 1st step recorded average daily consumption of 2.17g and 5.80g/rat of treated and untreated bait, respectively. The acceptability and mortality ratio was 27.27 and 40%, respectively. In this respect, Parshad and Malhi,1995, mention that the palatability of baits primarily depends on the bait characteristics (formulation, colour, outlook, odour), and on rodent behaviour and the availability of other food sources But in the 2nd step the average daily consumption of treated and untreated was 1.38 and 6.12g/rat, respectively. The acceptability and mortality ratio was 18.35 and 100%, respectively. Bird repellents (PT) for example, were added to rodenticide baits to decrease the hazards caused to non-target bird species. The results of this study refer to *Rattus rattus,* after exposure to the chemical poison obviously present decreased the length of the time that poison act...But mortality in the 1st step was 40% we need more studies of the effect on haematology, liver and kidney.

the average daily consumption of 8% PT bait and plain bait of was 3.78 and 7.11g/rat, respectively. The acceptability ratio was 34.71 and no mortality was recorded.

Valchev *et al.,* 2008, proved that, non-target organisms are potentially at risk of direct consumption of baits (primary hazard) and of eating poisoned rodents (secondary hazard). The intoxications with anticoagulant rodenticides in animals are relatively frequent. Therefore, the principles of diagnostics, treatment, and prevention should be observed with regard to the protection of animals against these types of intoxication kocher and Navjot, 2013, mention that, feeding of formulated baits having bromadiolone (anticoagulant) and cholecalciferol/Vitamin D3 (subacute rodenticide) mixed in the concentration less than their standard one, were capable to show the comparative results in the form of 100% killing of house rats. Out of the tested four formulations, combination with least concentration (having 0.001% bromadiolone + 0.01% cholecalciferol) was found to be most effective and economic bait against house rats for its safe usage especially under commensal situations.

Pelz and klemann 2004 suggested the need for adapted rat-control strategies to reduce hygienic problems and the risk of non-target poisoning hazards for livestock and wildlife.

Bird repellents (PT) for example, were added to rodenticide baits to decrease the hazards caused to non-target bird species. (Metwaly, 2011) recorded that.it is clear that the addition of16.6% PT to chlorophacinone bait has synergistically increased its efficacy as an anticoagulant rodenticide. Statistically the addition of 16.6% Potassium Tartrate PT recorded significant differences in prothrombin time when added to both wheat grain and 0.005% chlorophacinone/wheat grain bait. Soliman, S., *et al.*, 2009 stated that there were no changes in mortality values when16.6% PT was added to the poison bait. Statistically, no significant difference existed between .005% bromadiolone/wheat grain bait and PT/0.005% bromadiolone/wheat grain formulation in daily consumption.

The addition of PT slightly increased the acceptability of bromadiolone bait Complete killing or 100% death of rats has occurred over a period of 6-12 days after application**.**

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كفاءة تأثير إضافة طرطرات البوتاسيوم لطعم البرومادايلون في زيادة قابلية التغذيه للجرذ المتسلق ***Rattus rattus***

فاطمه مصطفى متولي

معهد بحوث وقاية النباتات – مركز البحوث الزلراعية – دقى – القاهرة – مصر

يهدف البحث الى زيادة آمان طعم البرومادايلون ٠,٠٠٥% كمبيد للقوارض و ذلك باستخدام مادة ترترات البوتاسيوم لإنتاج مبيد لا يؤثر على الطيور الداجنه و بتكاليف قليله . اثبتت النتائج انه باضافه طرطرات البوتاسيوم ادت الى زيادة نسبيه في قابلية التغذيه لطعم البرومادايلون للجرذ المتسلق معمليا بطريقة التغذيه الاختياريه. و كذلك الوصول الى نسبة موت ١٠٠% للجرذان الباقيه على قيد الحياه من تعرضها للمبيد مع ٨% طرطرات البوتاسيوم. سجلت الدراسه ارتفاع في نسبة قابلية التغذيه الاختياريه بمعدل ١,٨% عن استخدام الطعم فقط. و كذلك وصول الجرذان لنسبة ١٠٠% موت بعد معاملة المتبقي منها على قيد الحياه (شهر) بينما عند استخدام الطعم فقط للجرذان المتبقيه على قيد الحياة مرتين (شهرين).