

EFFECT OF DIFFERENT ADDITIVES ON THE ACCEPTABILITY AND EFFICACY OF ZINC PHOSPHIDE POISON BAIT AGAINST COMMON RODENTS AT KAFR-EL-SHEIKH GOVERNORATE.

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ABSTRACT

The efficacy of bone, fish and blood powder as attractive additive on sensation of zinc phosphide bait consumption and activity against *Rattus rattus* and *Rattus norvegicus* rodent species, in compared with crushed maize as conventional bait additive were estimated at Kafr El-Sheikh, Beala, El-Hamol and Metobes districts, Kafr El-Sheikh Governorate during 2001 summer season.

Data revealed that the tested additive materials when mixed with zinc phosphide at 1, 1.5 and 2 % rate of applications exhibited height % reduction of rats population at the for tested locations, when compared with those of crushed maize conventional bait additive.

It is clear that mixture of fish powder plus 1% zinc phosphide exhibited the highest % reduction of rats population at the four tested locations (69.5, 66, 69 and 74 %) reduction, followed by bone powder (68, 65,8 66 and 71 %) and blood powder (66.5, 64, 67 and 69 %), while crushed maize was the lowest one (62, 58, 63 and 65 %) reduction, respectively.

The same trend of activity was observed in case of mixtures of the tested additives with the rest of tested zinc phosphide concentrations at the same tested locations. The obtained % reduction in rats population for bone, fish, blood powder and crushed maize, mixed with 1.5 % (zinc phosphide concentration at the four tested locations) were (75, 73,77 and 75 %), (78, 76, 78 and 78 %), (73, 70, 72 and 73 %) and (65, 67, 64 and 70 %), while at 2 % concentration were (88, 87, 84 and 90 %), (90, 89, 87 and 92 %), (87, 85, 82 and 83 %) and (78, 75, 77 and 78 %), respectively.

INTRODUCTION

With the exception of man, rodents (Order: Rodentia) are the most successful mammals, also are the most destructive vertebrate animals on the earth. They gnaw through almost any object in their path to obtain food and shelter. The damage from rodents causes economic loss everywhere, furthermore, rodents are involved in transmission of more than 20 disease organisms. Rodents eat about 10 % of their bodyweight of food each day. It has been estimated that 130 million people could be fed each year with the food destroyed by the world's rat population, Shell (1987). In Egypt rodent cause sever problems in agricultural areas. The use of change in cropping patterns and deficiency in rodent control information increased these problems. The acute toxicants, e.g. thallium sulphate, sodium fluoroacetate, crimidine and zinc phosphide had been relatively ineffective, due to poison shyness, low palatability, poor selectivity and behavioral resistance

developing as a result of the rapid onset of poisoning symptoms before ingestion of the lethal dose had occurred. On the other hand, these acute poisons possess certain major advantages, fast kill with small quantities (Barnett, 1948 and Brooks, 1973).

Many complementary factors can be influence result of rodent control campaigns and one of the most important factors is the kind of bait material added to the poison. Food selection in rats is determined by many factors such as taste, odor and texture cues (Jackson, 1965 & Bullard and Shumake 1977). All rats (*Rattus* spp.), *Rattus rattus* and *Rattus norvegicus* feed to varying degrees on cereals, fruits and vegetables depending on their habitat conditions (Walter and Rexi, 1974). Roof rat, *R. rattus*, preferred cereal though attracting in addition to juicily or moistly materials, also, addition of cabbage, radish, coriander and onion to the standard bait raised the intake significantly (Majunder et al., 1966).

The present study aims to investigate the effectiveness of various additives on the activity of poisoned zinc phosphide bait under field conditions.

MATERIALS AND METHODS

Field experiments were carried out at Kafr El-Sheikh, Beala, El-Hamol and Metobes districts, Kafr El-Sheikh Governorate during 2001 summer season after rice harvest in 8 feddan infested area at each location to evaluate the effectiveness of bone, fish and blood powder as attractive additive materials on zinc phosphide bait activity against rats at 1, 1.5 and 2 % rate of applications. Crushed maize zinc phosphide bait was used as standard treatment. The dominant rat species were estimated using trapping technique adopted by Abd El-Kerime (1991) and identified according to Osborn and Helmy (1980).

The experiments were conducted in complete randomized block design consisting of four treatments 2 feddan each including control and were replicated three times (700 m² each). One kg of zinc phosphide poison bait consisted of zinc phosphide tested concentrations, mixed with 10 % of the tested additives and the appropriate amount of crushed maize were packed in 50 paper bags (20 gm each) and distributed beside rat burrows at the infested spots in each treatment for 48 hrs.

Average bait consumption before and after 3 days of treatment were estimated using crushed maize only for 4 days. The consumed amount was recorded daily by estimating the loss of weight. The average consumption of 3rd and 4th days was calculated. (El-Deeb et al., 1991).

The percent rats population reduction were calculated according to Peardan (1977) formula as follow:

$$\% \text{ reduction} = \left(100 \times \frac{\text{consumption post-treatment}}{\text{consumption pre-treatment}} \right) - 100$$

Data were statistically analyzed according to Duncans's multiple range test (1955).

RESULTS AND DISCUSSION

Data concerning the influence of bone, fish, blood powder and crushed maize as additives on zinc phosphide bait consumption (using three rat of application) at Kafr El-Sheikh, Beala, El-Hamol and Metobes districts are summarized in Tables 1,2 and 3. Tables 1 and 2 shows the effect of 1 and 2 % concentrations against the common rats *Rattus rattus* and *Rattus norvegicus*, while Table (3) presents those of 3 %.

Data in table (1) revealed that 1 % zinc phosphide bait with fish powder exhibited the highest % reduction of rat population at the four tested locations, (69.5, 66, 69 and 74 %) followed by bone powder zinc phosphide bait (68, 65, 66 and 71 %) reduction and blood powder (66.5, 64, 67 and 69 %) reduction while crushed maize was the least one (62, 58, 63 and 65 %) reduction, at the four tested locations, respectively. It is interesting also to notice that the same trend in activity was observed with the another two tested concentrations of zinc phosphide bait when mixed with the four tested additives.

Table (1): Effect of various additives on 1 % zinc phosphide bait activity against the common rats *Rattus rattus* and *Rattus norvegicus* at different field experimental locations.

Additive Materials	Bait consumption (gm)								% population reduction			
	Pre-treatment				Post-treatment							
	Locations				Locations				locations			
	1	2	3	4	1	2	3	4	1	2	3	4
Bone powder	1340	890	1435	710	424	311	488	206	68	65	66	71
Fish powder	1130	735	2210	1200	345	250	685	312	69.5	66	69	74
Blood powder	1400	1060	780	580	469	382	257	180	66.5	64	67	69
Crushed maize	1790	680	1850	1065	680	286	685	373	62	58	63	65

1: Kafr El-Sheikh 2: Beala 3: El-Hamol 4: Metobes

The obtained % reduction for, fish, bone, blood powder and crushed maize at 1.5 % zinc phosphide bait concentration can be arranged in descending order at the four tested locations as follow: (78, 76, 78 and 78 %), (75, 73, 77 and 75 %), (73, 70, 72 and 73 %) and (65, 67, 64 and 70 %) respectively, (Table 2), while the four tested additives when mixed with 2 % zinc phosphide bait the approximate order of reduction from greatest to least were (90, 89, 87 and 92 %), (88, 87, 84 and 90 %), (87, 85, 82 and 83 %) and (78, 75, 77 and 78 %), respectively.(Table 3).

Table (2): Effect of various additives on 1.5 % zinc phosphide bait activity against the common rats *Rattus rattus* and *Rattus norvegicus* at different field experimental locations.

Additive Materials	Bait consumption (gm)								% population reduction			
	Pre-treatment				Post-treatment							
	Locations				Locations				Locations			
	1	2	3	4	1	2	3	4	1	2	3	4
Bone powder	2400	1435	740	1900	600	387	170	475	75	73	77	75
Fish powder	1850	1155	1090	880	407	277	240	194	78	76	78	78
Blood powder	2070	1300	1200	1700	559	390	336	459	73	70	72	73
Crushed maize	1500	680	1170	930	525	224	421	279	65	67	64	70

1: Kafr El-Sheikh 2: Beala 3: El-Hamol 4: Metobes

Table (3): Effect of various additives on 2 % zinc phosphide bait activity against the common rats *Rattus rattus* and *Rattus norvegicus* at different field experimental locations.

Additive Materials	Bait consumption (gm)								% population reduction			
	Pre-treatment				Post-treatment							
	Locations				Locations				Locations			
	1	2	3	4	1	2	3	4	1	2	3	4
Bone powder	890	950	940	780	107	124	150	78	88	87	84	90
Fish powder	1050	670	810	650	105	737	105	52	90	89	87	92
Blood powder	740	1400	750	1400	96	210	135	238	87	85	82	83
Crushed maize	1300	1020	1600	1230	282	255	368	270	78	75	77	78

1: Kafr El-Sheikh 2: Beala 3: El-Hamol 4: Metobes

The present results are in concordance with those of Youssef,(1991) who found that the moonbean, carrot, beet and cucumber were the most preferable for *R. rattus* and *R. norvegicus* species than the other bait materials when added to zinc phosphide, furthermore the addition of 3 (w/w) cassia, carianaer, clove, cumin, anise, black pepper, vainly and caraway were most attractive additive than any other materials. Robert, (1997) stated that many ingredients were added to bait mixtures to enhance the bait's acceptance rats and mice, but about the only truly effective, readily available enhanced were 5 percent sugar, bacon drippings, and 5 percent peanut or corn oil added to the bait mixture. Majunder *et al.*(1966), found that the addition of cabbage, radish, coriander and onion to the standard bait raised the intake significantly. Asran,(1994) studied bait preference and platability of the house mouse *Mus musculus* and he found that consumption of wheat and sorghum among cereals, sunflower seeds among oil seeds, bran + 5 % molas and cowpea among legumes were highly preferred in a multi food choice tests. Saied (1985) found that *A. cahirinus* individuals responded

greatly to the crushed maize mixed with garlic, onion and black-pepper rather than cummins, peppermint and vanillia. Soliman *et al.*(1984) found that addition of 5 % sugar enhanced rat consumption from sorghum bait.

Statistically there are significant differences were observed between treatments when compared with that of the standard (crushed maize), also between 2 % and (1 and 1.5 %) concentrations and between locations, ($P < 0.05$).

In conclusion the most commonly used formulation of rodenticides are baits. These must be placed in selected baiting points and the objective is to attract the pest to the rodenticide rather than rely on contact from a treated environment. The bait formulation itself must be sufficiently attractive for the target rodent to consume a reasonable quantity, even in the presence of large quantities of alternative foodstuffs, various tested additives in this study are ideally preferentially attractive to rodents and increased zinc phosphide bait activity under field conditions.

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تأثير بعض الاضافات المختلفة على قابلية وفاعلية طعم فوسفيد الزنك ضد القوارض الشائعة بمحافظة كفر الشيخ تحت ظروف الحقل.
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تم تقدير فاعلية مساحيق العظم والسك والدم كمواد اضافية جاذبة لتحسين استهلاك وفاعلية طعم فوسفيد الزنك ضد القوارض الشائعة وهى *Rattus* و *Rattus norvegicus* بالمقارنة بطعم الفوسفيد + جريش الذرة التقليدى فى مراكز كفر الشيخ ، بيلا ، الحامول ، مطوبس بمحافظة كفر الشيخ. وقد بينت النتائج مايلى:

١- عند خلط الاضافات المختبرة مع فوسفيد الزنك بمعدلات ١ ، ١,٥ ، ٢ % أدى الى خفض كبير فى الكثافة العددية للفئران فى جميع مناطق الاختبار بالمقارنة بطعم فوسفيد الزنك + جريش الذرة .

٢- استخدام مخلوط المبيد بتركيز ١ % مع مسحوق السمك كمادة اضافية اعطى اعلى نسبة خفض فى تعداد الفئران فى مناطق الاختبار (٦٩,٥ ، ٦٦ ، ٦٩ ، ٧٤ %) تلاه مسحوق العظام (٦٨ ، ٦٥ ، ٦٦ ، ٧١ %) ثم مسحوق الدم (٦٦,٥ ، ٦٤ ، ٦٧ ، ٦٩ %) وكانت أقل نسبة خفض عند استخدام جريش الذرة (٦٢ ، ٥٨ ، ٦٣ ، ٦٥ %) فى مناطق الاختبار الأربعة على التوالى.

٣- نهجت باقى الاضافات نفس النهج من حيث الفاعلية عند خلطها بتركيزات ١,٥ ، ٢ % من فوسفيد الزنك فى مناطق الاختبار الأربعة وقد كانت نسب الخفض فى الكثافة العددية للفئران عند استخدام تركيزات ١,٥ ، ٢ % من فوسفيد الزنك [(٧٨ ، ٧٦ ، ٧٨ ، ٧٨ %) و (٧٥ ، ٧٣ ، ٧٧ ، ٧٧ ، ٧٥)]

٧٥ %) و (٧٣ ، ٧٢ ، ٧٠ ، ٧٣) و (٦٥ ، ٦٧ ، ٦٤ ، ٧٠ %) و [(٩٠ ، ٨٩ ، ٨٧ ، ٩٢ %) و (٨٨ ، ٨٧ ، ٨٤ ، ٩٠ %) و (٨٧ ، ٨٥ ، ٨٢ ، ٨٣ %) و (٧٨ ، ٧٥ ، ٧٧ ، ٧٨ %)] لمساحيق السمك ، العظام ، الدم ، جريش الذرة فى مناطق الاختبار الأربعة على التوالى.