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EFFECTIVENESS OF CERTAIN COMPOUNDS AS BIRD REPELLENTS AGAINST SOME BIRDS

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ABSTRACT

Laboratory and Field experiments had been conducted to study the repellent and toxic effect of four pesticides i.e Prothiofos, Fenthion, Oxadiazon and Metaloxyl + Copper on house sparrow, *Passer domesticus niloticus* under Laboratory conditions by applaying each of choice and non-choice feeding systems. The obtained results could be summarized as follows:-

1- Laboratory studies :-

The obtained results induced that in both one and two choice feeding methods Fenthion was the most repellent one followed by Prothiofos, Oxadiazon and Metaloxyl + Copper. In respect of repellency and toxicity; the obtained results revealed that Fenthion was the highest repellent (0.0038 mg/kg) and toxic one (0.027 mg/kg) to *Passer domesticus niloticus*, followed by Prothiofos (0.0045 mg/kg and 0.033 mg/kg), Oxadiazon (0.0048 and 0.028 mg/kg) and Metaloxyl + Copper (0.00501 mg/kg and 0.039 mg/kg).

2- Field studies :-

Studies were carried out at El-hamol district, Kafer El-shiekh G. The applied pesticides induced high protection for Squash, Watermelon and Sunflower seeds from creasted lark, *Galereda cristata* attack during the sowing stage. Also, the same compounds induced high protection from house sparrow, palm dove, rock pegion and hooded crow during the sprouting stage.

INTRODUCTION

Bird damage to crops, particularly cereal grains is a serious problem all over the world. In African countries, in a country like Egypt with a limited cultivated area, food in sufficiency is the major problem that faces the over growing human population. The Egyptian government started to approach and solve this problem by the reclamation of desert land.

Recently, in Egypt the house sparrow, *Passer domesticus niloticus* and creasted lark *Galereda cristata* are considered the most economic vertebrate pest in the agricultural land, particularly in the newly reclaimed areas until now. These pests were controlled chemically by using synthetic avicide such as repellent compounds (Methiocarb) or insecticides (El-Deeb, 1990 and Abd El-All et al. 1995).

Bird repellent approach is considered safe for the environment and living creatures. Their function is fully based on the physical or chemical senses of the target pest. Accordingly, these methods are classified into the following given groups; visual acoustical, tactile, gustatory and olfactory repellent (smell) (Fitzwater, 1982).

The aim of the present work is an attempt to minimizing the damage of the Bird for certain Vegetables.

MATERIALS AND METHODS

Tested compounds :-
A-Tokuthion (50% Ec):-
Common name : Prothiofos
Chemical name :-
O – (2, 4 – dichlorophenyl) O - ethyl – S – propyl – phosphorodthioate.
B – Lebaycide (50% Ec) :-
Common name : Fenthion
Chemical name :-
O,O – dimethyl – O – (3 – methyl – 4 – nitrophenyl) phosphorodthioate.
C- Ronstar (25% Ec):-
Common name : Oxadiazon.
Chemical name :-
5 – tetrabutyl –3 – (2, 4 – dichloro – 5 – isoprooxy phenyl) 1, 3, 4 – oxadiazol – 2- one.
D – Ridomil plus (50 % Wp):-
Common name : Metalaxyl + Copper
Chemical name :-
N – (2, 6 – dimethyphonyl) – N – (methoxyacetyl) – DL – alanine methyl ester.

Acclimatization and adaptation :-

The laboratory trials were conducted against house sparrow, *Passer domesticus niloticus*. Birds were trapped by " Paro trap" and transferred directly in aviary (2.4 x 2.4 x 3.6 m) to Laboratory. Birds were housed in a communal wire mesh holding cages (53 x 25 x 38 cm) of one bird / cage, for two weeks before testing and were allowed free access to the same diet and water for acclimatization (Koehler *et al* 1987).

1- Repellency tests :-
1-1- One-choice method :-

One-choice method described by Bullard and Shumake (1979) modified by Shefte *et al* (1982) based on original methods of Starr *et al* (1964),Schafer and Brunton (1971) was followed. Ten individually cages were used for each concentration (i.e. 0.025, 0.05 and 0.1 %) of each tested compound. Ten grams of the untreated whole sorghum was offered to each bird for four successive days before treatment then the same birds were exposed to another 10 gram of coated sorghum with the candidated concentration of each compound for the same pre-treatment period and consumed diet was daily calculated throughout the two periods. The repellency potential was calculated by using the following equation (Bullard *et al* 1983):-

$$\text{\% Repellency} = 1 - \frac{\text{Consumed amount of treated grains (g)}}{\text{Consumed amount of treated (g)} + \text{consumed untreated grains (g)}} \times 100$$

2-1- Two-choice method :-

The two-choice method test described by Russell *et al* (1989) was adopted. Ten birds were individually caged and used for each concentration of each test compounds. Ten gram from treated and untreated grains were separately exposed to each bird daily. In two small petri-dishes for four successive days. The position of the two dishes was altered daily to prevent any bias to location consumed amounts of sorghum grains were recorded. The repellency potential was calculated according to the same equation which mentioned above.

R_{50} determination :-

R_{50} values are calculated for the four tested chemicals using method of Engeman *et al* (1989). Ten individually caged house sparrows were used for each concentration of each tested compound. Untreated sorghum grains were used for four successive days for acclimatization and testing. Then, the treated sorghum grains were offered to each bird for 24 hour. Birds that consumed less than 40% from the offered food were considered repelled. The percentage of food consumption and repelled bird from treated grains were determined for each concentration. The estimated R_{50} values were calculated according to Weil (1952).

Toxicity test :-

Test method for acute oral toxicity to determine the LD_{50} was based on that followed by Shefte *et al* (1982). Birds were gavaged with propylene glycol solution of each chemical at a dose volume adjusted for each bird (the amount of solution equal to 0.5 % of bird weight). After dosing, birds were individually caged, provided with food, water and observed for 6 hour period for observing the signs of toxicity and 48 hour for mortality. Depending on mortality at the initial doses, LD_{50} values were calculated according the methods of Thompson and Weil and Finney(1952).

Hazard factor was calculated from the following equation of Schafer *et al* (1983).

$$\text{Hazard factor} = \frac{(R_{50} \text{ (mg / kg grains)}}{(LD_{50} \text{ (mg / kg. b.w.)}}$$

2- Field studies :-

2-1- During sowing stage :-

Field trials had been conducted under the conditions of Kafr El-sheikh Governorate to study the efficacy of the same four compounds to protect the sowing stage of Squash, Watermelon and Sunflower seeds. Prothiofos, Fenthion, Oxadiazon and Methaloxyl + Copper pesticides at rates 0.5% and 1.0 % were tested. Seeds were cleaned, sieved and coated with the tested compounds by using the method of Schafer *et al*, (1977). The appropriate amount of each tested compounds was added to small quantity of water and milk as adhesive material, then mixed with seeds in a beaker (Avery, 1989). Treated seeds were air-dried for 24 hours and planted. Each treatment was replicated in three separated plots (100 m^2). Another set of three untreated plots were left for comparison. Experimental plots were

separated by 100 m^2. The percentages of loss and protection index (PI) were calculated by the following equation according to El-Deeb (1990). % loss in untreated check = A-B /A x 100 where A = Number of seedling in standard untreated check. B = Number of seedling in the treated area.

2-2- During the sprouting stage :-

Repellency effect of sprayed tested compound. The repellency effect of 0.5 & 1.0 % concentrations the same tested compound was evaluated at the sprouting stage of the tested crops. Each compound was applied in three separated plots (each of 2 feddans) and another one was left as check control. The compounds were sprayed with required level using motorized knapsock sprayer.

RESULTS AND DISCUSSION

1- Laboratory studies :-

Data presented in Table (1) revealed that the four tested compounds in all concentrations showed considerable repellent effect to the tested animals enhanced with increasing of their concentration.

Table (1): Repellency percentage of some compounds toThe house sparrow, *Passer domesticus niloticus* Under Laboratory conditions.

Tested compounds	% Repellency					
	One-choice feeding (%conc.)			Two-choice feeding(conc.)		
	0.025	0.05	0.1	0.025	0.05	0.1
Prothiofos	56.1	59.3	69.2	65.4	72.0	77.0
Fenthion	60.4	68.1	69.0	66.0	76.3	82.3
Oxadiazon	55.0	57.3	59.7	59.0	68.1	72.2
Metalaxyl+ Copper	52.4	55.0	64.3	58.0	64.1	69.6

On the other hand, the comparative study showed that Fenthion compound exhibited the highest repellent effect i.e. house sparrow, *Passer domesticus niloticus* repelled with 60.4%, 68.1% and 69.0% when tested using one choice feeding method, with 0.025, 0.05 and 0.1% level respectively. But when Fenthion used with two choice feeding method as its three levels induced 66.0%, 76.3% and 82.3% repellency, consequentively.

These results agree with those obtained by Metwally *et al* (1993), Zidan *et al* (1994), Gabr *et al* (2001) and Gabr (2005).

Results of the repellency effect (R_{50}), lethal effect (LD_{50}) and Hazared factor of the tested compounds are summarized in Table (2) Data indicated that house sparrow, *Passer domesticus niloticus* was more susceptible to Fenthion (0.0038 mg/kg) followed by Prothiofos (0.0045 mg/kg), Ocadiazon (0.0048 mg/kg) and Metalaxyl + Copper (0.00501 mg/kg).

Table (2): Lethal effect (LD_{50}), repellency (R_{50}) and hazard Factor of some compounds on house sparrow, *Passer domesticus niloticus*.

compound	LD_{50} mg/kg	R_{50} mg/kg	Hazard factor
Prothiofos	0.033	0.0045	0.136
Fenthion	0.027	0.0038	0.140
Oxadiazon	0.028	0.0048	0.171
Metalaxyl + Copper	0.039	0.00501	0.128

On the other hand, Average values of lethal effect (LD_{50}) and Hazard factor reached (0.033 mg/kg and 0.136), (0.027 mg/kg and 0.140), (0.028 mg/kg and 0.171), respectively for the mentioned materials previously.

Reviewing the above reported results, it could be noticed that, the effectiveness of chemicals against the experimented birds considerably differ according to the chemical type, route entry and bird species, Abd El-All (1993), Zidan *et al* (1994) and Gabr *et al* (2001).

2- Under field conditions :-

The potential of the same tested compounds to protect seeds of Squash, Watermelon and Sunflower from Crested lark, *Galerida cristate* during sowing stage was investigated. The gained data in Table (3) proved that the effect of these compounds differed according to its chemical structure and crop species. The protection percentages of Fenthion at 0.5% and 1.0% concentrations were respectively; (93.2% and 97.2%) for Squash, (95.0% and 98.2%) for Watermelon and (96.6% and 99.1%) for Sunflower. Prothiofos ranked the second order showing good protection against the tested bird as (92.7% and 95.5%), (94.6% and 96.2%) and (95.1% and 98.2%) followed by Oxadiazon i.e. (91.4% and 94.3%), (92.1% and 95.2%) and (93.6% and 97.2%) for the same crops, respectively. On the other words, Metalaxyl + Copper compound was the lowest protecting one as it caused only (90.1% and 91.2%), (91.7 and 94.6%) and (91.8% and 96.5%) for Squash, Watermelon and Sunflower seeds consecutively. These finding agree with Wilson (1993 and 1999) and Abd El-All (1995).

Table (4) the yield data revealed that the birds i.e.house sparrow, *Passer domesticus niloticus*, Palm dove, *Streptopelia senegalensis*, Rock pigeon, *Columba livia* and Hooded crow, *Crovus corone* caused noticeable damage for the three investigated crops at first week age.

The percentages of these damage were, 4.6%, 3.1%, 5.6% and 6.9% for the treated Squash with 1% concentration from each compound Prothiofos, Ferthion, Oxadiazon and Metalaxyl + Copper, respectively. While at 0.5% the percentages of the bird damage were 5.1%, 3.8%, 6.2% and 7.1% for the same compounds respectively. Also, Watermelon at 0.5% concentration for the same compounds the bird damage was; 4.8%, 3.2%, 5.9% and 6.8% respectively but the damage percentage was; 4.1%, 3.0%, 5.1% and 5.3% at 1% concentration. Also, the rate of damage reduction using Prothiofos, Fenthion, Oxadiazon and Metalaxyl + Copper compound consecutively, 49%, 36%, 61% and 64% for 1.0% and 58%, 39%, 71% and 82% for 0.5% concentration.

Table (3): Percentage and role of varied seeds crops protection by using certain compounds.

Tested compounds	Squash seeds				Watermelon seeds				Sunflower seeds			
	Protection %		Rate protection		Protection %		Rate protection		Protection %		Rate protection	
	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
Prothiofos	92.7	95.5	4.5	7.7	94.6	96.2	5.2	7.0	95.1	98.2	3.8	7.2
Fenthion	93.2	97.3	5.1	9.7	95.1	98.2	5.8	9.2	96.6	99.1	5.5	8.2
Oxadiazon	91.4	94.3	3.0	6.3	92.1	95.2	2.4	5.9	93.6	97.2	2.2	6.1
Metalaxyl + Copper	90.1	91.2	1.6	2.8	91.7	94.6	2.0	5.2	91.8	96.5	0.22	5.3
Control	88.7				89.9				91.6			

Table (4): Repellency potential of some pesticide compounds against some Birds during sprouting stage.

Treatment	Squash sprouting					Watermelon sprouting					Sunflower sprouting				
	Damage %		Rate Damage Reduction		Diff. % (T_1-T_2)	Damage %		Rate % Damage Reduction		Diff. % (T_1-T_2)	Damage %		Rate % Damage Reduction		Diff. % (T_1-T_2)
	1 %	0.5	1 % (T_1)	0.5 (T_2)		1 %	0.5	1 % (T_1)	0.5 (T_2)		1 %	0.5	1 % (T_1)	0.5 (T_2)	
Prothiofos (insecticide)	4.6	5.1	48	53	- 5	4.1	4.8	49	58	- 9	3.2	3.9	42	51	- 9
Fenthion (insecticide)	3.1	3.8	32	40	- 8	3.0	3.2	36	39	- 3	2.4	2.8	32	37	- 5
Oxadiazon (Herbicide)	5.6	6.2	58	65	-7	5.1	5.9	61	71	- 10	4.1	4.7	54	62	- 8
Metalaxyl + Copper (Fungicide)	6.9	7.1	72	74	-2	5.8	6.8	64	82	- 18	5.1	6.6	67	87	- 20
Control	9.6		100	100	0	8.3		100	100	0	7.6		100	100	0

While, Sunflower at 0.5% concentration for the former compounds the bird damage percentage was 3.9%, 2.8%, 4.7% and 6.6% but the damage percentage at 1.0% concentration was; 3.2%, 2.4%, 4.1% and 5.1% respectively.

Regarding the rate damage reduction for the same tested compounds consecutively were 51%, 37%, 62%, 87% at 0.5% concentration and 42%, 32%, 54% and 67% at 1.0% concentration. The previous results proved that Fenthion was more Protection for the whole tested plants from bird damage. These Findings are in harmony with those obtained from Laboratory, Holler *et al* (1982),Brugger *et al* (1984), Wilson (1999) and Gabr *et al* (2001) are agreement with the present obtained Findings.

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كفاءة بعض المركبات كمواد طاردة للطيور

فـــــاطـــمة كامـــل خـــضر
معهد بحوث وقاية النباتات – مركز البحوث الزراعية – الدقي – مصر

أجريت التجارب المعملية والحقلية لدراسة التأثير الطارد والسام لأربعة مبيـدات هـي بروثيوفوس ، الفينثيون ، أوكساديازون وميتالوكسيل مع النحاس علي عصفور النيل الدوري تحت الظروف المعملية وذلك بتطبيق كل من نظام التغذية الإختياري والإجباري وقد لوحظ من النتـائج المتحصل عليها ما يلي :-

١ – أولاً: الدراسات المعملية :-

فقد دلت النتائج المتحصل عليها أن مبيد الفينثيون أعطي أعلي تأثير طارد في كل مـن نظام التغذية الإجباري والإختياري يليه مبيد بروثيوفوس وأوكساديازون ثم مبيد ميتالوكـسيل مـع النحاس علي التوالي .

وتـشير النتـائج إلـى أن مبيـد الفينثيـون كـان الأعلـى كفـاءة كطـارد (٠,٠٠٣٨ مليجرام/ كجم) والأكثر سمية (٠,٠٠٢٧ مليجرام / كجم) لعصفور النيل الدوري يليـه البروثيوفوس (٠,٠٠٤٥ مليجرام /كجـم ، ٠,٠٣٣ مليجـرام / كجـم) ثـم الأوكـساديازون (٠,٠٠٤٨ ، ٠,٠٢٨ مليجرام / كجم) والميتالوكسيل مع النحـاس (٠,٠٠٥٠ مليجـرام/ كجـم ، ٠,٠٣٦ مليجرام / كجم). على التوالى.

٢ – الدراسات الحقلية :-

أجريت الدراسات الحقلية في مركز الحامول بمحافظة كفر الشيخ حيث أوضحت النتائج أن المواد التى تم اختبارها أعطت حماية للمحاصيل المختلفة في طور الإنبات مثل الكوسة والبطيخ وعباد الشمس ضد القنبرة المتوجة وأيضا نفس المركبات أعطت حماية من عصفور النيل الدوري واليمام والحمام البري والغراب في طور البادرة .