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MOLLUSCICIDAL ACTIVITY OF CERTAIN PESTICIDES AGAINST *Monacha obstructa montago* (FAM:HELICIDAE) LAND SNAILS UNDER LABORATORY AND FIELD CONDITIONS.

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ABSTRACT

Laboratory and field experiments have been conducted to evaluate the molluscicidal activity of certain pesticides compared with Gastrotox 5 % (Metaldehyede), (the recommended compound) against *Monacha obstructa* land snails under laboratory and field conditions at Plant Protection Research Institute Mansoura Branch, Dakahlia Governorate during 2012 season.

Results can be concluded that the molluscicidal activity of tested compounds under laboratory conditions were arranged in the descending order according to their activity of LC_{50} values as follows: Neomyl > Mesarol > Kafrothrien > Agriflex > Koragien > Agrinet > Nafigator >Lambadasen > Alfased > Drociel > Somithion and Selian. Relative potency compared with Gastrotox were (0.75, 0.73, 0.56, 0.33, 0.21, 0.20, 0.12, 0.11, 0.10, 0.07, 0.04 and 0.03 times) for mention before compounds, respectively. Data showed that the percent reduction in population of *Monacha* sp. in field after 3 days (I.K) were (65.98, 63.44, 70.22 , 71.28 and 71.27 %) Also, reduction percentages (residue) after 28 days were (91.39, 78.66, 94.65, 91.55 and 91.48 %) reduction for Agrinet, Kafrothrien, Gastrotox, Neomyl and Meserol, respectively.

INTRODUCTION

Land snails (subclass: Pulmonata) are one of the most numerous with almost 35,000 described species of the world. Damage caused by land snails depends not only on their activity and population density, but also on their feeding habits, which differ from one species to another. The land snails feed on leaves, roots, tubers and ornamental plants (El-Okda, 1981). In addition, an undesirable smell cause during movement snails which prevents men and even animals from feeding on these contaminated plants (El-Okda, 1984). The main damage caused by *Monacha cartusiana* to fresh plant of the Egyptian clover was found to be about 5.65% (5.082 tons/feddan) four consecutive cutting (Okka, 2003). Bait technique is more suitable for reducing environmental pollution, moreover simple for use, focal treatment not area wide, thus it is usually low costly. (Mortada *et al.* 2006).

Thereby, the present study was conducted to estimate the molluscicidal activity of thirteen commercial products pesticides against *Monacha obstructa* land snails under Laboratory and field conditions.

MATERIALS AND METHODS

Laboratory experiments were planned to study the molluscicidal activity of certain compounds against *M. obstructa* compared with Gastrotox 5 % (Metaldehyede) and Neomyl as a recommended molluscicid under laboratory and field conditions at Plant Protection Research Institute Mansoura Branch, Dakahlia Governorate during 2012 season.

1- Experimental Snails:

Adult Snails of *M. obstructa* were collected from infested fields in Aga district, Dakahlia Governorate. The obtained snails were transferred in plastic bags to the laboratory, then kept in plastic containers filled with (5 - 7 cm) moist sterilized sand soil loamy 1:1 (v:v) and fed on fresh lettuce leaves for 14 days to be laboratory acclimatized . Dead snails were removed and only healthy ones were used in the experiments. Laboratory conditions at 25 °C ± 2 °C and 75 % R.H ± 5 % Soil moisture. (Mortada, 2002 and Daoud, 2004).

2- Tested pesticide

The following formulated insecticides (thirteen commercial products) were evaluated throughout the present study. The trade, common names and tested rates are as follows:

- Selian : prophenophos 72 % EC 750 cm / feddan .
- Lambadasen : lambadacyhalothrin 5 % EC 250 cm / feddan.
- Agriflex: abamectin + thiamethoxam 18.6 % 40 cm /100 liters.
-Nafigator : thiacloroprid 48 % SC 20 cm / 100 liters.
-Kafrothrien :deltamethrin 2.5 % EC 750 cm / feddan.
- Drociel: chloropyriphos 48 % EC 1 liter / feddan.
- Alfased :alpha-cypermethrin 10 % EC 250 cm /feddan.
-Koragien :chlora-nitranil-prole 20 % SC 20cm /100 liters.
- Somithion kz: fenitrothion 50 % EC 1.5 litera / feddan.
-Agrinet: methomyl 24 % SL 1 liter / feddan.
- Meserol : methiocarb 2 % 4 kg /feddan.
- Neomyl: Methomyl 20 % 1 kg / feddan.
-Gastrotox : metaldehyde 5 % 2kg /feddan.

3 - Laboratory Experiment:

Serial concentration of recommended dose, half and double each pesticide were prepared. Leaf dipping technique methods were used. A similar pieces of green lettuce leaves were dipped in glass jars containing 100 ml of the tested pesticides for 10 second, then left to dry before being offered to snails. Ten adult individuals were exposed to each treated leaf in disposable plastic box (24 × 16 × 10 cm.) the boxes covered with muslin cloth held by rubber bands to prevent snails from escaping. Each concentration was included 5 replicates; the untreated check was only treated with water and included an equivalent number of snails.

Poison bait technique was used as another method to test. 1, 2, and 4 % for each compound were tested. The poisonous baits were prepared by mixing a known amount of each compound with 5 parts of black sugarcane syrup and

then the mixture was incorporated with wheat bran to be finally 100 parts. The bait was moistened with appropriate amount of water to form a crumbly mash mixture. Ten adult snails were exposed to 10 grams bait in plastic box (24 × 16 × 10 cm). Five replicates were used for each concentration of bait. Control treatment was prepared using wheat bran bait mixed with black sugarcane syrup only without pesticides. (Mortada *et al.* 2006).

Mortality was recorded after 3, 5 and 7 days. At the end of this period, mortality percentages were estimated and corrected for natural mortality according to Abbott's formula (1925), then subjected to probit analysis by Finney's method (1971).

4 - Field experiments:

The field experiments were carried out at Aga district, Dakahlia Governorate, the pesticides that exhibited high efficacy in the laboratory tests were applied in a heavily infested orchard cultivated with orange against *Monacha* sp land snails. Gastrotox, Neomyl, Mesorol, Agrinet and Kafrothrin were tested as poisonous baits at the rate of the mention before. An experimental area two faddan. The field was irrigated four days before treatment. Ten trees were chosen for each treatment. Five treatment were conducted, in addition to control treatment without pesticides. pesticides were offered on plastic piece, at one meter around tree trunk, each one contained 100 gm / tree then divided into two parts put beside tree trunk. Number of alive snails were counted / tree after 1, 3, 7, 14, 21 and 28 days of application. Reduction percentages were calculated according to Henderson and Tillton's formula (1955) as follows:

$$\%\text{Reduction} = \left(1 - \frac{\mathbf{t}_2 \times \mathbf{r}_1}{\mathbf{t}_1 \times \mathbf{r}_2}\right) \times 100$$

where : r_1 = number of alive snails before treatment in untreated plots.
r_2 = number of alive snails after treatment in untreated plots.
t_1 = number of alive snails before treatment in treated plots.
t_2 = number of alive snails after treatment in treated plots.

Data were statistically analyzed using F test.

RESULTS AND DISCUSSION

Under laboratory and field conditions some experiments had been conducted to evaluate the molluscicidal activity of certain formulated insecticides (thirteen commercial products) as the mention before. Comparison with Neomyl (as recommended Molluscicides) against adults of *Monacha obstructa* land snails using leaf dipping and poison bait technique methods at Plant Protection Research Institute Mansoura Branch, Dakahlia Governorate during 2012 season .

Data in Table(1), showed that evaluation of certain pesticides compared with Neomyl 20 % (recommended compound) against *Monacha obstructa* as leaf dipping technique under laboratory conditions. LC_{50} and LC_{90} values were (1430.8, 2718.3, 5576.5, 7400.3, 2542.9, 934.7, 4681.1, 4438.6, 907.40, 22515.9 and 11881.6 ppm) and (8188.1, 10985.4, 21369.1, 39469.9, 16826, 3339.7, 25522.1, 23673.7, 3405.9, 226690 and 86417 ppm) for Agriflex, Agrinet, Alfased , Drociel, Koragien, Kafrothrien, Lambadasen, Nafigator, Neomyl, Selian and Somithion, respectively. It is clear that Kafrothrien the most effective one compared with Neomyl followed by Agriflex then Koragien and Agrinet while Somithion and Selian were the lowest effect. Relative potency compared with Neomyl were (0.63,0.33, 0.16, 0.12, 0.35, 0.97, 0.19, 0.20, 0.04 and 0.07 times) for mention before compounds, respectively.

Table (1): LC_{50}, LC_{90} and relative potency of certain pesticides compared with Neomyl 20 % against *Monacha obstructa* as leaf dipping technique under laboratory conditions.

Compounds	LC_{50} ppm	95% Fudicial limits		LC_{90} ppm	95% Fudicial limits		Slope & variance	Relative potency
		lower	upper		lower	upper		
Agriflex 18.6 %	1430.8	1166	1836.2	8188.1	3289.2	727930	1.74 ± 0.61	0.63
Agrinet 24 % SL	2718.3	1029.4	3704.6	10985.4	6957.5	80211.6	0.2.11 ± 0.715	0.33
Alfased 10 % EC	5576.5	4164.3	13333.8	21369.1	10416.8	669360	1.56 ± 0.60	0.16
Drociel 48 % EC	7400.3	5075.7	24371.3	39469.9	15714.4	289410	1.76 ± 0.59	0.12
Koragien 20 %SC	2542.9	-	-	16826	-	-	1.5 ± 0.60	0.35
Kafrothrien2.5 % EC	934.7	388.0	1301.5	3339.7	2349.6	8975.5	2.31 ± 0.66	0.97
Lambadasen 5 % EC	4681.1	3033.4	28123.2	25522.1	9036	635130	1.74 ± 0.61	0.19
Nafigator 48 % SC	4438.6	3044.4	2643.8	23673.7	9425.3	173580	1.76 ± 0.59	0.20
Neomyl 20 %	907.40	731.1	1233.5	3405.9	2196.5	7628.9	2.25 ±0.34	1
Selian 72 % EC	22515.9	8701.3	35372.7	226690	25867.2	372190	1.84 ± 0.62	0.04
Somithion kz50 %EC	11881.6	-	-	86417	-	-	1.48 ± 0.59	0.07

Relative potency compared with Neomyl 20 %

LC_{50} and LC_{90} values of certain pesticides compared with Gastrotox 5 % (recommended compound) against *Monacha obstructa* as poison bait technique under laboratory conditions. Table (2). LC_{50} and LC_{90} values were (1.28, 2.13, 4.28, 5.77, 0.43, 2.02, 0.77, 3.72, 0.59, 3.47, 0.57, 12.73 and 10.48 %) and (4.71, 6.24, 7.65, 9.55, 0.69, 7.44, 2.13, 1.67, 1.04, 5.31, 1.11, 16.12 and 17.14 %) for Agriflex, Agrinet, Alfased , Drociel, Gastrotox,

Koragien, Kafrothrien, Lambadasen, Mesarol, Nafigator, Neomyl, Selian and Somithion, respectively. The molluscicidal activity of tested compounds were arranged in the descending order according to their activity of LC_{50} values as follows: Neomyl > Mesarol > Kafrothrien > Agriflex > Koragien > Agrinet > Nafigator >Lambadasen > Alfased > Drociel > Somithion and Selian. Relative potency compared with Gastrotox were (0.75, 0.73, 0.56, 0.33, 0.21, 0.20, 0.12, 0.11, 0.10, 0.07, 0.04 and 0.03times) for mention before compounds, respectively.

Table (2): LC_{50}, LC_{90} and relative potency of certain pesticides compared with Gastrotox 5 % against *Monacha obstructa* as poison bait technique under laboratory conditions.

Compounds	LC_{50} %	95% Fudicial limits		LC_{90} %	95% Fudicial limits		Slope & ± variance	Relative potency
		lower	upper		lower	upper		
Agriflex 18.6 %	1.28	0.87	1.86	4.71	3.16	7.18	1.60 ± 0.44	0.33
Agrinet 24 % SL	2.13	1.04	3.06	6.24	4.25	9.15	2.82 ± 0.35	0.20
Alfased 10 % EC	4.28	2.90	6.16	7.65	5.13	10.14	1.89 ± 0.65	0.10
Drociel 48 % EC	5.77	3.96	7.06	9.55	7.45	12.22	2.01 ± 0.64	0.07
Gastrotox 5%	0.43	0.15	0.28	0.69	0.49	0.85	1.09 ± 0.63	1
Koragien 20 %SC	2.02	1.31	4.17	7.44	4.86	10.66	1.85 ± 0.56	0.21
Kafrothrien2.5 % EC	0.77	0.35	1.03	2.13	1.09	3.11	1.75 ± 0.64	0.56
Lambadasen 5 % EC	3.72	2.01	5.04	1.67	1.34	3.04	2.85 ± 0.79	0.11
Meserol 2 %	0.59	0.27	0.77	1.04	0.87	1.64	0.65 ± 0.36	0.73
Nafigator 48 % SC	3.47	2.11	4.95	5.31	2.95	8.56	1.76 ± 0.84	0.12
Neomyl 20 %	0.57	0.42	0.98	1.11	0.85	3.16	0.84 ±0.34	0.75
Selian 72 % EC	12.73	9.45	15.06	16.12	13.11	20.14	3.16 ± 0.89	0.03
Somithion kz50 %EC	10.48	7.91	13.41	17.14	11.61	23.20	3.11 ± 0.76	0.04

Relative potency compared with Gastrotox 5 % .

Field experiment

The molluscicidal activity of some pesticides were evaluated against *Monacha* sp. land snails at Aga district, Dakahlia Governorate during Aprilr-May 2012 plantation as poison bait method in orchard field.

The pesticides were exhibited in laboratory experiments tests and they were the most effective compounds when they were treated against *M. obstructa* as poison bait technique compared with Gastrotox 5 %. These compound were applied in field Table (3). Percent reduction in population of *Monacha* sp. after 3 days (I.K) were (65.98, 63.44, 70.22 , 71.28 and 71.27 %) for Agrinet, Kafrothrien, Gastrotox, Neomyl and Meserol, respectively. Also, reduction percentages(residue) after 28 days were (91.39, 78.66, 94.65, 91.55 and 91.48 %) reduction for the mention compound ,respectively. It is obvious that Neomyl gave the best results compared with Gastrotox 5% followed by Meserol , Agrinet 24 % and the last Kafrothrien2.5 %.

Table (3): Molluscicidal activity of certain pesticides compared with Gastrotox 5 % against *Monacha obstructa* land snails infesting orange fields at Aga, Dakahlia Governorate during April- May 2012 season.

Compounds	I.K after 3days	% Reduction after ..... (days)				Reduction (residue) %	Average
		7	14	21	28		
Agrinet 24 % SL	65.98	79.32	88.57	90.23	91.29	91.39	83.07
Kafrothrien2.5 % EC	63.44	67.01	70.48	76.36	78.66	78.66	71.19
Gastrotox 5%	70.22	78.95	83.19	89.45	94.65	94.65	83.29
Neomyl 20 %	71.28	81.88	82.22	90.11	91.55	91.55	83.40
Meserol 2 %	71.27	83.70	88.26	89.88	91.48	91.48	84.91

These results are agreement with those reported by (Daoud, 2004) tested Vertimec against *Eobania Vermiculata* and *Monacha contiana* on Egyptian clover crop 2002 season. He revealed that Neomyl exhibited the highest toxic action followed by Vertimec under field conditions. Zedan *et al.* (2006) evaluated five compound include metaldehyde against land snails, they found methomyl was the effective one. Mortada *et al.* (2012) reported that Molluscicides compound (Molotove, Gastrotox, Neomyl) were the most effective to population density reduction of land snails *M. contiana* compared with biocides (Agrien, Diple 2x, Protecto and Vertimec) on sugar beet and pea plantation.

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النشاط الابادى لبعض مبيدات الآفات كمبيدات للقواقع لمكافحة القوقع الأرضى *Monacha obstructa* تحت الظروف المعملية والحقلية .

محمد محمد مرتضى ، محمد ابراهيم داوود ، منى عبد الحميد على و وفاء عبد المجيد شهاوى
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أجريت تجارب معملية وحقلية لتقييم كفاءة بعض المبيدات (13 مبيد تجارى) لمكافحة قوقع البرسيم الزجاجى *Monacha obstructa* مقارنة بمبيدى النيوميل والجاستروتوكس كمبيدات موصى بها لمكافحة القواقع الأرضية. وقد أجريت التجارب المعملية بفرع معهد بحوث وقاية النباتات بالمنصورة محافظة الدقهلية وبمنطقة مركز أجا على محصول البرتقال حقليا .

اوضحت النتائج أن مبيدالجاستروتوكس والنيوميل الميزارول والآجرينيت والكافروثرين كانت أقوى المبيدات تأثيرا على قوقع البرسيم الزجاجى مقارنة بباقى المبيدات المختبرة معمليا. أما فى التجارب الحقلية فكان الترتيب تنازليا: مبيد الجاستروتوكس ثم النيوميل ثم الميزارول ثم الأجرينيت وأخيرا الكافروثرين . وكانت نسبة الخفض فى تعداد القواقع الأرضية بعد 28 يوم كما يلى: (94,65 ، 91,55 ، 91,48 ، 91,39 و 78,66 %) للمبيدات السابقة على الترتيب .

قام بتحكيم البحث
أ.د/ على على عبد الهادى كلية الزراعة - جامعة المنصورة

أ.د/ فاطمه كامل خضر مركز البحوث الزراعيه