

SENSITIVITY OF TWO LAND SNAIL SPECIES (*MONACHA CARTUSIANA* AND *EOBANIA VERMICULATA*) AGAINST SOME PESTICIDES UNDER LABORATORY AND FIELD CONDITIONS AT SHARKIA GOVERNORATE

HILMY, AMAL AND A.M.I. HEGAB

Plant Protection Research Institute, ARC, Dokki, Giza

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Abstract

The present research aimed to study the sensitivity of two land snails species, adults (*Monacha cartusiana* and *Eobania vermiculata*) towards , nemacur (nematicide), lebaycid (insecticide), sencor (herbicide) and antracol (fungicide) applied as poisonous bran baits under laboratory and field conditions at Sharkia Governorate.

The obtained results revealed that, the tested pesticides exerted substantial lethal effect against the two species after seven days post- treatment as mortality percentages that increased with increasing the concentration value and the duration of exposure.

M. cartusiana were more sensitive towards the tested pesticides than *E. vermiculata* , at laboratory, 7- days / LC50 values for *M. cartusiana* were, 474, 6329, 13612 and 17028 ppm when treated with nemacur, lebaycid, sencor and antracol respectively. The corresponding values for *E. vermiculata* were, 24199, 91622, 69403 and 169392 ppm.

The same trend was nearly observed when these compounds were applied against the two species under field conditions, the population reduction percentages after seven days post- treatment were 89.3, 73.8, 29.7 and 25.0 for *M. cartusiana* treated with lebaycid, nemacur, sencor and antracol respectively. The corresponding values for *E. vermiculata* were, 25.0, 20.0, 49.0 and 15.0 for *E. vermiculata* treated with lebaycid, nemacur, sencor and antracol respectively.

According to the obtained results, it could be recommended by applying, nemacur, Lebaycid, sencor and antracol as molluscicides among the integrated pest management (IPM) programs.

INTRODUCTION

Till now, the chemical control is the most effective way for the elimination of different pests. In Egypt, huge amounts of chemical pesticides including fungicides, nematicides, insecticides and herbicides were applied for controlling the different agricultural pests. These pesticides exert side toxic effect on non – target organisms such as the land snails.

The harmful land snails as *M. cartusiana* (Muller) and *E. vermiculata* (Muller) cause direct bad effect on the economy resulting from their feeding on various plants, daily activity (Foad , 2005) and also their rapid adaptation to different habitats (Asran and Fawkyia, 2001). Therefore, the biologists working in this field concerned with investigation of the molluscicidal activity of the various pesticides for controlling this pest (Kassab and Daoud, 1964, El-Okda, 1978, 1980, 1982, Hegab, 2003, Ebenso *et al.* , 2005, Ismail and Hegab, 2006, Ismail, 2008 and Ismail and Shetaia, 2009).

Metaldehyde, organophosphates, carbamates, pyrethroids and Triazinones are the major chemical groups used as insecticides (Anonymous, 1987). The present work was carried out to investigate the gedree of sensitivity of *M. cartusiana* and *E. vermiculata* towards nemacur, lebaycid, sencor and antracol. Also, for revealing the molluscicidal efficiency of the selected pesticides from the different chemical groups against *M. cartusiana* and *E. vermiculata* under laboratory and field conditions.

MATERIALS AND METHODS

1-The tested land snails

Healthy adults of *M. cartusiana* (Muller) with shell breadth (16- 18 mm) were selected for the present study during March 2009 from highly infested field cultivated with Egyptian clover (*Trifolium alexandrinum*) at Awlad-Sakr district, Sharkia Governorate. The snails *E.vermiculata* healthy adults with shell breadth (26 – 28 mm) were collected from the ornamentals, in small garden at Zagazig City. The snails were transported directly to the laboratory in muslin cloth bags and put in large glass boxes with conditions similar the natural habitat and were fed on wheat bran bait for acclimatization at least for 10 days under laboratory conditions.

2-The tested chemicals

A - Organophosphorous compounds

1- Lebaycid 50% EC (insecticide)

- Trade name : Lebaycid 50% EC.
- Common name : Fenthion

2- Nemacur 10 % GR (nematicide)

- Trade name : Nemacur 10 % GR
- Common name : fenamiphos

B - Carbamate compounds

Antracol 70 % WP (fungicide)

- Trade name : Antracol 70 % WP
- Common name: propineb

C - Triazinone compounds

Sencor 70 % WP (herbicide)

-Trade name: Sencor 70 %WP

-Common name : metribuzin

These samples were supplied by Central Agricultural Pests Laboratory, Dokky, Egypt.

3- Laboratory experiments

Evaluated pesticides were prepared as poisonous baits by mixing the calculated weight or volume of the pesticide with wetted bran to give the concentrations 0.5 , 1, 2 and 4% having an active ingredient (500, 1000, 2000 and 4000) ppm nemacur , (2500,5000, 10000 and20000) ppm lebaycid , (3500, 7000, 14000 and 28000) ppm sencor , (3500, 7000, 14000 and 28000) ppm antracol against *M. cartusiana*. and 4, 10, 20 and 30 % having an active ingredient (4000, 10000, 20000 and 30000)ppm nemacur, (20000, 50000, 100000 and 150000)ppm lebaycid , (28000, 70000, 140000 and 210000) ppm sencor and (28000, 70000, 140000 and 210000) ppm antracol against *E. vermiculata*. 10 grams of the poisonous baits were spread into each plastic box (3/4 kg capacity) .Ten healthy adult snails were introduced for each box , closing boxes with musline cloth and secured with rubber band to prevent snails from escaping (El-Okda, 1981). Each concentration was replicated four times. Control treatment was prepared using bran bait only without any pesticides. Mortality percentages were recorded, after 1,2, 4, 7, 15 and 21 days post- treatment. Observation of mortality entailed using stainless steel needle according to El-Okda (1981). Dead snails were removed after testing and mortality percentages were calculated until the end of the experiment (21days). The data were analyzed using the Probit analysis (Finney, 1971) for estimation the 7-days / LC50 values of the tested pesticides.

Field experiment

The field trails for *M. cartusiana* snails were performed at Zawar –Abou –El –Layl village- Awlad Sakr district- Sharkia Governorate, at the area of about one feddan cultivated with Egyptian clover (*Trifolium alexandrinum*) heavy infested. *E. vermiculata* trials were carried out in one feddan ornamental plants highly infested at the beach of Moweas sea , Zagazig City. The field was irrigated only one day before any treatments. The tested pesticides were applied with one concentration (2% against *M. cartusiana* and 20% against *E. vermiculata*) (indicated concentration + 95 parts of bran + 5 parts of sugar cane syrup). . About 100 gm of the tested baits were offered on plastic pieces 50x50 cm. Control treatments was designed by the same manner without any chemicals. Each treatment was replicated four times. Alive snails were

recorded in check (control) and treatments before and after 1, 3, 7, 15 and 21 days post-treatment. Population reduction percentages were calculated according to Henderson and Tillton equation (1955) as follows :

% Reduction = $100 \left[1 - \frac{t_2 r_1}{t_1 r_2} \right]$ Where : r_1 and r_2 are the number of alive snails before and after treatment respectively in untreated plots (control) , t_1 and t_2 are the number of alive snails before and after treatment respectively in treated plots . Data were subjected to statistical analysis and treatment means were compared by using F .test and L.S.D. values according to Snedecor (1957).

RESULTS AND DISCUSSION

Laboratory experiments

Data in Table (1) showed the mortality percentages of *M. cartusiana* adults treated with nemacur, lebaycid, sencor and antracol under laboratory conditions. Mortality percentages increased gradually with increasing the concentration value and the duration of exposure. Nemacur was the most effective compound, exhibiting the highest mortality percentage ranged between 50–100 after 7 days post-treatment with 7-days/LC50 (474ppm), the lower and upper confidence limits were 338 and 583. Lebaycid came in the second position of molluscicidal efficiency recording (30 – 80) mortality percentages with 7-days/LC50 (6329) ppm, the lower and upper confidence limits, 5130 and 7706 respectively. Sencor was less effective than nemacur and lebaycid with 7- days/ LC50 (13612) ppm, the lower and upper confidence limits, 11212 and 17147 respectively. Finally, antracol had the least toxic efficiency, the mortality percentage was ranged between 10 and 70 with 7- days /LC50 (17028) ppm, the lower and upper confidence limits were 14621 and 20346 respectively. It is clear that *M. cartusiana* revealed higher sensitivity towards nemacur followed by, lebaycid, sencor and antracol.

Data in Table (2) illustrated the effect of the tested pesticides against *E. vermiculata* adults under laboratory conditions . The descending order of 7-days/LC50 values was, (24199, 69403, 91622 and 169392) ppm of nemacur, sencor, lebaycid and antracol respectively with lower and upper confidence limits, 20757 and 30075, 59393 and 79871, 82318 and 101768 and 145302 and 210530 respectively. It is clear that the sensitivity of *E. vermiculata* had nearly the same trend observed with *M. cartusiana*.

Field experiment

Data in Table (3) showed the sensitivity of *M. cartusiana* snails towards the tested pesticides under field conditions as population reduction percentages. The applied concentration was 2% (2000, 10000, 14000 and 14000 ppm active ingredient)

of nemacur, lebaycid, sencor and antracol respectively. The population reduction percentages increased gradually with the time to the maximum values (89.3, 73.8, 29.7, 25.0) at lebaycid, nemacur, sencor and antracol respectively after 7- days post-treatment and then decreased gradually to (13, 9.5, 4.7 and 0.0) after 21- days post-treatment. It can be seen that, *M. cartusiana* obtained highest sensitivity towards the tested pesticides through the first week post- treatment. On the other hand, lebaycid exerted the highest toxic effect followed by nemacur, sencor and finally antracol.

Table (4) revealed the sensitivity of *E. vermiculata* snails towards the tested pesticides under field conditions as population reduction percentages. The applied concentration was 20% (20000, 100000, and 140000 and 140000 ppm active ingredient) of nemacur, lebaycid, sencor and antracol respectively. *E. vermiculata* snails revealed nearly the same trend of reaction against the tested pesticides as well as *M. cartusiana*. The maximum percentages were, (25.0, 20.0, 49.0 and 15.0) after 7- days post- treatment and the minimum ones were, (6.6, 5.0, 20.0 and 1.6) after 21- days post- treatment at lebaycid, nemacur, sencor and antracol respectively. It is clear that sencor exerted the highest toxic effect followed by lebaycid, nemacur, and finally antracol.

In conclusion, higher sensitivity of *M. cartusiana* and *E. vermiculata* were observed towards the organophosphorous and triazinon compounds. This means that the organophosphorous and triazinon compounds were the most effectives while carbamate compound appeared to be the least toxic one against the tested land snails.

These results are in agreement with the findings of Hegab (1998) who found that the organophosphates included the highest effect when were evaluated under field conditions. Aioub *et al.*, (2000) found that the carbamate compounds appeared to be the most toxic ones while the organophosphorous and herbicides were the least toxic ones. Also Daoud (2004) reported that newmeal revealed the highest toxic action against *M. cartusiana* and *E. vermiculata* in comparison with the other compounds.

Table 1. Mortality percentages and the values of 7- days//LC50 with confidence limits of *Monacha cartusiana* (Muller) treated with different pesticides as poisonous baits for 21 days under laboratory conditions.

Toxicant	Conc.ppm (a.i.)	% Mortality after indicated days						LC50	95% Confidence limit	
		1	2	4	7	15	21		Lower	Upper
Nemacur	500	0	0	20	50	60	80	474	338	584
	1000	0	0	40	80	90	100			
	2000	20	30	60	90	100	100			
	4000	20	40	60	100	100	100			
Lebaycid	2500	0	0	0	30	30	40	6329	5130	7706
	5000	0	10	30	40	60	60			
	10000	10	20	40	60	90	100			
	20000	20	40	50	80	100	100			
Sencor	3500	0	0	20	20	20	20	13612	11212	17147
	7000	0	0	30	30	50	80			
	14000	0	30	30	50	100	100			
	28000	20	30	40	70	100	100			
Antracol	3500	0	10	10	10	20	20	17028	14621	20346
	7000	0	10	20	20	40	40			
	14000	10	10	20	40	80	80			
	28000	10	20	20	70	90	90			
Control	0	0	0	0	0	0	0			

Table 2. Mortality percentages and the values of 7- days//LC50 with confidence limits of *Eobania vermiculata* (Muller) treated with different pesticides as poisonous baits for 21 days under laboratory conditions.

Toxicant	Conc.ppm (a.i.)	% Mortality after indicated days						LC50	95% Confidence limit	
		1	2	4	7	15	21		Lower	Upper
Nemacur	4000	10	10	10	10	10	10	24199	20757	30075
	10000	10	20	10	20	30	50			
	20000	10	20	20	40	40	80			
	30000	10	30	40	60	70	80			
Lebaycid	20000	0	0	10	10	20	30	91622	82318	101768
	50000	20	20	30	20	60	80			
	100000	30	40	50	50	70	90			
	150000	30	40	60	80	80	90			
Sencor	28000	10	10	10	20	40	50	69403	59393	79871
	70000	30	30	40	50	80	90			
	140000	40	50	70	90	100	100			
	210000	30	40	40	60	80	80			
Antracol	28000	0	0	0	0	10	20	169392	145302	210530
	70000	0	0	20	20	40	70			
	140000	20	30	40	40	60	80			
	210000	30	40	40	60	80	80			
Control	0	0	0	0	0	0				

Table 3. Population reduction percentages of *Monacha cartusiana* (Muller) at the concentration 2 % of the tested pesticides as poisonous baits under field conditions.

Toxicant	% population reduction after days				
	1	3	7	15	21
Lebaycid	78.00	85.00	89.30 a	82.70	13.00
Nemacur	64.00	71.40	73.80 a	60.70	9.50
Sencor	42.99	50.00	29.70 b	15.40	4.70
Antracol	20.30	50.00	25.00 b	6.20	0.00
L.S.D 0.05			38.42		

Table 4. Population reduction percentages of *Eobania vermiculata* (Muller) at the concentration 20 % of the tested pesticides as poisonous baits under field conditions.

Toxicant	% population reduction after days				
	1	3	7	15	21
Lebaycid	10.00	20.00	25.00 b	15.00	6.60
Nemacur	3.30	16.60	20.00 b	10.00	5.00
Sencor	28.00	30.00	49.00 a	25.00	20.00
Antracol	0.00	8.00	15.00 b	6.60	1.60
L.S.D 0.05			22.72		

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**حساسية نوعين من القواقع الارضية (*Eobania* و *Monacha cartusiana*)
vermiculata) ضد بعض المبيدات تحت الظروف المعملية والحقلية
 بمحافظة الشرقية**

امال حلمى السيد عبد الرحمن ، احمد مصطفى ابراهيم حجاب

معهد بحوث وقاية النباتات - مركز البحوث الزراعية - الدقى - الجيزة

يهدف هذا البحث الي :

دراسة مدى حساسية نوعين من القواقع الأرضية الضارة وهما:

قوقع البرسيم الزجاجى (*Monacha cartusiana*) اليافع و قوقع الحدائق البنسى الكبير

(*Eobania*) *vermiculata*) اليافع وذلك تجاه بعض المبيدات الكيميائية وهى:

نيماتور(مبيد نيما تودى)- ليباسيد(مبيد حشرى) - سنكور(مبيد حشائش) - انتراكول (مبيد

فطرى) والتي استخدمت كطعوم سامة تحت الظروف المعملية والحقلية بمحافظة الشرقية.

وقد أوضحت النتائج ان:

- المبيدات الكيميائية المختبرة قد اظهرت تأثير ابادى ملموس ضد كلا النوعين من القواقع الأرضية و ذلك بعد سبعة أيام من المعاملة كنسب مئوية للموت والتسى ازادت بزيادة قيمة التركيز وفترة التعرض.

- كانت قواقع(*M.cartusiana*) أكثر حساسية من قواقع (*E.vermiculata*) تجاه المبيدات الكيميائية المختبرة حيث

بلغت التركيزات القاتلة لنصف تعداد الأفراد المعاملة معملياً بعد سبعة ايام (٤٧٤ ، ٦٣٢٩ ،

١٣٦١٢ ، ١٧٠٢٨) جزء فى المليون وذلك لقواقع *M.cartusiana* المعاملة بالنيماتور-

الليباسيد - السنكور - الانتراكول على التوالي وكانت القيم المناظرة فى حالة قواقع

E.vermiculata (٢٤١٩٨،٦٩٣ ، ٩١٦٢١،٧٢٧ ، ٦٩٤٠٣،٣٧٥ ، ٩٦٩ ، ١٦٩٣٩١) جزء فى

المليون .

ب - وقد لوحظ ان هذه المركبات قد اتخذت نفس المنحى تقريبا عندما طبقت ضد كلا النوعين

تحت الظروف الحقلية حيث بلغت النسب المئوية للخفض فى تعداد قواقع *M.cartusiana* بعد

سبعة ايام من المعاملة بالليباسيد والنيماتور والسنكور والانتراكول هى (٨٩،٣ ، ٧٣،٨ ،

٢٩،٧ ، ٢٥،٠) على التوالي بينما انخفضت هذه القيم الى (٢٥٠٠ ، ٢٠٠٠ ، ٤٩،٠ ، ١٥،٠)

وذلك لقواقع *E. vermiculata*

وطبقا للنتائج المتحصل عليها فى هذا البحث فإنه يوصى باستخدام النيماتور والليباسيد

والسنكور و الانتراكول كمبيدات رخوية ضمن برامج مكافحة المتكاملة للافات.