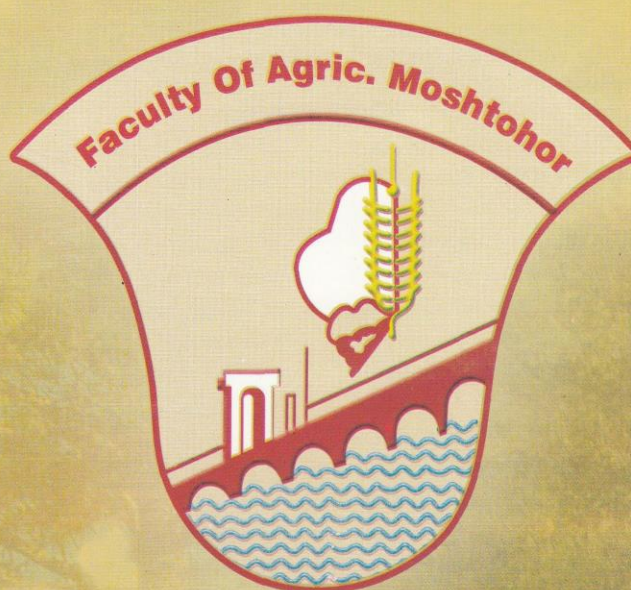


Annals Of Agricultural Science, Moshtohor

Faculty Of Agriculture, Moshtohor. Benha University

ISSN:1110-0419



Vol. 48 Number (2) June 2010

حوليات العلوم الزراعية مشتهر

كلية الزراعة بمشتهر جامعة بنها

ISSN:1110-0419



المجلد الثامن والأربعون - العدد الثاني - يونيو ٢٠١٠ م

EFFECT OF METHOMYL ON TWO SPECIES OF TERRESTRIAL SNAILS UNDER LABORATORY AND FIELD CONDITIONS

By

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ABSTRACT

Control studies on two land snails species by using methomyl under laboratory conditions showed that, the percent mortality of *Monacha obstructa* was 100% when methomyl baits were applied at 3 & 2% concentrations directly and 24 hrs. after prepatation of the mixture. Meanwhile, percentage of mortality reached up to 100% for *Eobania vermiculata* when the baits were used in the same day of preparation at 3% concentration. On the other hand, the lowest percentages of mortality (52 & 44%) were recorded for each snail, respectively after seven days of bait preparation at 0.5% concentration. On the other hand, the response of the land snails to the methomyl baits applied at 3% concentration under field conditions was high. The mortality percentage of treated land snails by methomyl at 3% concentration at the same day of preparation was (90 & 99%) on navel orange trees and swallow plants, respectively.

INTRODUCTION

Land gastropods are considered a group of the most serious pests attacking agricultural crops around the world. They cause costly damage to field crops, vegetables and fruit trees as well as ornamental plants. In addition, they work as intermediate hosts for many parasitic worms infesting man and his domestic animals (Godan, 1983).

Snails and slugs are well known to nearly one. However the former have shells and latters have not. Both have chewing mouth parts and chiefly ate nitgh. They attack many kinds of plants and often leave slime traces on the plants on which they have fed upon (Mischelbacher, *et al.* 1959).

In Sharkia Governorate land snails considered one of the dangerous crop pests casing severe damage especially in vegetables and field

crops. (Ghamry *et al.* 1993; Arafa, 1997; Ismail, 1997 and El-Massry, 1997).

In Egypt, land gastropods could be considered as dangerous crop pests and cause considerable damage to the majority of economic crops in most governorates. Considerable Damage increased especially in most areas where they find the optimum conditions for survival and dispersion (Kassab and Daoud, 1964 and El-Okda, 1981).

It has been universally agreed that the chemical methods are the best possible methods for controlling these harmful snails.

The presented study is a brief outline of the work which has been carried out under laboratory and field conditions to control the land snails by pesticides.

METHODS AND MATERIALS

1. The laboratory experiment:

In this test, the carbamate insecticide methomyl (Lannate 90% S.P.) was used against two species of snails *Monacha obstructa* and *Eobania vermiculata*. Adults of the two species were collected from Egyptian clover (*Trifolium alexandrinum*), swallow (*Strelibzia reginae*) and Navel orange (*Citrus sinensis*), Faculty of Agriculture, Moshtohor, Kaloubia Governorate. The snails were put in muslin cloth bags, transported to the laboratory and washed by water. Healthy individuals were kept in wooden boxes (40 x 40 x 40 cm) containing mixture of damp clay and sand (3:1) of about 7cm height and continually moistened with tap water to maintain high humidity 85-100%. The boxes were covered with muslin to prevent snails from escaping. *M. obstructa* and *E. vermiculata* snails were fed three times/week with fresh washed lettuce leaves and cucumber fruits. Each four hundred healthy individuals of each species of snails were prepared for the trial. Four concentrations of methomyl were used in this test (0.5%, 1%, 2% and 3%). Each concentration was prepared as baits containing 5% molasses and completing the weight of every bait with bran. Bait, at each of the mentioned concentrations, was offered for feeding by snails just after preparing and after one, three and 7 days of storage. 25 individuals from *M. obstructa* and *E. vermiculata* were used for each treatment. Five individuals were put in a glassy receptacle with 10gm of the bait and covered by muslin cloth. The snails

under each treatment were examined daily to count the dead and alive ones during eight days after treatment and change the treated baits with new.

2. Effect of methomyl on land snails under field conditions:

This trial was undertaken in navel orange trees and swallow plants in orchards with heavy infestation of land snails Faculty of Agriculture, Mostohor, Kaloubia Governorate, by using the same precedent stored methomyl baits with the same concentrations (0.5%, 1%, 2% and 3%) and each concentration was used in the same day of preparation of bait and after one, three and seven days of storage. With each plant orchard, 10 trees (or plants) were selected for each treatment. The baits were put under each tree on plastic sheets (50 x 50cm) before sunset and left until sunrise of the next day. The treated baits were changed every day. The collected snails over these baits were watched to define the different species of land snails and counting individuals from different stages (adults and juveniles) of each species. On the other hand, the dead and alive individuals of each species were counted. This experiment was continued for seven days in each plant orchard. Before and after test for each plant, the snails were counted on the trees and on the soil and herbs under the trees for three days left without collecting it. During this operation the counted snails were identified. Under each species (adults and juveniles) counts of dead and a live individuals were recorded.

The mortality percentages were calculated by using the **Henderson and Tilton (1955)** formula:

$$\text{Reduction\%} = \left[1 - \frac{t_2 \times r_1}{t_1 \times r_2} \right] \times 100$$

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

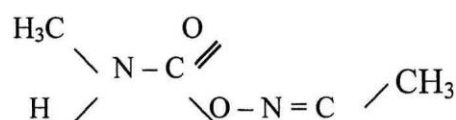
Pesticide used:

Trade name : Lannate 90% S.P.

Common name: Methomyl

Class : Carbamate compound, insecticide.

Chemical structure:



Chemical name : S-methyl – N – {(methyl carbamoyl) oxy} thioacetimidate

RESULTS AND DISCUSSION

1. The laboratory experiment:

Two species of snails *M. obstructa* and *E. vermiculata* were exposed to the methomyl baits with 4 different concentrations 0.5, 1, 2 and 3% and four storage periods (fresh baits and after one, 3 and 7 days). Data presented in Table (1) and Figures (1 & 2) show the effect of these baits on mortality percent of the tested snails. Data showed that the highest percentage of death was recorded when snails *M. obstructa* were exposed to 2 and 3% of methomyl baits under laboratory conditions. The mortality percent were 72, 84, 100 and 100 ($LC_{50} = 0.333$) in the treatment of fresh baits at different tested concentrations 0.5, 1, 2 and 3% respectively, after 4

days of treatment, but these percentages were 64, 80, 88 and 100% ($LC_{50} = 0.266$) mortality in case of stored baits for one day under 4 concentrations, respectively. While, those were 32, 56, 72 and 84% ($LC_{50} = 1.019$) and 28, 48, 68 and 80 ($LC_{50} = 1.063$) with the four concentrations when baits were stored for 3 and 7 days, respectively. While the animals of *E. vermiculata* Fig. (2) were more resistant to methomyl under laboratory conditions, showing lower mortality percentages as follows (68, 80, 88 and 100%) ($LC_{50} = 0.199$), (64, 64, 76 and 96%) ($LC_{50} = 0.359$), (32, 60, 68 and 80%) ($LC_{50} = 0.95$) and (28, 36, 52 and 76%) ($LC_{50} = 1.555$) into the different four stored period baits with

0.5, 1, 2 and 3% methomyl respectively.

In agreement with the present results, **Ghamry et al. (1994)** evaluated fourteen insecticides against two land snails; *M. contiana* and *E. vermiculata*. They mentioned that methomyl, thiodicarb, carbaryl and diamethoate were effective for killing snails after 12 days under laboratory conditions. Also, **Ismail et al. (2005)** evaluated six pesticides against *M. cartusiana*. They showed that methomyl gave the highest effect while spinosad was the lowest one. On the other hand, **Lokma (1999)** reported that Salute was the most effective one followed by Gastrotax Suntox, Diazon, Dursban, Serin and Protecto as poisonous baits against *M. cartusiana* and *Rumina decollate* land snails in USA. Moreover, **Khidr et al. (2009)** reported that Gastrotax (metaldehyde) was the most effective compound followed by Secnor and oxamyl which was the lowest effective one for both laboratory and field conditions after seventh day from treatment.

2. Under field conditions:

Results in Tables (2 & 3) cleared that the collected numbers of snails under plant or under plant orchard trees were changed according to the different storage periods of methomyl baits with different concentrations in navel orange and swallow. The highest numbers of snails were collected by fresh baits when used in the same day of preparation it under each concentration.

Numbers of collected snails were 354, 324, 370 and 505 individuals at 0.5, 1, 2 and 3%, respectively, in navel orange trees while the parallel values were 151, 161, 151 and 154 snails under the same concentrations in swallow. Besides, numbers of counted snails decreased when the period of storage was increased. The lowest number was recorded by baits used after 7 days of storage with the four different concentration, these were 211, 181, 187 and 213 snails in navel orange trees and 59, 68, 98 and 88 snails in swallow plants under 0.5, 1, 2 and 3% concentrations, respectively.

Table (2) and Fig. (3) showed that the percentage of snails mortality increased at high methomyl concentration in bait and decreased in low concentration. In case of baits were used in the same day of the preparing, percentages of snails mortality were 45.4, 64.1, 80 and 90% under 0.5, 1, 2 and 3% concentrations and 39, 46, 61.4 and 78%, by using baits stored for one day, behind that mortalities were 35, 41.4, 52.8 and 63.5%, in case of stored baits for 3 days, but were 17.5, 28.2, 46 and 47% mortality percent when the baits were stored for 7 days under the same four concentrations respectively, in navel orange trees. In case of swallow orchard plant (Table, 3 and Fig. 4), these percentages were (74, 83, 93.3 and 99%), (67.3, 80, 81 and 86%), (43.5, 55.4, 62 and 71%) and (17, 19.1, 21 and 26%) by offering the baits at the mentioned concentrations and the same periods of storage, respectively.

Table (1): Effect of methomyl on the mortality percentages of land snails *M. obstructa* and *E. vermiculata* under laboratory conditions.

Con.	Fresh Baits			Baits after one day			Baits after 3 days			Baits after 7 days		
	M.o		E.v	M.o		E.v	M.o		E.v	M.o		E.v
	LC ₅₀	% Mortality	LC ₅₀	LC ₅₀	% Mortality	LC ₅₀	LC ₅₀	% Mortality	LC ₅₀	LC ₅₀	% Mortality	% Mortality
0.5%	0.333	72	0.199	0.266	64	0.359	1.019	32	0.95	1.063	28	1.555
1%		84	80		80	64		56			48	
2%		100	88		88	76		72			68	
3%		100	100		100	96		84			80	
												76

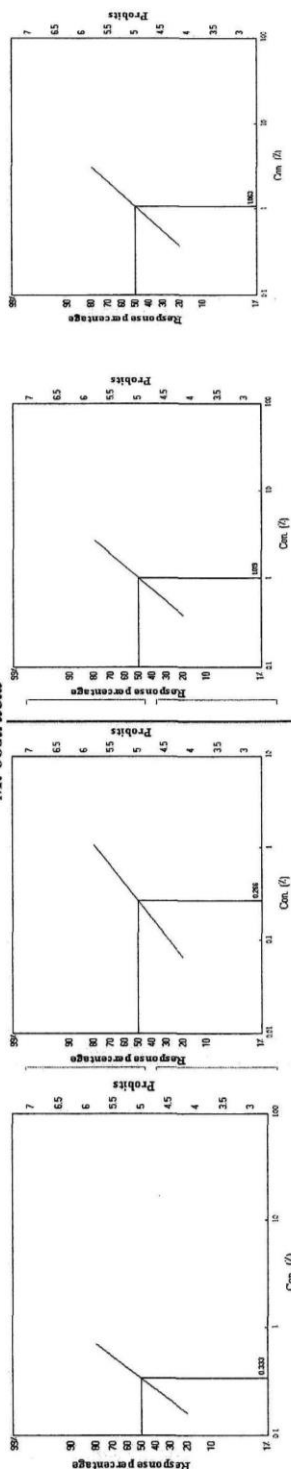
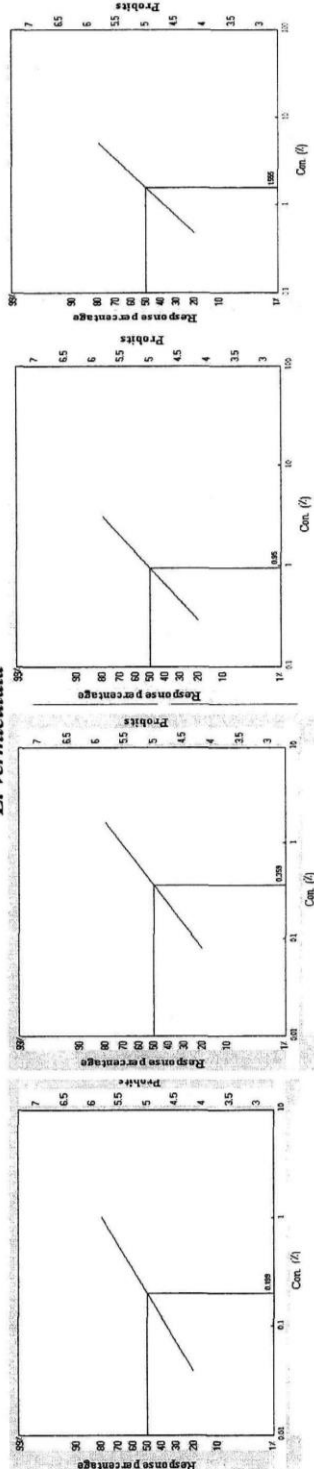
M. obstructa*E. vermiculata*

Table (2): Effect of methomyl on land snails on navel orange under field conditions.

Con.	Fresh Baits					Baits after one day					Baits after 3 days					Baits after 7 days				
	Total collected number			Mortality %		Total collected number			Mortality %		Total collected number			Mortality %		Total collected number			Mortality %	
	3 days before treatment	During treatment	3 days after treatment			3 days before treatment	During treatment	3 days after treatment			3 days before treatment	During treatment	3 days after treatment			3 days before treatment	During treatment	3 days after treatment		
0.5%	265	354	106	45.4		341	292	114	39.0		378	257	285	35.0		381	211	200	17.5	
1%	327	324	113	64.1		332	307	104	46.0		424	266	292	41.4		400	181	315	28.2	
2%	451	370	169	80.0		363	352	230	61.4		526	254	316	52.8		396	187	283	46.0	
3%	423	505	144	90.0		389	442	226	78.0		499	312	277	36.5		515	213	298	47.0	

Table (3): Effect of methomyl on land snails on swallow under field conditions.

Con.	Fresh Baits					Baits after one day					Baits after 3 days					Baits after 7 days				
	Total collected number			Mortality %		Total collected number			Mortality %		Total collected number			Mortality %		Total collected number			Mortality %	
	3 days before treatment	During treatment	3 days after treatment			3 days before treatment	During treatment	3 days after treatment			3 days before treatment	During treatment	3 days after treatment			3 days before treatment	During treatment	3 days after treatment		
0.5%	210	151	83	74.2		198	113	95	67.3		205	92	197	43.5		196	59	208	17.0	
1%	193	161	99	83.0		201	127	117	80.0		188	74	203	55.4		207	68	193	19.1	
2%	187	151	104	93.3		293	157	167	81.0		315	86	273	62.0		210	98	181	21.4	
3%	200	154	106	99.0		215	148	135	86.0		233	99	200	71.0		301	88	217	26.1	

Fig (3): Effect of methomyl on mortality% of land snails on navel orange

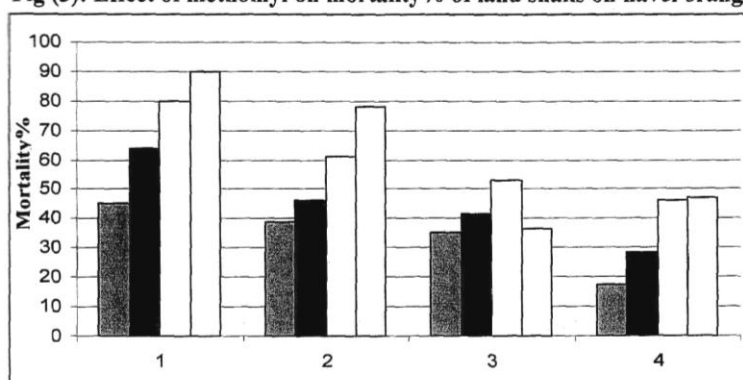
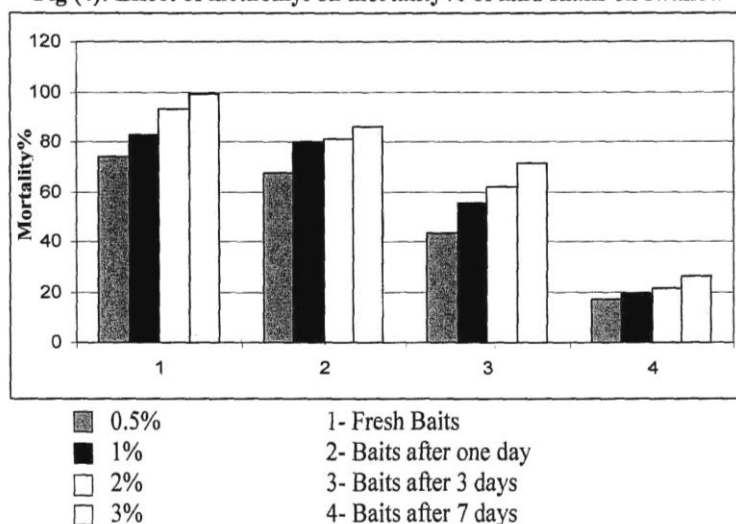


Fig (4): Effect of methomyl on mortality% of land snails on swallow



In similar studies, **Beshr, Sahar (2000)** found that the carbamate compound "Lannate" was the most toxic compound against *T. pisana* snail. While the two carbamate compound "Lannate and Deltanet" were the most toxic for *E. vermiculata* snail. Therefore, the carbamate compound Lannate is the most toxic compound against both tested snails *T.*

pisana and *E. vermiculata*. On the other hand, **Mortada (2002)** assured that metaldehyde gave highest results as compared to carbofuran 10%G, when they were dispersed on soil in pea field to control *Deroceras reticulatum* slugs. Moreover, **Hanafy, et al. (2003)** evaluated two methomyl baits were prepared using affine fraction of wheat bran and wheat flour

in granular against the inspected land snails in some treated orchards of fruit trees. They revealed that, the calculated mean numbers of dead snail species in the orchard of fig trees was high (9.47) for granule bait and (12.07) for fine bait while it was low in the

inspected vine yard (5.40) for granule bait and (3.0) for fine bait. Also, **Daoud (2004)** reported that Neomyl 90% exhibited the highest toxicity against *E. vermiculata* snails followed by Vertimic 1.8%EC as poisonous bait in field cultivated with clover.

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تأثير مبيد اللانيت علي بعض أنواع القواقع الأرضية تحت ظروف المعمل والحقل

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**معهد بحوث وقاية النباتات - مركز البحوث الزراعية بالدقى

الملخص العربى

تمت الدراسات في هذا البحث على مكافحة نوعين من القواقع الأرضية بواسطة استخدام مبيد اللانيت 90% في طعم سام تحت الظروف الحقلية والمعملية . أوضحت الدراسة التي تمت في المعمل أن نسبة الموت بين أفراد قوقع البرسيم *Monacha obstructa* كانت 100% عند تطبيق الميثوميل (لانيت 90%) في صورة طعوم بتركيز 2 ، 3% بعد تحضيره مباشرة وبعد تخزينه بيوم واحد فقط. وبالنسبة لقوقع الحدائق البنى *Eobania vermiculata* كانت نسبة الموت 100% عندما تم استخدام الطعم بتركيز 3% في نفس يوم تحضيره. بينما كانت أقل نسب للموت لكلا من القوقعين عندما تم استخدام الطعم بنسبة 0.5% بعد 7 أيام من تخزينه. من الناحية الأخرى فإنه عند التطبيق الحقلية بلغت نسبة الموت في القواقع المعاملة 90.99% في أشجار البرتقال أبو سرّة ونباتات عصفور الجنة علي التوالي عند استخدام طعم الميثوميل بتركيز 3% في نفس يوم التحضير .