



## Effect of methomyl on certain land snails under field conditions

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### Abstract:

Methomyl compound was applied as virulent baits with different four concentrations (0.5,1.0, 2.0, and 3.0%), and four treatments under each concentration were carried out as fellows (Fresh baits and baits treat after one, three, and seven days). Results illustrated that methomyl baits were effective in the percent of reduction of land snails *Monacha cartusiana* (O. F. Müller) (Gastropoda: Hygromiidae), *Succinea putris* (L.) (Gastropoda: Succineidae) and *Eobania vermiculata* (Müller) (Gastropoda: Helicidae) when it was used after preparing directly on an orchard tree and ornamental plants, Howsoever this effect was increased when baits were stored for one day, but the high effect was recorded when baits stored for three days, especially at high concentration 3%, reduction percentages were (84.7,73.2 and 59.8) and (88.3, 74.8 and 56.3%) for three species of snails in orchard tree and ornamental plants, respectively. Although the effect was decreased when baits had been stored for a week under field conditions. As well as the impression of lanate was increased as the concentration was increased in all treatments. Also, it is clear from the results that *M. cartusiana* was the most sensibility for these baits compounds under field conditions.

### Introduction

The increased pest status has been associated with the cultivation of new crops, intensification of the agricultural production system, and then spread through human trade and the trend of species adapted to these modified environments. Furthermore, in some crops, the significance of gastropods is only now becoming apparent with the decline in the importance of other pest groups, such as insects, for which effective control strategies have been developed (Barker, 2002). Land

snails are considered the most injurious pest in Egypt (Heiba *et al.*, 2002).

Likewise, *Monacha cartusiana* (Müller), Mollusca, Gastropoda, Pulmonata, Stylomatophora, Helicoidae, Monacheae were widely distributed in the Egyptian Governorates. They are found in vegetable and fields, fruit crops, orchards, ornamental and medical plants (Abou Senna *et al.*, 2016 and Rady, 2019). In Egypt, land mollusks have been increased and distributed rapidly in most Governorates. They caused considerable damage,

especially in most areas where they found suitable conditions for survival and dispersion (Kassab and Daoud, 1964 and El-Okda, 1979, 1980, 1981 and 1984).

The present study is planned to investigate the effect of time elapsed between the preparation of methomyl poison baits and their use on certain land snails which are the main pest of orchard trees and ornamental plants under field conditions.

## Materials and methods

### 1. Pesticide Used: Methomyl:

Methomyl (Copter 90% SP) is a Carbamate compound (S-methyl N (Methyl carbamoyloxy) thioacetamide) with a structure formula (C<sub>5</sub>H<sub>10</sub>N<sub>2</sub>O<sub>2</sub>S). Methomyl is purchased from the chemical company of Egypt chem international Agricultural chemical (Egypt, Cairo). The study was done in February 2021.

### 2. Mode of action:

Methomyl compound kills the animals by effectiveness on the nervous system.

### 3. Effect of the pesticide methomyl on land snails under field conditions:

This trial was appliance on orchard trees and ornamental plants with a heavy infestation of snails at Bahada Locality, EL-Qantar ELKhaerei, district, Qalubiya Governorate to study the activity of the carbamate pesticide methomyl. The toxicant was applied as poisonous baits at concentrations of 0.5, 1, 2, and 3%. Baits were prepared by using bran as carrier material with 5% molasses. Under each concentration, baits have been used directly after preparing and after one, three, and seven days of storage. Baits were prepared and stored under laboratory conditions as previously then transferred to the field. With each plant orchard, 10 trees (or

plants) were selected for every treatment.

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 count individuals from different stages (Adult and juveniles) of each species. On the other hand, the dead and alive animals were counted. Ten trees of each test plant were chosen as check control by using un poison baits. This experiment was continued for seven days. Before and after application snails were counted on the trees or plants, on the soil, and on herbs under the trees for three days left without collecting them. The percent reduction in the population density of each snail species was calculated by the formula given by Henderson and Tilton (1955).

% Reduction =  $[1 - (t_2 \times r_1 / t_1 \times r_2)] \times 100$ .

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

## Results and discussion

The effect of methomyl compound which was applied as baits at four concentrations and different four experiment periods to control the land snails *Monacha cartusiana* (O. F. Müller)

(Gastropoda: Hygromiidae), *Succinea putris* (L.) Gastropoda: Succineidae) and *Eobania vermiculata*

(Müller) (Gastropoda: Helicidae) in orchard trees and ornamental plants at Qalubiya Governorate. Data in Tables (1 and 2) demonstrated the effect of methomyl baits on percentages of population reduction of land snails in

orchard trees and ornamental plants. According to average percentages of population reduction of land snails in orchard trees and ornamental plants.

It had been clear that baits of methomyl gave a high reduction percentage of all tested land snails when applied directly after preparing or after one day of application at different four concentrations 0.5, 1, 2, and 3%. Average percentages of population reduction were 50.8, 57.9, 64.5, and 74.9%, 39.2, 54, 55.2, and 57.4%, and 25.4, 39.3, 43.1, and 50.5% for *M. cartusiana*, *S. putris*, and *E. vermiculata*, respectively in orchard tree.

On the other hand, these percentages after one day of storing were 56.0, 64.1, 70.3, and 80.2% and 43.5, 57.3, 63.2, 65.8 and 63% and 34.1, 44.9, 50.4, and 55.3% respectively. However, the efficiency of this compound increased when baits had been stored for three days after preparing than another experimental period. The reduction percentages were (62.5, 67.1, 75.8 and 84.7%, 46.6, 63.2 and 73.2%, and 35.1, 45.2, 54 and 59.8 % for population reduction in orchard trees for all different land snails, respectively.

Also, the population reduction percentages of the same different tested land snails by methomyl baits after Seven days of preparing decreased with the four tested concentrations as the period was increased to seven days after preparing under field conditions. Means of the population reduction percentages were 39, 45.6, 48.2 and 49.2%, 23.6, 31.7, 35.7 and 38.8%, and 14.4, 21.3, 28.0 and 30.2% for *M. cartusiana*, *S. putris*, and *E. vermiculata*, respectively in the orchard trees.

While the results in Table (2) showed the effect of methomyl baits on percentages of population reduction of land

snails ornamental plants. According to average percentages of population reduction of land snails in ornamental plants. It had been clear that baits of methomyl gave a high reduction percentage of all tested land snails when applied directly after preparing or after one day of application at different four concentrations of 0.5, 1, 2, and 3%. Average percentages of population reduction were 48.7, 57.4, 68.9 and 76.9, 41.6, 48, 56.9 and 62.3, 30.8, 35.3, 41.6, and 52.4 % for *M. cartusiana*, *S. putris*, and *E. vermiculata*, respectively.

The efficiency of this compound increased when baits had been stored for three days after preparing than another experimental period. The reduction percentages were (62.6, 72.4, 79.3 and 88.3, 55.4, 64.8, 66.2%, and 74.8%, and 42.5, 44.5, 51.9, and 56.3 % for population reduction in the ornamental plants for all different land snails, respectively. Also, the population reduction percentages of the same different tested land snails by methomyl baits after a week of preparing decreased with the four tested concentrations as the period was increased to seven days after preparing under field conditions. Means of the population reduction percentages were 33.3, 40.7, 43.8 and 46.7%, 23.4, 27.3, 34.7 and 35.2%, and 12.4, 21.8, 25 and 27.5% for *M. cartusiana*, *S. putris*, and *E. vermiculata*, respectively, in the ornamental plants.

Generally, from the limited data in the different mentioned Tables (1 and 2), it was clear that there was a contradiction of act upon by methomyl between the different land snails under any executed treatment of baits with any concentration. Results showed that the individuals of land snails *M. cartusiana* were the highest perceived by this compound followed by *S.*

*putris*, while *E.vermiculata* snail was more resistant to methomyl than other species under field conditions. And the juvenile stage was the most sensibility

for methomyl than the adult stage for all tested land snails under all different experimental periods with any concentration of poisonous baits.

**Table (1): Effect of time elapsed between preparation of poison baits and their offering to snails on their efficacy against certain land snails on an orchard tree.**

		% Reduction								
		<i>Monacha cartusiana</i>			<i>Succinea putris</i>			<i>Eobania vermiculata</i>		
		Juvenile	Adult	General Mean	Juvenile	Adult	General Mean	Juvenile	Adult	General mean
Contractions	Treatment									
%										
<b>0.5</b>	<b>Directly</b>	55.6	45.9	50.8	40.1	38.2	39.2	28.9	21.8	25.4
	<b>One day</b>	61.2	50.8	56	46	41	43.5	35.7	32.5	34.1
	<b>Three days</b>	64.1	60.9	62.5	53.1	40.1	46.6	39.8	30.3	35.1
	<b>Seven days</b>	41.9	36.1	39	29.3	17.9	23.6	16.8	11.9	14.4
<b>1.0</b>	<b>Directly</b>	65.2	50.6	57.9	60.2	47.7	54	43.9	34.7	39.3
	<b>One day</b>	69.9	58.3	64.1	63.2	51.4	57.3	50.3	39.5	44.9
	<b>Three days</b>	71.2	63	67.1	68.3	58	63.2	50	40.4	45.2
	<b>Seven days</b>	49.3	41.9	45.6	36.1	27.3	31.7	21.2	21.4	21.3
<b>2.0</b>	<b>Directly</b>	70.8	58.1	64.5	61.9	48.4	55.2	45.9	40,3	43.1
	<b>One day</b>	76.9	63.7	70.3	67.8	58.6	63.2	51.4	49.3	50.4
	<b>Three days</b>	80.4	71.2	75.8	70.4	61.1	65.8	62.1	45.8	54
	<b>Seven days</b>	52.6	43.7	48.2	39.5	31.8	35.7	32.1	23.9	28
<b>3.0</b>	<b>Directly</b>	77.6	72.1	74.9	64.4	50.4	57.4	52	48.9	50.5
	<b>One day</b>	84	76.4	80.2	71.3	54.6	63	59.2	51.4	55.3
	<b>Three days</b>	87.2	82.2	84.7	77.2	69.2	73.2	66.9	52.7	59.8
	<b>Seven days</b>	54.5	43.9	49.2	41.5	36.1	38.8	32.1	28.3	30.2

**Table (2): Effect of time elapsed between preparation of poison baits and their offering to snails on their efficacy against certain land snails on ornamental plants.**

		% Reduction								
		<i>Monacha cartusiana</i>			<i>Succinea putris</i>			<i>Eobania vermiculata</i>		
		Juvenile	adult	General mean	Juvenile	adult	General mean	Juvenile	adult	General mean
Concentration	Treatment									
<b>0.5</b>	<b>Directly</b>	53.1	44.3	48.7	44.1	39.0	41.6	32.3	29.3	30.8
	<b>One day</b>	66.3	49.5	57.9	53.1	42.1	47.6	40.7	33.3	37.0
	<b>Three days</b>	69.8	55.4	62.6	57	53.8	55.4	44.2	40.8	42.5
	<b>Seven days</b>	40.2	26.4	33.3	25.1	21.7	23.4	14.0	10.8	12.4
<b>1.0</b>	<b>Directly</b>	63.3	51.5	57.4	52.0	44	48.0	37.3	33.3	35.3
	<b>One day</b>	79	63	71	69	55.8	62.4	44	36.6	40.3
	<b>Three days</b>	82.5	62.3	72.4	73.1	56.5	64.8	45.6	43.4	44.5
	<b>Seven days</b>	45.8	35.5	40.7	31.3	23.2	27.3	25,1	18.5	21.8
<b>2%</b>	<b>Directly</b>	75.7	62.0	68.9	60.8	53.0	56.9	44.7	38.4	41.6
	<b>One day</b>	78.8	72.4	75.6	70.4	56.2	63.3	49.6	42.2	45.9
	<b>Three days</b>	82.4	76.1	79.3	72	60.4	66.2	59.6	44.2	51.9
	<b>Seven days</b>	50.1	37.5	43.8	38.9	30.4	34.7	29.4	20.6	25
<b>3%</b>	<b>Directly</b>	81.5	72.2	76.9	64.2	60.4	62.3	58,5	46.3	52.4
	<b>One day</b>	86.3	82.4	84.4	73.3	62.2	67.8	64.1	50.6	57.4
	<b>Three days</b>	93.2	83.4	88.3	76.5	73.1	74.8	60.1	52.5	56.3
	<b>Seven days</b>	52.3	41.1	46.7	40.2	30.2	35.2	31.5	23.5	27.5

Discussing the foregoing results, it seems clear that methomyl was very effective on land snails under field conditions when it was applied as toxicant baits. The highest effect of this compound was found on *M. cartusiana* Followed by *S. putris* and *E. vermiculata* snails. As well as data emphasized that, as the concentration of methomyl increased, percent reduction was obviously increased for all tested snails under all experimental periods.

These results agree with El-Okda (1984) tested barn baits containing 2% methomyl after preparing under plant growth of berseem, wheat, and vegetables against the land snails. He showed that baits caused 12-35% mortality percentage of the useful glass shell snail, *Oxychilus* sp. As well as, Radwan and El-Wakil (1991) reported that methomyl compound was more effective on *E. vermiculata* snail than carbosulfan and thiodicarb under laboratory conditions.

Youssef (2006) found that methomyl compound gave the highest percentage of mortality for *M. abstracta*, *E. ermiculata*, and *Theba pisana* (Müller) (Gastropoda: Helicidae) after 72 hrs. of treatment and that because of the good fermentation of components of the baits. And after seven days the effect of the baits decreases due to the breakdown of their components.

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