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EFFICACY OF CERTAIN PESTICIDES AGAINST *MONACHA CARTUSIANA* (MULLER) SNAILS UNDER LABORATORY AND FIELD CONDITION IN SHARKIA GOVERNORATE

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ABSTRACT: Efficacy of methomyl (90%WP), methomyl (20% SL), dimethoate (40%EC), monitor (60%EC) and the mixture of monitor + methomyl (90%WP) against adults of *Monacha cartusiana* snail was studied as poisonous baits under laboratory and field conditions. Under laboratory conditions the organophosphorus compound (dimethoate 40 % EC) was the most toxic compound than the other two compounds. The highest concentration (5%) of dimethoate and methomyl caused 100% and 95% mortality after 21 days of treatment, respectively. On the other hand, the concentrations (1.25 and 2.5%) of monitor failed to cause any mortality to snails, while the highest concentration (5%) of the same compound induced 50 % mortality only after the same period. The mixture of monitor and methomyl (90 % WP) at the concentration of 2.5 % from each caused only 80 % mortality after 21 days of treatment under laboratory conditions recording an antagonistic effect. The highest concentration of methomyl (20 % SL) recorded 45 % mortality after 21 days of treatment. The reduction percentage of *Monacha cartusiana* (Muller) population under field condition were 52.37, 32.54, 37.11, 10.99 and 33.19 % for methomyl (90 % WP), methomyl (20 % SL), dimethoate (40 % EC), monitor (60 % EC) and methomyl + monitor after 21 days of

treatment, respectively. Methomyl (90 % WP) was the most effective compound after the first 3 days of treatment than the other compounds under field conditions. It could be mentioned that methomyl 90 % WP is one of the promising compounds for controlling *M. cartusiana* under field conditions.

Key words: methomyl, dimethoate, monitor, *M. cartusiana,* snails.

INTRODUCTION

The land snails are considered one group of the most serious pests to agricultural crops. In addition, they are of importance in medical and veterinary practice, since they serve as intermediate hosts for certain parasitic worms of man and his domestic animals (Godan, 1983).

These pests have chewing mouth Parts so they cause very noticeable holes in leaves of the plant on which they feed and in some cases they bore into other parts of the attached plant (Michellbesher and Essing, 1950). Getzin (1965) and Crowell (1967) mentioned that poisonous baits are a suitable method for control of land mollusca. The land snail species *Monacha carrtsiana* (Muller), *Eobania vermiculata* (Muller), *Theba psiana* (Muller), *Helicella vestalis* (Muller) and *Cochlicella acuta* (Muller) (Helicidae; Pulmonata) are very serious pests to fruit orchards and different crops causing economic damage to several host plants in Egypt (Kassab and Daoud, 1964; Bishara *et al.*, 1968; El-Okda, 1981). There are many attempts were conducted to control these pests using pesticides and chemical fertilizers (El-Okda, 1980; Radwan and El-Wakil, 1991; Ghamry *et .al*, 1993 and 1994.

The aim of the present work is to evaluate the efficacy of some known pesticides against *Monacha cartusiana* (Muller) snails under laboratory and field conditions.

MATERIALS AND METHODS

1. Tested snails

Adult snails of *Monacha cartusiana* (Muller) were collected from some fields cultivated with Egyptian clover (*Trifolium alexandrium*) at Abou Kabeer region Sharkia Governorate. The

snails were transferred in plastic bags to the laboratory and maintained into plastic boxes (half liter capacity) supplied with fresh leaves of lettuce for acclimatization under 20 ± 2 °C and RH 80 ± 3% (El-Okda 1981).

2. Chemicals used

Three known toxicants belonging to two main groups of pesticides were used in the present work.

2-1. Carbamate compounds

2-1-1. Methomyl (S- methyl – N – [methyl carbamoyl) oxy] thioacetimidate) is one of the most known insecticides. Two formulations of this insecticide were used under two trade names:

a) Lannate 90 % wp supplied by Dow chemical company.
b) Newmeal 20 % SL supplied by KZ Chemical company – Egypt.

2-2. Organophosphorus compounds

2-2-1. Dimethoate:

O, O- Dimethy – S – (N-methyl carbamoyl methyl) phosphorodithioate] (insecticide and accaricide).

The commercial compounds was of the trade name: Cygon 40 % EC. Supplied by KZ chemical company – Egypt.

2-2-2. Monitor: [O, S- dimethyl phosphoramidothioate] (insecticide and accaricide).

The formulated compound was of the trade name Tamaron (60 % EC. Or Agromon supplied by Bayer AG Company.

The samples used in the present work were obtained from Central Agricultural pesticides laboratory, Egypt.

3. Laboratory Experiments

Poisonous baits of the tested compounds were prepared at the concentrations of 5, 2.5 and 1.25 %. The bait base used consists of 5 % sugar- cane syrup and 90 – 93.75 % wheat bran. Quantities of 100 gm of the toxic baits were placed separately in plastic boxes (half liter capacity. Ten adult snails were introduced into each box, the boxes were covered by muslin cloth and secured with rubber bands to prevent snails escaping. Four replicates were prepared for each concentration as well as for the check. The mortality

percentages were recorded daily along the experimental period (21 days) according to El-Okda (1980).

4. Field experiment

The field experiment was carried out in area of about 15 feddans cultivated with Egyptian clover (*Trifolium alexandrium*) in Abou-Kabeer province, Sharkia Governorate. The area of study was divided into plats of about 100 m^2 each and appropriate distance were left between each other as a belt. The field was irrigated one day before treatment. The tested toxicants were applied as poisonous baits at concentration of 5 % (5 parts of toxicant + 5 parts of sugar-cane syrup + 90 parts of wheat bran).

Control treatment was designed by the same manner without application the pesticides. Each treatment was replicated 4 times. Baits were laid on plastic sheets 30 X 30 cm (each holds 100 gm) and distributed in the experimental plots at known distances. The percentages reduction of snails population was calculated for each pesticide at tested concentration were calculated for each pesticide according to the formula of Henderson and Tillton (1955) as follows:

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

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 of treatment in treated plots.

The population density of *M. cartusiana* was determined in the experimental plots pre and post treatment using the quadrate sample size 50 X 50 cm according to Staikou and Lazaridou (1990). The reduction percentage were calculated after 1, 3, 7, 15 and 21 days post treatment.

The data obtained were subjected to statistical analysis and treatment means were compared by LSD test using MSTAC-C Computer program V.2.10 (1988).

RESULTS AND DISCUSSION

Data presented in Table (1) show that the mortality percentages of *M. cartusiana* (Muller)adults increased as the concentration and the period of exposure to the

chemicals increased. The organophosphorus compound dimethoate was the most toxic than methomyl and monitor, while monitor was the least toxic compound whereas it failed to cause any mortality to snails at the low concentration. The other two concentrations were also very weak and did not cause a considerable mortality until 21 days post-treatment. The highest concentration 5 % gave 50 % mortality only at the end of treatment period.

Methomyl came in the second position of efficiency recording 45, 90 and 95 % mortality at the end of the experimental period (21 days post-treatment) for the concentrations of 1.25, 2.5 and 5 %, respectively. It was noticed generally that percentages of mortality were increased at any post-treatment period as the concentration of any of the tested compound increased.

The mixture of monitor and Methomyl at the concentrations of 2.5 % of each had an antagonistic effect against the adults of *M. cartusiana* (Muller). Methomyl at the concentration of 2.5 % caused 90 % mortality after 21 days of treatment and Monitor induced 15 % only while their mixture caused 80 % mortality after the same period of treatment.

However, according to the mean values of mortality percentages of each compound and its concentrations at the end of treatment period, the compounds could be arranged according to their efficiency as follows: Dimethoate, Methomyl 90 % WP, Methomyl 20 %, Mixture of Monitor and methomyl and finally Monitor.

Concerning the field trials, data in Table (2) and Fig (1) indicate that after one of treatment methomyl 90 % WP, was superior compound causing the highest percentage of snail population reduction (85.24 %) followed descending by dimethoate (57.59 %), the mixture of methomyl and monitor, monitor and methomyl 20 % SL. These results of the field trials seem to be slightly conflicting with those obtained under laboratory conditions. After three days post-treatment, methomyl remained in the first position while the other compounds were changed their positions and methomyl 20 % improved its position to became the third instead of the last one. At

Table (1): Efficacy of the tested compounds as poisonous baits against the adults of *Monacha cartusiana* (Muller) under laboratory conditions.

Pesticides	Concent. %	Mortality percentages after indicated days					Mean	Grand mean
		1	3	7	15	21		
Methomyl 90 % WP	1.25	12.5	30	37.5	37.5	45	32.2	63.83b
	2.5	52.5	70	75	87.5	90	75	
	5	67.5	77.5	87.5	92.5	95	84	
Methomyl 20 % SL	1.25	2.5	7.5	12.5	15	17.5	11	15.0d
	2.5	5	10	15	15	25	14	
	5	7.5	15	40	42.5	45	30	
Dimethoate 40 % EC	1.25	47.5	67.5	80	95	95	77	82.0a
	2.5	57.5	62.5	77.5	97.5	100	79.5	
	5	70	85	92.5	100	100	89.5	
Monitor 60% EC	1.25	0	0.0	0.0	0.0	0.0	0	6.67e
	2.5	0.0	0.0	0.0	0	15	3	
	5	2.5	0.0	0.0	27.5	50	16	
Monitor + methomyl 90 %	2.5 + 2.5	30	35	47.5	72.5	80	53	17.66c

Table (2): Efficacy of the tested chemicals at the concentration of 5 % (as poisonous baits) against the land snails *Monacha cartusiana* (Muller) under field conditions.

Pesticides	Reduction percentage after indecated days post-treatment										Total	Mean
	1 day		3 days		7 days		15 days		21 days			
	Mean no. of snails	Red. %	Mean no. of snails	Red. %	Mean no. of snails	Red. %	Mean no. of snails	Red. %	Mean no. of snails	Red. %		
Methomyl 90 % WP	30.26	85.24^{a}	12.75	86.98^{a}	24.25	71.80^{a}	136.75	13.44^{c}	157.75	4.39^{a}	261.85	52.37^{a}
Methomyl 20 % SL	38.5	5.84^{e}	14.6	63.30^{c}	23.0	35.84^{c}	24.75	39.25^{a}	143.75	18.46^{b}	162.72	32.54^{a}
Dimethoate 40 % EC	34.75	57.09^{b}	12.50	67.10^{b}	14.75	36.08^{c}	29.5	20.27^{b}	24.6	5.00^{e}	185.54	37.11a
Monitor 60 % EC	21	25.0^{c}	38.0	9.52^{d}	15.0	11.32^{b}	20.0	9.09^{d}	17.5	0.00^{d}	54.93	10.99^{b}
Methomyl 90 % + Monitor	9.75	59.37^{c}	44.0	48.23^{d}	15.25	49.16^{b}	34.5	9.21^{d}	32.25	0.00^{d}	165.97	33.19^{a}

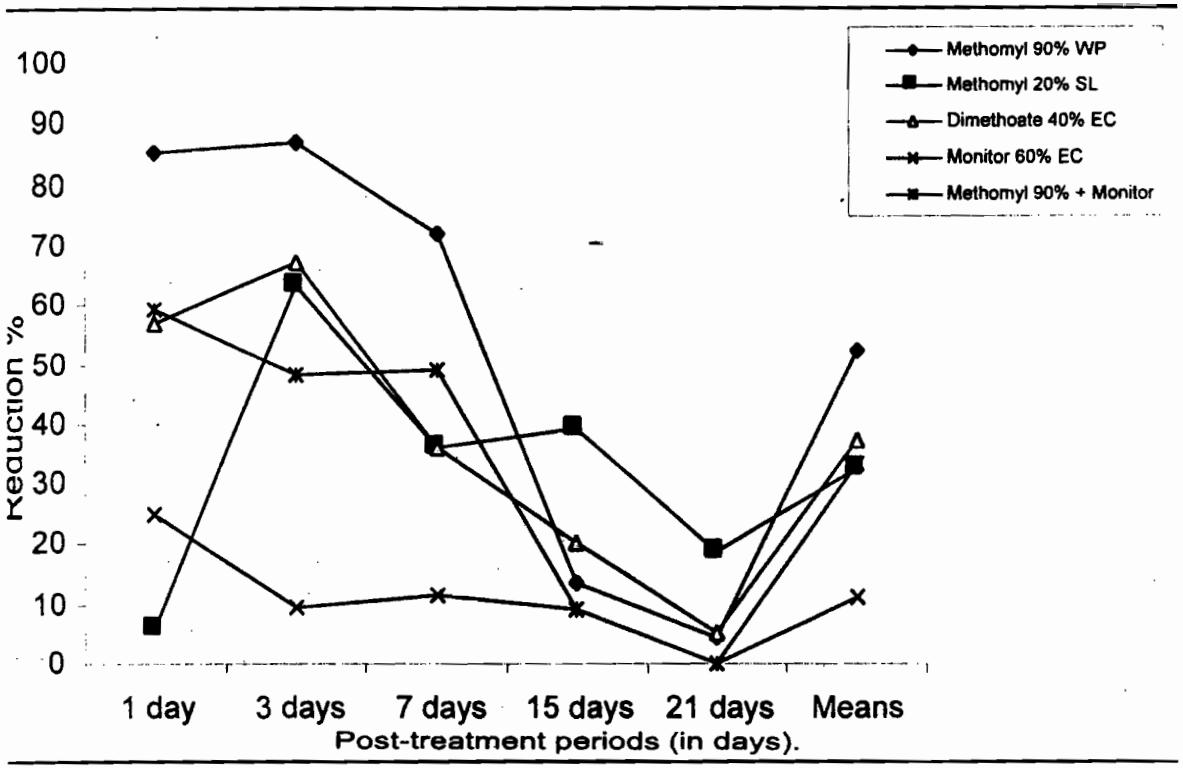

Fig. (1) Efficacy of the tested chemicals at the concentration of 5% (as poisonous baits) against the land snail *Monacha cartusiana* (Muller) under field conditions.

the 7th day after treatment the reduction percentages of snail populations were markedly reduced or remained nearly at the same level.

However, the efficiency of the tested compounds under field conditions could be arranged descending as follows: 52.37, 32.54, 37.11, 10.99 and 33.19.

In conclusion poisonous baits of methomyl 90 % WP could be recommended for the control of *M. cartusiana* high infestation under field conditions.

These results confirmed the findings of Hegab, (1998) who found that methomyl (lannate 90 % WP) when tested against the brown garden snail *Eobania vermiculata* in a citrus orchard as poisonous baits 1% induced the highest population reduction percentage, while profenofos compound at the same concentration gave the lowest reduction percentage. Aioub *et al.* (2000) evaluated the toxicity of malathion, profenophos, pirimiphos- methyl, methomyl, oxamyl, tralkoxydim and isoproturon against adult snails of *Eobania vermiculata* and *Monacha cartusiana* under laboratory conditions. The authors found that carbamate compounds appeared to be the most toxic while, organophosphorus and herbicides were the least toxicants. The two tested pesticides which exhibited the highest efficacy (methomyl and oxamyl) were further tested under field conditions against the two land snail species. Methomyl induced the highest effect as it caused the highest population reduction than oxamyl.

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تأثير بعض المبيدات ضد قوقع موناكا كارتوزيانا تحت الظروف المعملية والحقلية بمحافظة الشرقية

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أجريت هذه الدراسة لإختبار تأثير بعض المبيدات ضد قوقع موناكا كارتوزيانا *Monacha cartusiana* (Muller) على محصول البرسيم المصرى تحت الظروف الحقلية والمعملية بمحافظة الشرقية باستخدام الطعوم السامة بتركيزات مختلفة وهى ١,٢٥ ٪، ٢,٥٪، ٥٪ فى المعمل ثم باستخدام تركيز٥٪ فى الحقل والمركبات المستخدمة هى مركب الميثومايل ٩٠ % بودر، مركب الميثومايل ٢٠ % سائل ومركب الداى ميثويت ٤٠ % سائل ومركب المونيتور وخليط من مركب الميثومايل ٩٠ % + مركب المونيتور وكانت النتائج كالأتى:

١- مركب الدايمثويت ٤٠ % كان أكثر المركبات تأثيراً على القوقع من المركبات الأخرى وعلى الجانب الأخر التركيزات ١,٢٥ ، ٢,٥ % من مركب المونيتور لم تسبب أ ى موت للأفراد.

٢- المخلوط من مركب الميثومايل و مركب المونيتور بنسبة ٢,٥ % لكل منهما أعطى نسبة موت ٨٠ % بعد ٢١ يوم من المعاملة.

٣- تحت الظروف الحقلية أوضحت مركبات الميثومايل ٩٠ % بودر والميثومايل ٢٠ % سائل والداى ميثويت ٤٠ %، المونيتور ٦٠ % سائل والمخلوط المكون من الميثومايل ٩٠ % + المونيتور نسبة خفض للتعداد ٥٢,٣٧، ٣٢,٥٤، ٣٧,١١، ١٠,٩٩و ٣٣,١٩ % على التوالى لكل منهما بعد ٢١ يوم من المعاملة وينصح بإستخدام مركب الميثومايل ٩٠ % فى مكافحة القواقع تحت الظروف الحقلية.