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Evaluating the Efficiency of Some Different Chemical Compounds Against *Monacha Cartusiana* under Field Conditions at Sharkia Governorate.

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ABSTRACT

The toxicity effect of five pesticides belonging to different chemical groups as metaldehyde 5% (Acetaldehyde), methomyl 20% SL, methomyl 24% SL, methiocarb 2% RB(G) (Carbamate) and *Bacillus thuringiensis* (Biocide) 6.5%WP were tested in the field using two different methods as baits and spray technique at a recommended field rates against land snail *Monacha cartusiana (Muller)* in two fields cultivated with Egyptian clover and lettuce intercropping on cabbage at Kafr-Attallah, Zagazig district Sharkia Governorate during the activity period in April 2014.Results revealed that the poisons baits of metaldehyde, methomyl 20%, methomyl 24% and methiocarb showed the greatest effectiveness in reducing snails numbers than *B.thuringiensis* along the experimental period (21day).The molluscicidal efficacy of the five tested compounds according to reduction percentages for *M. cartusiana* can be arranged in descending order as follows: metaldehyde, methomyl 20%, methomyl 24% methiocarb and *B.thuringiensis*. On the other hand, the tested compounds (methomyl 20%, methomyl 24% and *B. thuringiensis*) when used as spray technique, methomyl 24% proved to be slightly more effective compound than methomyl 20%, while *B. thuringiensis* was found to be the lowest toxic one, in this respect against *M. cartusiana*. This study showed that all tested compounds were more active when used as baits than spray method except *B. thuringiensis*.

INTRODUCTION

Land snails become recently an economic serious pests in Egypt causing serious reduction in yield production of infested crops and fruits (Kassab and Daoud 1964, Nakhla and Tadros 1995). Among these pests, the glossy clover snails, *M. cartusiana* (Muller) which is the most abundance snail in all localities at Sharkia Governorate. It causes great direct damage to all plant parts by chewing soft vegetative growth, flower, roots and tubers or indirect damage by left unpleasant slimy tracks on the injured parts making humans and farm animals refuse eating on these plants (El-Okda,1980 & El-Massry, 1997).

Several attempts have been paid to control its dispersal by using synthetic pesticides. (Ismail *et al.* 2005, Hegab *et al.* 2006, Radwan *et al*., 2008 , El-Shahaat *et al.* 2009 and Sallam *et al.* 2016). Control with chemical substances still useful method but it preferred by using it as edible baits to avoid the environmental pollution.

Therefore, the objective of the present investigation is to evaluate the efficacy of certain five pesticides from different chemical groups by using, baiting and spray techniques against the land snail *M. cartusiana* under field conditions.

MATERIALS AND METHODS

1-Tested compounds:-

Five pesticides belonging to two different chemical groups and one biocide commercially used on a wide scale to control different types of pests in agricultural fields were used in the experiment. Chemical groups of pesticides, trade name, common name, active ingredient and their recommended application rates per Feddan were as follow:

a) Acetaldehyde group

Trade Name : Gastrotox

Common name : Metaldehyde (5%G) was used with the recommended application rates of 2Kg /Feddan.

b) Carbamate group

1-Trade Name : Newmeal

c) Biocide group

Trade Name : Bio-Gard

Common name : *B.thuringiensis* 6.5%WP was used with the recommended application rates of 1 kg / feddan.

All these formulations were supplied by Ministry of Agricultural and Reclimation, Agricultural Research Center, Egypt.

2- Field experiment:-

The efficacy of the above mentioned chemicals were tested by using two different techniques (poisons bait and spray technique) in a heavily infested field with *M. cartusiana* snails, at Kafr-Attallah, locality, Zagazig district Sharkia Governorate during 2014.. The infested area is about two Feddan. The first Feddan cultivated with Egyptian clover (*Trifolium alexandrinum*) and other one cultivated with lettuce intercropping on cabbage. This area was divided into plots of approximately equal 50 m^2 for each, with an area of 50 m^2 lifted between each other, in addition to the control. The area of each plot was divided into 4 replicates. All toxicant applications were done in early morning of the next day after irrigation.

(a)- Bait test:

Poisons baits were prepared as follows: the amount of tested chemicals + appropriate weight from bran + 5% sugar cane syrup (as attractant substance) to give 100 parts of baits. About 100 gm of the bait were offered on plastic sheets 30x30 cm and distributed in the experimental plots at a known distances. Control treatment was prepared by the same manner free from any pesticides. The experiment was repeated 3 times for each treatment. Alive snails were counted in cheek and treatment areas before application and after 1, 3, 7, 14 and 21 days post-treatment.

Population reduction percentages were calculated according to Henderson and Tillton equation (1955) as follows:

$$\% \text{ reduction} = \left(1 - \frac{t_2 \times r_1}{t_1 \times r_2}\right) \times 100$$

t_1 = a number of alive snails before treatment in treated plots.

t_2 = a number of alive snails after treatment in treated plots.

r_1 = a number of alive snails before treatment in untreated plots.

r_2 = a number of alive snails after treatment in untreated plots.

(b)- Spray test:

The three compounds (Methomyl 24% SL and 20% SL and *B. thuringiensis* 6.5% WP) were tested at a recommended rate per feddan. Methomyle 24% and 20% were applied at concentration of 1L / feddan. *B. thuringiensis* at a concentration of 1 kg / feddan, at area cultivated with lettuce intercropping on cabbage, the area was divided into plots as mentioned before. Four replicates for each treatment were used. The untreated areas considered as a control. The pesticides sprayed with a hydrolic motor spay (Back motor) in early morning after one day from irrigation. Population reduction percentages were calculated according to the above mentioned formula of Henderson and Tillton equation (1955).

RESULTS AND DISCUSSION

To evaluate reduction percentages of *M. cartusiana* snail, the predominant land snail at Sharkia Governorate, two fields trials were conducted in vegetables and field crops (lettuce intercropping cabbage and Egyptian clover) at Kafr-attalah by two methods, poisonous baits and spray technique at a recommended field rates to select the best effective method in controlling *M. cartusiana*.

Five chemicals, metaldehyde, methomyl (24,20% SL), methiocarb and *B.thuringiensis* were applied as poisons baits in at about one Feddan cultivated with Egyptian clover crop were shown in Table (1). Data indicated that reduction percentages were increased by increasing the time post treatment. After the first three days post-treament (initial effect), metaldehyde, methomyl 20%, methomyl 24% as well as methiocarb showed high initial reduction in *M. cartusiana* numbers with an average percentages of 78.14,75.09,71.65 and 65.15 % respectively. While, *B. thurigenses* had very low mean value of initial reduction percentage 07.14%. It is obviously that metaldehyde was the effective compound followed by methomyl 20%, methomyl 24% and methiocarb 2%, while *B. thuringienses* was the lowest one. Regarding residual effect, it is noticed that the percent reduction increased by the end of the experiment (21 days) until reaching to its maximum values, to give 95.66, 95.25, 94.50, 91.40% reduction for metaldehyde, methomyl 20%, methomyl 24% and methiocarb, respectively except *B. thuringienses* (give only12.98% reduction). It is appear from the obtained data that metaldehyde, methomyl 20 & 24% and methiocarb have been nearly equally in its high effective in reducing numbers of *M. cartusiana* when used as poisonous baits by the end of the experiment , except *B. thuringiensis*.

Table 1. Initial and residual effect of five tested pesticides baits against *M. cartusiana* infested Egyptian clover field at Sharkia Governorate during April 2014.

Tested pesticides	Application rate/ Feddan	Initial effect (%Reduction after three days)			Residual effect (%Reduction during the rest period 21days)		
		Pre-t	Post-t	G.mean	Pre-t	Post-t	G.mean
Metaldehyde 5%	2Kg / Feddan	67.50	14.75	78.14	67.50	03.00	95.66
Methomyl 20%	1L / Feddan	63.25	15.75	75.09	63.25	03.00	95.25
Methomyl 24%	1L / Feddan	63.75	18.00	71.76	63.75	03.50	94.50
Methiocarb2%	4Kg / Feddan	55.25	19.25	65.15	55.25	04.75	91.40
B. thuringiensis	1Kg / Feddan	38.50	35.75	07.14	38.50	33.50	12.98

Data in Table (2), illustrated the efficacy of three compound, namely methomyl 20%, methomyl 24% and *B.thuringiensis* by using poisonous baits and spray technique after 3 days, at a recommended field rates against *M. cartusiana* infesting lettuce intercropping on cabbage.

Table 2. efficacy of three tested pesticides as baits &spray against *M. cartusiana* infested lettuce intercropping on cabbage at Sharkia Governorate during April 2014.

Tested pesticides	Application rate/ Feddan	Application	(%Reduction after three days)		
			Pre-t	Post-t	G. mean
Methomyl 24%	1L / Feddan		40.50	6.25	84.56
Methomyl 20%	1L / Feddan	baits	39.75	7.00	82.38
B.thuringiensis	1Kg / Feddan		35.50	33.00	7.04
Methomyl 24%	1L / Feddan		40.50	17.50	56.71
Methomyl 20%	1L / Feddan	spray	39.75	19.50	50.94
B.thuringiensis	1Kg / Feddan		35.50	33.50	05.63
Control			34.75	34.75	0.0

Results revealed that methomyl 24% showed relatively higher efficacy in reduction percentage (84.56) than did methomyl 20% (82.38%) after 3 days post-treatment, for the application poisonous bait. On the other hand, when the same previous chemical compound used as spray technique caused a moderately effect in populations reduction of *M. cartusiana* with an average of 56.71 and 50.94%, respectively. while *B.thuringiensis* failed to induced satisfactory reduction in *M. cartusiana* numbers along the same time of experiments (after 3 days), whereas it gave the least mean values (07.14 & 05.63) for both the application (bait and spray techniques) respectively.

From the present field trials it could be reported that percent reduction markedly increased when metaldehyde, methomyl 24 & 20% and methiocarb applied as poisonous baits as compared when were used as spray form.

Generally, it is worthy to mention that the toxicity of the tested chemicals by using poisonous baits were more effectiveness as than spray technique.

Discussing the foregoing results, it is evident from the obtained results that metaldehyde, methomyl 20 & 24% and methiocarb induced the highest reduced effect when it used as poisonous baits followed by methomyl 24 % then methomyl 20% with the application of spray technique, However, *B. thuringiensis* was the least effective one when used by both technique (baits & spray) along the experimental period. Such finding is in accordance with those obtained by Ghamry *et al*. (1993) tested metaldehyde, methiocarb, thiocarb, cyanophos and monocrotophos by using baits against two land snails, *M. cartusiana* and *E. vermiculata*. They found that mortality after 14 days were 93, 87,70, 45 and 36% for *M. cartusiana* and 85, 82, 63, 39 and 28% for *E. vermiculata*, respectively. Miller *et al* (1988); El-Okda *et al*. (1989); Ismail (1997) and Aioub *et al.(* 2000), reported that carbamate gave a high toxic effect against *M. cartusiana*, *Eobania vermiculata* and *Thepa pisana* land snails under laboratory and field conditions. Daoud (2004) reported that newmeal exhibited a highest toxic effect against *M. cartusiana* snails followed by vertimec, marshal dursban, while curacron was the least one. Also similar toxic effects were found by Ismail *et al* (2005) who reported that methomyl and metaldehyde, gave the highest reduction percentage for *M. cartusiana* than the other tested compounds under field conditions. Abdel- Halim *et al.* (2006) who reported that Methomyl was the highest efficacy followed by lufenuron and indoxacarb while *B. thuringiensis* subsp. *kurstaki* (Bt), was the least effective compound against, *M. cartusiana* after 28 days of treatment under field conditions. Gabr *et al*. 2006) reported that Methomyl was the most effective toxicant against adults of *Monacha obstructa* and *Eobania vermiculata*. Also Hegab *et al*. (2006) tested metaldehyde against the land snail *M .cartusiana* under laboratory and field conditions. They revealed that the highest concentration of metaldehyde gave 100% mortality after7 days. Abd El-Aal (2007) evaluated the molluscicidal activity of methomyl and Protecto under field conditions. He proved that methomyl gave the highest toxic effect against, *M. cartusiana* and *E. vermiculata* snails while Protecto was the least effective compound during 15 days after treatment. Abd El-Aal and Hamed (2010**)** found that metaldehyde, profenofos were the most toxic to *E. vermiculata* and *M. cartusiana* with toxicity index of 88.6, 97.3 and 100.0, 100.0 ,respectively.

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تقييم كفاءه بعض المركبات الكيميائيه المختلفه على قوقع البرسيم الزجاجى (المونـاكا كارتوسيانا) تحت الظروف الحقليه بمحافظة الشرقية

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تم إجراء هذه الدراسة بغرض تقييم سميه بعض المركبات من ثلاث مجموعات مختلفه وهى الميتالدهيد(مبيد رخوى) والميثوميل٢٠% والميثوميل٢٤% والميثوكارب ٢%(مبيد كرباماتى حشرى) البيوجارد (مبيد حيوى) وذلك بتركيز الجرعه الحقليه الموصى بها لكل مركب ضد قوقع البرسيم الزجاجى (المونـاكا كارتوسيانا) على مساحه فدانان احدهما مزروع بالبرسيم المصرى والثانى بالخس المحمل على الكرنب بطريقتى الطعوم السامة والرش بقريه كفر عطاالله بالزقازيق فى اثناء شهر ابريل فتره نشاط القوقع عام ٢٠١٤ .اثبتت النتائج أن الطعوم السامة لكلاً من الميتالدهيد ٥% والميثوميل٢٠% والميثوميل٢٤% والميثوكارب ٢% سجلوا اعلى كفاءه فى خفض التعداد للقواقع وكان اقلهم كفاءه المبيد الحيوى البيوجارد بعد ٢١ يوم من المعاملة. اما باستخدام عمليه الرش فاظهر الميثوميل٢٤%أعلى تاثيرا فى خفض التعداد للقواقع عن الميثوميل٢٠% اما الباسيلس ثيروجنسس فى كلتا الحالتين الطعوم والرش كان اقلهم كفاءه فى عمليه الخفض على مدار فتره التجربه(اى بعد 3 ايام من المعاملة). وطبقا لنتائج الكفاءه العاليه التى سجلت بواسطه المركبات التى استخدمت كطعوم سامه فى خفض التعداد للقواقع عن التطبيق بعمليات الرش. فلذلك يمكن التوصيه باستخدام كلا من الميتالدهيد والميثوميل٢٠% والميثوميل٢٤% والميثوكارب كطعوم السامة لمكافحه قوقع البرسيم الزجاجى ضمن برامج المكافحه المتكامله على محاصيل الخضر.