

## ASSESSMENT OF MOLLUSCICIDAL ACTIVITY OF CERTAIN PESTICIDES AGAINST TWO LAND SNAILS UNDER LABORATORY AND FIELD CIRCUMSTANCES AT DAKAHLIA GOVERNORATE.

Zedan, H.A.; M.M. Mortada and Amera A. M. Shoeib  
Plant Protection Res. Inst., Agric., Res. Center, Dokki, Giza, Egypt.

### ABSTRACT

The activity of certain pesticides were evaluated against *Monacha cartusiana* and *Eobania vermiculata* land snails under laboratory and field conditions at Dakahlia Governorate using poisons bait technique.

Laboratory experiment revealed that Neomyl exhibited the highest toxic action against *M.cartusiana* snails followed by Vertimec, Marshal, Dursban, while Curacron was the least toxic one. Values of LC50's were 0.44, 0.54, 1.67, 3.69 and 4.67 % respectively. In respect of *E.vermiculata* snails LC50's values of the same tested compounds were 0.64 , 0.65, 2.94, 4.73 and 10.14 % for Vertimec, Neomyl, Marshal, Dursban and Curacron, respectively.

In field experiment Neomyl and Vertimec were tested against *M.cartusiana* on Egyptian clover crop and *E.vermiculata* infesting ornamental plants with 1, 2, 4 and 8 % concentrations.

The initial and residual activity of the two tested compounds were [(42 and 66.33 % ), (51 and 75.66 %), (55 and 83.33 % ) and (62 and 89.66 % ) ] and [(24 and 45 %), (31 and 55.66 %), (35 and 64.66 % ) and (40 and 72.66 %)] reduction after 3 and 21 days post-treatment for *M.cartusiana* snails respectively, while against *E.vermiculata* snails were [(31 and 54.66 %), (38 and 74.33 %), (52 and 82.33 % ) and (57 and 88 %)] and [(44 and 47 %), (49 and 58.66 %), (51 and 70.66 % ) and (58 and 81 %)]reduction respectively.

### INTRODUCTION

Nowadays, land snails are consider as an extremely injurious pest to field and vegetable crops as well as orchard trees and ornamental plants. (Mahrous *et al.* 2002, Mortada, 2002 and Zedan *et al.* 2005). In Egypt numerous efforts are devoted to control terrestrial mollusca. Until recently no chemicals had been reported to be more effective and specific against land snails than metaldehyde and methomoyl ( Zedan, 1999).

In contrast, one of the ways in which the population of snails could be brought down and their by controlled is the use of baiting, this procedure is more suitable for reducing environmental pollution, moreover, simple for use, focall treatment not area wide, thus it is usually low costly. In this respect the present study aim to evaluate the molluscicidal activity of certain pesticides belonging to various chemical groups against land snails using poisons bait technique under laboratory and field conditions.

### MATERIALS AND METHODS

Laboratory and field experiments were conducted at plant Protection Institute Dakahlia Branch. The resulting pronounced compounds were tested under field conditions.

### 1- Laboratory experiments:

Marshal, Neomyl, Curacron, Dursban and Vertimec were tested as poisonous baits. Four concentrations for each compound were tested, i.e. 0.5, 1.0, 2.0, 4.0 %. The poison baits were prepared by mixing a known amount of each compound with 5 parts of black sugarcane syrup, then the mixture was incorporating with wheat bran to be finally 100 parts. The bait was moistened with appropriate amount of water to form a crumbly mash mixture. Ten adult snails were exposed to 2.5 grams bait in plastic container (24 × 16 × 10 cm). Control treatment was prepared using wheat bran bait mixed with black sugarcane syrup only. Mortality percentages were calculated during the experimental period using Abbott formula (1925).

### 2- Field experiments:

Neomyl and Vertimec exhibited the highly toxic action against land snails at laboratory testes. Therefore were chosen to evaluate their activity in reducing the population density of *M. cartusiana* snails infesting Egyptian clover and *E. vermiculata* snails infesting ornamental plants at Mit- Azoon village fields and El-Mansoura city nurseries, respectively, during the period from early March to the end of April, 2005.

For this purpose, area of about half feddan cultivated with Egyptian clover was chosen and divided into five plots (380 m<sup>2</sup> each), including control, each plot was divided into three subplots represented 3 replicates for each treatment. Area of about 50 m<sup>2</sup> was left as buffer between each plot. Regarding nursery experiment area of about quarter feddan was chosen and divided in the same manner.

Neomyl and Vertimec were tested as poisonous baits at rates of 0.5, 1.0, 2.0 and 4.0 %. Baits were offered on plastic sac, each one contained 100 gm. The application was started after 3 days of irrigation. The population density of either *M. cartusiana* or *E. vermiculata* were estimated either on the plants or on the surrounded ground using 0.25 m<sup>2</sup> quadrat method, before and after 3, 7, 14 and 21 days post treatment. Reduction percentages were calculated according to Henderson and Tillton (1955) formula.

## RESULTS AND DISCUSSION

### 1- Laboratory experiments

The toxicity of Curacron, Dursban, Marshal, Neomyle and Vertimec against *M. cartusiana* and *E. vermiculata* land snails was studied using bait technique. The results are presented in Tables (1 and 2).

Table (1) shows the potency of the tested compounds against *M. cartusiana* while Table (2) presents that of *E. vermiculata*. The results indicated that Neomyle, exhibited the highest toxic action against *M. cartusiana* land snails, followed by Vertimec, Marshal, Dursban while Curacron was the least in activity. LC<sub>50</sub>'s were 0.44, 0.54, 1.67, 3.69 and 4.67 % respectively Table (1).

Concerning the activity of the same tested compounds against *E. vermiculata* land snails. Data tabulated in Table (2) revealed that Vertimec exhibited the first order of activity (LC<sub>50</sub> : 0.64 %) followed by Neomyle (0.65

%). It is of interesting to notice that the two tested compounds appears to be closely similar in activity. Values of LC<sub>50</sub> for the rest of the tested compounds could be arranged in descending order as follows 2.94, 4.73 and 10.14 % for Marshal, Dursban and Curacron respectively.

**Table (1) : percent mortality of *M. cartusiana* land snails treated with different concentrations and the corresponding LC<sub>50</sub> values of the tested compounds as poisonous bait method.**

Compound	Concentration %				LC <sub>50</sub>	( C.L. )		Slope
	0.5	1	2	4		Lower	Upper	
Curacron 72 % EC	16.66*	36.66	46.66	60.00	4.67	3.06	10.68	4.14
Dursban 48 % EC	26.66	36.66	50.00	66.66	3.69	2.28	7.79	4.33
Marshal 25 % WP	16.66	40.00	53.33	73.33	1.67	1.19	2.50	4.62
Vertimec 1.8 % EC	50.00	70.00	96.66	100	0.54	0.35	0.70	5.75
Neomyle 90 % WP	56.66	80.00	93.33	100	0.44	0.22	0.61	5.87

C.L. = Confidence Limits

\* Mortality %

**Table (2): Percent mortality of *E.vermiculata* land snails treated with different concentrations and the corresponding LC<sub>50</sub> values of the tested compounds as poisonous bait method.**

Compound	Concentration %				LC <sub>50</sub>	( C.L. )		Slope
	0.5	1	2	4		Lower	Upper	
Curacron 72 % EC	16.66 *	30.00	33.33	46.66	10.14	4.95	1374.62	3.99
Dursban 48 % EC	16.66	26.66	46.66	63.33	4.73	3.27	9.00	4.09
Marshal 25 % WP	13.33	20.00	33.33	63.33	2.94	2.04	5.88	4.23
Vertimec 1.8 % EC	46.66	56.66	86.66	96.66	0.64	0.38	0.86	5.40
Neomyle 90 % WP	43.33	63.33	73.33	93.33	0.65	0.32	0.94	5.30

C.L. = Confidence Limits

\* Mortality %

Discussing the aforementioned results it could be concluded that *M. cartusiana* snails appeared to be more sensitive to all tested compounds than *E. vermiculata* snail. Moreover Neomyle, the specific carbamate land snails molluscicide and biocompound Vertimec appeared to be the most pronounced among the tested compounds. Also, the activity of Neomyle and Vertimec were ( 10.6, 8.4 and 3.8 time) and (8.6, 6.8 and 3.1 time) than those of Curacron, Dursban and Marshal against *M.cartusiana* respectively. While it was in the same order of arrangement (15.6, 7.3 and 4.5 times) and (15.8, 7.4 and 4.6 times) than those of Curacron, Dursban and Marshal, against *E. vermiculata* snail respectively.

Our results agree with many authors who worked on the mollusciciding under laboratory conditions, for instances, Ismail (1997) evaluated eight pesticides against *M. cartusiana*. He found that oxamyl proved to be the highest toxic one followed by aldicarb, fenthion, ethoprop, oxamyl granules, bromoxymil and carbofuran while fenamiphos showed to be the lowest one. Lokma, (1999) tested seven compounds as molluscicides, using poisonous baits methods against *M. cartusiana* and *R. decollata* snails. Results indicated that Salut was the most effective one followed by Gastrotax, Suntox, Diazinon, Dursban, Sevien and Protecto. Moreover the snail *M. cartusiana* was more sensitive than *R. decollata*.

## 2- Field experiments.

Results of laboratory experiments revealed that carbamate insecticide Neomyle 90 % WP and the acaricide biocompound Vertimec 1.8 % EC had the upper order of potency against the tested land snails among all the tested compound. Therefore their activity were evaluated against *M. cartusiana* on Egyptian clover crop and *E. vermiculata* on ornamental plants using poison bait technique with rat of 1, 2, 4 and 8 % at Mansoura district during 2005 season .

From Table (3) it is obvious that the initial and residual reduction percentages of the two tested compounds against the population density of *M. cartusiana* snails were [ (42, 51, 55 and 62 %) and (66.33, 75.66, 83.33 and 89.66 % ) ] and [ (24, 31, 35 and 40 %) and ( 45, 55.66, 64.66 and 72.66 %) ] reduction after 3 and 21 days post-treatment for Neomyle and Vertimec, respectively with average % reduction of ( 54.17, 63.33, 69.17 and 75.83 %) and (34.5, 43.33, 49.83 and 56.33 %) at the end of the experiment, respectively.

Table (3): Efficiency of Neomyle and Vertimec in reducing the population density of *M. cartusiana* (Clover) snails infesting Egyptian clover plantation at Mansoura district.

Compound	Conc. %	I . K after 3 days	% Reduction after (days)			Residual effect	General Mean
			7	14	21		
Neomyle 90 % WP	1 %	42	65	65	69	66.33	54.17
	2 %	51	68	76	83	75.66	63.33
	4 %	55	79	84	87	83.33	69.17
	8 %	62	86	89	94	89.66	75.83
Vertimec 1.8 EC	1 %	24	31	45	59	45	34.5
	2 %	31	35	56	76	55.66	43.33
	4 %	35	43	71	80	64.66	49.83
	8 %	40	53	76	89	72.66	56.33

Regarding *E. vermiculata* snails (Table 4) the initial and residual activity percentages of the two tested compounds were [ (31, 38, 52 and 57 %) and ( 54.66, 74.33, 82.33 and 86 % ) ] and [ (44, 49, 51 and 58 %) and (47, 58.66, 70.66 and 81 %) ] reduction after 3 and 21 days post-treatment, respectively.

It is clear that Neomyl exhibited the highest toxic action against *E.vermiculata* snails followed by Vertimec.

Table (4): Efficiency of Neomyle and Vertimec in reducing the population density of *E.vermiculata* snails infesting ornamental plants at Mansoura district.

Compound	Conc. %	I. K after 3 days	% Reduction after (days)			Residual effect	General Mean
			7	14	21		
Neomyle 90 % WP	1 %	31	44	56	64	54.66	42.83
	2 %	38	61	78	84	74.33	56.17
	4 %	52	74	84	89	82.33	67.17
	8 %	57	84	88	92	86	72.5
Vertimec 1.8 EC	1 %	44	32	49	60	47	45.5
	2 %	49	45	60	71	58.66	53.83
	4 %	51	58	74	80	70.66	60.83
	8 %	58	70	85	88	81	69.5

These results are in harmony with those reported by many authors. Ghamry *et al.* (1993) tested five molluscicidal baits against *M. cartusiana* and *E. vermiculata* snails under field conditions. He found that mortality after 14 days were 93 (85), 87 (82), 70 (63), 45 (39) and 36 (28) % for metaldehyde , methiocarb , thiocarb , cyanophos and monocrotophos, respectively. Abd El-Aal (2001) evaluated seven pesticides against *M. cartusiana* under field conditions. He mentioned that the efficiency could be arranged as follows: fenamiphos > sethoxydin > oxamyl > monocrotophos > butachlor > Biofly and Seeds-gard. Since the respective values of reduction at 15 days after treatment were 48.81, 43.01, 36.01, 33.52, 29.08, 20.01 and 1.09 % respectively. Idress (2003) evaluated the activity of Agrein and Dipel 2x when tested at rate of 125, 250 and 500 gm / 200 L.W / feddan. Also, Vertemic was tested at rate of 10, 20, 30 and 40 cm / 100 L.W / feddan, against *M. cartusiana* and *S. putris* using spray and as poison bait methods against *M. cartusiana*, *T. pisana* and *C. acuta* snails on guava trees at rates of 1.25, 2.5, 5 and 10 %. The average of snails population reduction after 15 days post-treatment were (9.81, 23.8, 42.8 and 50.2 %) and ( 23.3, 33.4, 49.7 and 61.5 %) for *M. cartusiana* and ( 15.9, 32.5, 44.8 and 66.0 %) and (18.13, 21.76, 38.35 and 59.61 %) for *T. pisana* and (2.52, 13.44, 31.46 and 51.8 %), (14.55, 28.28, 33.05 and 54.4 %) for *C. acuta* snails.

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## تقييم فعالية بعض المبيدات ضد نوعان من القواقع الأرضية معمليا وحقليا في محافظة الدقهلية.

حنى على زيدان ، محمد محمد مرتضى وأميرة عبد الله محمد شعيب  
معهد بحوث وقاية النباتات - مركز البحوث الزراعية - الدقى -جيزة - مصر

تم إجراء تجارب معملية وحقلية لتقييم كفاءة بعض المبيدات بطريقة الطعوم السامة على قوقع البرسيم الزجاجى *M.cartusiana* و قوقع الحدائق البنى *Eobania vermiculata* فى محافظة الدقهلية . وأوضحت النتائج مايلى :

- 1- أعطى مبيد النيوميل ٩٠ % أعلى تأثير على قوقع البرسيم الزجاجى يليه مبيد الفيرتيمك ثم المارشال ، الدورسبان بينما الكوراكرون كان أقلهم تأثيرا على القواقع الأرضية .
- 2- كانت قيم الجرعة النصفية المميتة ( LC50 ) ( ٠,٤٤ ، ٠,٥٤ ، ١,٦٧ ، ٣,٦٩ ، ٤,٦٧ ، ٢,٩٤ ، ٤,٧٣ ) ضد قوقع البرسيم الزجاجى معمليا على الترتيب. بينما كانت ( ٠,٦٤ ، ٠,٦٥ ، ٢,٩٤ ، ٤,٧٣ ) ضد قوقع الحدائق البنى معمليا للمبيدات السابقة على الترتيب.
- 3- كما أعطى مبيد النيوميل ٩٠ % ومبيد الفيرتيمك نسبة خفض فى أعداد القواقع حقليا بلغت [ (٤٢ ، ٦٦,٣٣) ، ( ٧٥,٦٦ ، ٥١ ) ، ( ٦٩,١٧ ، ٥٥ ) ، ( ٦٢ ، ٨٩,٦٦ ) % ] و [ ( ٢٤ ، ٤٥ ) ، ( ٣١ ، ٥٥,٦٦ ) ، ( ٣٥ ، ٦٤,٦٦ ) ، ( ٤٠ ، ٧٢,٦٦ ) % ] على قوقع البرسيم الزجاجى بعد ٣ أيام و ٢١ يوم (كأثر باقى) على الترتيب. وكذلك كانت نسبة الخفض [ ( ٣١ ، ٥٤,٦٦ ) ، ( ٣٨ ، ٧٤,٣٣ ) ، ( ٥٢ ، ٨٢,٣٣ ) ، ( ٥٧ ، ٨٦ ) % ] و [ ( ٤٤ ، ٤٧ ) ، ( ٤٩ ، ٥٨,٦٦ ) ، ( ٥١ ، ٧٠,٦٦ ) ، ( ٥٨ ، ٨١ ) % ] على قوقع الحدائق البنى بعد ٣ أيام و ٢١ يوم أيضا على الترتيب.