

## MOLLUSCICIDAL EFFECT OF CERTAIN COMPOUNDS AGAINST TWO LAND SNAIL SPECIES, *MONACHA OBSTRUCTA* AND *EOBANIA VERMICULATA* UNDER LABORATORY AND FIELD CONDITIONS

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### Abstract

Effect of two natural compounds; Neemix 4.5% (plant extract) and Vertimic 1.8% bio compound (abamectin) in addition to the molluscicide compound Cekumeta 5.0% (metaldhyd) were evaluated as a bait or contact (thin film) against two land snail species, *Monacha obstructa* and *Eobania vermiculata* under laboratory and field conditions of Kafr El -Sheikh Governorate. Laboratory results showed that when the three tested compounds used as a bait, Cekumeta was the most toxic one against the two snail species followed by Vertimic, while Neemix was the lowest effective one. On the other hand, *M. obstructa* was more susceptible for Neemix and Vertimic than *E. vermiculata* while vice-versa occurred in case of Cekumeta bait compound. In case of contact method, Neemix compound was more toxic to *Eobania E.vermiculata* than *M. obstructa*. In contrast *M. obstructa* was more sensitive to Vertimic than *E.vermiculata*.

The field results were in harmony with those which were obtained from laboratory as Cekumeta molluscicide bait was the most efficient one against both species followed with Vertimic and Neemix when applied as baits. But when applied as a spray, Neemix was more efficacy than Vertimic. Also, *M. obstructa* was more susceptible to both compounds than *E.vermiculata*.

### INTRODUCTION

Recently, land snails are becoming a serious pest in Egypt. These animals attack the different kinds of plants e.g cereal, vegetables, fruit orchards and ornamental plants at the different growth stages reducing their yields (El-Okda, 1980). Land snails were controlled by chemical molluscicides. These chemical compounds may lead to problems of toxicity to non - target organisms and caused environmental pollution. Thereby, the present work was conducted to study the molluscicidal effect of some natural compounds i.e Neemix (plant extract) and bio compound Vertimic (abamectin) when used as a bait or contact comparatively with metaldhyd molluscicide compound against tow land snail species, *Monacha obstructa* and *Eobaina vermiculata* the most common and harmful species in Egypt under laboratory and field conditions.

## MATERIALS AND METHODS

### 1. Tested Compounds

- **Neemix 4.5%**. Ready made crude plant extract of Neem

*Azadirachta indica*.

- **Vertimic 1.8% E.C.** (Abamectine) : Bio compound produced

by the soil microorganism, *Streptomyces avermitilis*.

- **Cekumeta 5.0%**. (metaldhyd) : Ready made molluscicide granules bait.

**2. Tested Animals.** Two species of land snails, glassy clover snail *Monacha obstructa* and brown garden snail *Eobania vermiculata* were collected from the infested fields of Egyptian clover and ornamental plants, respectively at El-Shamarika village, Kafr El – Sheikh Governorate. Animals were transferred to laboratory, kept in glass boxes and fed on fresh lettuce leaves (El – Deeb *et al.* 2003). Forty adult animals of each species were divided into four replicates (each of 10 animals) for each test.

### 3 . Laboratory Experiments

**3.1. Baiting Technique.** The three tested compounds were evaluated as poison baits. Different concentrations of Neemix and Vertimic compounds were tested i.e. 2,3,4 and 5% for Neemix and 0.5,1,1.5 and 2% for Vertimic. The poison baits of Neemix and Vertimic were prepared by mixing each compound with 5% molasses + 93% bran while Cekumeta compound was used as ready made bait. Five grams of poison bait were put on plastic sheet placed on the surface of the soil in each box. Animals were exposed to the candidate concentration of the tested compound. A control test was parallel conducted with plain carriers. Mortality percentages were calculated during the period of 72 hours and LC<sub>50</sub> was determined for each compound according to Finney ( 1971) .

**3. 2. Contact (Thin film) Technique.** Thin layer film technique was used according to Ascher and Mirian (1981), whereas the tested concentrations ( 0.5,1,1.5 and 2%) for Neemix and Vertimic were applied in Petri – dishes using water. Two ml of each concentration of each compound were spread on inner surface of a Petri – dish by moving the dish gently in circles. Water was evaporated under room conditions in a few minutes leaving a thin layer film of tested compound. Animals were exposed to the candidate concentrations of the tested compounds for 72 h. A parallel control test was conducted using plain water. The killed animals were daily counted and removed. Mortality percentages were calculated and LC<sub>50</sub> was determined for each compound .

**4. Field Experiments.** The three tested compounds were evaluated as poison baits while Neemix and Vertimic only were evaluated as a spray against the two species of land snails under field conditions of El-Shamarika village, Kafr El-Sheikh Governorate.

**4.1. Baiting Application.** The poison bait of Neemix 4.5 % and Vertimic 1.8 % was prepared by mixing 2 parts of each compound + 5 parts molasses + 93 parts bran while Cekumeta compound was used as ready made bait. Two infested areas were chosen, the first infested with *M. obstructa* and the second infested by *E. vermiculata*. Each area was divided into 3 plots represent the number of the tested compounds. The area of each plot was one feddan divided into 4 replicates. One plot was left without treatment as a control. Baits of each compound were distributed on plastic trays (100 g for each one). The population of snail were counted daily in quadrate area ( 1x1meter ) and the population reduction percentages were recorded after 7 days post \_ treatment ( El\_ Okda,1984).

**4.2. Spray Application.** Neemix 4.5% and Vertimic 1.8% compounds were tested as a spray against the tow land snail species .The tested areas were chosen by the same method mentioned above. Each compound was applied as a spray at rate 2% on plants using hand sprayer. The population reduction percentage of snails was recorded after 7 days post\_treatment .

## RESULTS AND DISCUSSION

**1.Laboratory Studies.** Data in Table 1 show the efficacy of the three tested compounds when used as baits against two land snail species *Monacha obstructa* and *Eobania vermiculata*. Results showed that mortality percentage increased gradually with increasing the compound concentration in case of natural compounds Neemix and Vertimic for both snail species .Vertimic compound was more toxic against the two snail species than Neemix whereas it caused 56 and 43.8% mortality for *M. obstructa* and *E. vermiculata* with 1.9 and 2.7 LC<sub>50</sub>, respectively while Neemix achieved 52.3 and 71.3% mortality and 4.7 & 7.2 LC<sub>50</sub> for the two snail species, consecutively. The specific molluscicide compound Cekumeta was the most toxic one against the two snail species whereas it caused 85 and 100% mortality for *M.obstructa* and *E.vermiculata*, respectively. On the other hand, it is clear that *Monacha sp.*, was more susceptible for Neemix and Vertimic than *Eobania sp.*, while vice-versa occurred in case of Cekumeta compound where it was more toxic to *E. vermiculata* than *M. obstructa*. El-Okda (1984) and Miller *et al.*, (1988) mentioned that metaldhyd was highly toxic compound against snails.

Table 2 revealed the toxic effect of Neemix and Vertimic compounds when used as a contact (thin film) against the two tested land snail species. Data illustrate

that mortality percentage increased with increasing the compound concentration. Neemix concentrations 0.5, 1.0, 1.5, and 2.0% induced 6.3 & 12.5, 18.8 & 25.0, 31.3 & 37.5 and 37.5 & 56.3% mortality for *M.obstructa* and *E. Vermiculata*, respectively. The same concentrations of Vertimic gave 18.8 & 12.5, 31.3 & 25.0, 37.5 & 31.3 and 50.0 & 43.8% mortality for the same two species, consecutively. Neemix compound was more toxic to *E.vermiculate*, than *M.obstructa*, as  $LC_{50}$  was 1.9 for *E.vermiculate*, while it was 2.7 for *Monacha* sp., In contrast *M.obstructa.*, was more sensitive to Vertimic compound than *E.vermiculata*. whereas  $LC_{50}$  was 2.1 for *M.obstructa* and 2.7 for *E. vermiculata*. Zidan et al., (2001) found that  $LC_{50}$  of Neem plant extract was 71.2 and 84.0 ppm for *M.obstructa* and *E.vermiculata*, consecutively.

In view of the above toxicity results from Tables 1 and 2, it is evident that the susceptibility level of the two species of snails differed for the two tested compounds according to the method of application (bait or contact). Vertimic compound when used as a bait was more toxic than Neemix against the two species of snails and *M. obstructa* was more susceptible to both compounds than *E.vermiculata*. In case of contact method, Neemix was more toxic to *E.vermiculata* and Vertimic was more toxic to *M.obstructa*.

**2 – Field Studies.** Table 3 show the field performance of the three tested compounds when applied as baits against the two land snail species. Data indicate that Cekumeta compound gave the highest population reduction percentage for the two species as it induced 61.2 and 77.6 % for *M.obstructa* and *E.vermiculata*, respectively followed by Vertimic 29.5 and 48.5 % while Neemix compound gave the lowest values where it caused only 22.2 and 37.1 % for the two species, consecutively. Also, *E.vermiculata*, was more sensitive than *M.obstructa.*, for the baits of the three compounds.

Data shown in Table 4 present the comparative effect of Neemix and Vertimic compounds when applied as a spray against the two land snail species under the field conditions. Results showed that Neemix compound was more efficacy than Vertimic against the two species whereas it caused 17.3 and 23.4% population reduction for *M.obstructa* and *E. vermiculata*, respectively while Vertimic gave only 14 and 17.1% for the same two species, consecutively. Also, *M.obstructa*, was more susceptible to both compounds than *E.vermiculata*, The field results of both compounds were weak when used as a bait or spray while Cekumeta molluscicide ready made bait gave good results against the two land snail species under the field conditions.

Field results are in harmony with those which were obtained from laboratory as Cekumeta molluscicide bait was the most efficient one against both tested snail species under laboratory and field conditions followed by Vertimic while Neemix

compound was the lowest effective one. Similar results were obtained by Ghamry *et al.*, (1993), Hamdy *et al.*, (1994), Ghamry (1997) and Youssef (2001).

Reviewing the abovementioned results that obtained from the previous tables, it is obvious that there are different susceptibility levels between the two tested snail species according to type of compound (chemical group) and method of application (bait or contact). These differences in the sensitivity levels may be due to the physiological state of the snail which changes from species to another.

Godan (1983) stated that the phases of greater or lesser sensitivity are differ from species to another with shorter or longer life spans, but the general pattern of changing susceptibility with physiological condition remains. Therefore, definition the snail species is important for control.

Table 1. Effect of certain compounds used as a bait against two land snail species *Monacha obstructa* and *Eobania vermiculata*.

Compound	% Concentration	<i>Monacha obstructa</i>		<i>Eobania vermiculata</i>	
		% Mortality	LC <sub>50</sub>	% Mortality	LC <sub>50</sub>
Neemix	2.0	12.5	4.7	0.0	7.2
	3.0	25.0		6.3	
	4.0	37.5		19.0	
	5.0	52.3		31.3	
Vertimic	0.5	18.8	1.9	12.5	2.7
	1.0	31.3		25.0	
	1.5	37.5		31.3	
	2.0	56.0		43.8	
Cekumeta	5.0	85		100	
L.S.D.		28.1		23.3	

Table 2. Effect of Neemix 4.5 % and Vertimic 1.8 % used as a contact against two land snail species *Monacha obstructa* and *Eobania vermiculata*

Compound	% concentration	<i>Monacha obstructa</i>		<i>Eobania vermiculata</i>	
		% Mortality	LC <sub>50</sub>	% Mortality	LC <sub>50</sub>
Neemix	0.5	6.3	2.7	12.5	1.9
	1.0	18.8		25.0	
	1.5	31.3		37.5	
	2.0	37.5		56.3	
Vertimic	0.5	18.8	2.1	12.5	2.7
	1.0	31.3		25.0	
	1.5	37.5		31.3	
	2.0	50.0		43.8	
L.S.D.		27.8		23.2	

Table 3. Effect of some compounds as a bait against two land snail species under field conditions.

Compound	<i>Monacha obstructa</i>			<i>Eobania vermiculata</i>		
	No. animals before treatment	No. alive animals after treatment	% Population reduction	No. animals before treatment	No. alive animals after treatment	% Population reduction
Neemix 4.5 %	207	161	22.2	105	66	37.1
Vertimic 1.8 %	224	158	29.5	130	67	48.5
Cekumeta 5 %	170	66	61.2	85	19	77.6
	L.S.D.		10.5			15.2

Table 4. Effect of Neemix 4.5 % and Vertimic 1.8 % used as a spray against two land snail species under field conditions.

Compound	<i>Monacha obstructa</i>			<i>Eobania vermiculata</i>		
	No. animals before treatment	No. alive animals after treatment	% Population reduction	No. animals before treatment	No. alive animals after treatment	% Population reduction
Neemix	168	139	17.3	77	59	23.4
Vertimic	150	129	14	105	87	17.1
	L.S.D.		7.9			11.5

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تأثير بعض المركبات كميبيدات قواقع ضد نوعين من القواقع هما  
***Eobania vermiculata.* و *Monacha obstructa***  
تحت الظروف المعملية والحقلية

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تم دراسة تأثير نوعين من المركبات الطبيعية هما نيميكس ٤,٥% ( مستخلص نباتي )  
والمركب الحيوي فيرتيميك ١,٨% ( مستخلص فطري ابامكتين)إلى جانب مبيد القواقع سيكوميتا ٥  
% ( ميتالدهيد ) عند استخدامهم كطعوم أو باللامسة ضد نوعين من القواقع هما قوقع البرسيم  
الزجاجي *Monacha obstructa.* و قوقع الحدائق البني *Eobania vermiculata* تحت الظروف  
المعملية والحقلية بمحافظة كفر الشيخ. أظهرت النتائج المعملية أنه عند الاستخدام كطعوم كان مركب  
سيكوميتا الأكثر سمية لكلا النوعين من القواقع يليه فيرتيميك بينما كان مركب نيميكس أقلهم فعالية.  
ومن جهة أخرى كان قوقع *Monacha obstructa* أكثر حساسية للنيميكس والفيرتيميك من  
قوقع *Eobania vermiculata* بينما حدث العكس في حالة مبيد سيكوميتا. أما عند الاستخدام باللامسة  
كان مركب نيميكس هو الأكثر سمية لقوقع الحدائق البني عن قوقع البرسيم الزجاجي. وعلى النقيض  
كان قوقع البرسيم الزجاجي الأكثر حساسية للفيرتيميك عن قوقع الحدائق البني.  
وكانت النتائج الحقلية متوافقة مع النتائج المعملية حيث كان مبيد سيكوميتا هو الأعلى كفاءة  
ضد نوعي القواقع يليه فيرتيميك ثم نيميكس عند استخدامهم كطعوم ، ولكن عند استخدامهم رشاً على  
النباتات كان مركب نيميكس هو الأعلى كفاءة من الفيرتيميك. أيضاً كان قوقع البرسيم الزجاجي هو  
الأكثر حساسية للنيميكس والفيرتيميك عن قوقع الحدائق البني.