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SCREENING OF DIFFERENT MATERIALS FOR OVICIDAL EFFECT ON THE LAND SNAIL *EOBANIA VERMICULATA* (MULLER)

Gomaa, E.A.[1], A.E. Omar[1], A.G. El-Sisi[2], and M.A. Eskander[2]

1. Plant Protection Dept., Faculty of Agric., Zagazig Univ., Zagazig, Egypt.

2. Central Agricultural Pesticide Laboratory, Dokki, Giza, Egypt.

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ABSTRACT: A laboratory experiment had been conducted to throw some light on the ovicidal activity against *Eobania vermiculata* (Muller) snail using the following materials: 1- vegetable oils (cotton seed oil (60% EC), citronella oil (87% EC) and camphor oil (30% EC); 2- Petroleum oils ($CAPL_1$, $CAPL_2$, and solar (96.6% EC).); 3- Fertilizers (Ammonium nitrate, potassium sulphate, urea and cuppric acetate); 4- Pesticides: copper hydroxide (Champion) and carbofuran (Furan); 5- *Azadirachta indica* (A. juss) extracts. The results obtained indicated that solar (EC), camphor oil (EC), ammonium nitrate, ethanol extract of *A.indica* leaf (20% SL) and Furan were the most effective materials and could be arranged descendingly according to their LC_{50} values as follows: Furan ethanol extract of *A.indica*_leaf (20%SL), camphor oil, ammonium nitrate and solar, the corresponding LC_{50} values were 77.544, 150.335, 319.216, 475.4 and 1765.446ppm, respectively.

Key words: Petroleum oils, vegetable oils, fertilizers, *Azadirachta indica*, and pesticides.

INTRODUCTION

Land snails are considered one of the most economic and serious pests in Egypt. The snails cause great damage to numerous field crops, vegetables, fruits and ornamental plants. Severe attack reduces yield production as well as destroys the plant seedlings (El-Okda, 1980).

The control of terrestrial gastropod species by chemical

means is very limited to the use of the commercial products containing either metaldehyde or carbamates. Until 1984, methiocarb (Mesurol), copper sulphate, aldicarb, methomyl, lindane, carbaryl and trichlorfon (Dipterex) were the commonly used as molluscicides (Kassab and Daoud, 1964). One of the main problems associated with the use of these synthetic compounds is their harmful effects against non-target organisms including mammals and wildlife (Smith *et al.*, 1988). Therefore, efforts should be directed towards alternative, more safe, cheap and available means of control. The molluscicidal activity of some plant essential oil components and their blends against *Theba pisana* and *Helix aspersa* snails, the role of piperonyl butoxide in synergizing the toxicity of the tested chemicals were studied by El Zemity (2001). The results showed that thymol proved to be the most effective one of the tested products against the two tested snails followed by eugenol and pulegone.

The crude extracts from neem *Azadirachta indica* leaves, and seed oil and Bioblitz (EC formulation) were bioassayed against golden snail in the laboratory. The formulation product Bioblitz, was the most toxic to golden snail at 200 ppm. Urea (36%), 600 ppm, acted as toxicity enhancer giving 100% mortality at 50 ppm of Bioblitz. The benzene extract of the leaves and seeds of *A.indica* exhibited 100% mortality at 200ppm (Maini and Rejesus, 1993). On the other hand, ferrous sulphate proved to be the most potent fertilizer against the brown garden snail, followed by ammonium nitrate, ammonium sulphate and superphosphate (Zidan *et al.*, 1997).

An increased growth response of rice plants was generally observed in the treatment in which test snails were killed by the application of the surfactant sodiumdodecylsulphate (SDS). In addition to the molluscicidal activity, SDS at concentration higher than 5000 ppm was greatly inhibitory to egg hatching of *Pomacea canaliculata.* (Tzeng, *et al.*, 1994).

The aim of the present work is to evaluate the ovicidal activity of certain materials such as; petroleum oils, vegetable oils, metalic and non-metalic fertilizers, extracts of *A.indica*, and two pesticides against the land snail *E.vermiculata.*

MATERIALS AND METHODS

Tested Materials

Modified or formulated petroleum oils

$CAPL_1$, $CAPL_2$ and Solar (EC). They were mineral oils formulated as emulsifiable concentrate contained 96.6% v./v. base oil: chemically modified solar, lubrication cut of petroleum oil and crude solar oil corresponding for $CAPL_1$, $CAPL_2$ and Solar EC. They were produced by Central Agricultural Pesticide Laboratory.

Vegetable oils

Cotton seed oil, citronella and camphor oils were prepared as emulsifiable concentrate contained 60, 87 and 30% (v./v.) base oil, respectively

Mineral fertilizers

1- Ammonium nitrate (33%N) $NH_4 NO_3$; produced by Abo-Kair company for Chemicals and Fertilizers.

2- Urea 99% (NH_2-CO-NH_2) was supplied from Misr Co. for chemicals.

3- Potassium sulphate 99% ($K_2 SO_4$) was supplied from Misr Co. for Chemicals.

4- Cuppric acetate 98.5% $Cu(CH_3COO)_2.H_20$ was supplied from May & Baker LTD. Dagenham England.

Azadirachta indica (A. juss) extracts

The extracts were obtained as described by Maini and Morallo-Rejesus (1993). One hundred grams of dry leaves or seeds were soaked in 500 ml of ethanol or methanol at room temperature in a large flask for 24 hours. The flask was then shaken for 24 hours in a shaker and its contents were filtrated. The solvents were evaporated under vacuum using a rotary evaporator. Samples of each crude extract were kept in a refrigerator at – 4°C.

Pesticides

1. Carbofuran (Furan 10% G.)

Chemical name: 2,3 dihydro- 2,2–dimethylbenzofuran–7-yl methyl carbamate. The pesticide was obtained from AGRO Chem. Company.

2. Copper hydroxide (Champion 77% WP)

Chemical name: copper hydroxide. Produced by Nufarm Company.

Tested Eggs

Eggs of the land snail, *E.vermiculata* were obtained from

adult snails collected from heavily infested field in the pre-adult stage and fed until it reached maturity stage (Goden, 1983). Eggs were daily collected from soil. Clutches were removed carefully, put in petri-dishes, washed with distilled water and Kept until used.

Test Method

Serial concentrations of each material were prepared in water. Filter papers were placed in small plastic boxes and moisted with water. Ten eggs were put in a clean cloth, dipped for 10 seconds in material solution and transferred to the plastic box and covered with a piece of muslin cloth. Four replicates were used for each treatment. Control treatment was done without active material. Boxes were daily examined to observed hatching. (Aioub *et al.*, 2000). LC_{50} values for the test compounds were calculated according to the method of Fenney (1971).

RESULTS AND DISCUSSION

Ovicidal Effects of Some Formulated Petroleum Oils Against *E. vermiculata*

Data in Table 1 indicate that the solar (EC) proved to be the most effective compound against the snail eggs followed by $CAPL_2$ and $CAPL_1$ oils, whereas $CAPL_2$ and $CAPL_1$ were 65.4% and 20.542% as toxic as solar (EC) respectively, at the LC_{50} level.

The ovicidal effects of the mineral oils tested may be due to blocking of respiration of egg as a result of presence of oil film (Smith and Pearce, 1948).

The Ovicidal Effect of Formulated Vegetable Oils Against *E. vermicuata*

Data in Table 2 indicate that the camphor oil proved to be the most effective compound against the snail's eggs recording LC_{50} value of 319.216 ppm followed by the cotton seed oil and citronella oil where the LC_{50} values were 5486.041 and 11287.53 ppm), respectively.

These results agree with findings of Ragab *et al.* (2002) who reported that castor bean oil was more fetal to control the eggs of the snails (LC_{90}=660ppm).

Ovicidal Activity of Some Mineral Fertilizers Against *E. vermiculata*

Data in Table 3 showe that ammonium nitrate was the most effective fertilizer followed by cuppric acetate, urea and potassium

Table 1. Ovicidal effects of some formulated petroleum oils against *E. vermiculata* snail eggs

Materials	LC_{50} (ppm)	LC_{90} (ppm)	Slope	Toxicity index at	
				LC_{50}	LC_{90}
Solar (EC)	1765.446	10790.99	1.63	100	100
$CAPL_2$	2699.439	14919.71	1.726	65.4	72.32
$CAPL_1$	8594.245	29642.29	2.383	20.542	36.404

Toxicity index compared with solar (EC)

Table 2. Ovicidal effect of some formulated vegetable oils against *E. vermiculata* snail eggs

Materials	LC_{50} (ppm)	LC_{90} (ppm)	Slope	Toxicity index at	
				LC_{50}	LC_{90}
Camphor oil	319.216	1395.565	2.0	100	100
Cotton seed oil	5486.041	35952.03	1.57	5.819	3.88
Citronella oil	11287.53	114000.05	1.274	2.828	1.22

Toxicity index compared with camphor oil

sulfate; their LC_{50} values were 475.4, 1026.483, 1128.003 and 1862.833 ppm, respectively.

These results agree with Abdel- Hamid *et al.* (1998) who studied the effect of the commonly used fertilizers namely urea, ammonium nitrate, ammonium sulfate and sodium dihydrogen phosphate on egg- laying, hatchability of eggs and growth rate of the newly hatched *B. alexandrina*. The results revealed that fertilizers containing nitrogen had a greater effect than phosphorus or sulfur fertilizers.

Ovicidal Activity of *A. indica* Extracts Against *E.vermiculata*

Data in Table 4 indicate that ethanol extract of *A. indica* leaves (20%SL) showed the highest ovicidal action followed by

methanol extract of leaf (15%SL), ethanol extract of seed (40%SL) and methanol extract of seed (40%SL), the corresponding LC_{50} values were 150.335, 172.036, 296.252 and 319.049 ppm, respectively. Mostafa and Abdel-Mageed (1996) reported that 0.1 and 0.05% of neem oil showed a higher rate of mortality and the toxicity appeared after 6 hrs of exposure, with early stage of *B. alexandrina* eggs. Rao and singh (2000) studied the effects of sublethal treatments (20% and 60% of LC_{50} /24h) of *A. indica* oil, *Cedrus deodara* oil, *Allium sativum* bulb powder, and *Nerium indicum* (*N. oleander*) bark powder singly and in binary combinations, on reproduction and survival of African snail *Achtina fulica*. The authors showed that these compounds caused a maximum reduction in protein, amino acid, DNA, RNA and phospholipids levels and simultaneous increase in lipid peroxidation in the ovotestis of treated *A. fulica*.

Ovicidal Activity of Two Pesticides Against *E.vermiculata snail*

Data in Table 5 indicate that Furan showed the highest toxicity with LC_{50} value of 77.544ppm compared with 811.631ppm, for Champion. Aioub *et al.* (2000) studied the effects of six nematicides namely, aldicarb, carbofuran, ethoprophos,

Table 3. Ovicidal effect of some metallic and non-metallic fertilizers against *E.vermiculata* snail eggs

Materials	LC_{50} (ppm)	LC_{90} (ppm)	Slope	Toxicity index at	
				LC_{50}	LC_{90}
Ammonium nitrate	475.4	1447.876	2.65	100	100
Cuppric acetate	1026.483	3666.403	2.318	46.313	39.49
Urea	1128.003	2684.793	3.403	42.145	53.92
Potassium sulphate	1862.833	6771.045	2.287	25.52	21.38

Toxicity index compared with ammonium nitrate

Table 4. vicidal activity of *A. indica* extracts against *E. vermiculata* eggs

Materials	LC_{50} (ppm)	LC_{90} (ppm)	Slope	Toxicity index at LC_{50}	Toxicity index at LC_{90}
Ethanol extract of leaf 20% SL	150.335	466.541	2.606	100	100
Methanol extract of leaf 15% SL	172.036	806.451	1.91	87.386	57.85
Ethanol extract of seed 40%SL	296.262	570.74	4.501	50.744	81.74
Methanol extract of seed 40% SL	319.049	1468.433	1.933	47.12	31.77

Toxicity index compared with ethanol extract of leaf 20% SL.

Table 5. vicidal activity of Furan and Champion against *E. vermiculata* snail eggs

Pesticide	LC_{50} (ppm)	LC_{90} (ppm)	Slope	Toxicity index at LC_{50}	Toxicity index at LC_{90}
Furan	77.544	220.331	2.825	100	100
Champion	811.631	2431.695	2.689	9.554	9.06

Toxicity index compared with furan

fenamiphos and oxamyl, as soil treatment on egg hatchability of the two land snail species *E. vermiculata* and *Monacha cartusiana*. They found that carbofuran was the most effective one.

Data in Tables 1,2,3,4 and 5 indicate that solar EC, camphor oil (EC), Ammonium nitrate, ethanol extract of *A. indica* leaf (20% SL) and Furan were the most effective materials against the snail eggs, when tested by dipping technique. The tested materials could be arranged descendingly according to their LC_{50} values as follows: Furan, ethanol extract of *A. Indica* leaves (20%SL), camphor oil, ammonium nitrate and solar. The corresponding LC_{50} values were 77.544, 150.335, 319.216, 475.4 and 1765.446, ppm.

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تقييم التأثير الإبادى لمواد مختلفة ضد بيض القوقع الأرضى (إيبونيا فيرميكيولاتا)

العندروسى أحمد جمعه[1] - أحمد السيد عمر[1]
أحمد غازى السيسى[2] - مجدى عدلى إسكندر[2]

١- قسم وقاية النبات - كلية الزراعة - جامعة الزقازيق.
٢- المعمل المركزى للمبيدات - دقى - جيزة.

أجريت هذه التجارب المعملية لمعرفة تأثير بعض المواد التابعة لمجموعات كيماوية مختلفة ضد بيض القوقع الأرضي أيبونيا فيرميكيولاتا وهي:

١. مجموعة الزيوت المعدنية "كابل١، كابل٢، السولار" مجهزة في صورة مركزات قابلة للإستحلاب في الماء.

٢. زيوت نباتية "زيت الكافور - زيت بذرة القطن - زيت السترونيلا" مجهزة في صورة مركزات قابلة للإستحلاب في الماء.

٣. مستخلصات بذور وأوراق نبات الزنزلخت "مجهزة في صورة مركزات قابلة للذوبان في الماء".

٤. أسمدة معدنية "اليوريا - نترات الأمونيوم - سلفات البوتاسيوم - خلات النحاس" مجهزة في صورة مساحيق قابلة للذوبان في الماء.

٥. مبيدات آفات (الفيوران "مبيد حشري نيماتودي- مجهزة في صورة محببات" والشامبيون "مبيد فطري - مجهز في صورة مساحيق قابلة للبلل").

تم اختبار تركيزات مختلفة من المواد المختبرة في الماء حيث غمر البيض في مختلف التركيزات المستخدمه لمدة عشر ثواني ثم نقلت على ورق ترشيح مبلل موضوع في علب بلاستيك مغطاه بالشاش لمنع هروب الفقس الحديث، تم تسجيل عدد البيض الفاقس وحساب النسبة المئوية لعدم الفقس.

أوضحت النتائج أن أكثر هذه المواد تأثيراً ضد بيض القوقع إيبونيا فيرميكيولاتا مرتبة تصاعديا حسب قيم التركيز القاتل لنصف عدد الأفراد LC_{50} كما يلي:

مبيد الفيوران - المستخلص الإيثانولي لأوراق نبات الزنزلخت - زيت الكافور - سماد نترات الأمونيوم و مستحضر السولار، حيث كانت قيم التركيز التصفي القاتل LC_{50} على الترتيب ٧٧,٥٤٤ - ١٥٠,٣٣٥ - ٣١٩,٢١٦ - ٤٧٥,٤ - ١٧٦٥,٤٤٦ جزء في المليون.