TOXICITY EFFECT OF LAMBADA CYHALOTHRIN, AND METHOMYL ON TERRESTRIAL SNAILS, *EOBANIA VERMICULATA*, AND *HELICELLA VESTALIS* UNDER LABORATORY CONDITIONS

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ABSTRACT

Toxicity of insecticide pyrethroid (Lambada) and carbamate (Methomyl) against, different immature stages (two, four, six and eight weeks age) and adult stage of *Eobania vermiculata* and *Helicella vestalis* by feeding using leaf dipping technique for seven days under laboratory conditions. The characteristics of the obtained toxicity lines were taken as a criterion for the comparison between the efficacy of estimated insecticides. The immature stages proved to be more susceptible to the toxic action of both tested insecticides than the adult stage of the two tested terrestrial snails. There is a revese relationship between stages of two species and toxicity of tested insecticides. On the other hand, data revealed that the *H. vestalis* was more sensitive to the tested insecticides; Lambada and methomyl than *E. vermiculata*. Also data indicated that Methomyl proved to be more effective as molluscicide than Lambada for the two investigated terrestrial snails.

Keywords: *Eobania vermiculata, Helicella vestalis,* Lambada Cyhalothrin, Methomyl, Toxicity Land snails.

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INTRODUCTION

Terrestrial snails is one of the most significant threats of sustainable agriculture in many parts of the world (Barker, 2002). In Egypt, land snails are known as dangerous pests to field crops, vegetables, orchards and ornamental plants (Kassab, Daoud, 1964 and El- Okda, 1979). Damage caused by snails is due mainly to feeding and to contamination with their bodies, feces or slime, leading to deterioration of the product quality besides, and financial losses (Glesias *et al*., 2003). The importance of land snails as pest organisms has drastically increased in the past few decades (Godan, 1983 and Gathwait and Thomas, 1996). Radwan *et al*., (1992); Eshra, (2004); Moran *et al*., (2004); El-Shahaat *et al*., (2005, 2009) and Ghoneim, (2006) mentioned that, among the most serious land snails in Egypt, the brown garden snail, *Eobania vermiculata*, and the white snail, *Theba pisana*. These snails have a destructive effect to citrus species and feed on the foliage of many gardens and ornamental plants. Therefore, the control of these snails are becoming very important. Until now the chemical pesticides is still one of the most effective element in integrated pest management program of land snails. *i.e* showed that, methomyl exhibited greater efficacy than did methiocarb against *Eobania vermiculata* in both techniques. However, higher mortality rates were obtained in the topical application technique than in the poison bait experiments. Biochemical and histochemical examinations revealed that treatment of the snails with methomyl and methiocarb either by topical

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application or toxi baits caused significant decrease in carbohydrate, lipid and protein contents. This decrease was also more obvious after topical application than after baiting technique, and methomyl was found to be more toxic than methiocarb, (Radwan *et al.,* 2008). Also, the molluscicidal activity of 6 pesticides (Oxamyl, Lambada-cyhalothirin, Dinotefuran, Emamectin benzoate, Cadusafos, Chitosan) and three bioagent control spurge plant extract, thymol and mineral fertilizer and their combination were studied against the land snail *Eobania vermiculata* under laboratory and field conditions. Results showed that oxamyl and chitosan were the most toxic pesticides. Also, the thin film was more effective than dipping method, (Abbas, 2020).

The aim of this work is to determine the molluscicidal activity of two pesticides Lambada and Methomyl against the immature stages and adult of two-land snail's species *i.e Eobania vermiculata* and *Helicella vestalis* under laboratory conditions.

MATERIALS AND METHODS

Tested Pesticides:

1) Lambada 5 % – Cyhalothrin E.C).

Chemical Name: 3-(2-chloro- 3,3,3-trifluoro-1-propenyl)- 2,2-dimethyl-cyano (3- phenoxypheny) methyl cyclopropanecarboxylate

Trade Name: Sper Lambada- Cylothrin, obtained from Syngenta Company.

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2) Methomyl (Lannate 90 % W.P) insecticide.

Chemical Name: (S- methyl N-(methyl carbamoyl oxy) thioacetimidate.

Trade Name: Lannate 90 %, obtained from Kafer El-Zayat Company, Egypt.

Rearing and maintenance of Land snails:

Adult Land snails, were collected during Autumn (2018), *Eobania vermiculata* from infested vegetables and *Helicella vestalis* from infested citrus trees at Ashmoon district, Menufiya Governorate, Egypt. Snails were transferred in closed bags to the laboratory of Plant Protection Research Institute, ARC. Giza, Egypt. Healthy individuals were put in separate glass cages (40 x 25 x 20 cm) containing moisture peatmous soil about 8 – 12 cm soil hight, and covered with muslin with rubber band to prevent snails from escaping. Snails (each species) in each terrarium were fed daily with fresh leaves of white cabucha and dry crushed chicken egg shell as a source of calcium. These snails were kept under (20°C ± 2°C). The soil was moistened with tap water to allow the humidity reach (75 ± 5%). Soil moisture was measured by using (Light and moisture meter, Rapitest). The terrarium was examined weekly for egg laying, after hatching, the animals were divided into groups according to age (two, four, six and eight weeks) and Adult for the treatment. (Mobarak, 2003).

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Evaluation of the susceptibility of different stages of terrestrial snails *E. vermiculata* and *H. vestalis* to the tested pecticides:

Ten healthy individuals of the two species of snails were selected for each replicate and starved for 48 hours before starting the experiment. The applied concentrations from Lambada and Methomyl were 0.3, 0.5, 0.7 ,0.9, and 1.1 %, for two, four, six, eight weeks immature age and adult for both of investigated snails. The tested concentrations were prepared using distilled water then the white cabucha leaves were dipped in each concentration for 15 seconds before introduced to the experimental snails for feeding for seven days. Cheek control treated only with distilled water.

Mortality percentages, and (Half Lethal concentration) LC_{50} of two tested compounds were calculated after seven days of treatment according to Finney (1952) by using Bakr (2007) Computering program. Also, the Relative susceptibility factor were computed according to the following equation.

$$\text{Relative susceptibility} = \frac{LC_{50} \text{ of most susceptible stage}}{LC_{50} \text{ of the other tested stage}} \text{ X } 100$$

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RESULTS AND DISCUSSION

The recorded data in Tables (1 & 2) and Figures (1 & 2) represent the efficacy of insecticide (Lambada) after application as leaf dipping method to *E. vermiculata* and *H. vestalis* immature stages (two, four, six, and eight weeks) and adult. The Results showed that the recorded LC_{50} values of Lambada and methomyl were 0.99 and 0.75, % respectively for adult stage of *Eobania vermiculata*. But the values ranged between 0.47 to 0.82 % for Lambada, 0.33 to 0.70 % for methomyl at (two to eight weeks immature age stages) with the same snail species. LC_{50} values were 0.72 and 0.65 % for the adult stage of *H. vestalis* with lambada and methomyl, respectively. The LC_{50} values were ranged between 0.30 to 0.65 % , and 0.25 to 0.52 % for lambada and methomyl to the same immature age stages (two to eight weeks) respectively. This data revealed that in general, the immature stages proved to be more susceptible to the toxic action of both tested insecticides than the adult stage of the two tested snail species. The obtained results indicated that *H. vestalis* was more sensitive to the tested insecticides; Lambada and methomyle than *E. vermiculata,* for all the tested adult and immature stages. Also data indicated that Methomyl insecticide proved to be more effective as molluscicide than Lambada insecticide for the two investigated terrestrial snails.

The relative susceptibility values based on the LC_{50} of the most susceptible stage as 100% sensitivity were calculated to each insecticides for

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each snail specices. The calculated values revealed that the two weeks immature age stage proved to be the most susceptible age than the other immature and adult stages to the tested insecticides *i.e* lambada and methomyl for both of *H. vestalis* and *E. vermiculata.* Also the relative susceptibility was decreased to the lowest value for two, four, six and eight weeks immature age followed by adult stage. Thus the recorded susceptible values of *H. vestalis* to lambada were 100.00, 90.91, 61.22, 46.15 and 41.67 % respectively, and were 100.00, 96.15, 65.79, 48.07 and 38.46 % to methomyl for the same ages respectively. While these relative values for *E. vermiculata* to lambada were 100.00, 77.05, 67.14, 57.31 and 47.50 % respectively and were 100.00, 89.19, 67.35, 47.14 and 44.00 % respectively to methomyl.

Data also indicated that, the slope values of the toxicity line varid according to snail stage, and the age of immature stages, and moreover according to tested insecticide. Present results, in general showed that the slope values varied among the tested stages of both species land snails, this revealed that there are slight differences in homogeneity of individuals responses at immature ages stage toward both of tested snail species for the two investigated insecticides (methomyl and lambada). Moreover, the adult stage showed the highest slope values with both of *H. vestalis* and *E. vermiculata* snails than immature stage with exceptions of *H. vestalis* with methomyl. In general these data revealed that there are high homogeneity of

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responses of adult individual stage than individual of immature age stage with exceptions of the response of adult individuals towered methomyl in *H. vestalis.*

It could be concluded that Methomyl have the highest efficacy as molluscicide than lambada. The super- power of methomyl against land snails was recorded by several auothers such as Helmy (2010), for *Monacha cartusiana*, Lokma (2013), and Abdel-Rahman *et al.* (2019), for *Monacha cartusiana* and Eshra (2014), against *Theba pisana*, Rady *et al*. (2018), for *Eobania vermiculata* . On other hand, Ismail and Shettaia (2009) reported that metaldehyde was more effective than methomyl against *Monacha cartusiana* as well as Asran *et al*. (2011) proved that metaldehyde super-standing of oxamyl carbamate insectides against *Theba pisana.* Moreover, El-Shahat (2020) reported that ronectin (a biochemical agent) was most toxic for *M. cartusiana* and *E. vermiculata* than lannate. Also it could be concluded that the juveniles or younger immature ages were exceed the oldest ages and adult stage snails in it's responses to both of methomyl and lambada insecticides. This finding may be attributed to the imperfection shell of the younger immature stages than older or adult stags. Thus it could be more sensitive to toxic action of treated molluscicides. Mobarak, (2003), mentioned that immature ages were more susceptible to diazinon and Methomyl than mature age. Also, Mobarak and Kandil, (2014) found that the younger immature ages were more susceptible to Carbendazim (fungicide) than adult age. Moreover,

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data indicated that responses of land snail to molluscicides were varied according to snail species. (Mobarak, 2003) investigated that *E. vermiculata* was more susceptiple to diazinon and Methomyl than *M. obistructa* .

Table (1): Toxicity of Lambada and Methomyl on different stages of *Eobania vermiculata* after seven days of treatment under laboratory conditions

Stage		Lambada			Methomyl		
		LC_{50} %	**Slope**	**Relative susceptibility (%)**	**LC_{50} %**	**Slope**	**Relative susceptibility (%)**
Adult		0.99 (0.83-1.16)	3.24	47.50	0.75 (0.61-0.92)	2.62	44.00
Immature stage (week)	2	0.47 (0.29-0.60)	2.04	100.00	0.33 (0.28-0.36)	1.79	100.00
	4	0.61 (0.44-0.78)	2.06	77.05	0.37 (0.29-0.44)	1.54	89.19
	6	0.70 (0.52-0.90)	2.04	67.14	0.49 (0.40-0.54)	1.63	67.35
	8	0.82 (0.67-1.03)	2.53	57.31	0.70 (0.52-1.01)	2.00	47.14

* values between brackets represents the Lower and upper confidence limits (95%)

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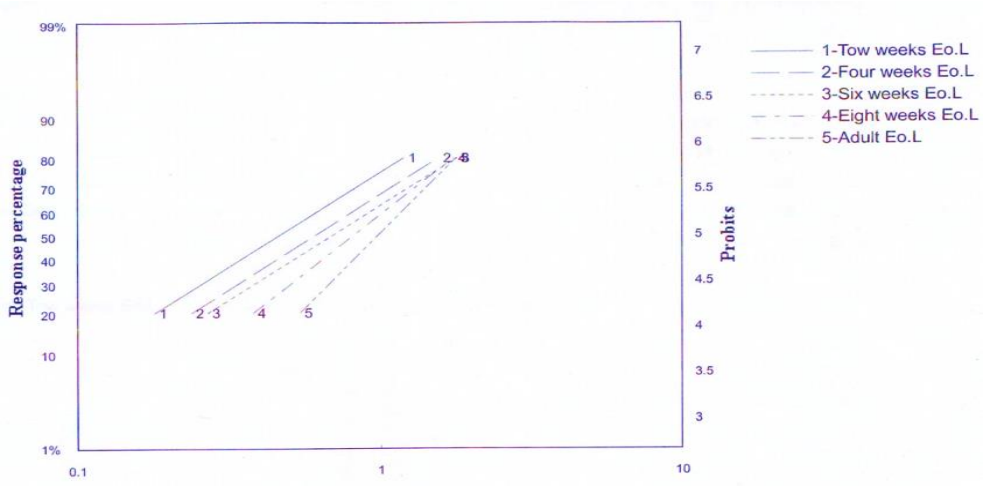
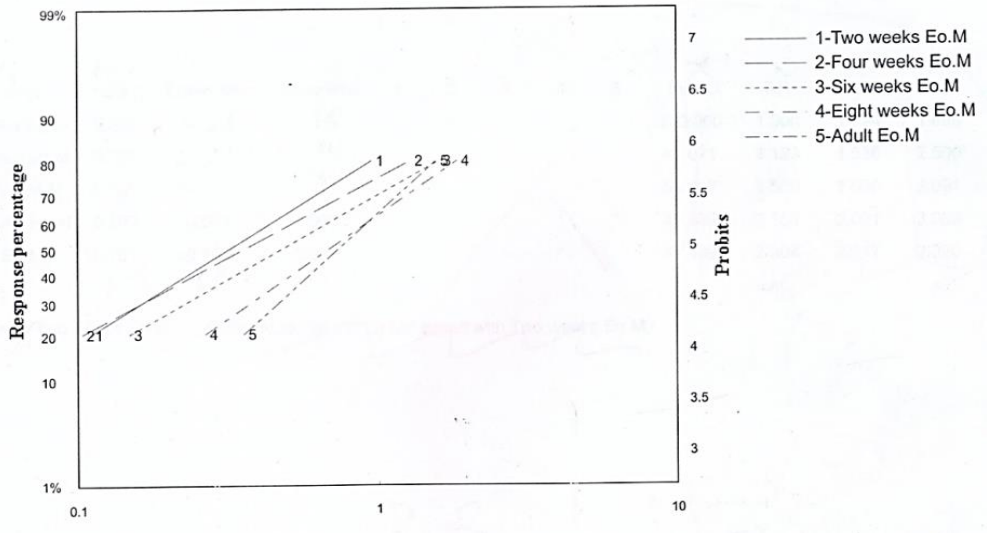


Concentrations % of Lambada

Fig. (1): Toxicity lines of Lambada on different stages of *Eobania vermiculata* after seven days of treatmeant under laboratory conditions



Concentrations % of Methomyl

Fig. (1): Toxicity lines of Methomyle on different stages of *Eobania vermiculat* after seven days of treatment under laboratory conditions

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Tabel (2): Toxicity of Lambada and Methomyl on different stages of *Helicella vestalis* after seven days of treatment under laboratory conditions

Stage		Lambada			Methomyl		
		LC_{50} %	**Slope**	**Relative susceptibility (%)**	**LC_{50} %**	**Slope**	**Relative susceptibility (%)**
Adult		0.72 (0.56-0.90)	2.35	41.67	0.65 (0.59-0.71)	1.76	38.46
Immature stage (week)	2	0.30 (0.12-0.41)	2.21	100.00	0.25 (0.08-0.36)	2.28	100.00
	4	0.33 (0.15-0.58)	1.69	90.91	0.26 (0.21-0.31)	1.63	96.15
	6	0.49 (0.18-0.62)	1.63	61.22	0.38 (0.30-0.46)	1.69	65.79
	8	0.65 (0.45-0.94)	1.82	46.15	0.52 (0.29-0.59)	1.82	48.07

* values between brackets represents the lower and upper confidence limits (95%)

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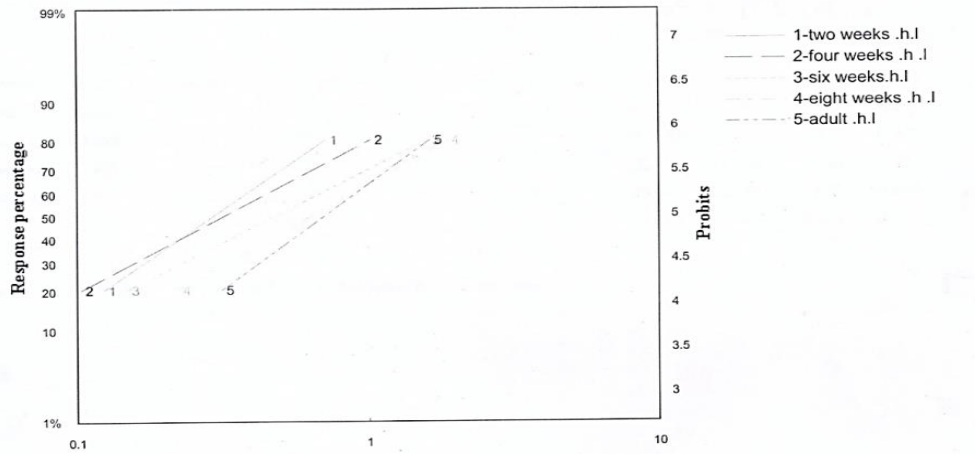
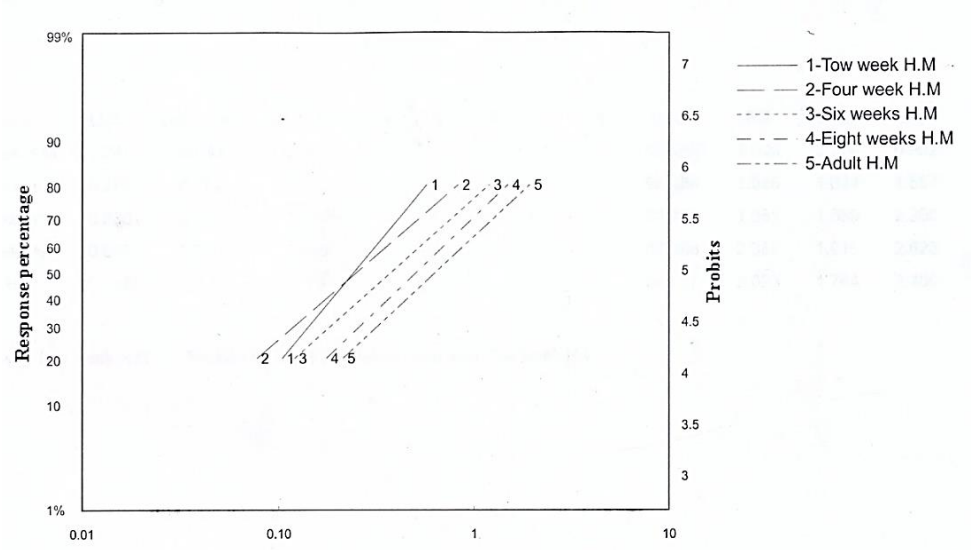


Concentrations % of Lambada

Fig (2): Toxicity lines of Lambada on different stages of *Helicella vestalis* after seven days of treatment under laboratory conditions



Concentrations % of Methomyl

Fig (2): Toxicity lines of Methomyl on different stages of *Helicella vestalis* after seven days of treatment under laboratory conditions

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التأثير السام للمبادا ثيهالوثرين والميثوميل على القواقع الارضية ايوبانيا فيرميكولاتا وهيليثيلا فيستالس تحت الظروف المعملية

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المستخلص

يستهدف هذا العمل تقييم تأثر المبيدات الحشريه البيروثرويد (لمبادا) والكربباميت (الميثوميل) ضد الاعمار الغير بالغه (٢ – ٤ – ٦ – ٨ أسابيع) وعمر البلوغ من ايوبانيا فيرميكولاتا وهيليثيلا فيستاليس باستخدام طريقه التغذيه على الاوراق المغموره فى التركيزات المجهزه لكل مبيد على حده لمدة سبعة ايام تحت الظروف المعمليه واستخدمت خطوط السميه كمعيار للمقارنه بين فاعلية المبيدات الحشريه المختبرة.

وأظهرت النتائج أن الافراد ذات الاعمار غير البالغه اكثر حساسيه من الافراد البالغه من القواقع المختبرة. ومن جهه أخرى أوضحت النتائج أن قوقع هيليثيلا فبستاليس أكثر حساسيه لمبيدى اللمبادا والميثوميل من قوقع ايوبانيا فيرميكولاتا فى جميع الاعمار سواء البالغه والغير بالغه. وكذلك أشارت النتائج الى ان مبيد الميثوميل الكربباميتى اكثر تأثيرا من مبيد اللمبادا من مجموعه البيروثرويد بالنسبه للقوقعين.

كلمات مفتاحية: ايوبانا فيرميكولاتا – هيليثيلا فيستالس – لامبادا ثيهالوثرين – ميثوميل – سمية القواقع الارضية.

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