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EFFECT OF ABAMECTIN AND HEXAFLUMURON AGAINST COTTON LEAFWORM, *SPODOPTERA LITTORALIS* (BOISDVAL) UNDER LABORATORY AND FIELD CONDITIONS

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ABSTRACT: *Field and laboratory experiments were conducted in Fayoum. Governorate during 2013 and 2014 cotton seasons to evaluate the effect of abamectin against cotton leafworm, Spodoptera littoralis. The obtained results indicated that 5 days after treatment the larval mortality percentages were 93.77 , 89.95 %, comparing with 98.95 and 95.85 % for the recommended IGR hexaflumuron (consult) at 2013 and 2014 , respectively , while it was, 10 days after application of abamectin 88.4 and 78.22% reductions comparing with 96.91 and 94.72% for the hexaflumuron, at 2013 and 2014 cotton seasons, respectively. As the residual effect , after 15 days it was 72.3 and 68.11 % for abamectin and 94.17 , 92.45 % for hexaflumuron , at 2013 and 2014 , respectively. The overall reduction was 84.8 , 78.8 % for abamectin and 96.4 , 94.3 % for hexaflumuron at 2013 and 2014 , respectively. Laboratory trials revealed that LC_{50} and LC_{90} of abamectin on cotton leafworm were 2.78 and 48.56 ppm at LC_{50} and LC_{90} , respectively, while it was 6464.2 and 100487.0 ppm for hexaflumuron .The slope values were 1.03±0.16 and 1.08±0.23 for abamectin and hexaflumuron, respectively.*

Key words: *IGR,, hexaflumuron, abamectin,* biopesticide**,** control, slope , lethal dose**.**

INTRODUCTION

Spodoptera littoralis in the major pest destructive cotton fields in Egypt. The insecticides represented the major element for controlling these pests for many years (Verkery and Wright , 1996 , Pinadoz *et al*., 2004, and MacBean ,2012). The environment, animals and human strongly affected by these hazard insecticides as well as the insects become resistance in the different degrees to their actions. So, it is necessary to use safe control agents including chemicals of new mode of action in control programs of both insect pests. Among the bioinsecticides, abamectin was found to be the last with the highest selective toxicity than insecticides.

This work aimed to evaluate the effect of abamectin and the IGR , hexaflumuron against *Spodoptera littoralis* under field and laboratory conditions.

MATERIALS AND METHODS

Field and laboratory trials were carried out to evaluate the effect of abamectin and the IGR , hexaflumuron against the cotton leafworm, *Spodoptera littoralis* , the major cotton insect pest in Egypt.

Field trials:

Field experiments were carried out in Fayoum Governorate during 2013 and 2014 cotton seasons.

Cotton leafworm trials:

The abamectin (250 ml) was evaluated against *Spodoptera littoralis* in cotton field. Egg masses in three feddans of cotton field were most collected and left to hatching. When the hatched larvae reached to about the end of 3rd instar larvae, the area was divided into two equal areas of one feddan for each, representing the three treatments, abamectin , hexaflumuron and control. The number of active larvae per 100 cotton plants were counted for every treatment before pesticide applications, except the newly hatched larvae in the egg masses, then 400 liters of each pesticide was performed using 400 L spraying motor. The

number of larvae per 100 cotton plants were counted 5, 10 and 15 days after spray.

The reduction in numbers of larvae after 5days was represented initial kill and the average reduction after 10 and 15 days was represented residual effect.

laboratory trials:

A susceptible strain of *Spodoptera littoralis* was used in experiment. Using dipping technique disks of castor bean leaves were dipped in gradual concentrations solutions of abamectin for 10 second and left to dryness and then offered to the 2nd the larval instar in glass containers. Every glass containers contains 100 larvae and three replicates were used for every concentrations and the control using castor bean leaves dipped water only and dried castor bean leaves before offered to the larvae. After treatment the larvae were held in at room temperature after 24hrs, the experiment was investigated and the dead larvae were recorded and removed. The a live larvae were transferred to another glass container contain untreated castor bean leaves. The experiment was investigated daily till 5th day. The percent mortalities of larvae after 5days were calculated and corrected when needed using Abbott s formula (1925), LC_{50} and LC_{90} were calculated to Finney (1971).

Henderson and Tilton (1955) equation was used to evaluate the reduction percentages of cotton larvae:

$$\text{Reduction \%} = \left[1-\left(\frac{\text{Treatment after}}{\text{Treatment before}} \times \frac{\text{Control before}}{\text{Control after}}\right)\right] \times 100$$

RESULTS AND DISCUSSION

Field trials

The effect of abamectin and hexaflumuron against cotton leafworm, *Spodoptera littoralis*:

The effect of abamectin against the cotton leafworm, *Spodoptera littoralis* during 2013 and 2014 cotton seasons evaluated and the obtained data presented in. For the initial kill which represented the percent reduction in the Table (1) numbers of the cotton leafworm larvae after 5 days of abamectin resulted in *93.77 , 89.95 %,* reductions in 2013 and 2014 cotton seasons, respectively, comparing with *98.95 and 95.85 %* for the recommended IGR hexaflumuron.

According to the residual effect, as shown in Table (1), 10 days after application of abamectin the reduction percentages in leafworm larvae were 88.4 and 78.22% comparing with 96.91 and 94.72% for the hexaflumuron, at 2013 and 2014 cotton seasons, respectively. Furthermore, as a residual effect , after 15 days reduction percentages in leafworm larvae were 72.3 and 68.11 % for abamectin and 94.17 , 92.45 % for hexaflumuron , at 2013 and 2014 , respectively.

The overall mean reduction of cotton leaf worms were 84.8 , 78.8 % for abamectin and 96.4 , 94.3 % for hexaflumuron at 2013 and 2014 , respectively. .

Cock *et al*., (2007) found that the Emamectin benzoate controlled *S. exigua* infestation in cotton plant up to 10 days after treatment compared to control. Prasad *et al.,* (2007) reported that Emamectin was most toxic against *S. litura* followed by Novoluron indoxacarb .

The previous data appeared highly effect of abamectin in controlling the larvae of cotton leafworm and strongly showed a promise in using this agent as bio insecticide in integrated control management of cotton leafworm, especially because it has a new mode of action than that of the recommended insecticides for this pest and it also for its low toxicity against beneficial insect.

Table (1): The effect of abamectin comparing with the recommonded insect growth regulater (IGR) hexaflumurion against the cotton leafworm, *S.littoralis* during 2013 and 2014 cotton seasons.

Insecticides Dose/feddan	No. of the larvae	Number of collected larvae (reduction percentages)			Overall mortality %	Hatchability %
		5 days	10 days	15 days		
2013 season						
Abamectin 250ml	650	46	61	18	84.8	80.8
		(93.77)	(88.4)	(72.3)		
Hexaflumurion 250ml	1200	25	30	7	96.4	93.1
		(98.17	(96.91)	(94.17)		
control	1100	1250	890	110	-	98
2014 season						
Abamectin 250ml	880	100	85	61	78.8	79.19
		(89.95)	(78.22)	(68.11)		
Hexaflumurion 250ml	1280	60	30	21	94.3	90.25
		(95.85)	(94.72)	(92.45)		
control	1150	1300	510	250	-	98

Laboratory trials:

Data recorded in Tables (2 & 3) revealed that LC_{50} and LC_{90} of abamectin on the fourth instar larvae of cotton leafworm were 2.78 and 48.56 ppm, respectively, while it was 6464.2 and 100487.0 ppm for hexaflumuron .

The slope values were 1.03±0.16 and 1.08±0.23 for abamectin and hexaflumuron, respectively.

These results are harmony with those of Argentinet, *et al*., (2002) and Biroh *et al*., (2008) , in addition Dhawan *et al.,* (2007) who found that the LC_{50} values of Emamectin benzoate against the third larvae of *Spodoptera littoralis* was 0.0001 ppm and Emamectin benzoate was the most toxic insecticide comparing to other treated insecticides.

The obtained results showed a promising results to use abamectin in the integrated control programs of lepidopterous insects especially cotton leafworm, *S. littoralis.*

Table (2): The LD_{50} , LD_{90} and slope of the abamectin on 4th stage larvae of cotton leafworm, *S.littoralis*

Days	Abamectin					
	LC_{50}	Slope	Confidence limits	LC_{90}	Slope	Confidence limits
24 hr	2.78	1.03±0.16	1.304 - 4.82	48.56	1.03±0.16	25.57-132.53
48 hr	2.12	1.097±0.21	-	31.10	1.097±0.21	-
72 hr	0.37	0.83±0.22	-	12.68	0.83±0.22	-

Table (3): The LD_{50} , LD_{90} and slope of the hexaflumuron on 4th stage larvae of cotton leafworm, *S.littoralis*

Days	Hexaflumuron					
	LC_{50}	Slope	Confidence limits	LC_{90}	Slope	Confidence limits
24 hr	6464.2	1.08±0.23	3859.4-16057.4	100487.0	1.08±0.23	31470.1-1592859.7
48 hr	670.01	1.17±0.19	362.24-1061.1	8421.95	1.17±0.19	4631.82-22982.91
72 hr	156.90	1.10±0.19	54.21-296.09	2293.44	1.10±0.19	1319.93-5161.22

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تأثير فعالية الأبامكتن والهكسا فلوموروون معمليا وحقليا على دودة ورق القطن

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الملخص العربي

إجريت التجارب المعملية والحقلية بمحافظة الفيوم مركز أبشواي معمليا وحقليا خلال عامى (2013– 2014) لتقييم تأثير فعالية الأبامكتن ومنظم النمو الهكسافلوموروون على دودة ورق القطن.

وقد أوضحت التجارب أن مركب الأبامكتن بعد 5 أيام من التطبيق قد سبب خفض قدرة (93,77 ، 89,85 ٪) فى تعداد يرقات ورق القطن مقارنة بنسب خفض فى تعداد يرقات ورق القطن قدرة (98,17 ، 95,85 ٪) لمركب الهكسافلوموروون خلال موسمى القطن 2013 ، 2014 على التوالى. بينما الأثر المتبقى لمركب الأبامكتن بعد 10 ، 15 يوم من التطبيق أظهر خفض فى تعداد يرقات دودة ورق القطن قدرة (88,4 ، 78,2 ٪) ، (72,3 ، 68,11 ٪) مقارنة بنسب خفض (96,91 ، 94,72 ٪) ، (94,17، 92,45 ٪) لمركب الهكسافليمورون موسمى القطن 2013 ، 2014 على التوالى. كان متوسط نسب الموت الكلية لليرقات 84.8 ،78,8 ٪ لمبيد الأبامكتن ، 96,4 ، 94,3 ٪ لمبيد الهكسافلوموروون خلال موسمى القطن 2013 ، 2014 على التوالى.

فى حين أوضحت التجارب المعملية أن قيمة LC_{50} and LC_{90} ليرقات العمر الرابع لدودة ورق القطن لمركب الأبامكتن كانت 48,56 ، 2,78 وقيمة الانحدار 1,03± 0,16 وكانت القيم 6464,2 ، 100487 جزء فى المليون لمركب الهكسافلوموروون وقيمة الانحدار 1,08± 0,23.