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EFFECT OF SOME DIFFERENT COMPOUNDS ON AMERICAN BOLLWORM, *Helicoverpa armigera* (Hubner) IN COTTON FIELDS

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ABSTRACT

Field experiments were conducted at Aga district, Dakahlia Governorate during 2011 and 2012 cotton seasons to study the effect of five pesticides; Methomyl, Profenofos, Cholorpyrifos, Deltamethrin, Lambada-Cyhalothrin and insect growth regulator (IGR), Chlorfluazuron; against eggs and larvae of *Helicoverpa armigera* and infested cotton buds. Results showed that in case of *H. armigera* eggs Chlorpyrifos caused the highest reduction percentage of in egg of bollworm (72.03%), followed by Deltamethrin 69.29% , Profenofos 68.93%, Lambada-Cyhalothrin 67.29% and Methomyl 65.98%, while the least reduction was 62.44% for Chlorfluazuron. In case of the larvae, the results showed Chlorpyrifos caused the highest reduction 79.58% followed by Chlorfluazuron 73.29%, Profenofos 72.54%, Deltamethrin 64.22% , Lambada-Cyhalothrin 58.40%. While the lowest reduction percentage was 56.68% for Methomyl. In case of the infested cotton buds, Chlorpyrifos caused the highest reduction with 75.54%, followed by Chlorfluazuron 72.05%, Profenofos 70.47%, Deltamethrin 57.18% and Lambada-Cyhalothrin 57.06%, while the lowest reduction was 48.54% for Methomyl.

Generally Chlorpyrifos was most effective on the eggs and larvae of *H. armigera* and the infested cotton buds, while Chlorfluazuron was the least affective on *H. armigera* eggs, but Methomyl was the least effective on the larvae of *H. armigera* and infested buds.

INTRODUCTION

Cotton is one of the most important economical crops in Egypt and allover the world. Xiulian, *et al.* (2004) the larvae of *H. armigera* fed on a wide range of the economically important crops including cotton, corn, tomato, sunflower, legumes, tobacco and several cucurbitous and citrus crops. Moral, (2006) the cotton bollworm fed on most plant parts including, leaves, flower buds, and fruits at different larval development instars. Reed and Pawar (1981) In India, where *H. armigera* commonly destroys more than half the yield crop, losses were estimated at over $300 million per annum. Karim *et al.* (1999) the chemical pesticide most widely used to control *H. armigera*. In Pakistan, Curacron eradicated significantly the population of *H. armigera* after three successive application. Preetha *et al.* (2007) Thiodicarb, Monocrotophos, Profenofos caused inhibition in *H. armigera* egg hatch the percentages mortality of eggs were, 60.00, 34.00 and 99.00 % compared with 1.00 % in untreated eggs. Mosallazad *et al.* (2003) Endosulfan, Profenofos and Thiodicarb have been the commonly used insecticides for controlling *H. armigera* in recent years in Iran. Al-Shannaf *et al.* (2012) Chlorfluazuron was the highest initial reduction (75.00 and 80.6%); residual mean (83.75 and 79.45%) and annual mean (80.83 and 79.83%) on *H. armigera* during two

successive seasons, respectively. Shah *et al*. (2003) Chlorpyrifos was the best insecticide for controlling *H. armigera* infesting chickpea followed by Endosulfan, Lambda-Cyhalothrin and cyhalothrin. Tariq *et al.* (2005) Chlorpyrifos and Profenofos showed 73 % and 70% mortality on the *H. armigera* larvae in cotton field

The aim of this work was to study the effect of five insecticides and one Insect Growth Regulators, (IGR) against larvae and eggs of *H. armigera* and infested cotton buds by *H. armigera*

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MATERIALS AND METHODS

Field experiments were carried out at Aga district, Dakahlyia Governorate, Egypt during two growing cotton seasons of 2011 and 2012 to evaluate the effect of five insecticides and one Insect Growth Regulators, (IGR) (Table, 1) against larvae and eggs of *H armigera.* and infested cotton buds by *H. armigera*. The experimental area about four feddans was cultivated with the Egyptian cotton variety, Giza 86 and sown during the fourth week of March at the two cotton seasons. The cotton areas were subjected to normal agricultural practices allover study periods.

Experimental design:

The experimental area was divided to seven plots each plot half feddan, (6 plots for treatments and one plot for untreated (control). Each plot was divided to four replicates. The plots were distributed in completely randomized block design. Cotton plants in this experiment did not previously receive any pesticide treatments.

Insecticides used:

The insecticides used were two synthetic Pyrethroids, one IGR, two phosphorous and one Carbmate (Table, 1).

Table (1): Tested insecticides

Common name	Trade name	Formulation and % a.i.	Rate /feddan
Methomyl	Nudrin	SP-90%	300g
Profenofos	Curacron	EC-72	750ml
Chlorpyrifos	Dursban	EC-48%	1000ml
Deltamethtrin	Cothrin	EC-5%	750ml
Lambda-Cyhalothrin	Kendo	EC-2.5%	750ml
Chlorfluazuron	Atabron	EC-5%	400ml

a. i.= Active ingredient

The evaluation of tested insecticides was based on two sprays of ten days intervals at June 22nd and 1st July during 2011 and 2012 seasons using a motor sprayer type solo 20-L volume.

Sample technique:

Weekly twenty cotton plants (five plants for each replicate) were chosen randomly and investigated visually from each treatment to count the numbers of eggs and larvae of *H. armigera* and the infested buds. The number of eggs, larvae and infested buds were recorded before treatment and after 1, 7 and 10 days the insecticides treatment and 3, 7 and 10 days for

IGR from treatments. The effect of insecticides and IGR were studied against the eggs during the first spray only. The reduction percentages in *H. armigera* larvae and eggs and infested cotton buds were calculated using the equation suggested by Tilton and Henderson (1955).

RESULTS AND DISCUSSION

Data in Table (2) showed the reduction percentages of *H. armigera* eggs after one, seven and ten days from treatment by insecticides and three, seven and ten days for IGR. Chlorpyrifos showed the highest reduction percentage of the *H. armigera* was (76.33 and 67.73 %) followed by Deltamethrin 72.81 and 65.77 %, Profenofos (71.92 and 65.95 %), Lambda-Cyhalothrin (70.12 and 64.47 %) and Methomyl (67.93 and 64.04 %) in the 2011 and 2012 seasons, respectively. The lowest reduction percentage was 66.04 and 58.84% for Chlorfluazuron in 2011 and 2012 seasons, respectively.

Table (2): Reduction percentages of the *H. armigera* eggs number after treated with different compounds during 2011 and 2012 seasons.

Treatment	Season	%reduction of eggs after				Average season	Average of the two seasons
		24 hours	3days	7days	10days		
Methomyl	2011	57.81	-	68.06	77.94	67.93	65.98
	2012	53.13	-	63.35	75.65	64.04	
Profenofos	2011	61.62	-	71.93	82.22	71.92	68.93
	2012	51.25	-	68.42	78.18	65.95	
Chlorpyrifos	2011	62.35	-	73.05	93.60	76.33	72.03
	2012	53.13	-	67.11	82.96	67.73	
Deltamethrin	2011	70.28	-	73.41	74.74	72.81	69.29
	2012	58.33	-	69.29	69.69	65.77	
Lambda-Cyhalothrin	2011	68.63	-	68.42	73.33	70.12	67.29
	2012	63.32	-	65.68	64.43	64.47	
Chlorfluazuron	2011	-	49.32	61.13	87.69	66.04	62.44
	2012	-	45.31	53.95	77.27	58.84	

According to the average reduction percentage of the two seasons, the tested compounds can be arranged in order as follows Chlorpyrifos, Deltamethrin, Profenofos, Lambda-Cyhalothrin, Methomyl and Chlorfluazuron.

Results in Table (3) indicated that the reduction percentage of *H. armigera* larvae after treatment by different compounds. The highest reduction percentages were (70 and 70 %) recorded after ten days of second spray in the first and second seasons for Methomyl, but the percent seasonal reduction were (54.66 and 58.70 %) in the two seasons. While, the highest reduction percentages of Profenofos were (80 and 85 %) recorded in the ten days of the second spray in the two seasons of study, but the percent seasonal reduction were (70.29 and 74.79 %) in the two seasons of study.

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Chlorpyrifos caused the highest reduction of *H. armigera* larvae after 24h and seven days of the second spray (89.47 and 86.67%) in the first and second seasons, but the percent seasonal reduction were (81.79 and 77.37%) in the two seasons of study. The highest reduction percentages were (70 and 80%) recorded after ten days of second spray in the first and second seasons for Deltamethrin, but the percent seasonal reduction were (59.89 and 68.55%) in the two seasons of study. Meanwhile, the highest reduction percentages were (70 and 70 %) recorded after ten days of second spray in the first and second seasons for lambada-cyhalothrin, but the percent seasonal reduction were (60.63 and 56.18 %) in the two seasons of study. On the other hand, Chlorfluazuron caused the highest reduction of *H. armigera* larvae after ten and seven days of second spray (85 and 84%) in the first and second seasons, but the percent seasonal reduction were (72.94 and 74.09%) in the two seasons of study.

Generally results revealed that the preferable compounds against *H. armigera* larvae were Chlorpyrifos causing highly reduction percentage (79.58%) as a mean of the two seasons followed by Chlorfluazuron (73.29%), Profenofos (72.54%), Deltamethrin (64.22%) and Lambada-Cyhalothrin (58.40%) reduction percentages. While the lowest reduction percentages of *H. armigera* was (56.68%) recorded for Methomyl as a mean of the two seasons.

Data in Table (4) shows the reduction percentages of infested cotton buds by *H. armigera* after one, seven and ten days from treatment for insecticides three, seven and ten days for IGR. Chlorpyrifos showed maximum reduction percentage 77.32 and 73.75 % during 2012 and 2011 seasons followed by 72.06 and 72.03 % for Chlorfluazuron during 2011 and 2012 seasons; 71.32 and 69.62 % for Profenofos; 60.28 and 54.08 % for Deltamethrin; 60.19 and 53.29 % for Lambda-Cyhalothrin and 51.69 and 45.38 % for Methomyl during 2012 and 2011 seasons.

According to the average reduction percentage of the two seasons, the tested compounds can be arranged descendingly as follows Chlorpyrifos, Chlorfluazuron, Profenofos, Deltamethrin, Lambda-Cyhalothrin and Methomyl.

Generally Chlorpyrifos was the highest effective compound against *H. armigera* which infested cotton buds and caused the highest reduction on the bud infestation, while the lowest effective compound against *H. armigera* was Methomyl.

Murthy and Ram (2002) Novaluron treatment gave effective control of the American bollworm larvae up to 10 days after spraying. Kumar *et al.* (1996) the treatment of 2nd instar larvae of *H. armigera* with Diflubenzuron (10-1000 ppm) caused 24.8 % adult abnormalities. Shah *et al*. (2003) found that Chlorpyrifos was the best insecticide for controlling *H. armigera* infesting chickpea followed by Endosulfan, Lambda and Cyhalothrin. Aslam *et al.* (2004) found Quinalphos was most effect up to three days, whereas Thiodicarb and Chlorpyrifos were most toxic effect up to 7 days against *H. armigera* under field conditions.

Shannaf *et al.* (2012) indicated that Chlorfluazuron was the highest initial reduction (75.00 and 80.6%); residual mean (83.75 and 79.45%) and annual mean (80.83 and 79.83%) on *H. armigera* during the two successive seasons, respectively. Gogi *et al*. (2006) conducted field experiment efficacy of the two insect groth regulators at two recommended application rates, Buprofezin was not effective against *H. armigera* at any tested dose. Lufenuron was effectively suppressed *H. armigera* populations, resulting in significant reductions in crop damage. Preetha *et al.* (2007) Thiodicarb, Monocrotophos, Profenofos insecticides caused inhibition in *H. armigera* egg hatch. The percentages of eggs mortality were 60.00, 34.00 and 99.00 % compared with 1.00 % for the insecticides, respectively in untreated eggs

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تاثير بعض المركبات المختلفة على دودة اللوز الأمريكية فى حقول القطن

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أجريت التجارب فى مركز أجا بمحافظة الدقهلية خلال موسمى 2011 و2012 لدراسة تاثيرخمس مبيدات (الميثوميل و البوروفينوفوس والكلوربيرويفوس و الدلتا ميثرين و لمبادا-سيهالوثرين) ومنظم النمو الحشرى (الكلورفليوازيرون) ضد يرقات وبيض دودة اللوز الامريكية على نباتات القطن والوسواس المصاب .أظهرت النتائج ان مبيد الكلوربيرويفوس سبب اعلى نسبة خفض فى تعداد بيض دودة اللوز الأمريكية وكانت 72.03 % يلية الدلتا ميثرين 69.29 % و البروفينوفوس 68.93% و لمبادا-سيهالوثرين 67.29 % والميثوميل 65.98 % ، بينما كان أقلهم مبيد الكلورفليوازيرون 62.44%. أما فى حالة الاصابة بيرقات دودة اللوز الأمريكية أوضحت النتائج ان الكلوربيرويفوس سبب أعلى نسبة خفض 79.58 % يلية الكلورفليوازيرون 73.29 % و البوروفينوفوس 72.54% والدلتا ميثرين 64.22% و لمبادا-سيهالوثرين58.40 % ، بينما سبب مبيد الميثوميل أقل نسبة خفض 56.68 % . فى حالة إصابة البراعم الزهرية أوضحت النتائج أن الكلوربيرويفوس سبب أعلى نسبة خفض 75.54 % يلية الكلورفليوازيرون 72.05% و البوروفينوفوس 70.47% والدلتا ميثرين 57.18% و لمبادا-سيهالوثرين 57.06 % ، بينما سبب مبيد الميثوميل أقل نسبة خفض 48.54% . بصفة عامة وجد أن مركب الكلوروبيروفوس كان أعلاهم تاثيرا على البيض واليرقات والوسواس المصاب ، بينما كان مبيد الكلورفليوازيرون أقلهم تاثيرا على البيض ومبيد الميثوميل أقلهم تاثيرا على اليرقات والوسواس المصاب.

قام بتحكيم البحث

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Table (3): Reduction percentages of the *H. armigera* larvae after treated with different compounds during 2011 and 2012 seasons.

Treatments	Season	First spray					Second spray					Average season	Average of the two seasons
		24 hours	3 days	7 days	10 days	Average	24 hours	3 days	7 days	10 days	Average		
Methomyl	2011	52.38	-	47.83	48.00	49.40	52.63	-	57.14	70.00	59.92	54.66	56.68
	2012	51.25	-	54.35	53.13	52.97	58.33	-	65.00	70.00	64.44	58.70	
Profenofos	2011	71.43	-	65.22	60.00	65.55	73.68	-	71.43	80.00	75.03	70.29	72.54
	2012	77.50	-	70.65	65.63	71.26	75.00	-	75.00	85.00	78.33	74.79	
Chlorpyrifos	2011	80.95	-	82.61	72.00	78.52	89.47	-	85.71	80.00	85.06	81.79	79.58
	2012	75.00	-	82.61	66.66	74.75	83.33	-	86.67	70.00	80.00	77.37	
Deltamethrin	2011	50.00	-	60.87	58.00	56.29	52.63	-	67.89	70.00	63.50	59.89	64.22
	2012	55.00	-	69.66	66.66	63.77	66.67	-	73.33	80.00	73.33	68.55	
Lambda-Cyhalothrin	2011	42.86	-	67.39	58.00	56.08	57.42	-	68.14	70.00	65.18	60.63	58.40
	2012	40.00	-	60.87	56.25	52.37	50.00	-	60.00	70.00	60.00	56.18	
Chlorfluazuron	2011	-	57.14	70.65	70.00	65.93	-	76.32	78.57	85.00	79.96	72.94	73.29
	2012	-	58.00	73.91	70.00	67.30	-	76.67	84.00	82.00	80.89	74.09	

Table (4): Reduction percentages of the infested cotton buds by *H. armigera* after treated with different compounds during 2011 and 2012 seasons.

Treatments	Season	First spray					Second spray					Average season	Average of the two seasons
		24 hours	3 days	7 days	10 days	Average	24 hours	3 days	7 days	10 days	Average		
Methomyl	**2011**	40.00	-	56.25	43.10	46.45	41.67	-	52.63	38.64	44.31	45.38	48.54
	2012	45.46	-	58.33	41.33	48.37	56.86	-	56.67	51.52	55.02	51.69	
Profenofos	**2011**	70.00	-	65..63	61.21	65.61	72.92	-	68.42	79.55	73.63	69.62	70.47
	2012	63.64	-	66.67	62.67	64.32	76.47	-	76.67	81.82	78.32	71.32	
Chlorpyrifos	**2011**	76.00	-	70.00	66.89	70.96	76.67	-	74.74	78.18	76.53	73.75	75.54
	2012	72.73	-	75.00	72.00	73.24	82.35	-	80.00	81.82	81.39	77.32	
Deltamethrin	**2011**	50.00	-	62.50	51.72	54.74	58.33	-	47.37	54.55	53.42	54.08	57.18
	2012	63.64	-	66.67	48.00	59.44	64.71	-	55.00	63.64	61.12	60.28	
Lambda-Cyhalothrin	**2011**	40.00	-	57.11	43.84	46.99	59.92	-	50.38	68.83	59.58	53.29	57.06
	2012	52.27	-	59.38	52.00	54.55	69.12	-	62.50	65.91	65.84	60.19	
Chlorfluazuron	**2011**	-	73.21	64.29	67.49	68.33	-	77.78	72.93	76.62	75.78	72.06	72.05
	2012	-	65.71	67.86	69.14	67.57	-	78.57	74.29	76.62	76.49	72.03	