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Effect of sequence control sprays on cotton bollworms and side effect on some sucking pests and their associated predators in cotton fields.

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ABSTRACT

Field evaluation of sequence control sprays were carried out at Abou-Hamad district, Sharkia Governorate, Egypt in the two successive cotton growing seasons 2008 and 2009 against cotton bollworms, *Pectinophora gossypiella* (Sound.), *Earias insulana* (Boisd.) and *Heliothis armigera* (Hüb.) infesting cotton green bolls as well as some sucking pests and some important predators. The seasonal average reductions in cotton bollworms infestation attained 66.67 and 61.18 % in 2008 and 2009 seasons.

Conventional insecticides mixture IGRs treatments attained 91.82 and 84.42 % in 2008 season of *Nezara viridula* and *Tetranychus* spp.; 90.13 and 75.38% of *N. veridula* and Aphids in 2009 season, respectively. The lowest mean numbers of insects were 0.78 and 1.48 insects/week of *Tetranychus* spp. and *N. viridula* in 2008; 0.41 and 3.33 individuals/week in 2009 season in treatments of true spiders and *N. viridula* compared with untreated plots recorded 0.96 and 1.48 in 2008 season of true spiders and *N. viridula*, while in 2009 the lowest mean numbers were 1.26 and 7.93 individuals/week of *Tetranychus* spp. and *N. viridula*. The tested programs resulted in the highest degree of % reduction for all investigated predators except for *Chrysoperla carnea* attained 99.54 ,94.05 and 91.89 % of *Peaderus alfierii*, *Coccinella* spp. and *Scymnus* spp. in 2008.In 2009 seasons the highest reduction were 100.00, and 84.30 % of *Coccinella* spp. and *Scymnus* spp.

The insect predators (*Chrysoperla carnea*, *Coccinella* spp. *Orious* spp., *Peaderus alfierii*, *Scymnus* spp., and true spiders) were influence significant and insignificant relationship in the two seasons and ranged between positive & negative relationship. On the other hand, results indicate that the all predators affect sucking pests with 29.73, 32.54; 35.57,83.22; 61.88,83.54; 49.14,46.26 and 52.46,58.26% mutable regression values of *Aphis gossypii*, *B. tabaci*, *Emboasca lybica, N. viridula* and *Tetranychus* spp. during 2008 and 2009, respectively.

INTRODUCTION

Cotton, *Gossypium barbadence* L. is one of the most important economical crops in Egypt and allover the world where it is employed in several industrial productions i.e. ginning, textile, Food oil, soap, furniture and many other industries, as well as a source of foreign coin when exported to another countries. Cotton bollworms are the most destructive pests infesting cotton plants. The pink bollworm (PBW), *Pectinophora gossypiella* (Saunders) (*Lepidoptera: Gelechiidae*) is the key pest of cotton, (*Gossypium* spp.) in many cotton producing areas of the world. Continuing economic losses, social and environmental concerns. In Egypt, Cotton plants are usually subjected to be attacked by numerous insect pests and or Egyptian conditions during all different stages of their growth are the aphid, *Aphis gossypii*

Glover; the whitefly, *Bemesia tabaci* (Genn.); the cotton leafhopper, *Empoasca lybica* (deBerg;) the cotton thrips, *Thrips tabaci* (lind.); the Egyptian cotton Leafworm, *Spodoptera littoralis* (Boisd.); the spiny bollworm, *Earias insulana* Boisd.; the pink bollworm, *Pectinophora gossypiella* (Saund.) and the common red spider mite, *Tetranychus* spp.; Al-Shannaf (2002). The most serious pests are pink bollworm, *Pectinophora gossypiella* (Saunders) and the spiny bollworm, *Earias insulana* (Boisd.) which are considered destructive pests infesting cotton plants and causing usually severe damage resulting in high loss in both quantity and quality of the obtained yield. (Knight 2000) stated that the effect of individual insecticides as well as their combined action on major cotton pests and certain insect predators. However, any information on the interaction of insecticide mixtures on major pests is indispensable in cases of pest outbreaks. Also, insecticidal mixtures might play an important role in IPM systems where more than one pest are involved in plant infestation. IGRs are claimed to be safer for beneficial organisms than conventional insecticides, and they have been successfully used in IPM programs against many tree and small fruit pests.

The benzoylurea, chlorfluazuron (Atabron) and hexaflumuron (Consult) as insect growth regulators (IGRs) were studied in cotton fields and stated that chlorfluazuron is highly selective against lepidopterous larvae (Hegab, 2008). Alternative of conventional insecticides with biorational compounds are currently being investigated and included the used that are compatible with integrated pest management (Horowitz and Ishaaya 2004).

The aim of this study were carried out to evaluate the effectiveness of sequence insecticides mixtures with Insect growth regulators IGRs against cotton bollworms, (pink, spiny and american bollworms) infesting cotton green bolls and side effect on some major of cotton pests such as, (*Aphis gossypii, Bemisia tabaci, Empoasca lybica, Thrip tabaci, Tetranychus* spp. and *Nezara viridula)* and side effect on some important predators in cotton fields.

MATERIALS AND METHODS

1. Effect of control programs against cotton bollworms

Field experiments were carried out at Abou-Hamad distreict, Sharkia Governorate, Egypt, during two consecutive cotton growing seasons of 2008 and 2009. The experimental area was cultivated with the Egyptian cotton variety, Giza 86 sown after clover at 15th and 27th March during the two seasons, respectively in order to carry out control studies on the pink bollworm, *P. gossypiella* (Saund.), the spiny bollworm, *E. insulana* (Boisd.) and american bollworm, *H. armigera* (Hub.) attacking cotton plants and side effect on some sucking pests *Aphis gossypii, Bemisia tabaci, Empoasca lybica, Tetranychus* spp. and *Nezara viridula)* and their associated predators. The cotton areas were subjected to normal agricultural practices allover study periods and the following studies were conducted:

1. Sequence control against cotton bollworms:

1.1. Experimental design:

An area of about one feddan of cotton was subjected to each treatment of sequence insecticides. The experimental area of each treatment was divided into one treatment and control during 2008 and 2009 seasons; respectively each was divided to four replicates. Four sprays were applied at two week intervals for Profenofos, (Curacron) / mixture atabron (1st spray ; three weeks intervals were applied for pyrethroid, S-fenvalerate (Sumi-alfa) 5% EC. 2nd spray ;3rd spray Chlorpyrifos

methyl, (Dursban) / mixture atabron and 4th spray Chlorpyrifos methyl, (Dursban) / mixture consult during 2008 and 2009 seasons. Spray program begin on 1st and 15th July, 5th and August. in 2008 season, respectively., spray program begin on 10th ,26th July, 16th August and 1st Sept., respect. In 2009. Field spray applied by using dorsal solo motor, 20 litter in capacity and started at 3% infestation of green cotton bolls.

1.3. Sampling techniques:

Weekly samples of 100 cotton bolls were collected just before and after the treatment and control treatments and were externally and internally inspected. The number of larvae in green cotton bolls were calculated to compare the efficiency of tested control agents against pink, spiny and American bollworms using, Henderson and Tilton equation (1955).

2. Insecticides:

2.1. Synthetic pyrethroids, S-fenvalerate, (Sumi-alfa EC 5%) used at rate of 600 ml/feddan

2. 2. Organo-phosphorous compounds:

-Profenofos, (Curacron EC 72%), at rate of 750 ml/feddan

-Chlorpyrifos methyl, (Dursban EC 48%), at rate of 1000 ml/ feddan.

2.3. Insect growth regulators (IGR's) compounds

- benzoylurea, Chlorfluazuron (Atabron 5 % EC) used at rate of 400ml/feddan.

-benzoylurea, Hexaflumuron (Consult 10 % EC) used at rate of 200ml/feddan.

3. Side effect of conventional insecticides /IGRs mixtures against major cotton pests populations on cotton fields

3.1. Experimental design:

The harmful effect of the tested compounds against some cotton pests was investigated. The numbers of pests *Aphis gossypii*, *Bemisia tabaci*, *Empoasca lybica*, *Tetranychus* spp. and *Nezara viridula*), were counted on 25 cotton plant, the insect were counted on three levels from three replicates of each treatment (100 cotton plant/treatment and control), before and weekly after insecticide applications. Weekly samples of cotton plant were started from 23th of April until 15th of September in 2008 season, from 29th of April until 15th of September in 2009 season. The reduction in number of sucking pests and predator's population were calculated using, Henderson and Tilton equation (1955).

4- Side effect of conventional insecticides /IGRs mixtures against non target predators populations on cotton fields:

The harmful effect of the tested compounds against some predators aphid lion, *Chrysoperla carnea*; beetles, *Coccinella* spp.; anthocoride bugs *Orious* spp.; staphylinid beetle. *Peaderus alfierii; Scymnus* spp. and True spiders were counted on three cotton levels (top, middle and bottom/plant).Twenty five cotton plants for every replicate, before and weekly after insecticide applications. The mean weekly numbers for each predator were recorded and the reduction percentage were estimated according to Henerson and Tileton equation (1955).

RESULTS AND DISCUSSIONS

1. Effect of control programs against cotton bollworms:

Data in Table (1) showed that boll larval numbers were influenced by tested programs in comparable with untreated cotton area. The reduction percentages in the boll infestation due to the tested programs were different. The highest average of reduction percentages were recorded (81.98 and 80.77%) after the 3rd and 2nd spray application, while the median reduction percentages were recorded after 4th and 1st

spray of application (53.60 and 50.39 %) during 2008 season. In 2009, the highest average of reduction percentages were (80.00 and 64.08 %) after the 2nd and 3rd weeks of application for 2nd and 3rd spray of applications, resp., while the lowest mean of reduction were recorded (59.17 and 41.46 %) of the 1st and 4th spray of application. These data clear that 2nd and 3rd sprays is the best program achieved the highest reductions through the two cotton seasons followed by 4th spray in 2008 and 1st spray in 2009. Results cleared that all the tested control sprays caused highly decreasing in cotton bollworms larvae compared with untreated area. Seasonal mean numbers were (5.78 and 9.11) in the two seasons compared with in untreated plots (42.33 and 40.78). The seasonal reduction in cotton bollworms larvae were (66.67 and 61.18 %) in the two seasons of study, respectively.

Results are agree with the authors in all the worlds such as Sidhu, *et al*. 1986; Watson, *et al.* 1986; Sarag and Satpute, 1988 and Dhawan, *et al*. 1990 reported that the conventional insecticides were the most effective reduction percentage of the cotton bollworms resulted in increased high yield of cotton seeds. Abdalla (1991) stated that the effects of chemical control programs on the rate of infestation of cotton bolls by the two bollworms, *Pectinophora gossypiella* and *Earias insulana* in Egypt. The obtained results revealed that three or four sprays through the season caused a satisfactory decrease of infestation and loss of yield. Simwat and Dhawan (1992) assessed the efficacies of conventional insecticides were the most compounds potent against cotton bollworms, while diflubenzuron alone and in combination with insecticides sequence reduced pest incidence and increased yield, although diflubenzuron was less effective than the other insecticides. Khattak *et al*. (2004) evaluated the effects of seven insecticides on cotton bollworms, and on the beneficial fauna on cotton. All the insecticides at their recommended rates were more effective on bollworms than untreated plots. Hegab (2008) stated that, all tested control programs influenced the boll infestation percentages compared with untreated cotton areas. high reduction of larval numbers in green cotton bolls was recorded (74.33, 73.58, 63.72, 59.70 and 54.87 %) at insecticides only, insecticides then *Trichogramma*, Dipel 2x then insect ides, Dipel 2x only and *T. evanescense* only during three cotton seasons. Yousif-Kalil *et al.* (2008) found that relative effectiveness of spinosad and methoxyfenozide compared with chlorpyrifos against the pink bollworm *P. gossypiella*. The seasonal average reductions in pink bollworm attained 86.90, 81.93 and 63.62 % in 2004 season; 84.79, 82.19 and 57.76 % in 2005 season.

Table 1: Effect of tested controlling programs on the larval number of cotton bollworms and reduction percentages during 2008 and 2009 seasons.

Season	N. of larvae after treatment		1st spray					2nd spray							3rd spray					4th spray					Seasonal mean/week	% Seasonal reduction
			1st week		2nd week		Mean R. %	1st week		2nd week		3rd week		Mean R. %	1st week		2nd week		Mean R. %	1st week		2nd week		Mean R. %		
			N	R.%	N	R.%		N	R.%	N	R.%	N	R.%		N	R.%	N	R.%		N	R.%	N	R.%			
2008	T	2.00	2.00	28.75	1.00	72.22	50.39	1.00	84.32	2.00	80.00	3.00	77.94	80.77	3.00	82.14	4.00	81.82	81.98	14.00	42.76	22.00	44.44	33.40	5.78	66.27
	C	5.00	7.00	-	9.00	-	-	14.00	-	25.00	-	34.00	-	-	42.00	-	55.00	-	-	94.00	-	99.00	-	-	42.33	-
2009	T	2.00	1.00	65.00	2.00	33.33	59.17	2.00	79.41	1.00	86.54	2.00	74.07	80.00	4.00	65.00	6.00	63.16	64.08	29.00	35.33	35.00	47.59	41.46	9.11	61.18
	C	7.00	10.00	-	13.00	-	-	34.00	-	26.00	-	27.00	-	-	40.00	-	57.00	-	-	75.00	-	85.00	-	-	40.78	-

T. = treatment C= Control R.= Reduction % N. =Number of larvae

2. Side effect of conventional insecticides /IGRs mixtures against major cotton pests populations on cotton fields.

-Aphis gossypii:

Results in Tables (2 and 3) indicated that *A. gossypii* were influenced by the tested control programs. The highest mean of reduction percentages were recorded (100.00, 87. 79 and 83.89 %) of the 2nd, 1st and 3rd spray program in the first season. While in the second one the highest mean of reduction percentages were recorded (100.00, 100.00, 62.79 %) in the 1st, 2nd and 3rd spray, but the least mean of reduction percentages was recorded (38.71 %) of the 4th spray program, Meanwhile the average seasonal mean numbers of aphid population were 2.78 and 32.85 in the two seasons, respectively. But the seasonal reduction percentages were recorded (78.95 and 75.38%) in the 1st and 2nd seasons.

Generally, from the test spray programs, results revealed that the pest tested sprays were 1st, 2nd and 3rd in the two seasons, respectively. Compare with 15.37 and 33.44 in untreated area in the two seasons, respectively.

-Bemicia tabaci:

As shown in Tables (2 and 3) results cleared that the all tested programs caused highly decreased *B. tabaci* .The highest mean of reduction percentages were recorded (85.48 and 64.02 %) of the1st and 3rd spray programs, while the lowest reduction percentage were 32.74 and 45.89 of the 3rd and 4th sprays in 2008 season, but in the second season the highest mean of reduction percentages were recorded (54.72 %) of the 1st spray program, while the lowest mean of reduction percentages were recorded (28.38 %) of the 4th spray program in the 1st season. In 2009 season the least mean reduction were recorded 28.38 % of the 4th spray .Seasonal average of reduction percentages were recorded (57.03 and 42.19 %) in the 1st and 2nd seasons, respectively On the other hand the seasonal average numbers of *B. tabaci* were recoded (16.96 and 27.19 individuals) in untreated area in the two seasons, respectively.

Results are accordance with author in all the worlds such as Ishaaya *et al.* (2002) found that Emamectin is a macrocyclic lactone insecticide with low toxicity to non-target organisms and the environment, and is considered an important component in pest-management programmes for controlling field crop pests. Emamectin exhibits a considerable activity on the whitefly *Bemisia tabaci* (Gennadius). Otoidobiga, *et al*. (2003) found that *Bemisia tabaci* was susceptibilite to the insecticides currently sprayed on cotton. Naranjo and Akey (2005) stated that acetamiprid used for the control of *Bemisia tabaci* (Gen.) in cotton compared with a proven selective regime based on the insect growth regulators (IGRs) pyriproxyfen and buprofezin. Acetamiprid was highly effective in controlling all stages of *B. tabaci* compared with an untreated control, and generally produced lower pest densities than the IGR regime. Acetamiprid depressed populations of fewer predator taxa; but, for eight predator taxa significantly affected by both regimes, the average population reduction was roughly equal. In contrast, only four taxa were significantly reduced in the IGR regime compared with the untreated control and three of these were omnivores that function primarily as plant pests. Because of its, acetamiprid may play an important role in later stages of *B. tabaci* control where less emphasis is placed on selectivity. However, our results suggest that acetamiprid would be a poor substitute for the currently used IGRs in the initial stage of control where insecticide selectivity is crucial to a functional integrated control program for *B. tabaci* in cotton.

-Empoasca lybicia

Data in Tables (2 and 3) cleared that the reduction percentages in Jassid insect were different. The reduction percentages in this pest due to the tested programs were different: The highest mean of reduction percentages were recorded (84.86 and 60.17

%) of the 2nd and 3rd spray in 2008 season. While the lowest mean of reduction percentages were recorded (46.40 %) of the 4th spray program .In 2009 season, the highest mean of reduction percentages were recorded (89.07 and 67.75 %) of the 2nd and 1st spray. While the least mean of reduction percentages was recorded (48.10 and 31.81 %) of the 3rd and 4th spray. Also, results revealed that the seasonal average reduction percentages were recorded (62.41 and 59.18 %) during first and second season. From the previous results found that the pest spray program effect on Jassid were 2nd and 3rd in 2008 & 3rd and 1st in 2009 season.

-Nezara veridula:

Results in Tables (2 and 3) cleared that green bugs, *N. veridula* insect were influenced by the tested programs in comparable with untreated cotton area. The mean of reduction percentages in this pest due to the tested programs were different. The highest mean of reduction percentages were recorded (100. 00, 92.15, 91.84 and 83.27 %) of 2nd, 3rd and 4th and followed by 1st spray in 2008 season, but the highest mean of reduction percentages were recorded (94.85, 94.11, 85.90 and 85.76 %) of the 4th ,3rd, 2nd and 1st spray in 2009. The seasonal mean numbers were recorded (1.48 and 3.33 individuals) in the two seasons, respectively compared with (7.41 and 7.93 individuals) in untreated area. Results revealed that the seasonal average reduction percentages were recorded (91.82 and 90.13 %) in the two seasons, respectively.

***-Tetranychus* sp.**

Results in Tables (2 and 3) showed that *Tetranychus* sp. numbers were influenced by the test spray programs in comparable with untreated cotton area. The reduction percentages in this pest due to the tested sprays were different: The highest mean of reduction percentages were recorded (100.00 and 98.83 %) of the 1st and 2nd spray program in 2008 season. While the lowest mean of reduction percentages were recorded (61.17 %) of the 3rd spray program .In 2009 season, The highest mean of reduction percentages were recorded (60.60 and 52.61 %) of the 4th and 1st spray. While the least mean of reduction percentages was recorded (44.20 and 35.26 %) of the 2nd and 4th spray during 2009 season. Results revealed that the seasonal average reduction percentages were recorded (84.42 and 48.17 %) during first and second season.

Table 2: Sid effect of some chemical compounds on insect populations in cotton fields, Sharkia Governorate, 2008 season.

Insects	N. before spray	Number of insect /75 cotton plants																					General of mean/week	% seasonal reduction
		1st spray					2nd spray							3rd spray					4th spray						
		1st week		2nd week			1st week		2nd week		3rd week			1st week		2nd week			1st week		2nd week				
		N	R.%	N	R.%	Mean	N	R.%	N	R.%	N	R.%	Mean	N	R.%	N	R.%	Mean	N	R.%	N	R.%	Mean		
Jassid	9.33	4.0	47.02	3.33	69.28	58.49	2.0	85.24	3.0	53.87	0.0	100	84.84	2.33	54.47	4.0	65.86	60.17	4.0	48.15	1.0	44.45	44.40	2.85	62.41
	10.33	3.0		12.0			15.0		12.0		3.33			1.47		2.47			3.0		2.0			6.07	
Aphid	15.0	3.0	75.57	0.0	100	87.79	0.0	100	0.0	100	0.0	100	100	9.0	79.04	3.0	88.72	83.89	3.0	51.13	3.0	37.08	44.11	2.78	78.95
	7.33	10.0		18.67			15.67		29.0		23.67			21.0		13.0			5.0		2.33			1.537	
Whitefly	15.0	7.67	72.39	14.33	98.57	85.48	24.0	19.59	34.0	6.24	11.67	71.99	32.74	28.0	48.03	9.0	80.0	64.02	9.0	19.04	3.33	72.74		16.00	67.63
	9.0	14.67		4.33			13.0		20.33		25.0			32.33		27.0			6.67		7.33			14.96	
Green bug	8.0	10.67	66.32	1.0	99.82	83.27	0.0	100	0.0	100	0.0	100	100	0.67	84.29	0.0	100	92.15	0.0	100	1.0	88.48		1.48	91.82
	10.0	80		7.0			5.33		4.33		3.0.			5.33		11.67			14.33		7.66			7.41	
Tetranychus spp.	3.0	0.0	100	0.0	100	100	1.0	22.33	3.0	97.66	0.0	100		1.0	22.33	0.0	100		2.0	55.33	0.0	100		0.78	77.52
	2.33	1.33		1.0			1.0		0.33		0.33			1.0		1.0			1.00		1.67			0.96	

R.= Reduction % N =Number of larvae

Table 3: Sid effect of some chemical compounds on insect populations in cotton fields, Sharkia Governorate, 2009 season.

Insects	No. before spray	Number of insect /75 cotton plants																						General of mean/week	% seasonal reduction
		1st spray					2nd spray							3rd spray					4th spray						
		1st week		2nd week			1st week		2nd week		3rd week			1st week		2nd week			1st week		2nd week				
		No.	R.%	No.	R.%	Mean	No.	R.%	No.	R.%	No.	R.%	Mean	No.	R.%	No.	R.%	Mean	No.	R.%	No.	R.%	Mean		
Jassid	33.83	19.83	41.38	2.50	94.12	67.75	2.33	94.78	3.33	84.75	3.50	83.47	89.07	5.25	85.05	20.58	11.14	48.10	9.75	83.85	17.00	9.76	31.81	9.56	39.18
	22.16	22.16		27.84			29.33		26.34		16			23		15.17			13.84		12.34			20.47	
Aphid	52.67	0.0	100	0.0	100	100	0.0	100	0.0	100	0.0	100	100	0.0	100	44.67	25.57	62.79	135.67	39.88	113.33	37.53	38.71	32.83	75.38
	21	22.33		32.33			28.67		20.67		37.67			23.33		25			38.67		72.33			33.44	
White fly	19.67	11.33	44.0	50	63.43	54.72	82	70.53	40	18.83	30	14.31	35.22	52	29.29	60	71.54	50.43	38.67	24.77	47.67	33.01	28.38	45.74	42.19
	15	16		23.33			34.67		25.67		19.67			30.67		24.67			38.67		27.33			27.19	
Green bug	4.67	0.0	100	9.67	71.32	85.76	9.67	77.05	5.67	81.37	0.33	99.28	85.90	1.33	94.32	1.0	93.90	94.11	2.0	91.44	0.33	98.24	94.85	3.33	90.13
	1.33	4.67		9.67			12		8.67		13			6.67		4.67			6.67		5.33			7.98	
True spider	2.67	0.0	100	0.33	5.21	52.61	0.67	42.20	0.33	23.04	0.67	47.37	44.20	0.33	28.72	0.33	41.49	35.26	0.67	92.67	0.33	28.72	60.60	0.61	48.17
	7.67	1.0		1.0			3.33		0.66		1.0			1.33		0.67			1.00		1.33			1.26	

3- Side Effect of certain spray programs against the predator populations in cotton fields:-

The hazardous effect of some conventional insecticides and IGRs on most abundant six predators in cotton fields i.e.; aphid lion, *Chrysoperla carnea*; beetles, *Coccinella* spp.; anthocoride bugs *Orious* spp.; staphylinid beetle. *Peaderus alfierii*; *Scymnus* spp. and True spiders, were determined. Tables (4 and 5) the pre- and post – treatment numbers and the mean seasonal reduction of the predator's population.

Chrysoperla carnea

As shown in Tables (4 and 5) showed that the seasonal average numbers recorded weekly was 15.26 individual in 2009 season, followed by 12.22 individual in the second one.

The tested spray programs arranged in descending order against *Ch. carnea* were as follow 4th, 3rd, 1st and 2nd as they recorded 100.00, 56.26, 53.33 and 40.76 % mean reduction in 2008 season; 75.40, 65.83, 46.68 and 44.63 % in 2nd ,1st, 4th and 3rd in 2009 season, respectively. While the seasonal reduction in the two seasons were recorded 62.69 and 58.14 in 2008 and 2009, respectively. Bendict *et al*. (1986) reported that number of predaceous insects were not significantly affected by treatment by chlordimeform. Also, found decreasing of average seasonal abundance, the beneficial arthropods were *Chrysopa* spp.. El-Saadany *et al*. (1999) stated that predator density, *Chrysopa* carnea [*Chrysoperla carnea*] were three times more numerous in pheromone treated fields than the corresponding cotton fields treated with conventional insecticides. Hegab (2002) the harmful side effects of three spray programmes (Es-fenvalerate, Es-fenvalerate + profenofos and Es-fenvalerate + profenofos + thiodicarb) on the incidence of flying adults of some predaceous insects such as, *Chrysoperla carnea* in cotton during 1998 and 1999 seasons. The results obtained indicated that the three tested spray programmes had highly significant adverse effects on the population density of this arthropod species. Recorded 37.67 and 49.18 % in 1998 and 1999 seasons.

***Coccinella* spp.**

The conventional insecticide and IGR mixture caused the highest reduction in the numbers of the predatory stages of *Coccinella* spp., attained 100.00 % mean reduction in the 2nd, 3rd and 4th spay program followed by76.20 % reduction in the 1st spray and attained 94.05 % seasonal reduction in 2008 season. In 2009 season the all tested programs caused the highest mean reduction percentage in all tested programs attained 100.00 % and showing highest seasonal reduction percentage attained 100.00 %. Tables (4 and 5). Bendict *et al*. (1986) reported that number of predaceous insects were not significantly affected by treatment by chlordimeform. Also, found decreasing of average seasonal abundance, the beneficial arthropods were *Coccinella* spp., El-Saadany *et al*. (1999) stated that that predator densities *Coccinella undecimpunctata*, were three times more numerous in pheromone treated fields than the corresponding cotton fields treated with conventional insecticides. Hegab (2002) the harmful side effects of three spray programmes, (Es-fenvalerate, Es-fenvalerate +profenofos and Es-fenvalerate +profenofos +thiodicarb), showed the sensitivity of the considered arthropod species. *Coccinella* spp. insect showed the lowest reduction percents in their population density exhibiting means of 37.67% in 1998 season and 50.22 % in 1999 season, respectively.

***Orius* spp.**

The numbers of these bugs were low during the two cotton seasons of 2008 and 2009 recording 0.41 and 1.70 individual /week, in control treatment, respectively. Data in Tables (4 and 5) showed that *Orious* spp. in both experimental seasons were highly affected with all tested programs which resulted in mean reductions of 93.24, 95.83, 100.00 and 73.43 % in 2008 seasons of all the tested programs, respectively;100.00,100.00, 53.06 and 49.83 % in 2009 season and caused 90.63 and 75.34 % highly seasonal reduction in two seasons, respectively. Bendict *et al*. (1986) reported that number of predaceous insects were not significantly affected by chlordimeform and caused decreasing of average seasonal abundance of *Orius* spp.. El-Saadany *et al*. (1999) stated that *Orius* spp. were decreased population numbers in cotton treated by insecticides. Hegab (2002) stated that the three tested spray programmes had highly significant adverse effects on the population density of *Orius* spp.recorded 52.95 and 40.35 % reduction during two seasons, respect.

Paederus alfierii

This predator was found in low numbers in both experimental seasons 0.18 and 0.00 individual /week in 2008 and 2009 seasons, respectively. The all tested program arranged in descending order against *P. alfierii* were as follow, 2nd, 3rd 4th and 1st mean reduction as they recorded 100.00 ,100.00,100.00 and 98.16 % mean reduction in 2008 season;100.00 % mean reduction in 2009 season, respectively The seasonal average reduction percentage were recorded 99.54 and 100.00 % seasonal reduction in the two seasons, respect. El-Saadany *et al*. (1999) stated that that predator densities, *Paederus alfierii* were three times more numerous in pheromone treated fields than cotton fields treatment with conventional insecticide. Hegab (2002) found the effect of three spray programmes on *Paederus alfieri* in cotton 1998 and 1999 seasons. The results obtained indicated that the three tested spray programmes had highly significant adverse effects on the population density of *P. alfieri*. was recorded 66.36 and 56.83 in 1998 and 1999 seasons.

***Scymnus* spp.**

Data in Tables (4 and 5) showed that 3rd , 2nd and 1st programs caused 100.00, 95.83 and 93.24 % highly mean reduction followed 74.45 % reduction in the 1st spray in 2008 season;100.00, 95.47, 83.03 and 58.69 % in 2009 season, respectively and causing 91.89 and 84.30 % highly seasonal reduction in the two

seasons, respectively. Bendict *et al*. (1986) reported that number of predaceous insects wre not significantly affected by treatment by chlordimeform and decreasing *Scymnus* spp. population numbers. Hegab (2002) results obtained indicated that the three tested spray programmes had highly significant adverse effects on *Scymnus* spp. recorded 58.68 and 47.36 % reduction in the two seasons.

True spiders

The seasonal mean numbers of the true spiders recorded 13.11 and 14.37 spiders in untreated area in 2008 and 2009 seasons, respectively.

Data in Tables (4 and 5) revealed that the harmful effect of the used insecticides on true spiders in descending order is as follow;4th, 3rd, 2nd and 1st program, recording 100.00, 94.89, 89.25 and 70.23 % mean reductions, in 2008; 2nd, 3rd, 4th and 1st programs, recording 79.03, 64.27, 26.06 and 24.67 % mean reduction in 2009 season. Also, results revealed that the all tested programs caused 88.59 and 48.51 % seasonal mean reduction in the two seasons, respectively.

The present results are in fully agreement with those obtained by many authors such as; Bendict *et al*. (1986) reported that number of spiders were not significantly affected by treatment by chlordimeform. Murray and Lioyd (1997); Abo-Elhagag (1998); Laba *et al*. (1998) in Indonesia, found that, several insecticides namely organochlorine, organophosphate, carbamate and pyrethroid insecticides and formamidine acaricides, also had a negative effect on natural enemies. Aioub *et al.* (2002), who reported that insecticides applications in cotton fields against different pests had an adverse and highly significant effect on numbers of spider Nada (1990), found that insecticides slightly reduced the populations of spiders associated with cotton pests and the differences between their numbers in treated and untreated fields were not significant. Hegab (2002) results indicated that the three tested spray programmes had highly significant adverse effects on the population density of true spiders recorded 44.47 and 66.17 % reduction. Yousif-Khalil *et al*. (2008) found that chlorpyrifos caused the highest degree of % reduction for all investigated predators, followed by spinosad and methoxyfenozide, and recorded general reduction of 77.44, 49.36 and 42.20 % in 2004 season, and 70.71,49.22 and 35.05 % in 2005 cotton season, respectively. Otto *et al*. (2009) reported that pesticides play a double role: Providing a barrier for chemical spray drift and as a refuge for beneficial arthropods such as pollinators and predators. Pesticide can negatively affect the beneficial arthropods.

Table 4: Side effect of different control programs on predacious populations in cotton fields, Sharkia Governorate, 2008 season

Predators	No. before spray	No. of predators/100 cotton plants																					Seasonal mean/week	% Seasonal reduction
		1st spray					2nd spray						3rd spray					4th spray						
		1st week		2nd week		Mean	1st week		2nd week		3rd week		Mean	1st week		2nd week		Mean	1st week		2nd week		Mean		
		No.	R. %	No.	R. %		No.	R. %	No.	R. %	No.	R. %		No.	R. %	No.	R. %		No.	R. %	No.	R. %			
Chrysoperla carnea	9.67	5	30.37	4.67	57.07	53.72	15.33	55.33	11	27.01	10	39.93	40.76	7	88.42	3.67	24.09	56.26	0.0	100	0.0	100	100	7.67	62.69
	16	16.67		18			14.33		14.33		10.33			10.67		8			4.67		11			12.22	
Coccinella spp.	14.33	7.67	32.40	0.0	100	76.2	0.0	100	0.0	100	0.0	100	100	0.0	100	0.0	100	100	0.0	100	0.0	100	100	7.67	92.07
	25.67	25.33		22.67			21.67		14		11.33			15		6.67			3		1.0			13.41	
Paederus alfierii	18	1.66	94.31	0.0	100	98.14	0.0	100	0.0	100	0.0	100	100	0.0	100	0.0	100	100	0.0	100	0.0	100	100	0.18	99.54
	2	3		4.33			3.33		6.67		4			2.67		2.33			4.67		2.33			4.37	
Scymnus sp.	19	6.33	48.89	0.0	100	74.45	0.0	100	4.33	91.40	0.0	100	97.14	0.00	100	1.33	91.95	95.98	0.0	100	0.0	100	100	1.33	97.89
	7.67	5		11.67			18.33		20.33		15.33			12.67		6.67			14.67		10.33			12.78	
Orius sp.	8	2	88.47	0.0	100	99.24	0.0	100	0.0	100	1.0	87.5	95.83	0.0	100	0.0	100	100	0.66	66.68	0.0	100	73.43	0.41	90.43
	4.33	8.0		3.33			4.33		7.33		4.33			0.0		0.0			0.67		0.67			2.7	
True spiders	21	6.67	66.70	5.0	73.75	70.23	6.67	76.86	2.0	90.90	0.0	100	89.25	0.0	100	1.0	89.77	94.89	0.0	100	0.0	100	100	2.37	88.59
	14.3	13.67		13			19.67		13.0		14.33			8.0		6.67			13.0		12.67			13.11	

Table 5: Side effect of different control programs on predacious populations in cotton fields, Sharkia Governorate, 2009 season.

Predators	No. before spray	No. of predators/100 cotton plants																						Seasonal mean/week	% Seasonal reduction
		1st spray					2nd spray							3rd spray					4th spray							
		1st week		2nd week		Mean	1st week		2nd week		3rd week		Mean	1st week		2nd week		Mean	1st week		2nd week		Mean		
		No.	R. %	No.	R. %		No.	R. %	No.	R. %	No.	R. %		No.	R. %	No.	R. %		No.	R. %	No.	R. %			
Chrysoperla carnea	18.0	0.0	100	14	31.66	65.83	3.33	78.94	23.67	62.21	19.67	74.02	75.4	18.0	52.57	9.33	34.49	44.43	18.67	30.79	27.67	89.56	44.68	14.95	58.14
	19.33	19.67		22.0			17.0		15.67		12.0			12.67		7.33			15.33		15.67			15.24	
Coccinella spp.	14.33	0.0	100	0.0	100	100.0	0.0	100	0.0	100.0	0.0	100	100.0	0.0	100.0	0.0	100.0	100.0	0.0	100.0	0.0	100.0	100.0	0.0	100.00
	26.67	30.0		17.33			25.0		13.67		14.0			18.67		8.33			4.67		3.00			15.18	
Paederus alfierii	2.0	0.0	100	0.0	100	100.0	0.0	100	0.0	100	0.0	100	100	0.0	100	0.0	100	100	0.0	100	0.0	100	100	0.0	100
	9.67	4.67		4.0			6.0		3.0		3.0			4.33		2.0			5.67		12.67			5.24	
Scymnus sp.	16.33	0.0	100	0.0	100	100.0	3.33	89.43	0.0	100	0.67	94.99	95.47	7.33	77.14	3	88.89	83.03	4.0	82.67	14.34	34.72	58.69	3.43	84.30
	9.67	9.67		10.67			18.67		14.33		12.67			19		16			13.67		13			14.19	
Orius spp.	8.67	0.0	100	0.0	100	100.0	0.0	100	0.0	100	0.0	100	100	2.0	57.03	2.0	49.08	53.06	5.33	44.74	6.0	49.83	48.29	1.70	78.34
	4.33	0.33		3.0			6.37		2.0		3.67			4.0		0.67			5.0		2.0			3.0	
True spiders	27.67	23.67	22.54	25.33	24.79	24.67	5.00	80.61	8.33	69.73	4.67	84.74	79.03	5.00	82.39	14.33	44.14	64.27	13	40.55	25.67	11.56	26.06	14.11	48.51
	14.30	14.33		13.67			13.33		14.0		17.33			14.67		15.67			11.33		15.0			14.37	

3- The relationship between some cotton pests and the predacious arthropods in cotton fields:

Results in Tables (6 and 7) indicated the influence of *Scymnus*, *Coccinella* spp. *Scymnus* spp., *Orious* spp. and true spiders were insignificant in the two seasons and ranged between positive & negative relationship. On the other hand, results indicate that the all predators affect on aphids with 29.73 and 32.54 % in the two seasons.

Table 6: Simple correlation and multiple regression coefficient between some predacious predators associated with some cotton pests in Sharkia Governorate during 2008 cotton season

Insects	Predators	Correlation (r)	S.E.	Probability	Simple regression	Multiple regression
Ahid	Scymnus	-0.3973	0.2226	Ns	16.16 NS	32.54 NS
	Chrysoperla	0.1909	0.2381	Ns	50.53**	
	Coccinella	-0.3973	0.2226	Ns	16.16 NS	
	Peaderus	-0.0486	0.2422	Ns	31.66*	
	True spider	0.1092	0.2411	Ns	35.78*	
	Orius spp.	-0.0919	0.2415	NS	0.0935 NS	
Jasied	Scymnus	0.6817	0.1774	**	16.16NS	83.54**
	Chrysoperla	0.7262	0.1667	***	46.87**	
	Coccinella	0.6817	0.1774	**	46.88**	
	Peaderus	0.4821	0.125	*	39.21NS	
	True spider	0.7499	0.1604	***	35.78*	
		0.5583	0.2012	*	0.4336*	
Acari	Scymnus	-0.1283	0.2405	Ns	53.87**	58.26*
	Chrysoperla	-0.7386	0.1635	***	53.24**	
	Coccinella	-0.1283	0.2405	Ns	9.12 NS	
	Peaderus	-0.4261	0.2194	Ns	57.09***	
	True spider	-0.4912	0.2113	*	49.56**	
	Orius spp.	-0.0359	0.2424	NS	0.0864 NS	
Wight fly	Scymnus	-0.2150	0.2369	NS	11.53 NS	83.22**
	Chrysoperla	0.6539	0.1835	**	59.93***	
	Coccinella	-0.2150	0.2369	Ns	11.53 NS	
	Peaderus	0.6364	0.1870	**	44.03**	
	True spider	0.5652	0.2001	*	43.98**	
	Orius spp.	0.1215	0.2407	NS	0.0217NS	
Green bug	Scymnus	-0.1309	0.2404	NS	5.35NS	46.26 NS
	Chrysoperla	0.5513	0.2023	*	46.32**	
	Coccinella	-0.1909	0.2404	Ns	5.35 NS	
	Peaderus	0.4691	0.2142	*	28.98 NS	
	True spider	0.4337	0.2185	Ns	32.33*	
	Orius spp.	0.0245	0.2425	NS	0.10 NS	

Table 7: Simple correlation and multiple regression coefficient between some predacious predators associated with some cotton pests in Sharkia Governorate during 2009 cotton season.

Insects	Predators	Correlation (r)	S.E.	Probability	Simple regression	Multiple regression
Ahid	Scymnus	0.4307	0.2127	ns	21.09 ns	29.73 Ns
	Chrysoperla	0.2065	0.2306	Ns	6.69 ns	
	Coccinella	-0.0560	0.2353	Ns	0.32 ns	
	Peaderus	0.3506	0.2207	Ns	1661 ns	
	True spider	0.1679	0.2324	Ns	5.29 ns	
	Orious spp.	0.3619	0.2197	ns	0.1374ns	
Jasied	Scymnus	0.4365	0.2121	Ns	42.62**	61.88*
	Chrysoperla	0.4365	0.2121	Ns	23.09 ns	
	Coccinella	0.6741	0.1741	**	78.77***	
	Peaderus	0.1187	0.2340	Ns	10.79 ns	
	True spider	0.3089	0.2241	Ns	12.40 ns	
	Orious spp.	0.2115	0.2304	Ns	0.1701ns	
Acari	Scymnus	-0.5309	0.1997	**	53.87**	52.46 Ns
	Chrysoperla	-0.6437	0.1804	**	52.24**	
	Coccinella	-0.1399	0.2334	Ns	9.12 ns	
	Peaderus	-0.6249	0.1840	**	57.09***	
	True spider	-0.4306	0.1997	*	49.56**	
	Orious spp.	-0.3509	0.2217	Ns	0.1840 Ns	
Wight fly	Scymnus	0.5301	0.1999	*	33.48*	35.57 Ns
	Chrysoperla	0.2535	0.289	Ns	11.69 Ns	
	Coccinella	-0.0936	0.2347	Ns	2.44 Ns	
	Peaderus	0.4225	0.2136	Ns	33.49*	
	True spider	0.1826	0.2317	Ns	28.46 Ns	
	Orious spp.	0.2176	.02301	Ns	0.1626 Ns	
Green bug	Scymnus	0.5368	0.1994	*	44.05**	49.14 Ns
	Chrysoperla	0.5368	0.1988	*	83.42***	
	Coccinella	-0.1344	0.2336	Ns	22.89 ns	
	Peaderus	0.5815	0.1917	**	56.09***	
	True spider	0.3832	0.2177	Ns	36.55*	
	Orious spp.	0.3075	0.2242	Ns	0.3399*	

Data in the same tables cleared that the relationship between jasied and insect predators mentioned were positive and ranged between significant & insignificant in the two seasons. Data indicate that the influence of five population predators were significant effect & caused 61.98 and 83.54 % mutable regression in the 1st and 2nd seasons.

Present data in the same table indicate the relationship between *B. tabaci* and all population predators were positive and insignificant of all predators, except *Coccinella* spp. had a negative relationship and significant relationship with *Scymnus* spp. in the 1st season, while it were (negative & positive) and (significant and insignificant relationship) in the 2nd one. Results cleared that the influence of five population predators studied were 35.57 and 83.22 % multiple regression values and (insignificant and highly significant) in the 1st and 2nd seasons, respect.

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ARABIC SUMMARY

تاثير تتابع الرش ضد ديدان اللوز فى القطن والتاثيرات الجانبية على الافات الثاقبة الماصه و المفترسات الحشرية المصاحبة لها

حاتم محمد حاتم الشناف

معهد بحوث وقاية النباتات-مركز البحوث الزراعية-دقى جيزة

اجريت تجربة حقلية بمركز ابوحماد بهدف تقييم تاثير تتابع رش المبيدات ضد ديدان اللوز واثرها على نسب الأخفاض فى ديدان اللوزحيث سجلت اعلى نسبة انخفاض 66.67 و61.18% فى موسم 2008و2009 على التوالى.

اوضحت النتائج التاثير الجانبى لتتابع رش المبيدات ضد ديدان اللوزعلى الافات الثاقبة الماصة الموجودة فى حقول القطن وكانت اعلى نسبة انخفاض 90.13 و75.38 % للاكاروس و البقة الخضراء حيث سجل اقل تعداد لكل من الاكاروس و البقة الخضراء 0.78و1.48 & 0.41 و 3.33 فرد/اسبوع في 20082009 على التوالى مقارنة بالكنترول.

أظهرت النتائج التاثير الجانبى لتتابع رش المبيدات ضد ديدان اللوز على المفترسات المصاحبة حيث سجلت اعلى نسبة انخفاض فى التعداد لحشرة الرواغة ،ابو العيد والاسكمنس 99.5 و 94.05 و91.89 % فى موسم 2008 .وكان اعلى نسبة انخفاض 100،100 و84.83% لابو العيد ، الرواغة والاسكمنس في موسم 2009.

وكان هناك علاقة ارتباط بين المفترسات الحشرية والحشرات الثاقبة الماصة تراوحت بين علاقة معنوية وغير معنوية فى موسمى الدراسة حيث كانت قيم معامل الارتباط كالتالى(29.73و32.54 %) مع المن (35.57و83.22%) مع الذبابة البيضاء ،(61.88و83.54%) مع الجاسيد،(49.14 و 46.26 %) مع البقة الخضراء و(52.46و58.26 %) مع الاكاروس فى 2008 و2009على التوالى.