

SIDE EFFECT OF CERTAIN PESTICIDES ON THE NON-TARGETE INSECTS AND COTTON FIBRE QUALITY

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ABSTRACT

The cotton variety Giza 70 was cultivated during two successive seasons of 1997 and 1998. The experimental area was randomly divided into strip plots design. Each plot was treated with one of the following pesticides: Deltanet®, Match®, Evisect® and Sirene® during 1997 season. The application was done every two weeks. Side-effect of these insecticides in terms of increasing or decreasing the numbers of insects that spread out in the field was studied in relation to their side-effect on yield and fiber quality (in both seasons). Insects inspection was done for a period of 9 weeks. None of the tested compounds increased the numbers of the aphids (*Aphis gossypii*) more than that found on the untreated plants. Deltanet® showed the lowest mean number (15 aphids/5 leaves). Also, the effect of all used compounds on the numbers of the Jassid was not significant by the end of the inspection period. The numbers of the whitefly (*Bemisia tabaci*) were low except on those plants treated with Match® when the number was counted a week after the third spray (83 adults/5 leaves). That number was decreased to 7 adults/5 leaves a week later.

Also, Match® increased the number of the cottonseed bugs *Oxycaemus hyalinipennis* (16.3 insect/plant), while the number of the bugs was 13-insect/untreated plant. Evisect® as well as Sirene® reduced

the numbers of bugs on the treated plants. Moreover, there was no side effect of the applied compounds on either increasing or decreasing the numbers of the green bugs *Nezara viridula*. However, Sirene[®] as a selective compound against the pink-bollworm *Pectinophora gossypiella*, didn't reduce the number of the larvae, while Evisect[®] did.

During 1998 season, the same compounds that were used in 1997 season, were also used in addition to Aim-X[®] and Cascade[®]. Non of the tested compounds showed any side effect on the predator lacewing (*Chrysopa vulgaris*). Aim-X[®] and Cascade[®] increased the numbers of the aphid and the numbers of the pink-bollworm larvae. A higher yield was obtained from those plants treated with Deltanet[®].

Regarding the side-effect of the used compounds on fiber quality, it was found that they have no effect on staple length, elongation and lint strength during both seasons, except that, Cascade[®] increased lint fineness in 1998 season.

INTRODUCTION

Several species of insects and mites are found in cotton fields, including those, which are destructive. The most damaging pests are those attacking squares and bolls: the spiny-and pink bollworms. Also, the cotton leafworm can reduce yield if it destroys too much foliage.

Aphids seldom affect yield, but white flies can reduce plant vigor and lint yields (Naranjo *et al.*, 1996) and both can reduce the grade of lint and its quality by its contamination with honeydew (Henneberry *et al.*, 1998).

Therefore, effective, selective and safe insecticides should be applied since they are considered as feasible means for insect control until more biologically based management systems can be developed. Using such compounds for pest management coordinated with production practices would achieve economical protection from pest injury with minimum hazards to crop, human health and the environment.

Nevertheless, none of the recommended and commonly applied pesticides proved to be permanently fully effective. In addition, these pesticides might have their side effect on the incidence of certain harmful insects or/and the absence of others, which can be useful as biological control agents. The use of certain pesticides was found to increase the population density of certain insects or mites (El-Sorady *et al.*, 1995) and that might be due to their side effect on their parasites and predators. Others (J.H. mimics) change the sex ratio (Kelada *et al.*, 1980) as cypermethrin and chlorfluazuron do (Zytoon and El-Zoghby, 1992). Also, chlorpyrifos prompted a sex ratio shift in *Aphis melinus* off-spring giving more males (Rosenheim and Hoy, 1988).

Therefore, the aim of the present investigation was to study the probable side effect of certain target or non-target insecticides belonging to different pesticide groups on those insects. Also spread out in cotton fields in terms of increasing or decreasing their population in relation to their effect on cotton yield and fiber quality.

MATERIALS AND METHODS

Experimental site:

Field experiments were carried out at the Experimental Farm of the Faculty of Agriculture (Saba Basha), located at Abis district, Alexandria, during two successive cotton growing seasons (1997 and 1998). An area of about $\frac{1}{4}$ feddan (1050 m^2) was cultivated with Giza 70 cotton variety at mid of April of both 1997 and 1998 seasons.

Experimental design:

The experimental area was randomly divided into strip plots. Each plot ($5 \times 25 \text{ m} = 125 \text{ m}^2$) represents a pesticide treatment and therefore each plot was separated from the adjacent one by two meters space to minimize the interference of spray drift.

Table (1). The tested insecticides, insect growth inhibitors (IGIs), insecticide/IGI mixtures and the pheromone/ insecticide mixture during the first and second cotton growing seasons (1997 and 1998).

Group: pesticide	Formulation used (rate of application) ml/Feddan	Chemical name
(A) Carbamates 1. furathiocarb	Deltanet® 400 E.C.* ^{1,2} (400)	[O-n-butyl-(2,2-dimethyl-2,3-dihydrobenzofuran-7-yl) N,N dimethyl N,N' = thiocarbamate].
(B) Insect Growth inhibitors (IGIs) 1. lufenuron	Match® 50 E.C.* ^{1,2} (400)	(RS)-1-[2,5-dichloro-4-(1,1,2,3,3,3-hexafluoropropoxy)phenyl]-3-2,6= difluorobenzoyl) urea.
2. flufenoxuron	Cascade® 100 E.C.** ² (250)	1-[4-(2-chloro-α, α, α-trifluoro-P-tolyloxy)-2-fluorophenyl]-3-(2,6 difluorobenzoyl) urea
(C) Pesticide/IGI mixtures 1.furathiocarb/lufenuron	Aim X® 500 E.C.** ² (750)	The chemical name of each compound have been mentioned.
(D)Pheromone/insecti cide mixture	Sirene® 1,2 (contain 0.16% pheromone (gossypure) and 6.4% cypermethrin)	Cypermethrin®:(RS) α-cyano-3-phenoxybenzyl (1RS, 3 RS, 1RS, 3RS) -3-(2-dichlorovinyl)- 2,2=dimethyl-cyclopropane carboxyate.
(E) Others: thiocyclam	Evisect® *1,2 (600)	N,N dimethyl-1,2,3-trithian-5-ylamine hydrogenoxalate.

* compounds produced by NOVARTIS and ** by Cynamid
1 during 1997 and 2 during 1998.

Pesticides application:

The tested compounds and their used rates (recommended field rates) are shown in Table 1. Pesticides application was done each two weeks and performed by using a knapsack sprayer (20 L.). In 1997, the application started on 29th of July, while in 1998, started on 10th of August. Sirene[®] was applied in drops of 50 µl at a rate of 2000 drops/feddan. Each drop contains 0.08 µl of the pheromone "gossyplure" and that black drop was put on the top of a plant in a right row followed by another one on the left within two meters distance and so on.

Insects inspections.

Insect's inspections were carried out prior to pesticide application and a week after to determine the effect of each compound on insect's populations. Counts of those insects that were found during each of the growing seasons were recorded every week along a sampling period of nine weeks during the seasons of 1997 and 1998.

Counts of the aphids and whiteflies were carried out according to El-Nawawy *et al.* (1979) and the counts of the bollworms and predatory insects were done according to El-Henidy *et al.* (1987).

The examined leaves were randomly picked up from five plants. Five leaves were taken from the lower, median and upper parts of each inspected cotton plant (2+2+1 leaves, respectively/plant). The leaves were also examined in the laboratory using a binocular to count the alive aphids. Picking up samples of twenty-five bolls/replicate did counts of the bollworms from the treated plants and then they were dissected for internal inspection.

Determinations of cotton yield.

In each treatment, seed cotton (opened bolls from twenty-five cotton plants were picked up to determine the rate of cotton yield/plant, and from which, the total yield/feddan was relatively calculated. The calculation was based on the whole area of a feddan which is equal to 4200 m², the distance between plants is 30 cm and the distance between rows is 60 cm.

Fiber quality:

Laboratory samples were drawn and prepared as directed in the recommended practice, D 1441 of the A.S.T.M. Fiber length parameters (span length 2.5% and span length 50%) were measured as directed in the recommendations of the A.S.T.M. (D-1447-83) using the digital "Fibrograph".

Lint fineness was measured (D-1448-84) using the "Micronaire" instrument. Lint strength and elongation were done by the "Stelometer" (at $\frac{1}{8}$ ") and the strength was calculated as follows:

$$\text{Lint strength (gm/tex)} = \frac{\text{Breaking weight (kg)} \times 15}{\text{lint sample weight}}$$

All the fiber quality measurements were done at the Fiber Technology Laboratory, Faculty of Agriculture, Saba Basha, Alexandria Univ. Four replicates were used for each measurement.

Statistical analysis:

Data obtained concerning the counts of targeted and non-targeted insects and also those related to fiber quality were statistically analyzed by Analysis of Variance (ANOVA) using COSTAT (a microcomputer program for the analysis of the biological research experiments). Means were separated following a significant F test by using the method of least significant differences (LSD) ($P = 0.05$ to 0.01).

RESULTS AND DISCUSSION

A. The incidence of targeted and non-targeted insects:

1. Throughout the period of pesticides application 1997 season.

The comparative performance of the examined treatments on those targeted and non-targeted insects is illustrated in Table 2. The counts of insects were expressed as mean numbers of insects/5 leaves or 25 bolls

(for bollworms). It was observed that the mean numbers of the inspected insects fluctuated during the inspection period of nine weeks.

The mean numbers of the aphid (*Aphis gossypii*, Glover) leaves were relatively higher in the untreated plants by the end of the inspection period (51 aphids/5 leaves). None of the tested compounds increased the numbers of aphids more than those found on the untreated plants. The statistical analysis showed that there was a significant effect due to the use of the tested materials (Match[®], Deltanet[®], Evisect[®] and Sirene[®]). Although, Sirene[®] is a non-targeted or selective compound against aphids, it showed a lower mean number of aphids (18 aphids/5 leaves). On the other hand, Deltanet[®] showed the lowest mean number of aphids (15 insect/5 leaves).

The peak number of the Jassid *Empoasca lybica* (de Berg.) appeared a week after the first spray which has been carried out on the 29th of July and then this number decreased after the 2nd application (on the 14th of August). The effect of all used treatments was not significant by the end of the inspection period. Although, the level of the whitefly adults increased mainly during the favored prevailing weather conditions at the last part of the growing season, *Bemisia tabaci* (Genn.) numbers were low on cotton plants allover the period of inspection. Those mean numbers of the whiteflies on treated (except for those treated with Match[®]) and untreated plants were found to be far away from the economical threshold levels (ETLs) that suggested by Gameel (1973) (200 adults/100 leaves), Stam *et al.* (1994) (6-8 adults/leaf) and Naranjo *et al.* (1998) (5-10 adults/leaf). The higher number of white flies that exceeded all the ETL suggested by the above-mentioned authors was that counted on September 16th (83 adults/5 leaves) on those plants treated with Match[®] (a week after the third spray, inspection No. 6). Nevertheless, that high number decreased within 7 days to be 7 adults/5 leaves. In this respect, if the number of the white fly adults exceeded the ETL, it would be better to use and find out a selective and effective insecticide to prevent their migration to another host in a massive number.

Table (2). Mean number of inspected insects/5 leaves or 25 bolls (for bollworms) during the growing season of 1997.

Insect	Aphis gossypii								
	No. of inspection								
	↓		↓		↓		↓		
Treatment	1	2	3	4	5	6	7	8	9
Match ^a	14.67a	24.0c	24.00	26.67	25.00d	50.30c	109.00	40.00	33.67b
Deltanet ^a	0.00	160.0a	22.00	32.00	80.33ab	65.00b	67.00	35.30	15.00c
Evisect ^a	3.78b	83.0b	34.67a	23.33	76.30b	49.67c	74.67	27.00	41.00ab
Sirene ^a	0.78c	346c	20.00	26.00	55.67c	92.00 b	154.00	55.00	18.00c
Control	11.56ab	165a	30.00a	41.00	89.00a	100a	120.00	49.00	51.00a
F	**	**	**	N.S	*	**	N.S	N.S	N.S
	Oxycarenus hyalinipennis								
	1	2	3	4	5	6	7	8	9
	↓		↓		↓		↓		
Match ^a	3.33	2.00	1.00	4.00	2.67	2.67b	1.33	4.00a	16.33a
Deltanet ^a	0.00	13.00	12.67	8.67	5.33	5.00a	0.00	4.67a	5.00b
Evisect ^a	3.00	7.00	2.33	6.33	3.33	5.00a	2.33	1.00c	0.00
Sirene ^a	3.00	3.00	0.00	4.33	2.67	0.00	0.00	4.00a	2.67c
Control	5.00	3.00	2.00	9.00	6.20	0.00	0.00	3.00b	13.00ab
F	N.S	N.S	N.S	N.S	N.S	*	N.S	*	*
	Nezara viridula								
	1	2	3	4	5	6	7	8	9
	↓		↓		↓		↓		
Match ^a	0.33	1.0	0.00	3.00	0.67	1.33	0.0	2.00a	2.33
Furathion	0.00	4.0	0.00	4.33	3.67	1.33	0.0	2.00a	2.67
Evisect ^a	0.33	1.0	0.33	3.00	3.33	2.33	2.0	0.67b	0.00
Sirene ^a	1.00	3.0	4.00	5.00	0.00	0.00	0.0	1.00b	0.33
Control	1.50	3.0	0.00	6.00	3.10	2.90	0.0	0.00	1.30
F	N.S	N.S	N.S	N.S	N.S	N.S	N.S	*	N.S
	Pectinophora gossypiella								
	1	2	3	4	5	6	7	8	9
	↓		↓		↓		↓		
Match ^a	0.0	0.0	0.0	3.30	6.00	0.00	0.00	6.33	4.67
Deltanet ^a	0.0	0.0	0.0	1.66	5.67	6.67	0.00	5.33	5.30
Evisect ^a	0.0	0.0	0.0	2.00	7.00	5.00	2.67	3.30	0.00
Sirene ^a	0.0	0.0	0.0	5.00	9.00	0.00	0.00	6.33	7.67
Control	0.0	0.0	0.0	2.00	7.00	4.20	0.00	6.10	7.30
F	0.0	0.0	0.0	N.S	N.S	N.S	N.S	N.S	N.S

Table (2) continued...

Insect Treatment	<i>Empoasca hybica</i>								
	No. of inspection								
	↓ 1	2	↓ 3	4	↓ 5	6	↓ 7	8	9
Match ^e	16.33b	50.67b	36.30	6.33	15.67	1.33	1.33	5.67b	7.33
Deltameth ^e	24.00a	164.30 a	32.00	18.3	28.00	12.00	20.62	10.00 a	3.33
Evisect ^e	5.00c	23.67c	36.67	6.00	15.67	12.00	8.33	6.00b	9.67
Sirene ^e	15.33b	39.00b	26.00	18.00	22.00	14.00	24.00	11.33 a	4.33
Control	23.00a	97.00a b	40.00	21.00	23.00	11.00	15.00	12.10 a	9.20
F	**	*	N.S	N.S	N.S	N.S	N.S	*	N.S
Insect Treatment	<i>Bemisia tabaci</i>								
	1	2	3	4	5	6	7	8	9
	↓	↓	↓	↓	↓	↓	↓	↓	↓
Match ^e	0.0	15.0	14.33	16.33	38.0	83.33c	70.00b	9.00	0.0
Deltameth ^e	0.0	0.0	0.00	0.00	0.0	0.00	4.67b	6.67	0.0
Evisect ^e	0.0	30.0	31.33	3.00	0.0	0.00	7.00a	6.33	0.0
Sirene ^e	0.0	9.0	8.33	2.00	0.0	21.67a	8.00a	3.33	0.0
Control	0.0	14.0	25.00	3.00	0.0	19.3b	0.00	3.90	0.0
F	0.0	N.S	N.S	N.S	N.S	*	*	N.S	0.0
Insect Treatment	<i>Earias insulana</i>								
	1	2	3	4	5	6	7	8	9
	↓	↓	↓	↓	↓	↓	↓	↓	↓
Match ^e	0.0	0.0	0.0	12.0b	6.00b	35.00	15.0	30.00 a	4.67
Furathion	0.0	0.0	0.0	26.0a	18.00a	25.00	11.0	21.00 b	0.00
Evisect ^e	0.0	0.0	0.0	21.0a b	6.70b	23.00	15.7	7.33c	1.33
Sirene ^e	0.0	0.0	0.0	22.0a b	8.33b	16.00	15.0	15.33 c	4.33
Control	0.0	0.0	0.0	29.0a	19.20a	33.00	14.2	25.00 ab	8.20
F	0.0	0.0	0.0	**	*	N.S	N.S	*	N.S

Mean on the same sampling date not followed by the same letter (s) are significantly different $P \leq ., ., .$ to $., ., .$ (LSD), N.S, Statistically non-significant.

Arrows indicate pesticide application and the counts before application at the same day.

The cotton seed bug *Oxycaerus hyalinipennis* (Costa) is a late season pest attacking the ripe seeds of cotton and other Malvaceous plants. On cotton, it feeds on the seeds in the mature opened bolls and in any other bolls, which have opened prematurely. The problems it causes are that lint may be slightly stained because of crushing bugs during ginning giving a powerful smell in the lint (this also a reason for the lack of their predators); the seeds become sterile and their oil content will be reduced. The cotton seed bug was found during the cotton growing season of 1997 (because of the presence of okra plants nearby). Among the used compounds, and by the end of the inspection period, Match[®] again gave high incidence of the bug (16.3 bugs/plant) and the mean number of the bugs was more than that found on the untreated plants (13.0 bugs/plant).

On the other hand and allover the inspection period, Evisect[®] seemed to be effective in reducing the number of the bugs on the treated plants. Sirene[®], as a non-targeted insecticide against *O. hyalinipennis*, was also as effective as Evisect[®]. That might be possible because it contains Cypermethrin, which in a way or another was in contact with those bugs during their activity and movement on those leaves with black drops of Sirene[®].

The green stink bug *Nezara viridula* (L.) attacks more than 200 host plant species including cotton. On cotton, fungus spores of the genus *Nematospora* can be transmitted due to the feeding of the green bug (Schmutterer, 1977). This green bug was found in lower numbers during this growing season only. None of the used compounds has a selective or side effect on this insect. Allover the period of inspection, statistical analysis showed that these were no significant differences between the numbers of the bugs on treated and non-treated plants.

Both, the spiny (*Earias insulana* (Boisd.) and pink boll worm (*Pectinophora gossypiella*, Saund.) as internal fruit feeders started to appear on August the 21st. All the applied compounds even Sirene[®] (the selective and targeted compound against the pink bollworm), has no effect in reducing the numbers of the infested bolls by both boll worms. That was assured by the statistical analysis allover the period of inspection of the pink boll worm, giving non-significant differences.

It was expected that Sirene® would be effective in reducing the incidence of the pink-boll worm (as the mean numbers of larvae/25 bolls) but it was found that Evisect® was effective to some extent in this respect.

For the spiny bollworm, there were significant differences between its numbers on treated and untreated plants. In the last inspection, its numbers were lowered in all the treatments including the control, showing non-significant differences.

2. Throughout the period of pesticides application in 1998 season.

The effect of six different compounds used in the growing season of 1998 on target and non-target insects is illustrated in Table 3. The numbers of the white fly adults/5 leaves were relatively higher before the beginning of application program on August the 10th. Then they decreased a week after the first spray (when they were counted on the 17th of August). They were still in low numbers after that allover the period of pesticide application and inspection with a range of 0.0-7 adults/5 leaves, in those treated plants and a range of 0.0-3.7 adults/5 leaves in the untreated plants. It was observed that during the last parts of both growing seasons (1997 and 1998), the population levels of the whitefly were low.

Regarding the side effect of the used compounds, there was no such effect on the predator *Chrysopa vulgaris* (Schneider) (Neuroptera: Chrysopidae). The predator was found to be more or less in constant numbers on those treated and untreated plants. These results are in agreement with those of El-Sorady *et al.* (1995) who found that certain organophosphoates and carbamates were useful in cotton fields for protecting predators.

The aphid, *A. gossypii* was absent during the first three inspections; however, its numbers increased sharply on those plants treated with Aim-X® giving higher population level of 66.3 which increased to 108 and then to 230 aphids/5 leaves in the last three inspections (No. 7, 8 and 9, respectively) while the mean numbers of aphids on those untreated

Table (3). Mean number of inspected insects/ 5 leaves during the growing the season of 1998.

Insect	<i>Bemisia tabaci</i>										<i>Chrysopa vulgaris</i>									
	No. of inspection										No. of inspection									
	1	2	3	4	5	6	7	8	9		1	2	3	4	5	6	7	8	9	
Treatment																				
Match [®]	14.3b	4.00	2.67	0.00	2.33b	1.67b	0.33	1.33	0.33b		1.7	1.0	1.00c	0.33	3.33	2.00	2.00	2.00	2.67	
Aim-x [®]	4.7d	4.33	2.33	0.67c	1.00c	0.67c	0.33	0.00	0.33b		1.0	1.7	0.67c	1.00	2.33	1.67	1.67	1.33	1.67	
Evisect [®]	18.3ab	0.67	3.00	3.00ab	2.33b	3.00a	0.00	0.00	0.00		0.0	1.7	2.00b	2.00	0.33	1.33	1.00	0.67	1.00	
Deltanet [®]	22.3a	4.67	5.33	4.00a	5.66c	3.33a	1.33	0.33	1.33a		0.0	3.0	2.00b	2.00	1.67	2.00	2.00	1.67	3.00	
Cascade [®]	9.0c	4.67	7.00	0.00	1.67c	0.67c	0.00	0.00	0.00		1.7	2.3	5.67a	4.00	1.33	2.67	2.33	2.00	1.33	
Sirene [®]	4.7d	5.00	5.00	3.00ab	2.33b	2.00b	1.00	0.67	1.00ab		1.0	1.0	1.33bc	3.00	2.33	2.67	2.33	2.00	1.30	
Control	3.7d	3.67	3.67	2.00b	0.67d	0.67c	0.00	0.67	0.00b		1.0	1.0	0.67c	1.67	1.00	1.33	0.67	0.00	0.67	
F	*	N.S	N.S	*	**	*	N.S	N.S	*		N.S	N.S	**	N.S	N.S	N.S	N.S	N.S	N.S	
<i>Empoasca lybica</i>																				
Treatment																				
Match [®]	0.0	0.0	0.0	0.00	0.00	0.0	3.33d	6.67c	39.33c		7.67	3.00	0.33	2.33	0.33b	1.33b	1.67b	2.67a	0.33c	
Aim-x [®]	0.0	0.0	0.67	3.33	43.30	29.3	66.33a	108.00a	230.00a		1.33	0.67	1.33	0.33	0.00	0.33c	0.33c	0.00	0.00	
Evisect [®]	0.0	0.0	1.67	2.00	26.30	14.3	56.00b	100.33a	65.67b		2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Deltanet [®]	0.0	0.0	0.00	0.00	0.00	0.0	0.00	0.00	0.00		5.00	0.00	0.00	0.33	0.00	0.33c	0.33c	0.33b	0.00	
Cascade [®]	0.0	0.0	0.00	2.33	21.63	12.0	43.67c	75.00b	80.33b		2.00	1.00	3.00	1.67	0.00	1.00b	0.67c	0.00	0.00	
Sirene [®]	0.0	0.0	0.00	1.00	0.62	1.0	5.67d	10.00c	16.33d		1.33	1.00	2.00	5.67	5.67a	5.67a	4.00a	2.00a	1.67b	
Control	0.0	0.0	0.00	0.00	0.00	0.0	2.67d	5.00c	5.33d		0.33	0.33	1.33	2.00	0.33b	1.00b	0.67c	0.33b	2.67a	
F	0.0	0.0	N.S	N.S	**	**	**	**	**		N.S	N.S	N.S	N.S	**	**	*	*	**	

plants were 2.67, 5.0 and 5.33 aphids/5 leaves, respectively. Same trend was found in those plants treated with Cascade®. The mean numbers of aphids were found to be 43.67, increased to 75 and then to 80.33 aphids/5 leaves of those plants treated with Cascade® in the last three inspections. The aphids were totally absent all over the period of inspection and throughout the pesticides application program in those plants treated with Deltanet®. Except for those plants treated with Deltanet® or/and Sirene®, the mean numbers of aphids on the other treated plants differed significantly from those on the untreated ones in inspection No. 9. The range of the mean numbers of aphids on all treated plants was 16.3-230/5 leaves, while the mean number of the aphids on the untreated plants was 5.3 aphids/ 5 leaves.

It is noticed that Sirene® had no side-effect on the biological control agents of the aphids, since it didn't affect the mean numbers of the predator *C. vulgaris*.

The Jassid, *E. lybica*, was almost absent on those plants treated with Evisect® and there were fewer numbers of the insect on those treated and untreated plants. The higher numbers were observed in all plants before spraying when they were examined on August the 10th and also they were higher after the second application of Sirene® giving a mean number of 5.67 insects/5 leaves during the fourth, fifth and sixth inspections. Sirene® increased the number of the Jassid on those treated plants and that was because the Jassids may be non-targeted insects.

The numbers of the inspected pink (*P. gossypiella*) and spiny (*E. insulana*) bollworm larvae/25 bolls, their percent of infestation and their total numbers throughout the period of pesticide application and inspection are illustrated in Table 4.

The total numbers of the pink-bollworm larvae were peaked by the end of September (29th) (the 7th inspection) and by the beginning of October (4th) (the 8th inspection). The spiny bollworms started to rise up on the 8th of September during the 4th inspection.

The total numbers of the pink-bollworm larvae, collected all over the period of inspection (8 weeks), were higher in those plants treated with Evisect®, Aim-X® and Cascade® (38, 33 and 27 larvae/(25 x 8) bolls, respectively. The total number of the pink-bollworm in those plants

Table (4). Numbers of the pink- and spiny- bollworms larvae/25 bolls, percent of infestation and total numbers throughout the period of pesticide application and inspection.

Insect	<i>Pectinophora gossypiella</i>										<i>Earias insulana</i>							
	No. of inspection										No. of inspection							
	1	2	3	4	5	6	7	8	Total	1	2	3	4	5	6	7	8	Total
Treatment		↓ W ₁		↓ W ₂		↓ W ₃		↓ W ₄			↓ W ₁		↓ W ₂		↓ W ₃		↓ W ₄	
Match ^a	3.0 (20.0)*	1.0 (4.0)	0.0 (0.0)	1.0 (4.0)	1.0 (4.0)	1.0 (4.0)	3.0 (12.0)	5.0 (20.0)	17.0	1.0 (4.0)	1.0 (4.0)	1.0 (4.0)	2.0 (8.0)	2.0 (8.0)	2.0 (8.0)	4.0 (16.0)	6.0 (24.0)	19.0
Aim-X ^a	3.0 (12.0)	1.0 (4.0)	2.0 (8.0)	2.0 (8.0)	2.0 (8.0)	2.0 (8.0)	8.0 (32.0)	13.0 (52.0)	33.0	0.0 (0.0)	0.0 (0.0)	2.0 (8.0)	2.0 (8.0)	2.0 (8.0)	2.0 (8.0)	1.0 (4.0)	0.0 (0.0)	9.0
Evisect ^a	4.0 (16.0)	0.0 (0.0)	1.0 (4.0)	4.0 (16.0)	4.0 (16.0)	5.0 (20.0)	8.0 (32.0)	10.0 (40.0)	38.0	1.0 (4.0)	1.0 (4.0)	0.0 (0.0)	3.0 (12.0)	3.0 (12.0)	3.0 (12.0)	2.0 (8.0)	1.0 (4.0)	13.0
Deltanet ^a	3.0 (20.0)	0.0 (0.0)	1.0 (4.0)	2.0 (8.0)	2.0 (8.0)	3.0 (12.0)	3.0 (12.0)	3.0 (12.0)	20.0	1.0 (4.0)	0.0 (0.0)	0.0 (0.0)	3.0 (12.0)	3.0 (12.0)	4.0 (16.0)	3.0 (12.0)	1.0 (4.0)	17.0
Cascade ^a	3.0 (12.0)	3.0 (12.0)	2.0 (8.0)	3.0 (12.0)	3.0 (12.0)	2.0 (8.0)	3.0 (12.0)	6.0 (24.0)	27.0	2.0 (8.0)	2.0 (8.0)	1.0 (4.0)	2.0 (8.0)	2.0 (8.0)	2.0 (8.0)	3.0 (12.0)	3.0 (12.0)	17.0
Sirene ^a	2.0 (8.0)	1.0 (4.0)	0.0 (0.0)	1.0 (4.0)	1.0 (4.0)	1.0 (4.0)	2.0 (8.0)	3.0 (12.0)	11.0	0.0 (0.0)	4.0 (16.0)	4.0 (16.0)	3.0 (12.0)	4.0 (16.0)	4.0 (16.0)	4.0 (16.0)	3.0 (12.0)	28.0
Control	4.0 (16.0)	3.0 (12.0)	1.0 (4.0)	1.0 (4.0)	1.0 (4.0)	1.0 (4.0)	1.0 (4.0)	0.0 (0.0)	12.0	2.0 (8.0)	2.0 (8.0)	2.0 (8.0)	7.0 (28.0)	5.0 (20.0)	6.0 (24.0)	6.0 (24.0)	5.0 (20.0)	35.0
Total of insects	26.0	8.0	26.0	8.0	13.0	16.0	31.0	42.0	158	7.0	10.0	10.0	24.0	20.0	23.0	23.0	19.0	136.0

(-)* Percent of infestation = No. of larvae/25 bolls x 4. Arrows indicate pesticide application and the counts done directly before the application at the same day.
W₁, W₂, W₃, W₄ = inspection time a week after the first, second, third and fourth application, respectively.

Table (5). The effect of the tested compounds on the fibre quality and yield production of Giza 70 (1997 and 1998 seasons).

Season Treatment		Span length		Lint finesses "Micronaire"	Elongation	Lint strength G/tex	Cotton weight/ 25 plants (gm)	Cotton weight/feddan Kg (=Kantar)
		25%	50%					
1997:								
Match [®]		35.19	17.42	3.31	5.50	32.76	480	864 (5.50)
Deltanet [®]		35.49	17.36	3.32	5.62	33.16	960	1728(11.01)
Evisect [®]		35.54	17.33	3.37	5.38	32.75	850	1530 (9.75)
Sirene [®]		35.17	17.30	3.36	5.50	32.61	325	585 (3.73)
Control I		35.10	17.37	3.35	5.62	32.85	345	621 (3.96)
F		N.S	N.S	N.S	N.S	N.S		
1998:								
Match [®]		35.65	17.38	3.40a	5.62	31.95	530	954 (6.07)
Aim-x [®]		35.64	17.39	3.30bc	5.63	33.30	630	1134 (7.2)
Evisect [®]		35.42	17.21	3.33bc	5.63	32.61	1200	2160 (13.7)
Deltanet [®]		35.83	17.60	3.32ab	5.50	32.89	1540	2772 (17.6)
Cascade [®]		35.50	17.01	3.18c	5.75	33.40	1030	1854 (11.8)
Sirene [®]		35.47	17.38	3.35a	5.60	33.05	380	683 (4.32)
Control		35.06	17.27	3.38ab	5.50	32.89	378	680 (4.3)
F		N.S	N.S	*	N.S	N.S	-	-

N.S = Not significant and * = Significant.

treated with Sirene® was as much as that of the untreated plants, while in the other treated plants, the numbers of the pink-bollworm larvae were higher than that of Sirene® and control.

On the other hand, the numbers of the spiny-bollworm counted throughout the whole period of inspection were higher in the untreated plants and also in those plants treated with Sirene® (35 and 26 larvae/(25 x 8) bolls, respectively. The total of the total numbers of *P. gossypiella* was higher (158 larvae) than that of the spiny-bollworm *E. insulana* (136 larvae).

From the above-mentioned results, it is not advisable to use Sirene® alone in a controlling program for cotton pests or especially for the pink-bollworm. It would be better to use other effective pesticide against the pink-bollworm alternatively with Sirene® (not in a mixture) before the time of bolls formation to avoid yield reduction.

B. The effect of fiber quality and yield:

The effect of the used compounds on yield and the fiber quality in both growing seasons of 1997 and 1998 is shown in Table 5. It is seen from the table that all the applied and tested compounds have no side effect on the staple length (2.5 and 50% span length), elongation and lint strength (g/tex) in both the growing seasons of 1997 and 1998.

Lint finesses had not been affected with those compounds used in 1997, while it had been affected with those compounds used in 1998. Cascade® gave high lint finesses (a low reading of micronaire, 3.18) and that reflected on the lint strength (33.4 g/tex). Nevertheless, there were no significant differences between the means of lint strength of those treated and untreated plants.

The weights of cotton seed/25 plants were higher in those plants treated with Deltanet®, Evisect and Cascade® and their yields were 17.6, 13.7 and 11.8 kent./feddan (1998 season), respectively. It was observed that the number of the pink-bollworm larvae in those plants treated with Deltanet® was higher than that of the control; nevertheless, it gave the higher cotton yield. Deltanet might have its effect on the other elements that cause yield loss.

In both seasons, higher cotton yield parameters were gained from those plants treated with Deltanet® and Evisect®, since also they gave 11.01 and 9.75 kent./fed. respectively (1997 season). Although, Sirene® was effective against *P. gossypiella* larvae, reducing their numbers and their infestation percentages when it was compared with the other used compounds (Table 4). The yield of those plants treated with Sirene, was low and this explains that the pink-bollworm larvae was not the only ones that cause yield-loss because also Sirene® was not effective against the spiny-bollworm (*E. insulana*) which is considered as a vital element in yield loss.

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الملخص العربي

التأثير الجانبي لبعض مبيدات الآفات على الحشرات الغير مستهدفة وعلى خواص الجودة لشعيرات القطن

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تم زراعة صنف القطن جيزة ٧٠ في موسمين متتاليين (٩٧، ١٩٩٨) مع تقسيم القطعة التجريبية المنزرعة إلى شرائح تمثل المعاملات بأربعة مركبات في موسم ١٩٩٧ هي الملتش (مثبط للنمو الحشري) والذلتانيت (مبيد كيميائي)، والايغيسكت (مبيد حشري) والمسيرين (خليط من مبيد السيبرمثرين وفرمون الجوسيلور) بالمقارنة مع النباتات الغير معاملة لدراسة التأثيرات الجانبية لهذه المركبات على تعداد الحشرات المنتشرة خلال الموسم بالتأثير المباشر عليها أو التأثير الغير مباشر بزيادة تعدادها نتيجة للتأثير المحتمل على الأعداء الحيوية لهذه الحشرات. والتي كان منها أسد المن (والذي تم حصره في موسم ١٩٩٨).

وقد تم تطبيق المركبات المستعملة مرة كل أسبوعين مع تكرار رش المبيد الواحد في الشريحة المخصصة له مع اجراء الفحص الحشري أسبوعيا قبل عملية الرش وبعد الرش بأسبوع وهكذا لمدة تسعة أسابيع متتالية.

وقد تذبذب تعداد الحشرات خلال فترة الفحص ولم تؤد أي من المبيدات المختبرة إلى زيادة أعداد حشرات المن عن تلك الأعداد التي تم حصرها في النباتات الغير معاملة بل أدى مركب الذلتانيت إلى خفض تعدادها (١٥ حشرة/من/أوراق) وكذلك مركب المسيرين (١٨ حشرة/من/أوراق) بالمقارنة مع تعداد حشرات المن على النباتات الغير معاملة (٥١ حشرة/من/أوراق) وذلك خلال الفحص للتسعة والأخيرة. ولم يكن هناك أي تأثير معنوي للمركبات المستعملة على تعداد الجاسيد.

أما بالنسبة للذبابة البيضاء فقد كان تعدادها خلال فترة الفحص قليلا فيما عدا ذلك التعداد العالي الذي تم حصره في ١٦ سبتمبر (الفحص السادسة) بعد أسبوع من الرشمة الثالثة (٨٣ حشرة كاملة / ٥ أوراق) في تلك النباتات المعاملة بالملتش وانخفض هذا العدد في خلال أسبوع إلى ٧ حشرات كاملة / ٥ أوراق.

وجدير بالذكر أنه في خلال موسم ٩٧ انتشرت بقعة بذرة القطن وزادت أعدادها في النباتات المعاملة بمركب الماتش (١٦,٣ بقعة/نبات) بينما كان هذا الحد في النباتات الغير معاملة ١٣ بقعة/نبات ، أما مركب الايفيسكت فقد أدى استعماله إلى خفض تعداد البق على النباتات المعاملة ومثله في هذا التأثير مركب الميرين .

ومع ظهور البقعة الخضراء في هذا الموسم أيضا لم يكن هناك أي تأثير جانبي للمركبات المستعملة في زيادة أو خفض تعداد هذه الحشرة وبين التحليل الإحصائي عدم وجود فروق معنوية بين النباتات المعاملة والغير معاملة . وبالرغم من أن مركب السرين متخصص لديدان اللوز القرنفلية إلا أنه لم يؤثر على خفض تعداد اليرقات ولكن اتضح أن مركب الايفيسكت هو الأكثر فاعلية في هذا الخصوص.

أما في موسم ٩٨ فقد استعملت مركبات الايمكس والكاسكيد بالإضافة إلى تلك المركبات التي استعملت موسم ٩٧ ، ولم يظهر أي من المركبات المستعملة أي تأثير جانبي على المفترس أسد المن الذي ظل في أعداد ثابتة على النباتات المعاملة والغير معاملة . كما وزادت أعداد المن في النباتات المعاملة بمركب الايمكس بمعدل ١٠٨ - ٢٣٠ حشرة من / ٥ أوراق بالمقارنة مع النباتات الغير معاملة (٠,٦٧ - ٥,٣٣ حشرة من / ٥ أوراق) ومثله في هذا التأثير مركب الكاسكيد .

أما بالنسبة لديدان اللوز القرنفلية فقد زادت أعدادها مع استعمال مركبات الايفيسكت والايمكس والكاسكيد وبالرغم من هذا زادت الإنتاجية في تلك النباتات المعاملة بالاييفيسكت والكاسكيد . كما أدى مركب الدلتانيت إلى زيادة عالية في الإنتاجية وبالنسبة للتأثير الجانبي على خواص التيلة ففي موسمي ٩٧ ، ١٩٩٨ لم يظهر أي تأثير للمركبات المستعملة على طول التيلة والاستطالة والمثانة أما مركب الكاسكيد فقد أدى استعماله موسم ١٩٩٨ إلى زيادة نعومة الشعيرات .