Impact of Certain Insecticides Against Pink Bollworm *Pectinophora gossypiella*, Sucking Pests, and Their Associated Predators in Cotton Fields

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Abstract

Field experiments were conducted at ALZagazig Al-Sharkia Governorate during 2017 cotton season to tested some chemical insecticides on the larvae of *Pectinophora gossypiella* cotton bolls. Three insecticides of Chlorpyrifos+Chlorfluazeron then Lambda-Cypermethrin and then Chlorpyrifos) on *P. gossypiella*, certain sucking pests, (*Aphis gossypii*, *Bemecia tabaci*, *Empoasca* spp., *Nezara veridula* and *Tetranychus* spp.) and their associated predators, (*Coccinella* spp., *Chrysoperla* spp., *Peaderus alferii*, *Scymnus* spp., *Orius* spp. and true spiders). The resultes showed that 1st spray was moderately effective on *P. gossypiella* larvae and recorded 67.33 % reduction after 2nd week while, the highest reduction was 85.71% after 2nd week of 2nd spray. The seasonal mean of reduction was 73.89% after the three sprays. In case of studying the effect of pesticides used to control pink bollworm and its effect on sucking piercing pests. Also, data revealed that the 1st spray was the preferable spray on *Tetranychus*. spp. and *Aphid gossypii* attained (100 and 87.79 %), respectively. while in the case of the 2nd spray the effect were noticed on *A. gossypii*, *Tetranychus*. spp. and *Empoasca* spp., which attained (100, 53.40 and 56.20 %). While the 3rd spray recorded the high mean of reduction percentages on *N. veredula* and *A. gossypii* attained (92.15 and 84.16 %). The seasonal mean of reduction percentages after the three sprays can be arranged as follows: (90.65, 79.82, 71.52, 58.56 and 36.49 %) of *A. gossypii*, *N. veredula* ,*Tetranychus*. spp., *B. tabaci* and *Empoasca* spp., respectively. On the other hand, the effect of the tested compounds on *Chrysoperla* spp. were 53.72, 8.23 and 9.39 % reduction recorded after the three sprays, respectively. The obtained results cleared that the tested predators affected on all sucking pests population numbers and recorded the lowest seasonal mean 23.78 % which recorded on *Chrysoperla* spp. On the other side there was found a relationship ranged between positive & negative and insignificant between *Coccinella* spp. and the sucking pests, and the relationship was positive and significant with *Empoasca* spp. In the case of the *Chrysoperla* spp., the relationship was, and significant with *Empoasca* spp., *N. veridula* and *Tetranychus* spp. numbers. Whereas in the case of *Scymnus* spp., the relationship was positive or negative and significant in the case of *B. tabaci*, *N. veridula* and true spider mites. At the same time, the relationship between *Orius* spp. beetles and sucking piercing pests ranged between positive & negative, significant and insignificant, and that relationship was significant and negative true spiders and insignificant & positive with other insect piercing insects. Generally, multiple regressions between the sucking pests and predators were 65.19, 72.24, 55.75, 71.45 and 41.56 for (*Coccinella* spp., *Chrysoperla* spp., *Peaderus alferii*, *Scymnus* spp., *Orius* spp. and true spiders), respectively. It could be concluded that the treatment of pink bollo worm using the following pesticide program (Chlorperifos + Chlorfloiseron and then Lambadacyhalothrin alone and then Chlorperifos alone) led to a significant reduction in the number of pink bolloworm, pests associated with this effect were low on insect predators associated with perforating sucking insects in cotton fields..

Key words: *Pectinophora gossypiella*, Insecticides, Sucking pests, Predators.

Introduction:

In Egypt, cotton is subjected to be attacked by several pests. The piercing- sucking pests, cotton bollworm and cotton leaf worm which are the key economical important pests affecting cotton (*Gossypium barbadens*e L.) production. The success of cotton bollworm control programme relies of use of pesticides belonging to different groups in certain sequence, timing of application and interval of spraying (Watson *et al*., 1986). *P. gossypiella* was considered the most serious pests attacking cotton plants during flowering as well as fruiting stages and cause great losses of cotton yield (Abd El-Mageed *et al*., 2007). The application of insecticides in sequential use induced higher reduction in *P. gossypiella* larval number as compared with the lower reduction resulting from several applications with the same insecticide alone. (Ramsubramanian, 2004) fount that the control of *P. gossypiella* depends exclusively on conventional insecticides which have an important role in management programs to control cotton bollworms. The relatively highest reduction percentage were recorded with the use of chloropyrifose. The highest reduction percentages of *P. gossypiella* gave about 90% (Ibrahim *et al.*, 2017). The tested insecticides recorded significant protection for cotton polls against cotton bolloworm infestation (Siham, Ismail, 2019). Sequence organophosphours compounds had higher effects against *Empoasca lypica* and *A. gossypi* (Abou-Kahla *et al*., 1992). The effect of Cypermethrin and Sulprofos, on *A. gossypii* were lower under field condition. The piercing- sucking pests suck cell contents of infested plants while feeding, exert huge amounts of honeydew that eventually promotes development of sooty mould, which reduces the photosynthetic efficiency of the plant (Kerns and Gaylor, 1993). In Egypt, cotton plants are usually subjected to be attacked by numerous insect pests during all different stages of their growth i.e. *A. gossypii*; *B. tabaci*; *Empoasca spp.*, *P. gossypiella* and *Tetranychus* spp. (Al-Shannaf, 2002). The predatory bugs, such as *Orius majusculus* and *Orius laevigatus* are used to control *Thrips tabaci* in the UK; *O. laevigatus* is well adapted to living in confined spaces, which could increase its chances of coming into contact with *Thrips palmi* (Chambers *et al.*, 1993). A single *Orius strigicollis* usually eats more than 200 of thrips sucking pest during its lifetime (including immature and mature stages, and assuming a stable temperature of 25ºC (Wang, 1994). Several predators' species are found in cotton fields associated with cotton pests, such as, coccinellids, chrysopids, staphylinids and true spiders; the role of these predators is highly significant against cotton pests (Ibrahim, 2001). The insect predators *Chrysoperla carnea*, *Coccinella* spp. *Orious* spp., *Peaderus alfierii*, *Scymnus* spp., and true spiders were influenced significant and insignificant relationship and ranged between positive and negative relationship. Also, reported the all predators affect sucking pests (Al-Shannaf, 2010). The organophosphorous compound, Dursban can be considered as good control pesticide against tested sucking pests recorded highly reduction percentages and caused serious damage to associated predators on cotton plants at the end of the season (Ibrahim *et al*., 2017).

The aim of this study was to evaluate the effectiveness of some insecticides against *Pectinophora gossypiella* infesting green cotton bolls in the cotton field, side effect on some major of cotton pests such as, (*Aphis gossypii*, *Bemisia tabaci*, *Empoasca* spp, *Nezara veridula* and *Tetranychus* spp.), side effect on different important predators and the relationship between the sucking pests and their associated predators in cotton fields.

Materials and Methods:

A. Insecticides used:

No.	Insecticide group	Trade name	Common name	Rate/Feddan	Company product
1	Organophosphorus OP	Dursban EC48%)	Chlorpyrifos	1000 ml	Agrochem
2	Pyrethroids	Karate EC 2.50%	Lambda-Cyhalothrin	750 ml	Syngenta
3	Benzyl phenyl urea (BPU)	Atabron EC 5 %	Chlorfluazuron	400 ml	Ishihara Sangyo.

Fadden=4200.83 m^2, Fadden=0.42 Hectare

B-Field experiment:

Field experiment was carried out at ALZagazig ergion in AlSharkia Governorate, Egypt, during 2017cotton growing season. The experimental area was cultivated with the Egyptian cotton variety, Giza 94 which sown at 22nd March, The cotton areas were subjected to normal agricultural practices all over study period.

1. Experimental design:

The experimental area (one feddan) was divided into one treatment and untreated, each was divided into three replicates each 700m^2. The treatments were arranged in a completely randomized block design. The sprays were applied at two week intervals the 1st spray Chlorpyrifos+ Chlorfluazeron the 2nd spray Lambda-Cyhalothrin and the 3rd spray chlorpyrifos using solo motor, 20 litter in capacity.

2. Sampling techniques:

A- Pink bollworm:

75 green cotton bolls were collected randomly from each treatment just before and weekly after spraying (25 bolls from each replicate). The number of the pink bollworm larvae in green bolls were calculated to compare the efficiency of the tested compounds against the pink bollworm and the sprayed started at 3% infestation of green cotton bolls. The reduction percentages in the number of larvae were calculated according (Henderson and Tilton, 1955).

B. Piercing sucking pests:

The harmful effect of the tested compounds against certain sucking pests was investigated. The numbers of (*A. gossypii*, *B. tabaci*, *Empoasca* spp., *N. veridula* and *Tetranychus* spp.), were counted on 25 cotton plants and repeated three times in each treatment and control, the insects were counted on three levels (upper, middle, and lower), before and weekly after insecticide applications with Chlorpyrifos+ Chlorfluazeron then Lambda-Cyhalothrin and then Chlorpyrifos in 2017 season. The plants directly inspected/sector/sampling date in each plant represented/replicate in each treatment. The populations of the sucking insects were counted directly on the inspected plants. The application treatments started from the 15th week Jul. Whereas in the case of the *Tetranychus* spp were counted in square inches at the three levels (top, middle and bottom/plant) of 10 plants /replicated using hand lens a (10 x) power. The reduction in number of sucking pests were calculated using, (Henderson and Tilton, (1955).

C-The side effect on predators:

The harmful effect of the above-mentioned chemicals were tested against some predators; mentioned above. The numbers of predators were counted on the three cotton levels (top, middle and bottom/plant) before and weekly after applications. Twenty five of cotton plants for every replicate

were used. The mean weekly numbers for each insect predator were recorded and the reduction percentages were calculated according to (Henerson and Tilton 1955).

D. Statistical analysis:

All the obtained resulted were statistically analyzed according to completely randomized design and factorial experiments. The appropriate methods were used for the analysis of data according to (Little and Hills, 1975). To make all possible comparisons between the means of different treatments, which proved to be statistically significant, Duncan's multiple range test [least significant range (L.S.R) test] was done. N.S. indicates that the differences between treatments are not significant, whereas * and ** indicate that the differences between treatments are significant and highly significant at 0.05 level of probability, respectively.

Results and Discussion:

1. Effect of some insecticides against the pink bollworm larvae:

Data in Table (1) shows that the mean numbers of the pink bollworm larvae were influenced by the tested insecticides in comparable with untreated cotton field. The reduction percentages in the number of pink bollworm larvae were different due to the tested insecticides. The highest value of the reduction percentage was 88.56 % at 2nd spray followed by 69.79 at 3rd spray, while the lowest mean of reduction was 87.33 % recorded at 1st spray. Meanwhile the seasonal mean of reduction was 73.89%.

Results are agreed with (Khidr *et al*., 1996) who studied the effect of different insecticides in four rotations against the bollworms infesting cotton plants, they used the pyrethroid, cypermethrin (cymbush), profenofs (curacron), the carbamate, thiodicarb (larvin) and the mixture, Delfos (Dursban + XRD 473). Insecticides treated plots reduced the incidence of bollworms infestation on cotton. (Abd El-Mageed *et al.*, 2007) reported that the sequence of Betacyfluthrin and Malathion and Lufenuron, Malathion induced the infestation of pink bollworm larvae. Hegab (2008) stated that, Clorpyrifos, Es-fenvalerate and Carbamate insecticides caused high reduction in cotton bolls. (Yousif-Kalil *et al.*, 2008) found that Chlorpyrifos caused high reduction to bollworm. Also results are agree with (Ibrahim *et al.*, 2017) who reported the relatively highest reduction percentage for (Chloropyrifose) on *P. gossypiella* larvae. The results of this study agreed with the researchers' findings, and it was scientifically proven that the treatment of pink bolloworm larvae with conventional insecticides reduced the incidence of cotton boll infection.

Table 1. Effect of some insecticides against pink bollworm, *P. gosypiella* in cotton fields during 2017

Treatments / Insects	No. of insect in untreated plots before treatment	1st spray						2nd spray						3rd spray						Seasonal mean	
		1 week		2 week		Mean		1 week		2 week		Mean		1 week		2 week		Mean			
		N	R%	N	R%	N	R%	N	R%	N	R%	N	R%	N	R%	N	R%	N	R%	N	R%
P. gosypiella	4.00	1.33	71.46	2.33	63.19	1.83	67.33	1.66	83.40	2.00	85.71	1.83	88.56	6.00	70.00	7.00	69.57	6.50	69.79	3.39	73.89
Control	4.00	4.66		6.33		5.49		10.00		14.00		12.00		20.00		23.00		21.50		12.99	

N=Mean number of predators population, R=Reduction percentages in the predators population.

2. The side effect against certain piercing sucking pests.

***-Aphis gossypii*:**

Results in Table (2) indicates that the numbers of *A. gossypii* were influenced by the tested insecticides. The highest mean of reduction percentages were (87.79, 100.00 and 84.16%), respectively recorded at the 1st , 2nd and 3rd sprays of application with (Chlorpyrifos+Chlorfluazeron, Lambda-Cyhalothrin and Chlorpyrifos) and the seasonal mean of reduction was 90.65 %.

Bemicia tabaci:

Data presented in Table (2) shows that the numbers of *B. tabaci* individual were influenced by the tested insecticides. The mean reduction percentages were (73.86, 37.79 and 64.02 %), respectively recorded of the three sprayers of application. The seasonal mean of reduction percentages was 58.56 %.

-Empoasqa* spp*:

Data in Table (2) clears that the mean numbers of *Empoasqa. spp* influenced by the tested insecticides. The mean reduction percentages were (40.39, 56.20 and 12.90 %), respectively recorded of the three sprayers applied after 7th week of application. But the seasonal mean of reduction percentages was moderately value attained 51.88 %.

Nezara veridula:

Data presented in Table (2) indicates that the numbers of *N. veridula* population numbers were influenced by four tested insecticides. The mean reduction percentages were (47.32, 100 and 92.15 %), respectively recorded of the three sprayers applied after 7th week of application. Also data indicated that the seasonal mean of reduction percentage was relatively high value recorded 79.82% reduction.

Table 2. Effect of some insecticides against different sucking pests in cotton fields during 2017.

Treatmnts / Insects		No. of pests in untreated plots before treatment	1st spray						2nd spray								3rd spray						Seasonal mean	
			1 week		2 week		Mean		1 week		2 week		3 week		Mean		1 week		2 week		Mean		N	R%
			N	R%	N	R%	N	R%	N	R%	N	R%	N	R%	N	R%	N	R%	N	R%	N	R%		
Aphid gossypii	T	15.00	5.00	75.57	0.00	100	2.50	87.79	0.00	100	0.00	100	0.00	100	0.00	100	9.00	79.60	3.00	88.72	6.00	84.16	2.83	90.65
	C	7.33	10.00		16.67		13.34		15.67		29.00		23.67		22.78		21.00		13.00		17.00		17.21	
Bemicia tabaci	T	15.00	7.62	49.20	14.33	98.57	10.97	73.86	26.00	20.00	28.00	17.36	10.00	76.00	21.33	37.79	28.00	48.04	9.00	80.00	18.50	64.02	16.93	58.56
	C	9.00	16.67		4.33		10.50		13.00		20.33		25.00		19.44		32.33		27.00		29.67		19.87	
Empoasca spp	T	9.33	4.00	11.50	3.33	69.28	3.66	40.39	2.00	14.74	5.00	53.87	0.00	100	2.33	56.20	2.33	14.30	4.00	11.50	3.16	12.90	3.10	36.49
	C	10.33	3.00		12.00		7.500		15.00		12.00		3.33		10.11		3.00		5.00		4.00		7.20	
Nezara veridula	T	8.00	9.00	12.50	1.00	82.14	5.00	47.32	0.00	100.0	0.00	100	0.00	100	0.00	100.0	0.67	84.29	0.00	100.0	0.33	92.15	1.77	79.82
	C	10.00	10.00		7.00		8.50		5.33		4.33		3.00		4.22		5.33		11.67		8.50		7.07	
Tetranychus spp	T	3.00	0.00	100	0.00	100	0.00	100	1.00	22.33	2.00	37.87	0.00	100	0.75	53.40	1.00	22.33	0.00	100	0.50	61.16	0.60	71.52
	C	2.33	1.33		1.00		1.17		1.00		2.50		0.33		1.28		1.00		1.00		1.00		1.15	

N=Mean number of predators population R=Reduction percentages in the sucking pests population population T= No. in Treatments C= No. in untreated, 1st spray= Chlorpyrifose +Chlorfluazeron, 2nd spray =Lambda-cyhalothrin, 3rd spray= Chlorpyrifose.

***Tetranychus* spp.**

The results in Table (2) shows the numbers of *Tetranychus* spp. were influenced by the tested control insecticides. The mean of reduction percentages were (100, 53.40 and 61.16%), respectively recorded after the 7th weeks of application, while the seasonal mean of reduction was 71.52 %.

From the previously results the preferable seasonal mean of reduction percentages can be arranged as follows: (90.65, 79.82, 71.52, 58.56 and 46.49 %), respectively of *A. gossypii*, *N. veredula*, *Tetranychus* spp. *B. tabacii* and *Empoasqa* spp. The *A. gossypii* suck cell contents of infested plants while feeding, exert huge amounts of honeydew that eventually promotes development of sooty mould, which reduces the photosynthetic efficiency of the plant (Kerns and Gaylor, 1993). The effect of Cypermethrin and Sulprofos, on *A. gossypii* were greatest in the Sulprofos-treated plots and lowest in the Cypermethrin treated plots. *B. tabaci*, *A. gossypii* and *E. lybica* are considered among the economic pests of cotton plants (Abdel-Salam, 1995). Chloropyrifose was considered as common pesticide used in cotton fields for long time to control several cotton pests with high efficacy against lepidopterous insects and caused most efficacy against aphids while it was less effective *B. tabaci* (Ibrahim, 2001). The current results reached in the research are in agreement with most researchers in different

countries, such as (Otoidobiga *et al.*, 2003) found that *B. tabaci* was susceptible to the insecticides currently sprayed on cotton. Regarding sucking pests treated using Alpha -Cypermethrin insecticides was the most efficient against aphid followed by Profenophos and Deltamethrin. Meanwhile in case of *B. tabaci* and *Empoasqa* spp. the tested insecticides recorded moderately effect. Pyrethroids compound were the most toxic effect on *Tetranychus* spp. while Profenophos was the least toxic one (Zaki, 2012). Field experiments indicated garlic extract efficacy showed the highest sustainable control of aphids, whitefly and spider mites on cotton plants, where the sprays started just after cotton plants emergence, indicated the numbers of pests were very low while the 3rd program was started after 20 days of cotton plants emergence was tended to be the highest sustainable control of leafhoppers. In case of *N. viridula*, it could be decided that the Dursban can be used as effective insecticide on sucking pests at the end season of study (Ibrahim *et al.*, 2017).

3. The side effects of insecticides on total predators:

With regard to the associated natural enemies, *Coccinella* spp., *Ch. carnea*, *P. alfierii*; *Orius* spp., *Scymnus* spp. and True spiders. Data presented in Table (3) based on the average of reduction percentage of the cotton season indicated that, the lowest reduction of the three tested sprayers were 76.20 % recorded in *Coccinella* spp. after 1st spray, while the lowest mean of reduction 8.23 % was recorded after 2nd spray for *C. carnea*. While in the case of *P. alferii* the lowest mean of reduction was 98.16% after 1st spray. *Scymnus* spp. was the lowest sprayer affect and recorded 74.45% after 1st spray. But *Orius* spp. was the median reduction after the 3rd spray recorded 45.88%. While after 2nd spray true spider mites affect with the tested insecticides and the reduction percentages was 53.40% Table (3).

Generally the data cleared that, the tested compounds caused the lowest effect on *C. carnea* after the three sprays recorded 23.78 %.

Several predators' species are found in cotton fields associated with cotton pests, such as, coccinellids, chrysopids, staphylinids and true spiders; the role of these predators is highly significant against cotton pests (Ibrahim, 2001). The insect predators *Chrysoperla carnea*, *Coccinella* spp. *Orious* spp., *Peaderus alfierii*, *Scymnus* spp., and true spiders were influenced significant. Also, reported the predators affect sucking pests (Al-Shannaf, 2010). These results are different with the (Ibrahim *et al*., 2017), where thy indicated that spraying conventional insecticides separately at the end of the season reduced the number of predators associated with piercing sucking pests.

4-The relationship between certain piercing sucking pests and associated predators.

The results in Table (4) shows that the relationship between the weekly mean numbers of *A. gossypii*, *B. tabaci*, *Empoasca* spp., *N. veridula* and *Tetranychus* spp. and *Coccinella* spp. ranged between positive & negative relationship and significant, in-significant of *A. gossypii* and *B. tabaci* (r= 0.09 and 0.67), but it were significant and ranged between positive & negative relationship between *Chrysoperla* spp. and *Empoasca* spp., *N. veridula* and *Tetranychus* spp. (0.44, 0.53 and -0.56) respectively. While in case of the relationship between *Orius* spp. and *A. gossypii*, *Empoasca* spp., *T. tabaci*, *N. veridula* and *Tetranychus* spp. were ranged between positive & negative relationship and significant or in-significant (r=57, 0.21, 0.29, -0.24 and 0.49), respectively.

The relationship between *Scymnus spp.* and *A. gossypii*, *Empoasca* spp., *B. tabaci*, *N. veridula* and *Tetranychus* spp. were ranged between positive & negative relationship and significant or in-significant (r=0.41, 0.13, -0.51, 0.53 and -0.57), respectively. Also data indicated that there were ranged between positive & negative relationship and in-significant (r_1= 0.18, 0.31, 0.18 0.37 and -0.46), respectively

between the sucking insects tested and *Tetranychus* spp., but it was negative and significant (r_1=-0.46) of true spider mites. The impact of the tested insects as the total effect of as (multiple regression values) were 65.19, 72.24, 55.79, 71.45 and 41.56 % for the predators, respectively. (Nada, 1990) indicated that field experiments using different insecticides caused slightly reduced the populations of spiders associated with cotton pests. (Mohyuddin *et al*., 1997) in the cotton fields tested different insecticides in Pakistan for control of sucking pests and bollworms. *Bemisia tabaci*, *Amrasca devastans* [*A. biguttula*] and *thrips tabaci* were lower than in those where farmers spray insecticides 5-7 times. The tested insecticides individual caused high effect on major cotton pests. Also, insecticidal mixtures might play an important role in IPM systems where more than one pest is involved in plant infestation (Knight , 2000). Other researcher cleared that non-significant correlation found between the populations of certain sucking pests *A. gossypii* and *B. tabaci* infesting cotton and their natural enemies except that of spider mites, correlation was generally negative while it was positive for whitefly. The obtained data showed that non-significant correlation coefficient found between the populations of certain sucking pests *T. tabaci*, *A. gossypii* and *B. tabaci* infesting cotton and their natural enemies except that of spider mites, correlation was generally negative while it was positive for whitefly (Taha *et al.,* 2001). The applications insecticides in cotton fields against different pests had an adverse and highly significant effect on numbers of spider (Aioub *et al*., 2002). Field studied rvealed acetamiprid used for the control of *Bemisia tabaci* in cotton compared with a proven selective regime based on the insect growth regulators (IGRs) pyriproxyfen and buprofezin (Naranjo and Akey, 2005). The synthetic Pyrethroids, Lambda-Cyhalothrin, Esfenvalerate and Deltamethrin were the greatest reduction of the predator's population Younis *et al.* (2007). The two tested Pyrethroids were the most toxic effect on *Tetranychus* spp. while Profenophos was the least effect one. In addition, alpha-Cypermethrin and Deltamethrin were more toxic against predators than profenophos (Zaki, 2012). The Organophosphorous compound can be considered as preferable control pesticide against sucking pests, but caused serious damage to associated predators on cotton plants at the end of season period that disturbed the natural balance in cotton cultivation area environment (Ibrahim, *et al*., 2017).

Table 3. Average number of predators and percent reduction during 2017

Treatments / Predators	Treatments	No. of pests in untreated plots before treatment	1st spray						2nd spray								3rd spray						Seasonal mean	
			1 week		2 week		Mean		1 week		2 week		3 week		Mean		1 week		2 week		Mean			
			N	R%	N	R%	N	R%	N	R%	N	R%	N	R%	N	R%	N	R%	N	R%	N	R%	N.	R%
***Coccinella* spp.**	T	16.33	7.67	52.40	0.00	100	3.83	76.20	0.00	100.00	0.00	100	0.00	100.00	0.00	100.00	0.00	100	0.00	100	0.00	100	1.27	92.07
	C	25.67	25.33		22.67		24..70		21.67		14.00		11.33		15.67		15.00		6.67		10.84		16.84	
Chrysoperla spp.	T	9.67	5.00	50.37	4.67	57.07	4.83	53.72	8.00	18.94	8.50	1.86	6.00	3.90	7.50	8.23	7.00	8.55	3.67	10.24	5.33	9.39	5.89	23.78
	C	16.00	16.67		18.00		17.34		16.33		14.33		10.33		13.66		10.67		8.00		9.34		13.45	
Peaderus alferii	T	18.00	1.66	96.31	0.00	100	0.83	98.16	0.00	100	0.00	100	0.00	100	0.00	100	0.00	100	0.00	100	0.00	100	0.27	99.39
	C	2.00	5.00		6.33		5.67		15.33		6.67		4.00		8.67		12.67		2.33		7.50		7.28	
***Scymnus* spp.**	T	19.00	6.33	48.89	0.00	100	3.16	74.45	0.00	100	4.33	91.40	0.00	100	1.44	97.13	0.00	100	1.33	96.01	0.66	98.01	1.75	89.86
	C	7.67	5.00		11.67		8.34		18.33		20.33		15.33		17.99		12.67		6.67		9.67		12.00	
Orius spp.	T	8.00	2.00	86.47	0.00	100	1.00	93.24	0.00	100	0.00	100	1.00	87.50	0.33	95.83	1.00	45.88	1.00	45.88	1.00	45.88	0.78	78.32
	C	4.33	8.00		3.33		5.67		4.33		7.33		4.33		5.33		1.00		1.00		0.00		3.67	
True spider mites	T	3.00	0.00	100	0.00	100	0.00	100	1.00	22.33	2.00	37.87	0.00	100	0.75	53.40	1.00	22.33	0.00	100	0.50	61.16	0.60	71.52
	C	14.33	13.67		13.00		13.34		19.67		15.00		16.33		17.00		8.00		6.67		7.34		12.56	

N=Mean number of predators population, R=Reduction percentages in the predators population, T= No. in treatments C= No. in untreated, 1st spray=Chlorpyrifose +Chlorfluazeron, 2nd spray =Lambda-cyhalothrin, 3rd spray= Chlorpyrifose.

Table 4. Simple correlation (r), Multi-regression % and SE± between the number of certain piercing sucking pest and associated predators during 2017.

Predators / Insects	*Coccinella* spp.				*Chrysoperla* spp.				*Orius* spp.				*Scymnus* spp.				True spider			
	Simple correlation (r)			Multi-regression %	Simple correlation (r)			Multi-regression %	Simple correlation (r)			Multi-regression %	Simple correlation (r)			Multi-regression %	Simple correlation (r)			Multi-regression %
	R	SE±	Probability		R	SE±	Probability		R	SE±	Probability		R	SE±	Probability		r	SE±	Probability	
Aphid gossypii	0.09	0.22	0.68 NS.		0.22	0.22	0.32 NS.		0.57	0.18	0.0058**		0.41	0.20	0.060 NS.		0.18	0.22	0.44 NS.	
Empoasqa spp	0.67	0.17	0.0006 **		0.44	0.20	0.038*		0.21	0.22	0.926N.S.		0.13	0.22	0.56 NS.		0.31	0.21	0.15 NS.	
emecia tabat	-0.15	0.22	0.49 NS	65.19	0.23	0.22	0.29 NS.	72.24	0.29	0.22	0.15N.S.	55.79	-0.51	0.19	0.0130 *	71.46	0.18	0.22	0.43 NS.	41.56
Nezara veridula	-0.14	0.22	0.0.52 NS.		0.53	0.19	0.011*		-0.24	0.22	0.28 N.S.		0.53	0.19	0.0119 *		0.37	0.21	0.08 NS.	
Tetranychus spp.	-0.06	0.22	0.78 NS.		-0.56	0.19	0.002**		0.49	0.19	0.20*		-.57	0.18	0.006**		-0.46	0.19	0.34*	

R= correlation, SE±=Standard error, 1st spray= Chlorpyrifose +Chlorfluazeron, 2nd spray =Lambda-cyhalothrin, 3rd spray= Chlorpyrifose.

Conclusions:

As a conclusion, it can be asserted that this study pointed out to minimize repetition of insecticide application in the same season; furthermore, the importance of applied insecticide to directing tactics to fight against resistance development for this conventional insecticide where Chlorpyrifos + Chlorfluazeron, Lambda-Cyhalothrin and Clorpyrifos could be used as contol program. These findings may have considerable practical implications for *P. gossypiella*, certain sucking pests and associated predators management, and this leads to obtaining the optimum regimen of insecticides, which gives the reduction of cotton bollworm infestation and piercing sucking pests were Chlorpyrifos+ Chlorfluazeron, Lambda-Cyhalothrin and Clorpyrifos program.

References:

Abd El-Mageed, A.E.M.; E.M. Anwar; L.R.A. Elgohary; and H.F. Dahi (2007). Evaluation of several programs of sequences pesticides application on cotton bollworms and some other sucking pest in cotton field. J. Entomol., 4: 93-103.

Abdel-Salam, A.H. (1995). The biotic factor: evaluation of their performance under natural conditions in cotton plantation. Ph.D. Thesis, Fac. of Agric., Mansoura Univ., Egypt. 175 pp.

Abou-Kahla, M.M.; A.E.M. El-Sorady, R.M. Salem; and A.M. Hussain (1992). Impact of several sequences of insecticides against certain cotton pests and the associated predators in cotton fields. J. Agric. Res., Tanta Univ., 18: 804-817.

Aioub, A.A.A.; E.A. Gomaa; W.M.H. Desuky; and A.A.A. Zaki (2002). Management of sap sucking insect population on cotton plants by imdacloprid application and NPK fertilization. Zagazig J. Agric. Res., 29 (1): 269-289.

Al-Shannaf, M.H.A. (2002). Studies on some cotton pests. Ph.D. Thesis. Fac. Agric. Zagazig Univ., 297 pp.

Al-Shannaf, M.H.A. (2010). Effect of sequence control sprays on cotton bollworms and side effect on some sucking pests and their associated predators in cotton fields. Egypt. Acad. J. Biol. Sci., 3 (1): 221 – 233.

Chambers, R.J.; S. Long; and N. Helyer (1993). Effectiveness of *Orius laevigatus* for the control of *Frankliniella occidentalis* on cucumber and pepper in the UK. Biocont. Sci. and Technol., 3: 295-307.

Hegab, M.E.M. (2008). Studies on some elements of integrated control of cotton bollworms. Ph.D. Thesis, Fac. Agric. Al-Azhar Univ., 231pp.

Henderson, C.F. and F. Tilton (1955). Test with acaricide against the brown wheat mite. J. Econ. Entomol., 48 :157-161.

Ibrahim, M. M.A. (2001). Studies on some piercing-sucking insect pests infesting cotton plants. Ph.D. Thesis, Fac. Agric., Zagazig Univ., Egypt. 198 pp.

Ibrahim, M.M.A.; H.M.H. Al-Shannaf; A.A.A. Zaki and M.E.M.A. Hegab (2017). Impact of garlic extract in comparison with chloropyrifose insecticide against certain pests and associated predators in cotton fields at Sharkia Governorate, Egypt. Zagazig j. Agric. Res., 44 (1): 281-293,.

Kerns, D.L.; and M.J. Gaylor (1993). Induction of cotton aphid outbreaks by insecticides in cotton. Crop Prot., 12(5): 387-393.

Khidr, A.A.; W.M.H. Desuky; A.A. El-Sheakh; and S.A. Raslan (1996). Sequential use of some insecticides against cotton bollworms in control trials. Egypt, J. Agric. Res., 74(2): 321-331.

Knight, A.I. (2000). Tebufenozide targeted against codlig moth (Lepidoptera: Tortricidae) adults, eggs and larvae. J. Econ. Entomol., 93: 760-767.

Little, T.M. and F.J. Hills (1975). Statistical methods in agricultural research. Available from U.C.D. Book Store, University of California, Davis: 241pp.

Mohyuddin, A.I.; G. Jilani; A.G. Khan; A. Hamza; I. Ahmed; and Z. Mahmood (1997). Integrated pest management of major cotton pests by conservation, redistribution and augmentation of natural enemies. Pakistan J. of Zool., 29: (3): 293-298.

Nada, M.A. (1990). Control of certain pests infesting cotton plants in Sharkia Region. Ph.D. Thesis Fac. Agric., Zagazig Univ.,: 203pp.

Naranjo, S. and D.H. Akey (2005). Conservation of natural enemies in cotton: comparative selectivity of acetamiprid in the management of *Bemisia tabaci*. Pest Manag. Sci., 61(6): 555-566.

Otoidobiga L.C.; C. Vincent; and R.K. Stewart (2003). Susceptibility of field populations of adult *Bemisia tabaci* Gennadius (Homoptera: Aleyrodidae) and *Eretmocerus* sp. (Hymenoptera: Aphelinidae) to cotton insecticides in Burkina Faso (West Africa). Pest Manag. Sci., 59 (1):97-106.

Ramsubramanian, T. (2004). Magnitude, mechanism and management of pyrethroids resistance in *Helicoverpa armigera* (Hubner) in India. J. Entomol., 1: 6 –11.

Seham, M.Ismail (2019). Influence of some insecticide sequences on the injurious insect- pests of cotton plants. Bull. of the Nat. Res. Cent., 43:149.

Taha, H.A.; S.M. Soliman; A. Abd-El-Haleem; and S.A. El-Raies (2001). Field studies on the main pests infesting cotton with refer to their natural enemies. Reprinted from the Proc. of the Belt. Cotton Conf. 2: 885-888. Nat. Cotton Coun. Memphis TN.

Younis, A.M.H.; H.S. Hamouda; A.S. Ibrahim; and M.A.Z. Zeitoum (2007). Field evaluation of certain pesticides against the cotton bollworms with special reference to their negative impact on beneficial arthropoda. 8th African Crop Sci. Soci. Conf., Elminia, Egypt 27-31 October, :933-1002.

Wang, C.L. (1994). The predacious capacity of two natural enemies of *Thrips palmi* Karny, *Camplylomma chinensis* Schuh (Hemiptera: Miridae) and *Orius sauteri* (Poppius) (Hemiptera: Anthocoridae). Plant Prot. Bull. (Taiwan). 36: 141-154.

Watson, W.M.; Amera, M. Rashed; Nagwa, M. Hussein; and M.W. Guirguis (1986). Potencies of certain insecticides against the pink bollworm *Pectinophora gossypiella* (Saund.) as influenced by chemical control program in Egypt. Bull. Ent. Soc. Egypt Econ. Ser., 15: 79-86.

Yousif-Khalil, S.I.; S.A.A. Raslan; Ola, I. Hegab and Omnia S. Abd-Elsttar (2008). Efficiency of spinosad and runner against pink bollworm and predators population on cotton fields. Zagazig J.Agric.Res., 35 (2): 407- 422.

Zaki, A.A.A. (2012). The pink bollworm, side effect on some sucking pests and their associated predators. Egypt . J. of Appl. Sci., 27 (12B) 194-207.

تأثير بعض المبيدات الحشرية ضد دودة اللوز القرنفلية *Pectinophora gossypiella* والآفات الثاقبة الماصة والمفترسات المرتبطة بها في حقول القطن

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الملخص

أجريت تجارب حقلية في منطقة الزقازيق محافظة الشرقية خلال موسم زراعة القطن لعام 2017 لاختبار بعض المبيدات الحشرية على يرقات دودة اللوز القرنفلية التى تصيب لوز القطن. تم إجراء ثلاثة رشات للمبيدات الحشرية، (كلوربيريفوس + كلورفلويزيرون ثم لامباداسيهالوثرين ثم كلوربيريفوس) على دودة اللوز القرنفلية وبعض الآفات الثاقبة الماصة (المن، الذبابة البيضاء، نطاطات الأوراق، البقة الخضراء والعنكبوت الأحمر)، وبعض المفترسات المرتبطة بها (خنافس أبو العيد، أسد المن، حشرة الرواغه، الاسكمنس، بقة الأوريس، والعناكب الحقيقية). أظهرت النتائج أن متوسط نسبة الخفض لتعداد يرقات دودة اللوز القرنفلية بعد أسبوعين للرشة الأولى 67.33 %، بينما سجل أعلى نسبة خفض 85.71٪ بعد الأسبوع الثاني من الرشة الثانية. وكان متوسط الخفض الموسمي 73.89 ٪ بعد ثلاثة رشات على التوالي. في حالة دراسة تأثير المبيدات الحشرية المستخدمة على الآفات الثاقبة الماصة. أيضاً بينت النتائج أن الرشة الأولى قد سجلت أعلى نسبة خفض على العنكبوت الأحمر، يليه على المن، وكانت (100 و 87.79 ٪) ، على التوالي. بينما في حالة الرشة الثانية ، لوحظ أن تأثير المبيدات على المن والعنكبوت الأحمر ونطاطات الأوراق كانت (100 و 53.40 و 56.20 ٪) على التوالي. بينما سجل أكبر نسبة خفض فى الرشة الثالثة على البقة الخضراء والمن بنسبة بلغت (92.15 و 84.16٪) على التوالي.و يمكن ترتيب متوسط نسب الخفض الموسمية للتعداد بعد الثلاث رشات على النحو التالي: (90.65، 79.82، 71.52، 58.56 و36.49٪) لكل من حشرات المن، البقة الخضراء، العنكبوت الأحمر، الذبابة البيضاء ونطاطات الأوراق على التوالي. من ناحية أخرى، كان تأثير المركبات على أسد المن 53.72 و8.23 و9.39 ٪ بعد 3 رشات على التوالي. أثرت المبيدات المختبرة على تعداد الآفات وسجل أقل متوسط خفض للتعداد 23.78% لمفترس أسد المن. على الجانب الآخر وجدت علاقة ارتباط تراوحت بين موجبة أو سلبية وغير معنوية بين مفترس أبو العيد والآفات الثاقبة الماصة، وكانت تلك العلاقة موجبة وسالبة ومعنوية مع نطاطات الأوراق، وكانت تلك العلاقة قوية مع نطاطات الأوراق والبقة الخضراء وتعداد العنكبوت الأحمر. بينما في حالة مفترس الاسكمنس تراوحت العلاقة بين موجبة أو سالبة وكانت تلك العلاقة معنوية في حالة الذبابة البيضاء والبقة الخضراء والعناكب الحقيقية. وفي الوقت نفسه تذبذبت العلاقة بين خنافس الأوريس والآفات الثاقبة الماصة بين موجبة أو سالبة ومعنوية وغير معنوية وكانت تلك العلاقة معنوية وسالبة مع العنكبوت الحقيقي، وغير معنوية وموجبة مع باقى الحشرات الثاقبة. بشكل عام، وجدت علاقة انحدار بين الآفات الثاقبة الماصة والمفترسات المصاحبة لها وبلغت نسبة الخفض حتى 65.19 و72.24 و55.75 و71.45 و41.56 % لخنافس أبو العيد، أسد المن، الراوغه/اسكمنس، بقة الأوريس والعناكب الحقيقية على التوالي. يستخلص من نتائج الدراسة أن معاملة دودة اللوز القرنفلية باستخدام برنامج المبيدات التالي: (كلوربيريفوس + كلورفلويزيرون ثم لامباداسيهالوثرين منفرداً ثم كلوربيريفوس منفرداً) قد أدى إلى خفض كبير في تعداد دودة اللوز القرنفلية، والآفات المرتبطة بها، وكان هذا التأثير منخفضاً على المفترسات الحشرية المرتبطة مع الحشرات الثاقبة الماصة في حقول القطن.

الكلمات المفتاحية: دودة اللوز القرنفلية، مبيدات حشرية، آفات ثاقبة ماصة، مفترسات.