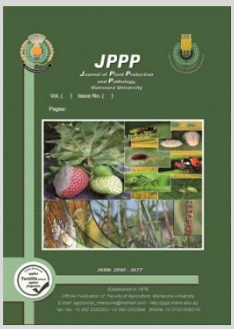
Journal of Plant Protection and Pathology

Journal homepage: www.jppp.mans.edu.eg
Available online at: www. jppp.journals.ekb.eg

Effect of some Insecticides on Pink Bollworm, *Pectinophora gossypiella* (Saunders) (Lepidoptera: Gelechiidae), Associated Predators in Cotton Field and some of their Biochemical Effects

El-Sayed, A. A.; A. E. A. Amer and Eman M. Abd-ElAzeem*

Plant Protection Research Institute, Agriculture Research Center (ARC) , Dokki Giza, Egypt.



ABSTRACT

Efficiency of profenofos, chlorpyrifos and alpha-cypermethrin against *Pectinophora gossypiella* and their associated predators in cotton field at Zagazig, Sharkia Governorate. Alpha-cypermethrin increased mean seasonal reduction percentages (92.92%), while, profenofos decrease it (78.38%). Alpha-cypermethrin caused the highest mean seasonal reduction percentages in the Coccineledae, *Chrysoperla carnea* and True spider predators (88.26, 73.67 and 85.70%, respectively). The pupal mortality percentage increased while, pupal duration, adult emergency percentage, pupal weight, pupation percentage, deposited eggs and hatchability percentage decreased. The activity of trehalase, invertase and acetylcholine esterase enzymes decreased but of amylase and AST (Aspartate aminotransferase) increased. Disturbance recorded in ALT (Alanine aminotransferase) enzyme, total lipid and total soluble protein content relative to control.

Keywords: *Pectinophora gossypiella*, Profenofos, Chlorpyrifos, Alpha-cypermethrin, Coccineledae, *Chrysoperla carnea*.

INTRODUCTION

The pink bollworm is the most destructive pests infesting cotton plants; it causes serious damage in cotton bolls resulting in high reduction in quantity and quality of cotton yield (Kandil *et al*., 2012). The use of insecticides remains the major strategy in dealing with cotton pests as it is quick and effective (Wang *et al.,* 2012). In Egypt, cotton control programs including different sprays with conventional insecticides are recommended by Egyptian Ministry of Agriculture to combat these pests (El-Khayat *et al*., 2015).

Predators as (Coccineledae, *Chrysoperla carnea* and True spider) are received much attention as pest control agent due to their polyphagous and voracious nature, vast geographical distribution (Seago *et al*., 2011). Insecticides have acute and residual toxicity on natural enemies (Yongqiang *et al*., 2016).

Insects utilized the carbohydrates in production of energy or conversion to proteins and lipids. Hydrolyzing enzymes of carbohydrates include trehalase, which is activated during molting to generate production of glucose for chitin build-up and two important digestive enzymes, amylase and invertase which important for utilization of sucrose by insects (Naveed *et al*., 2009 and Rashwan, 2013). In addition, protein is the major biochemical components necessary for an organism development, growth and performance of its vital activities (Rashwan, 2013).

The aim of this work is to study the reduction percentages, biological and physiological effects related of alpha-cypermethrin, chlorpyrifos and profenofos on the pink bollworm *P. gossypiella* field strain and their side effects on some associated predators in cotton field.

MATERIALS AND METHODS

Field experiments:

The work was carried out at Sharkia Governorate. Field experiments were carried out at Zagazig District and laboratory in Plant protection institute Sharkia branch.

Insecticides used:

1- Profenofos (Actacron, 72% EC) the field rate was 750 ml/feddan.

2- Chlorpyrifos (Dorsil, 48% EC) the field rate was 1000 ml/feddan.

3- Alpha-cypermethrin (Alpha zed, 10% EC) the field rate was 750 ml/ feddan.

1-Coccinellidae family includes Coccinella septempunctata, C.

Experimental design:

The experimental area was two feddans divided to four equal blocks. One block for each treatment and control. Each block was divided into four replicates (525 m^2 for each) cultivated with the cotton variety, Giza 94. The blots were distributed completely randomized block design. The spraying was carried out at 25th July in 2018, when the general average of the pink bollworm larvae was reached to about 3%. The tested insecticides were sprayed three times with two weeks intervals using a knapsack motor sprayer, 20 liter volumes and using 200 liter per feddan.

Samples:

One hundred green cotton bolls were taken randomly from each replicate before treatment and weekly after treatment. The bolls examined in the laboratory to record the number of pink bollworm larvae.

The numbers of Coccineledae, C. carnae and True spider predators were counted directly on hundred cotton plants chosen randomly in each treatment and control (25

* **Corresponding author.**
E-mail address: emo1azem@yahoo.com
DOI: 10.21608/jppp.2020.84594

plants per replicate) before treatment and weekly after treatment.

The efficiency of the tested insecticides was measured as a reduction percentage in the numbers of the pink bollworm larvae and associated predators using the equation of Henderson and Tilton (1955).

$$\% \text{ Mortality} = 100\,[1 - \frac{Ta \times Cb}{Tb \times Ca}]$$

Where: Ta = Post treatment insect counts
Cb = Untreated insect count before treatment
Tb = Pretreatment counts
Ca = Untreated insect count after treatment.

Biological effects:

At the end of cotton season, one hundred full grown larvae of the pink bollworm were separated singly from green cotton bolls which collected from each treatment and control. Larvae fed separately on cotton seed in glass tubes (2.5 x 7cm) and placed in an incubator at 26±1ºC and 70±5 RH. The food was daily renewed until pupation. Full grown larvae were weighted. The pupae transferred separately to clean glass tubes until adult emergency, recorded its duration and weight. The emerged moths were sexed and transferred to glass jars (three pairs /glass jar) and replicated four times. The moths were fed on 10% sugar solution. Each jar was inspected daily to record the preoviposition, oviposition and postoviposition periods, longevity of males and females, the number of deposited eggs/female and hatchability percentages.

Biochemical effects:

The present experiment was designed to study the changes in the activities of carbohydrate hydrolyzing, transaminase (AST & ALT) and acetylcholine esterase (AChE) enzymes also, total lipid (TL) and total soluble protein (TSP) contents in the supernatant of the homogenate of the pink bollworm larvae as affected by profenofos, chlorpyrifos and alpha-cypermethrin as compared to untreated larvae under field conditions.

The preparation of samples:

Twenty five health pink bollworm larvae (full grown) were collected from each treatment and control at the end of cotton season. The larvae were homogenized in distilled water with jacket of crushed ice for three minutes. The homogenate were centrifuged at 3500 R.P.M. for 10 minutes at 5ºC. The supernatant was immediately assayed to determine transaminase, amylase, invertase, trehalase and acetylcholine esterase (AChE) activities also, total lipid and total soluble protein were determined.

Enzymes measurements:

a- The activities of transaminase enzymes (AST and ALT) were determined calorimetrically according to the method of (Reiteman and Frankel 1957).

b- The carbohydrate hydrolyzing enzymes: The activities of amylase, invertase and trehalase enzymes were determined according to (Ishaaya and Swiriski, 1976).

c- Acetylcholine Esterase (AChE) activity: The activity of (AChE) was determined according to the method described by (Simpson *et al*., 1964).

d- Total lipids (TL) and Total soluble protein (TSP): The TL were estimated by (Schmit, 1964), while TSP colorimetric determination in total homogenate of larvae was carried out as described by (Gornall *et al*., 1949).

Statistical analysis:

The obtained data were statistically analyzed using one way randomized design. The proper "F" and LSD value were calculated as described by (Little and Hills, 1975).

RESULTS AND DISCUSSION

Efficiency of the profenofos, chlorpyrifos and alpha-cypermethrin on PBW larvae and associated predators in cotton field:

a- Pink bollworm

The results in Table (1) showed that reduction percentages in the numbers of PBW larvae for alpha-cypermethrin were 92.71, 92.50 and 93.54% while, for profenofos were 77.74, 78.42 and 78.75% on the other hand, it were 83.04, 82.16 and 82.15 recorded by chlorpyrifos after 1st, 2nd and 3rd sprays, respectively.

Table 1. Reduction percentages of the tested insecticides against the pink bollworm larvae in cotton field

Insecticides	Rate\ feddan	Numbers of pink bollworm larvae before application	Numbers of larvae and % reduction	Number and reduction percentages of pink bollworm larvae									% average seasonal reduction
				1st spray			2nd spray			3rd spray			
				1 week	2 week	Mean reduction	1 week	2 week	Mean reduction	1 week	2 week	Mean reduction	
Alpha-cypermethrin	250 ml	3.00	Numbers	0.50	1.00	92.71	1.25	2.00	92.50	2.00	2.50	93.54	92.92
			% Reductions	93.75	91.67		92.79	92.21		93.33	93.75		
Chlorpyrifos	1000 ml	4.00	Numbers	2.25	3.75	77.74	5.25	7.00	78.42	8.00	12.00	78.75	78.30
			% Reductions	78.91	76.56		77.28	79.55		80.00	77.50		
Profenofos	750 ml	3.50	Numbers	1.50	2.50	83.04	3.50	5.50	82.16	6.50	8.00	82.15	82.45
			% Reductions	83.93	82.14		82.69	81.63		81.43	82.86		
control		4.50	Numbers	12.00	18.00		26.00	38.00		45.00	60		

Generally, alpha-cypermethrin was the highest compound against the pink bollworm, it caused seasonal reduction percentage 92.92% followed by 82.45% for profenofos, while the lowest one was 78.30% for chlorpyrifos.

These results also agree with those obtained by El-Basyouni (2003) who found that synthetic pyrethroids were the most efficient compounds compared with organophosphrus and carbamate insecticides against the larvae of pink bollworm. Also Younis *et al*. (2007) reported that, the synthetic pyrethroid exhibited the greatest reduction in bollworms infestation compared with the organophosphrus pesticide treatment (chlorpyrifos and profenofos). Also Balakrishman *et al*. (2009) indicated that

alpha-cypermethrin at its recommended rates was more effective in reducing the incidence of bollworms. Zidan *et al.* (2012) mentioned that, the tested pyrethroid insecticides alpha-cypermethrin were more efficient in controlling the bollworms larval population than carabamate and organophosphrus compounds.

b- Predators:

Coccineledae: The results in Table (2) showed that reduction percentages in the numbers of Coccineledae were 88.54, 88.62 and 87.61% for alpha-cypermethrin; 70.08, 69.65 and 69.31% for chlorpyrifos; 70.86, 74.92 and 73.91% for profenofos after 1st, 2nd and 3rd sprays, respectively. Alpha-cypermethrin was the most harmful against Coccineledae and caused the highest seasonal reduction percentage which was 88.26% followed by 73.23% for profenofos, while, the lowest one was 69.68% for chlorpyrifos.

C. carnae: The results in Table (2) recorded the reduction percentages in the numbers of *C. carnae* were 74.68, 73.28 and 73.04% for alpha-cypermethrin; 50.54, 49.77 and 49.56% for chlorpyrifos; 55.91, 55.26 and 54.17% for profenofos after 1st, 2nd and 3rd sprays, respectively. The highest reduction percentage in the number of *C. carnae* was 73.67% for alpha-cypermethrin followed by 55.11% for profenofos, while the lowest one was 49.96% for chlorpyrifos.

True spiders: The reduction percentages in the numbers of True spider were 85.31, 86.65 and 85.20% for alpha-cypermethrin; 70.45, 71.26 and 71.36% for chlorpyrifos; 74.48, 74.12 and 74.22% for profenofos after 1st, 2nd and 3rd sprays. The highest seasonal reduction percentage in the number of True spider was 85.72% for alpha-cypermethrin followed by 71.02% for profenofos, while, the lowest one was 74.27% for chlorpyrifos, (Table 2).

Generally, the three insecticides were harmed the Coccineledae and True spider more than ***C. carnae*** as compared with control.

These result are in agreement with these of Abd-El Rahman (2015) recorded the reduction percentage of es-fenvalerate and chloropyrifos ranged 41-70.50% in the predators associated with cotton pests (Coccinella, Chrysoprella, Scymnus, peadurus and true spider mites). Similarly, Yongqiang *et al.* (2016) showed the dangerous toxic and long risk duration of alpha-cypermethrin and chlorpyrifos on the natural enemies (*Snellenius manilae* and *Telenomus remus* adults).

Table 2. Reduction percentages of the tested insecticides on some predators in cotton fields

Predators	Insecticides	Rate\ feddan	Numbers of predators before application	Numbers and % reduction	Number and reduction percentages of predators									% average seasonal reduction
					1st spray			2nd spray			3rd spray			
					1 week	2 week	Mean reduction	1 week	2 week	Mean reduction	1 week	2 week	Mean reduction	
Coccineledae	Alpha-cypermethrin	250 ml	20.00	Numbers	3.00	2.00	88.54	1.25	1.00	88.62	0.75	0.50	87.61	88.26
				Reductions	88.41	88.67		89.38	87.86		89.38	85.83		
	Chlorpyrifos	750 ml	15.00	Numbers	5.75	4.00	70.08	2.50	2.00	69.65	1.75	0.75	69.31	69.68
				Reductions	70.38	69.78		71.67	67.62		66.94	71.67		
	Profenofos	1000 ml	19.00	Numbers	7.00	5.00	70.86	2.75	2.00	74.92	1.50	1.00	73.91	73.23
				Reductions	71.53	70.18		75.39	74.44		77.63	70.18		
	Control		17.00	Numbers	22.00	15.00		10.00	7.00		6.00	3.00		
Chrysoperia carnae	Alpha-cypermethrin	250 ml	17.00	Numbers	6.00	5.00	74.68	4.00	3.25	73.28	1.25	0.75	73.04	73.67
				Reductions	73.86	75.49		73.86	72.69		75.49	70.59		
	Chlorpyrifos	750 ml	19.00	Numbers	13.00	11.00	50.54	8.50	6.75	49.77	2.75	1.50	49.56	49.96
				Reductions	49.32	51.75		50.29	49.25		51.75	47.37		
	Profenofos	1000 ml	20.00	Numbers	12.00	10.50	55.91	7.75	6.50	55.26	2.50	1.50	54.17	55.11
				Reductions	55.56	56.25		56.94	53.57		58.33	50.00		
	Control		20.00	Numbers	27.00	24.00		18.00	14.00		6.00	3.00		
True spiders	Alpha-cypermethrin	250 ml	12.00	Numbers	2.00	2.50	85.31	2.25	1.75	86.65	1.25	1.00	85.20	85.72
				Reductions	85.90	84.72		87.87	85.42		85.68	84.72		
	Chlorpyrifos	750 ml	11.00	Numbers	4.00	4.25	70.45	4.75	3.25	71.26	2.25	1.75	71.36	71.02
				Reductions	69.23	71.67		72.06	70.45		71.88	70.83		
	Profenofos	1000 ml	10.00	Numbers	3.00	3.5	74.48	3.75	2.75	74.12	1.75	1.5	74.22	74.27
				Reductions	74.62	74.33		75.74	72.5		75.94	72.5		
	Control		11.00	Numbers	13.00	15.00		17.00	11.00		8.00	6.00		

Biological effects:

Immature stages: The results in Table (3) showed that the three insecticides shorten the *P. gossypiella* pupal period compared with the untreated. The shortest pupal period was 9.39 days for alpha-cypermethrin as compared with 10.13 days for untreated. No significant differences were recorded on prepupal weight between the three insecticides and control. The lowest prepupal weight was 0.0280g for alpha-cypermethrin while, it was 0.0357g for untreated. Significant effects on pupal weight were found between the three insecticides and untreated. The lowest pupal weight was 0.0198g for alpha-cypermethrin as compared with 0.0254g for untreated.

All insecticides which showed highly significant effect in the pupal mortality percentages compared with untreated. The highest mean pupal mortality was 54.25% recorded for alpha-cypermethrin compared with zero for untreated.

Adult stage: Data in Table (3) described the effect of the three tested insecticides that showed highly significant effect in the adult emergence percentages compared with untreated. The lowest mean emergency percentage was 45.76% recorded for alpha-cypermethrin as compared with 100% in untreated. Non-significant differences were found for pre-ovipostion, oviposition and post-oviposition periods for all insecticides compared with untreated.

Alpha-cypermethrin caused shortest the pre-oviposition, oviposition and post-oviposition periods; 1.79, 11.46 and 5.62 days, compared with 2.32, 12.53 and 5.8 days for untreated, respectively. Non-significant difference were found on female and male longevity for the three insecticides compared with untreated, alpha-cypermethrin shortened female and male longevity recorded 18.86 and 20.34 days compared with 20.66 and 22.41 for untreated, respectively.

The effect of three insecticides on number of deposited eggs and hatchability showed non-significant reduce in the deposited eggs/female compared with untreated. The highest reduce number of laid eggs was 122.08 eggs/female for alpha-cypermethrin compared with 198.38 eggs/female in untreated. Hatchability percentage cleared that highly significant effects were found between all insecticides compared with untreated. The lowest mean of hatchability percentage was 51.11% for alpha-cypermethrin as compared with 90.80% in untreated.

Generally, the tested insecticides increased the pupal mortality percentages and decreased pupal duration, adult emergency, pupal weight, pupation, number of deposited eggs and hatchability percentages as compared with control.

Similarly Hegab *et al*. (2019) and Moustafa and salem (2019) recorded that the alpha-cypermethrin and chlorpyrifos increased the larval and pupal mortality while, decreased the larval and pupal duration also decreased the larval and pupal weight, pupation, sex ratio percentages, adult longevity, oviposition periods, the number of laid eggs and hatchability percentages.

Table 3. Effect of alpha-cypermethrin, chlorpyrifos and profenofos on some biological aspects of the *P. gossypiella*

Insecticides	prepupal weight (g)	pupal duration (day)	pupal mortality %	pupal weight (g)	adult emergency %	Pre-oviposision (day)	Oviposision (day)	Post-oviposision (day)	female longevity (day)	male longevity (day)	egg no.	Hatchability %
Alpha-cypermethrin	0.0280	9.39	54.25a	0.0198	45.76c	1.79b	11.46	5.62	18.86	20.34	122.08	51.11c
Chlorpyrifos	0.0305	9.57	31.67b	0.0236	68.33b	1.83b	12.15	6.18	20.16	21.03	142.33	65.59b
Profenofos	0.0291	9.43	26.64bc	0.0227	73.36b	1.93b	12.97	5.71	20.61	21.29	130.66	64.09b
Control	0.0357	10.13	0c	0.0254	100a	2.32a	12.53	5.8	20.66	22.41	198.38	90.80a
p	ns	ns	0.0018 **	ns	0.0000 ***	0.0050 **	ns	ns	ns	ns	ns	0.0007 ***
$LSD_{0.05}$			19.88		19.89	0.2533						12.7940

The small letters in the column with the same symbols mean values with non significant difference.
The small letters in the column with different symbols mean values with significant difference.
LSD: means triplicate measurements of two independent experiments
ns means non-significant effect
**** means highly significant effect**
***** means very highly significant effect**

II- Biochemical effects:

a- Transaminase activities: Data in Table (4) showed that, the three insecticides caused increase in the activity of AST enzymes which were 116.44, 105.12 and 84.64% for alpha-cypermethrin, profenofos and chlorpyrifose, respectively relative to untreated. Also, chlorpyrifose caused increase in ALT activity which was 0.24% in contrast to alpha-cypermethrin; profenofos decrease the enzyme activity which were -14.94 and -35.12% as relative to untreated.

B- Carbohydrate hydrolyzing enzymes: The three insecticides decreased the activity of invertase and trehalase enzymes as relative to untreated, alpha-cypermethrin caused highly decrease in the previous two enzymes which were -28.20 and -41.27, respectively. While, were -14.22, & 3.84% for chlorpyrifos and -5.91 & -19.51% for profenofos. On the other hand, the alpha-cypermethrin, chlorpyrifos and profenofose increase the activity of amylase enzyme were -44.49, -88.71 and -128.36%, respectively (Table 4).

Table 4. Biochemical effect of alpha-cypermethrin, chlorpyrifos and profenofos on *P. gossypiella* full grown larvae

Treatments	Increase or decrease than untreated larvae (RA %)							
	Transaminase enzymes		Carbohydrate hydrolyzing enzymes			(AChE) esterase U^{-g}	(TSP) mg^{-g}	(TL) mg^{-g}
	ALT mg^{-ml}	AST mg^{-ml}	Amylase U^{-g}	Trehalase U^{-g}	Invertase U^{-g}			
Alpha-cypermethrin	-14.94	116.44	44.49	-41.27	-28.20	-79.49	-0.01	312.13
Chlorpyrifos	0.24	105.12	88.71	-3.84	-14.22	-91.87	0.59	205.22
Profenofos	-35.12	84.64	128.36	-19.51	-5.91	-72.93	0.29	-85.66

(ALT)= Alanine aminotransferase (AST) = Aspartate aminotransferase Concentration expressed as (mg/ml)
TSP= (Total Soluble Protein) TL = (Total lipid) AChE= (Acetylcholine esterase)
RA (Relative activity %) = Treatment-Untreated / Untreated x 100
A positive value means increase in enzyme activity and the negative values means a decrease.

c- Acetyl Choline Esterase (AChE): The obtained data in Table (4) showed the alpha-cypermethrin, chlorpyrifos and profenofose compounds negatively decreased the enzyme activaty as relative to untreated larvae, it recorded -79.49, -91.87 and -72.93%, respectively.

d- Total soluble protein and the total lipids:

The obtained data in Table (4) showed increase in the TSP content 0.59 and 0.29% for chlorpyrifos and profenofose, respectively while, alpha-cypermethrin decreased the content -0.01% as relative to untreated. On the other hand, alpha-cypermethrin and chlorpyrifos increased the TL level to 312.13 and 205.22%, respectively while; profenofose decreased the level to -85.66% as relative to control.

Generally, the three insecticides decreased the activity of trehalase, invertase and acetylcholine esterase

enzymes while, increased in the activity of amylase and AST enzymes as related with control. Also, they caused disturbance in ALT enzyme activity, total lipid and total soluble protein contents relative to control.

In this respect, Hegab *et al.* (2019) recorded changes in the activity of carbohydrates, transaminase, acetylcholine esterase enzymes, total soluble protein and total lipid contents when the american bollworm larvae treated with (lufenuron, pyridalyl and chlorpyrifos).

REFERENCES

Abd-El Rahman, T.A.; Zakaria, H.; Salem, M.S.; Dar, R. A. A. and Hiekel, N. S. A. (2015): Residual effect of profenofos on cotton bollworm, *Earias insulana* (Boisd.) using two ground motor sprayer Internat. J. Adv. Res., 3: 886-893.

Balakrishman, N. B.; Kumar, V. and Sivasubramanan, P. (2009): Bioefficacy of bifenthrin 10% EC against sucking insects, bollworms and natural enemies in cotton. Madrase Agricultural journal, 96: 225-229.

El-Basyouni, S. A. (2003): Efficiency of some conventional insecticides on controlling the larvae of the bollworms, *Pectinophora gossypiella* and *Earias insulana*. J. Agric. Sci. Mansoura Univ. Egypt, 28: 1901-1906.

El-Khayat, E. Z.; Rashad, A. M.; Abd-El Zaher, T. R.; Shams El-Din, A. M. and Salim, H. S. (2015): Toxicoloical and biological studies of some pesticidal formulations against *Pectinophora gossypiella* (Saunders) (Lepidoptera: Gelechiidae) American-Eurasian. J. of Toxicological Sciences, 7: 01-06.

Gornall, A. Q.; Bradwill, C. J. and David, M. N. (1949): Determination of serum proteins by means of biuret reaction, J. Biol. Chem., 177: 751-766.

Hegab, M. E. M.; Abd-ElAzeem, E. M. and El-Medany, W. A. Z. (2019): Efficiency of three insecticides and its latent effects on some biological and biochemical aspects of American bollworm *Helicoverpa armigera* (Hüb.). Egyptian Journal of Agricultural Research, 97: 2

Henderson, D.F. and Tilton, E.W. (1955): Tests with acaricides against the brown wheat mite. J. Econ. Entomol., 48: 157-161.

Ishaaya, I. and Swiriski, E. (1976): Trehalase, invertase and amylase activities in the black scale, *Saissetia oleae* and their relation to host adaptability. J. Ins. Physiol., 16: 1025 - 1029.

Kandil, M. A. A.; Ahmed, A. F. and Moustafa, H. Z. (2012):Toxicological and biochemical studies of lufenuron, chlorfluazuron and chromafenozide against *Pectinophora gossypiella* (Saunders). Egypt. Acad. J. Biol. Sci., 4: 37- 47.

Little, T. M. and Hills F. J. (1975): Statistical method in agriculture research available from U.C.D. Book store, University of California, Davis: 241pp.

Moustafa, H. Z. and Salem M. S. M. (2019): Influence of three insecticides from three different groups on *Pectinophora gossypiella* (Saund.) (Lepidoptera: gelechiidae). International J. of Entomol. Research, 4:127-131.

Naveed, A.; Dayananda, G. Y. and Hosetti, B. B. (2009): Effect of some selected insecticides on the activity of invertase at different stages of pentatomid bug, *Cyclopelta siccifolia* W. Our Nature, 7: 222-225.

Rashwan, M. H. (2013): Biochemical impacts of rynaxypyr (coragen) and spinetoram (radiant) on *Spodoptera littoralis* (Boisd.) Nat. Sci., 11: 40-47.

Reiteman, S. M. D. and Frankel, S. (1957): A colorimetric method for the determination of serum glutamic oxaloacetic acid and glutamic pyurvic transaminase. Ann. J. Clin. Pathol., 28: 56-62.

Schmit, S. (1964): Colorimetric determination of serum total lipids using sulfophospho vanilic mixture. Ph. D. thesis, Biomerieux – Company of France, Lyon.

Seago, A. E.; Giorgi, J. A.; Li, J. and Ślipińskia, A. (2011): Phylogeny, classification and evolution of ladybird beetles (Coleoptera: Coccinellidae) based on simultaneous analysis of molecular and morphological data. Molecular Phylogenetics and Evolut., 60: 137-151.

Simpson, D. R.; Bull, D. L. and Lindquist, D. A. (1964): A semi micro technique for the estimation of cholinesterase activity in boll weevils Ann. Entamol. Soc. Am., 57: 367-371.

Wang, Y.H.; Chen, L.; An, X.; Jiang, J.; Wang, Q.; Cai, L. and Zhao, X. (2012): Susceptibility of adult *Trichogramma nubilale* (Hymenoptera: Trichogrammatidae) to selected insecticides with different modes of action. Crop Prot. 34: 76-82.

Yongqiang, L.; Xiangying, L.; Chao, Z.; Feng, L. and Wei, M. (2016): Toxicity of nine insecticides on four natural enemies of *Spodoptera exigua*. Sci. Rep., 6: 39060.

Younis, A. M.; Hamouda, H. H. S.; Ibrahim, A.S. and Zeitoum, M. A. Z. (2007): Field evaluation of certain pesticides against the cotton bollworms with special reference to their negative impact on beneficial arthropoda African Crop Science conference Proceedings 8th African Crop Science Society, Elminia, Egypt, October 27-31: 993-1002.

Zidan, N.; El-Hoda, A.; El-Naggar, G. B.; Aref, S. A. and El-Dewy, M. E. (2012): Field evaluation of different pesticides against cotton bollworms and sucking insects and there side effects. Journal of American Science, 8: 128-136.

تأثيربعض المبيدات علي دودة اللوز القرنفلية واعدائها الطبيعية في حقول القطن وبعض تأثيراتها البيوكيميائية

علي احمد احمد السيد ، عادل السيد علي عامر و إيمان محمد عبد العظيم السيد

معهد بحوث وقاية النباتات ـ مركز البحوث الزراعية ـ دقى- جيزة ـ مصر

تأثير البروفينوفوز والكلوروبيريفوز و الفا- سيبيرميسرين علي دودة اللوز القرنفلية والاعداء الطبيعية المصاحبة لهم في حقول القطن بالزقازيق محافظة الشرقية. الفا- سيبيرميسرين زاد متوسط النسبة المئوية الموسمية للخفض (٩٢,٩٢%) بينما البروفينوفوز قلله (٧٨,٣٨%). الفا- سيبيرميسرين سبب اعلى نسبة مئوية للخفض الموسمي لكلا من كوكسينيليدي و كريسوبيريلا والحلم الحقيقي (٨٨,٢٦، ٧٣,٦٧، ٨٥,٧٠%)على الترتيب. زادت نسبة موت العذارى بينما قلت فترة حياتها ووزنها والنسبة المئوية للتعذيروعدد البيض والنسبة المئوية للفقس. قل النشاط الانزيم للتريهاليزوالانفرتيز و الاستيل كولين استريز بينما زاد نشاط الاميلز و AST. سجلت المبيدات خلل في انزيمات ALTومحتوى الدهون الكلي والبروتين الكلي المذاب.