TOXICOLOGICAL, BIOLOGICAL AND BIOCHEMICAL STUDIES OF CONVENTIONAL AND NON CONVENTIONAL INSECTICIDES ON COTTON LEAFWORM *SPODOPTERA LITTORALLIS* (BOISD.) UNDER LABORATORY CONDATIONS

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Abstract:

Laboratory studies were conducted to evaluate the toxic effect of Chlorpyrifos, bioinsecticide Dipel 2x and IGR, Triflumuron against 2nd and 4th instars larvae of the cotton leaf worm *Spodoptera littorals* (Boisd.) and its effects on some biological and biochemical parameters on 4th instars larvae.

Results showed that Chlorpyrifos was very effective insecticide, followed by Triflumuron and Dipel 2x. The LC_{50} values obtained were 0.275, 1.11 ppm and 2.42 gm/L on 2nd instar larvae, while, the LC_{50} was increased to 0.963, 2.17 ppm and 6.189 gm/L on 4th instar larvae for Chlorpyrifos, Triflumuron and Dipel 2x, respectively. Concerning, The latent effect data indicated that larval and pupal periods resulted from treated 4th instar larvae with LC_{50} was increased. The larval durations were 19.66, 16.33 and 16.66 days for Triflumuron, chlorpyrifos and Dipel 2x compared with 10.33days in control treatments respectively.

In addition to , data showed an increase in pupal duration to 13.66, 11.66 and10.33 days for Triflumuron, Chlorpyrifos and Dipel 2x compared with 8.66 in untreated check,respectively, also, pupation percentage was decreased, to 49.15 66.10 ,and % 69.49compared with % 98.33for control. The fecundity, hatchability, longevity, resulted from female developed of 4th larval instar treated with, triflumuron, chlorpyrifos and Dipe2x significant decreased compared with the control treatments.

On the other hand , biochemical analysis revealed that a reduction in the total lipids, total protein, and total carbohydrate. Acetylcholine esterase (AChE) content was very affected after treatment 4th larval instars *Spodoptera littorallis*, with the LC_{50} of each insecticide.

Keywords: Chlorpyrifos and Dipel 2x, Triflumuron, *Spodoptera littorallis,*

1.INTRODUCTION

The cotton leaf worm, *Spodoptera littoralis* (Boisd.) is considered as one of the most serious insect pests to different Egyptian crops, where the pest attacks and cause heavy damages to different parts of host plants. The main way for controlling this pest is still by using chemical insecticides there are many problems with have appeared with the repeated use of insecticides including hazards to man and his animals , environmental pollution and also, appearance of resistant strains of insect pests to insecticides (**Paoletti and Pimentel 2000**). To avoid this phenomenon, there is a necessary to use different insecticide having different modes of action **(Aydin & GÜrkan 2006).** For this reason, it has become necessary to look for alternative means of pest control which can minimize the use of chemicals **(El-Aswad, 2007**). Using insect growth regulators (IGRs) in pest control which are considered to have little human toxicity **(Schmutterer, 1985).** IGR compounds are known as insect developmental inhibitors. These IGR have been used against several insect species (**Pineda *et al.,* 2007; El-barky *et al*., 2009 and Wang &Tian, 2009).** More attention necessary to use**d** bioinsecticides such as bacteria, fungi, and viruses (**Rao *et al.,*1990).** These groups have differed modes of action **(Asher, 1993 and Thompson *et al.*, 1999**) and their properties may differ considerably from the conventional insecticides. In Egypt, IPM strategy for protection of cotton plants based on the rotation of insecticides. Biocides or IGRs has used the first spray to newly hatched larvae, while, OP and Pyrethroids were used for the second, third and fourth sprays, respectively, against cotton leafworm and bollworms. **(Sawicki and Denholm, 1987; Temerak, 2002. and Abdel-Sattar *et al.,* 2012).**

The present study aims to evaluate the toxicity effect of Chlorpyrifos, bioinsecticide, Dipel 2x and IGRs, Triflumuron against *S. littorallis* (Boisd.) and the effect of these compounds on some latent and biochemical aspects of the 4th instar larvae were studied under laboratory conditions.

2.MATERIALS AND METHODS

This experiment was conducted in the Bioassay laboratory of the Pesticides tests Department, to study the toxicological, biological and biochemical effects of conventional and non - conventional insecticides on cotton leafworm, *S. littoralis.*

2.1.Insect culture:

Laboratory strain of cotton leaf worm, *S. littoralis* was obtained from Plant Protection Research Institute, Agriculture Research Centre, Giza, Egypt. The strains were reared on castor bean leaves at 27±2C^{O} and 65±5 % R.H. The bioassay tests were carried out using freshly moulted 2nd and 4th instars. The formed pupae were collected and placed in clean jars with moist saw dust placed at the base to provide as pupation site. Adults were provided with 10% sucrose solution, for nutrition and small oleander branches as oviposition sites. Egg masses were kept in plastic jars until hatching. (**El- Defrawi *et al.,* (1964).**

2.2.Insecticides used:

1- Chlorpyrifos (Pestban 48%EC) as organophosphorus insecticide

2- Bioinsecticide Dipel 2x 6.4 % W.P. *Bacillus thuringinsis* is subsp kustaki 32000 IU /mg produced by abbott laboratories , North Chicago, U.S.A.

3- Triflumuron (Alsystin,SIR) 48% SC: as insect growth regulators

2.3.Toxicity tests:

Serial concentrations of tested compounds were prepared in water. Five concentrations (5, 2.5, 1.25, 0.625 and 0.312 ppm) for triflumuron, chlorpyrifos concentration were (10, 5, 2.5, 1.25 and 0.625 ppm) and concentrations (15, 7.5, 3.75, 1.87 and 0.937 g/L) were used for Dipel 2x. Three replicates were used, (each replicate contains 20 second and fourth larvae of *S. littorallis* for each concentration. Control larvae were treated with water only. Castor bean leaf was dipped into different concentrations of tested compounds for 5 seconds and left to dry under laboratory condition as well as control treatments were dipped for the same period. Mortality measured after 24 hrs for Chlorpyrifos. Triflumuron and Dipel 2x, mortality were recorded at 48 hours after treatment. Mortality rates were corrected according to **Abbott's formula (Abbott, 1925**)

2.4.Biological studied:

The 4th instar larvae of *S. littorallis* fed on castor leaves for 24 hrs treated with LC_{50} of the tested compounds , then left to complete their life-cycle on leaves only. Some biological aspects such as a percentage of larval mortality, larval duration, pupation percentage, and pupal duration, the percentage of adult's emergence, fecundity, hatchability, and longevity were determined.

2.5.Biochemical studies:

Tissue preparation:

Total body tissue samples were collected from *S. littorallis* as 4th instars larvae fed on treated cotton leaves with LC_{50} values of three compounds. Insect bodies were homogenized in distilled water (one gm. insect bodies / 5 ml) using a chilled glass Teflon tissue grinder for 3 min. Homogenates were centrifuged at 8000 r.p.m for 15 min at 2 C^{O} in a refrigerated centrifuge. The supernatant can be used directly or stored at 5 C^{O} until use for biochemical determination

2.6.Enzymes measurements:

Total carbohydrates were determined according to (**Dubois *et al*., 1956**)

Total proteins were determined according to (**Bradford,1976)**

Total lipids were determined according to (**Knight *et al*.,1972)**

Acetylcholine esterase (AChE) was measured according to the method described by **Simpson *et al*. (1964**).

2.7.Statistical analysis:

Data were calculated as mean ± SE and analyzed using analysis of variance technique (ANOVA) followed by the least significant difference (LSD). The probability of 0.05 or less was considered significant.

3.Results and Discussion

Toxicological studies:

Toxicity of Tested compounds on 2nd and 4th instar larvae of cotton leaf worm:

Data presented in Table (1) demonstrated the LC50 and slope values for the tested compound against the 2nd instar larvae of the cotton leaf worm, *S. littoralis* under laboratory conditions

Data indicated that Chlorpyrifos was more effective, followed by triflumuron and Dipel 2x. the LC_{50} values were 0.275, 1.11 ppm and 2.42 gm/L for 2nd instar larvae, while increased to 0.963, 2.17 ppm and 6.189 gm/L for Chlorpyrifos, Triflumuron and Dipel 2x on 4th instar larvae of *S. littorallis*, respectively.

Results agreement with those of **Mink and Luttrell (1989**) who mentioned that diflubenzuron was as effective as commonly used insecticides (pyrethroid, carbamate and organophosphorus and Bacillus thuringinsis insecticides) against 3rd and 5th instar larvae of *Spodoptera frugiperd*a when mortality observed until the pupation.

Also, they reported that pyrethroid, carbamate and organophorous insecticides resulted in higher larval mortality of *S. frugiperda* than *B. thuringiensis* biocides. While **Fahmy and Kandil (1989**) found that both diflubenzuron and triflumuron had equitoxic against the cotton leafworm larvae of *S.littoralis*.Whereas, **Mostafa (1998)** recorded that diflubenzuron was approximately as toxic as triflumuron against the larvae of Agrotis ipsilon.In converse, **El-said *et al.* (1989)** reported that diflubenzuron was effect to 4th larval instars of *S.littoralis*. Also, **El-Halim (1993**) recorded insecticidal and latent effect of Dipel 2x against second instar larvae of *S. littorallis* fed on a diet containing 64, 192, 320, 5120 or 6400 IU Dipel 2x/ml in the laboratory. Whereas, **Osman and Mahmoud (2009**) mentioned that Dipel 2x, BioFly, Agrin, BioGaurd, Spinosad, Neemix, Mectin, and Match recorded higher mortality in the 1st instar larvae of *Spodoptera littorals* comparing to the third and fifth instar larvae, although Match, Mectin, and Spinosad showed also excellent efficacy against third larval stage at all tested concentrations.

Data in Table (2) indicated that the percentage of larval mortality had increased by an increase of concentration and tested compound. Chlorpyrifos at high concentration was proved to be the most effective insecticide (91.53, 89.77 %) on 2nd and 4th instar larvae at high concentration followed by triflumuron (89.83, 80 %) and Dibel 2x (88.14, 74.58 %), respectively. These percentage of larval mortality had decreased by a decrease of concentration and tested compound (33.9 and 28.21% for Chlorpyrifos followed by triflumuron (40.68 and 25.42 %) and Dipel 2x (30.51 and 22.03%).

Also **El-khayat et al. (2012),** reported that the second instar larvae reflected higher level of susceptibility towards all the tested insecticides that included: Insect growth regulators (Nomolt 15% Mimic 24% a Runner 24%); Bioinsecticides, Tracer, XDE and Dipel 2x; and Organophosphorus (Chlorpyrifos) than the fourth one. They found that

Table (1): Toxicity of the tested compounds against 2nd instar larvae of cotton leaf worm, *S. littoralis* (Boisd.) under laboratory condition

Tested compounds	Second instar larvae		Fourth instar larvae	
	LC_{50}	Slope	LC_{50}	Slope
Pestban 48% Chlorpyrifos	0.275	0.779 ± 0.083	0.963	1.17 ± 0.11
Alsystin 48% SC Triflumoron	1.11	1.40 ± 0.157	2.17	1.53 ± 0.15
Dipel 2x *B. thuringinsis*	2.42	1.36 ± 0.1173	6.189	1.85 ± 0.113

LC_{50} and LC_{90} values, chlorpyrifos was the most effective insecticide recorded 0.1 and 0.809 ppm for 2nd instar larvae and 0.472 and 6.838 ppm for 4th instar larvae, respectively, while, tebufenozide appeared to be the least effective compound against both tested instars that gave 9.901 and 36.447 ppm against 2nd instar, and 65.736 and 1000.775 ppm against the 4th one, respectively. They reported that the rest compounds gave moderate effects in this respect. Also, **(Abd El-Kareem *et al*., 2010)** reported that Protecto was the most potent bioinsecticide compared with Viruses, Profect, and Bonanza. The mortality rates increased at the termination of the larval stage. Second larval instar showed higher susceptibility to all the tested compounds than the 4th larval instar. This might be due to differences in sizes and defense mechanisms between instars. It is well documented that older instars of the cotton leafworm are able to tolerate the toxic effect of these bioagents. Similar observations were reported by **(Mabrouk, 2001; Mabrouk : Hanafy *et al., 2005*; Abdel-Aziz, 2007).**

3.1.Biological effects

Results in Table (3) showed the latent effects of treating 4th larval instar of *S. littoralis* by different tested compounds Chlorpyrifos, Trifelumoron, and Dibel2x with LC_{50}. larval stage it is clear that all tested compounds, significantly increased the duration of the larval stage than that of the untreated check, revealed that larval durations were 19.66, 16.33and 16.66 days for Triflumuron, Chlorpyrifos and Dipel 2x compared with 10.33days in control treatments, respectively.

These results are similar to that obtained by **Abd El-Kader *et al*. (1995**) who reported that larval and pupal durations of *S.littoralis* were increased due to feeding on I.GRS, Atabron, and Alsystin. Also, **Dean *et al*., (1998)** who reported that lufenuron is known as an insect development inhibitor/ insect growth regulator. It is active against larval developmental stages, causing cuticular lesions and interfering in the chitin biosynthesis.

Concerning the pupal stage duration was affected in all treatments compared with the check. Data in the same table showed an increase in pupal duration to 13.66, 11.66 and 10.33days for Triflumuron, Chlorpyrifos and Dipel 2x compared with 8.66 in control treatments. These results may be due to the delaying of molting process. In addition, there was a decrease in pupation percentage (49.15, 66.10% and 69.49%) in case of pupae resulted from 4th instar larvae treated by the LC_{50} value of Triflumoron, Chlorpyrifos and Dipel 2x compared with (98.33 %) in control treatments.

These results are agreement with that obtained by **Abo El-Ghar *et al.(*2009**) reported that all the tested compounds, Thuringiensin (β-exotoxin of *B. thuringiensis*), abamectin (avermectin B1) and diflubenzuron, especially abamectin, resulted in a pronounced decrease of pupation in both susceptible (16–26%) and field (9.4–36.0%) strains of S. littoralis compared with the control (78.7 and 70.8%, respectively),also the emergence of adults in the susceptible strain was highly affected by all treatments compared to that in the control.

Concerning adult stage data in Table (3) showed that the adult's emergence percentages were highly significantly reduced to 25. 86 %, 53.44%, and 67.24% compared with (96.66 %) in control treatments when 4th instar larvae treated with the LC_{50} values of trifelumoron, and Dibel2x respectively. chlorpyrifos showed a decrease in adult longevity from treated 4th instars larval. The decrease was 9.6 and 8.66 days, while the control value was 11.63 days, respectively, while trifelumoron showed an increase in adult longevity reached to 12. 53 days compared to 11.6 days for control treatments respectively.

These results are in agreement with that obtained by **Abdel-Ghany *et al.* (1985**) who indicated that the treatment of 5th instar larvae of *S. littoralis* with IGRS, methoprene, diflubenzuron, and triflumuron (Bay SIR-8514) inhibited the adult emergence, also, **Radwan et al. (1984)** they reported that the lifespan of females of *S. littorallis* treated (at conc.10-200ppm) with IGRS, diflubenzuron and triflumuron was significantly shorter that of untreated females. Also, **Abdel El-Hafez *et al*. (2013)** reported that the 2nd and 4th instar larvae of the cotton leafworm, *S. littoralis* treated with bio-product, Spinosad 24 SC, Dipel 2x 6.4 WP and Protecto 9.4 Wp mixed with three vegetable oils to enhance the activity and persistence of the bio-products, the treatments decreased the adult longevity, in respect of control.

Also, data in Table (3) showed decreased in a number of eggs laid by female developed from treated 4th larval instars with LC_{50} values of trifelumoron chlorpyrifos and Dibel2x from 581.33in control to 206.66, 363.33 and 343.33eggs/ female respectively .Also, the hatchability decreased to 19.47, 73.78and 83.59 ,% respectively, compared with % 94.61in control treatments when 4th larval instars treated with LC50 values of trifelumoron chlorpyrifos and Dibel2x respectively.

These results agree with (**Sammour *et al.*,2008**) who found a reduction in fecundity and egg hatchability of cotton leaf worm after treatment of 4th larval instars with chlorfluazuron and lufenuron and failure of egg hatchability may be due to the penetration of insecticide into the eggs and prevent hatchability by interfering with embryonic cuticle synthesis so the new hatch probably cannot use its mus-

Table (2) larval mortality percentage of 2nd and 4th instar larvae of *S. littorals* affected feeding on different concentration of the tested Compounds

Chlorpyrifos			Triflumoron			Dipel 2x		
Conc. ppm	2nd instar	4th instar	Conc. ppm	2nd instar	4th instar	Conc. g/L	2nd instar	4th instar
			Av. % Mortality					
0.625	33.9	28.21	0.3125	40.68	25.42	0.937	30.51	22.03
1.25	45.76	30.51	0.625	44.24	38.98	1.875	49.15	28.81
2.5	66.1	44.24	1.25	71.17	49.49	3.75	69.49	49.15
5	81.36	71.19	2.5	84.95	74.58	7.5	81.36	55.93
10	91.53	89.77	5	89.83	80	15	88.14	74.58

Table (3) : Effect of the tested compounds on the biological aspects of 4 th larvae of *S. littoralis*

Tested compounds	Av. Larval Duration (days) mean ±SE	Av. % Pupation	Av. Pupal duration (days) mean ±SE	Av. Emerged Moths %	no. of eggs/ female mean ±SE (Fecundity)	Av, e% of hatcha-bility	Adult Lon-gevity days ± SE
Pestban 48% Chlorpyrifos	19.66±1.20	49.15	13.66±0.88	25.86	206.66 ±23.33	19.47	12. 53
Alsystin 48% SC Triflumoron	16.33±0.33	66.10	11.66±0.88	53.44	363,33 ±23.33	73.78	9.6±0.66
Dipel 2x *B. thuringinsis*	16.66±0.88	69.49	10.33±0.88	67.24	343.33±34.80	83.59	8.66±0.66
Control	10.33±0.66	98.33	8.66±0.33	96.66	581.33±15.91	94.61	11.6±0.33
LSD at 5%	-	1.12	-	2.63	-	3.2	-

cles to free itself from egg chorion. Also, **(Pineda *et al.* 2007**) reported that Spinosad and methoxyfenozide reduced in a dose-dependent manner the fecundity and fertility of *S. littorallis* adult when treated orally and residually. **Abo- El -Ghar *et al.* (2009**) recorded that the fecundity of moths of S. *littoralis* treated as 4th instar larvae with thuringiensin (β -exotoxin of *B. thuringiensis*), abamectin (avermectin B1) and diflubenzuron was highly reduced, especially in Thuringia in (65.3–89.0%) and abamectin (57.6–87.4%) treatments compared with that of control.

3.2.Biochemical effects.

Data represented in Table (4) indicated that the effect of the tested compounds on the total protein content in the fourth larval instar of the cotton leafworm, *S. littorallis*. Results indicated that chlorpyrifos showed the lea highest total protein content after treatment with LC_{50} values (31.33mg./g. b.wt.) followed by Dipel2x with (26.4mg./g. b.wt) triflumoron with (25.53mg./g. b.wt compared with (35.7mg./g. b.wt.), in control treatments.

Also, data in the same Table showed the effect of the tested compounds at LC_{50} on the total carbohydrates content in the fourth larval instar of the cotton leafworm, S. *littorallis*. Results indicated that, the least total carbohydrates content after treatment with chlorpyrifos at LC50 values (9.46mg./g. b.wt.), followed by Dipel2x with (11.18 mg./g. b.wt.) and triflumoron with (10.2 mg./g. b.wt), compared with (13.26 mg./g. b.wt.). in control treatments.

Concerning total lipids content in the fourth larval instar of the cotton leafworm, S. *littorallis* treated with LC_{50} of the tested compounds, results indicated that chlorpyrifos showed the least total content after treatment with LC_{50} values (2.73 mg./g. b.wt.), followed by Dipel2x (2.76 mg./ g. b.wt.), triflumoron (3.5 mg./g. b.wt.), compared with (4.02 mg./g. b.wt.), in control treatments.

Data in Table (4) indicated that the effect of the tested compounds on Acelylcolinesterase (AchE) content in the fourth larval instar of the cotton leafworm, *S. littoralis* treated with LC50 of the tested compounds. Results indicated that chlorpyrifos showed the least (AchE) content with (13.47 µg AchBr/min/g.b.wt), followed by Dipel2x with (14.97µg AchBr/min/g.b.wt), and triflumoron (22.5 µg AchBr/min/g.b.wt), compared with (18.53 µg AchBr/min/ g.b.wt), in control treatments.

These results are in agreement with those of (**El-barky *et al*., 2008**) in Egypt, who observed that significant decrease in carbohydrates content at *S. littorallis*, 5th larval instar, after treatment by radiant (Spinetoram) with $LC_{50.}$ (**El-sheikh *et al.,* 2013)** in Egypt, evaluated two insect growth regulators and *B. thuringiensis* (used at LC_{50}) were used for the treatment of 2nd larval instar of cotton leafworm, *S. littorallis*. Treatment caused significant decreases in total carbohydrates during the pupal stage and the sequential combined effect treatments had a more decreasing effect than the individual treatments. **(El-Gabaly, 2015**) in Egypt, indicated that the chlorpyrifos, lufenuron, and protecto at their LC_{50} values caused a decrease in the total protein content of 4th larval instar of S. littorallis may by arrangement in descedisly as 35,35.1,35.9,36.6 and 37.8my/g.bwt which recorded of post-treatment spinetoram relative to control. (**Assar *et al.,* 2016)** in Egypt, indicated that the total proteins, total carbohydrates, and total lipids content were decreased when treated 4th larval instar of *S.littoralis* with emamectin and teflubenzuron as insect growth regulators. Also, **Awadalla *et al*. (2017)** reported that protecto showed the highest total carbohydrate content in the treated larvae *S. littoralis* (16.90 mg/g.b.wt.) than the other products followed by highly, pestban, and ethephon. The percentage of the change in the total carbohydrate content in the fourth larval instar treated with the LC50 values recorded the highest decreasing percentage when treated larvae by plant growth regulator ethephon and represented by (48.98%). Larvae exhibited the highest total protein content were treated with highly (38.40mg/g.b.wt.) followed by bestban, protecto, then ethephon. Highest decreasing percentage of total protein content found in larvae treated with ethephon and represented by (-30.8%).Whereas the highest total lipids content was found in larvae treated with highly (7.94 mg/g.b.wt.) followed by bestban, protecto, ethephon. Highest decreasing percentage when treated larvae chitin synthesis inhibitor, and represented by (-18.60%) On the other hand, Lufenuron increases the Acetylcholinesterase activity significantly. Methomyl act as carbamate insecticide through excitation of the insect nervous system, which in turn cause an alteration in the function of nicotinic and GABA- gated ion channels which leads to involuntary muscle contractions and tremors **(Salgado *et al*., 1998**). According to such an activity, it was expected that such insecticide may produce cytotoxic Efficiency of Diple thuringiensis var. kurstaki alone and its mixture with two insecticides against action either in neurons or non-target cells. The cytotoxic action in neurons may alter the neurotransmitter mechanisms through interfering processes of methomyl with the production of acetylcholine in the synaptic region which affect in turn the activity of the acetylcholinesterase to be in form of false inhibition. **(Abd El- Mageed and Shalaby, 2011)** using IGR's. Reduction in acetylcholinesterase appeared **(Mostafa, 1998)** using teflubenzuron. On other hands, spinetoram induced a moderate increase in activity of acetylcholinesterase by (**El-Barky *et al.* (2008), Fahmy and kandil (1989). Gaaboub et al. (2005)** investigated the inhibition of AChE by two insecticides; chlorpyrifos and thiodicarb in the head homogenates of two cotton leafworm Spodoptera littorallis strains; laboratory and field

Table (4) Effects of the tested compounds on the biochemical aspects in 4th instar larvae of cotton leafworm *Spodoptera littorallis*

Tested compounds	Mean Total protein (mg/g.b.wt)	Mean Total carbohydrate mg./g. b.wt ±SE	Mean Total lipids mg./g. b.wt ±SE	µg Ach Br/ min/ g.b.wt) ± SE
Pestban 48% Chlorpyrifos	31.33±0.44	9.46±0.31	2.73±0.14	13.47±0.60
Alsystin 48% SC Triflumoron	25.53±0.60	10.2±0.90	3.5±0.28	22.5±5.85
Dipel 2x *B. thuringinsis*	26.4±0.55	11.18±0.34	2.76±0.14	14.97±2.02
Control	35.78±0.26	13.26±0.67	4.02±0.24	18.53±0.20

strains; cutworm, *Agrotis ipsilon,* and honey bee Apis millefra. They cited that the AChE from different insects is identical in its properties. Highly activity of AChE was detected in the head homogenate of adult insect of the honey bee. The highest inhibition potency was obtained with thiodicarb against all the tested insect species. The lowest inhibition was obtained with thiodicarb and chlorpyrifos against field strain of *S. littorallis* compared to laboratory strain. **Nour El-Hoda *et al*,(2012)** indicated that both chlorpyrifos and profenophos expressed higher levels of Acetylcholinesterase (AChE) activity than the reference (Lab-susceptible) in both PBW and SPW larvae strain.

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دراسات سميه وبيولوجيه وبيوكميائيه لمركبات تقليدية وغير تقليدية على دودة ورق القطن فى المعمل

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الملخص العربى

تمت هذه الدراسة في المعمل بغرض تقييم التأثير السام والبيولوجي والبيوكميائي لكلا من الكلوربيريفوس والدايبل x2 و منظم النمو الحشري (الترايفليوموروون) ضد يرقات العمر الثاني والرابع لسلالة معملية لدودة ورق القطن.حيث غذيت يرقات العمر الثاني والرابع لمدة 24 ساعة في حالة الكلوربيريفوس و48 ساعة في حالة الدايبل x2 و الترايفليوموروون على ورق خروع تم غمره لمدة 15ثانية في سلسلة تركيزات لكل مركب من المركبات الثلاثة المختبرة لتحديد قيم التركيز النصفي لكل مركب. أوضحت النتائج إن مركب الكلوربيريفوس كان اكثر فاعلية ضد كل من العمر الثاني والرابع حيث بلغت قيمة التركيز النصفي القاتل لهppm 0.275 , 0.963 **للعمرين الثاني والرابع على التوالي و يليه مركب الترايفليوموروون في التأثير حيث بلغت قيمة التركيز نصف المميت له** 1.11 , 2.17 ppm**للعمرين على الترتيب.ينما جاء مركب الد يبل x2 بالمرتبة الثالثة حيث بلغت قيمة التركيز نصف المميت له** 2.42 gm**و**6.189**للعمرين على التوالي .تأثرت المعايير البيولوجية لليرقات بعد المعاملة للعمرالرابع بتركيز نصف المميت بالمركبات الثلاثة. التأثير تنوع مع اختلاف العمر اليرقى والمركب المختبر وبناء على ذلك أدت المعاملة بالمركبات الثلاثة المختبرة إلي خفض نسب التعذير والخروج للحشرة الكاملة وكمية البيض والفقس وكان لمعاملة العمر الرابع بمنظم النمو الحشري الترايفليوموروون التأثير الأقوى في هذا الشأن . معاملة العمر الربع بالمركبات الثلاثة كانو اكثر فاعلية في زيادة لكل من فترة البقاء اليرقى والعذري. وأظهر التحليل الكيميائي أثر هذة المعاملت علي نسبة الكربوهيدرات ،البروتين والليبيدات الكلية وكذلك إنخفاض نسية هذة المكونات في جسم الحشرات المعاملة .**