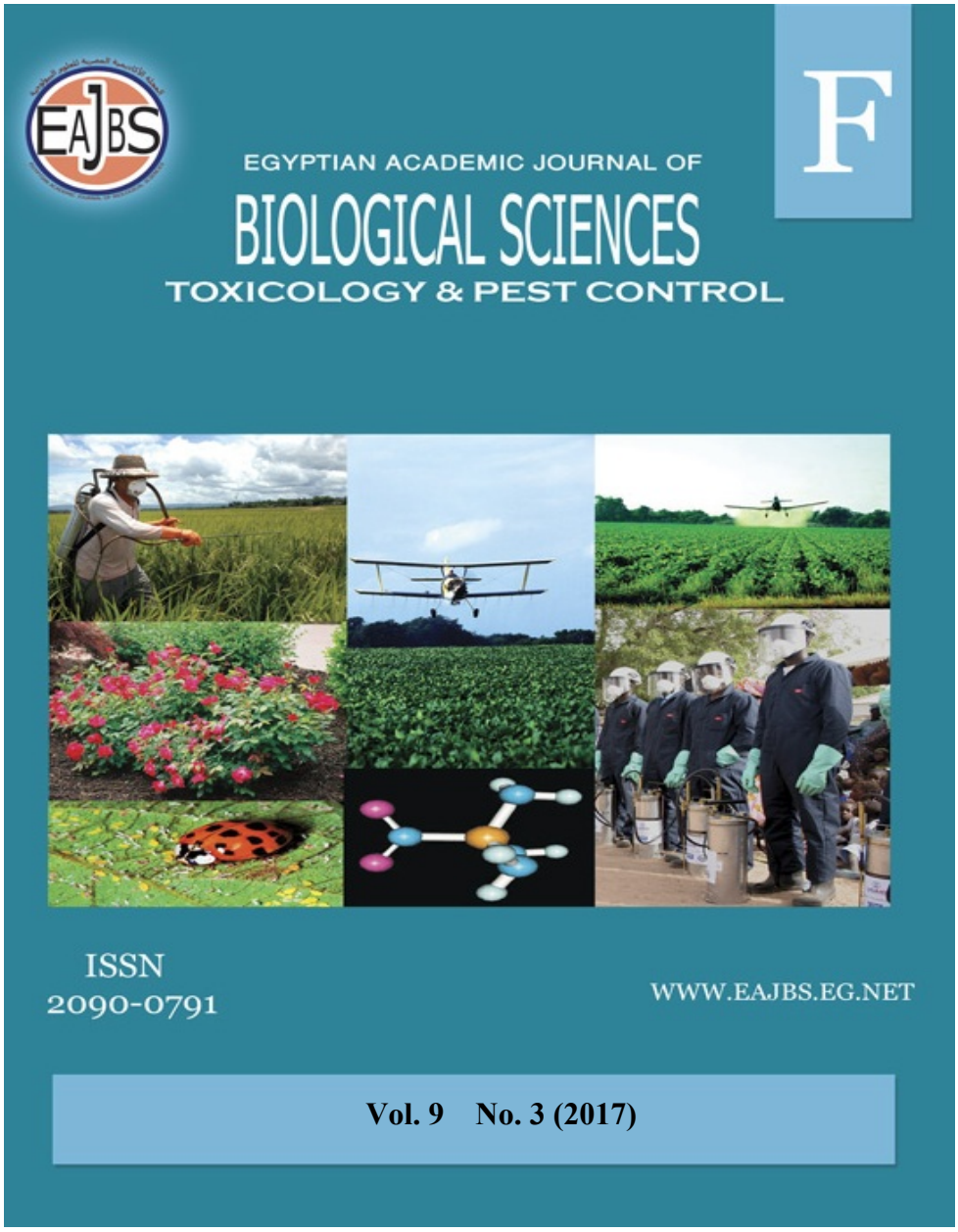

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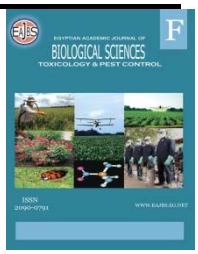

Efficacy of Certain Chemical and Bio-insecticides against Piercing-Sucking Pests, Cotton Leafworm and Associated Predators in Cotton Fields at Sharkia Governorate, Egypt.

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ABSTRACT

Two experiments were conducted in cotton fields, *Gossypium barbadense* L. variety Giza 86 at Zagazig District, Sharkia Governorate, Egypt during 2013 and 2014 seasons to evaluate the efficacy of some chemical and bio-compounds against some cotton pests and its side effects on associated predators. In the first experiment, each of parathion-methyl, spinosad, azadirachtyin and dinotefuran compounds were tested at field only against the piercing-sucking pests (aphids, *A. gossypii*; whitefly, *B. tabaci* **;** leafhoppers, *Empoasca* spp ; stink green bug, *N. veridula* and spider mites, *Tetranychus* spp.), associated predators and added Diple DF (*Bacillus thuringiensis* subsp. *Kurstaki)* in addition to the obvious compounds against cotton leafworm, *S. littoralies* . In the second experiment, each of parathion-methyl, spinosad, azadirachtyin, dinotefuran and *B. thuringiensis*) compounds were tested as field-laboratory technique to evaluate the latent effect of tested compounds on biological aspects of the second instar larvae of cotton leafworm.

The obtained results of the 1st experiment revealed that, the efficacy of tested compounds were varied as pests, seasons and time after application. The highest general mean effect of 81.85, 72.26 and 59.46% reduction were recorded for dinotefuran on aphids during the 1st season, on *N. veridula* during the 2nd one and on *Tetranychus* spp.during the 1st season, respectively. On the other hand, the highest general mean effect of 80.01 and 74.82 % reduction were recorded for parathion-methyl on *B. tabaci* and *Empoasca* spp during the 1st season, respectively. In case of *S. littoralies* the highest general mean effect of 75.91 % reduction were recorded for Parathion-methyl insecticide during 2014 season.

In regard to the side effects of tested compounds on predators associated with cotton pests, the dinotefuran insecticide recorded highest general mean effect of 68.05 and 88.46 % reduction on lady bird beetles and true spider mites during the 2nd season, respectively. On the other hand, the parathion-methyl insecticide recorded highest general mean effect of 70.03, 71.88 and 68.11 % reduction on green lacewing, scmynus, and heave beetle during the 2nd season and 65.43 % on orius bug during the 1st season respectively.

The obtained results of biological effects of compounds tested as field-laboratory technique on the 2nd instar larvae of cotton leafworm revealed that, the highest mean of mortality of 86.67 %, longest larval duration of 12.25 days and lowest pupation percentage of 13.33 % were recorded for larvae fed in laboratory on cotton leaves sprayed in field with parathion-methyl insecticide at zero time. The *Btk* compound decreased the pupal duration and shortest female longevity period compared with control and other tested compounds. Also, the lowest pupal weights of 0.2976 g/pupa and emergence percentage of 62.50 % were recorded for *Btk* compound. At the end, the lowest eggs number of 581.67 eggs/female was recorded for females emerged in parathion-methyl insecticide treatment at zero time. So, the *Btk* compound recorded good effect on *S. littoralies* biology followed by parathion-methyl insecticide.

INTRODUCTION

Cotton crop, *Gossypium barbadense* L. is still as one of important income crops to Egyptian farmers and many farmers all over the world cotton plants are infested by many serious pests species throughout the growth season.

The sap sucking pests; aphids (*Aphis gossypii*), white flies (*Bemisia tabaci* Gen.), leafhoppers (*Empoasca* spp.), and plant spider mite (*Tetranychus* spp.) are start to infest cotton plants early in the season and contentious till end of growth season causing varying damage as pest density and plant growth stage. The cotton plants during vegetative, flowering and fruiting periods expose to infestation of cotton leafworm, *Spodoptera littoralies* (Boisd.) and green stink bug (*Nezara veridula*) the previous pests are consider as cotton plants key pests in addition to bollworms (Al Shannaf, 1994 & 2002; Hafez, *et al.*, 1996; Ibrahim, 2001 & 2006; Ibrahim *et al,* 2006). The sap sucking pests, aphids,; whiteflies; leafhoppers; and plant spider mite caused serious direct damage to infested cotton plants by sucking plant sap ; in adding to indirect damages of aphids and whitefly as production of honey dew exudates which present suitable media for sooty mold fungi on different plants parts , the highest damage of these fungi come at the end of season as low quality of cotton lint and interfering with picking and ginning (Raboudi *et al.,* 2002). Also, the leafhopper suck sap from leaves veins on the undersides of mature leaves, mostly on the lower half of plants canopy; the midrib veins become roughened, the affected leaves may become distorted, leathery and develop yellow or red blotches. Severe infestation may push plants to shed squares and resulted small bolls, while the larger bolls may turn soft and spongy and fail to mature Chavan *et al.,* 2010). In the same trend, cotton leafworm is considered as one of the most harmful pest causing severe damage by feed on vegetative and fruit parts that resulting in magnitude loss of the yield.

The chemical insecticides still as only and first tool for pest management on crops for long time in most developing countries. This has contributed to the environmental pollution through air or as residues in food. The indiscriminate application of organophosphates and other insecticides, instead of controlling cotton pests populations, increases their reproductive potential (Denholm and Devine, 2013).

Recently due to the increasing development of resistance to old and traditional insecticides, intensive research have been carried out for evaluating new insecticides (environmentally biopes-ticides) with novel mode of action against sucking insects, with minimum hazards for mammals and natural enemies to control cotton pests (Ibrahim 2001, Al Shannaf 2002 & 2010 and Lobna - Zidan, 2012).

The present work was conducted to evaluate the efficacy of some new compounds (new mode of action) to managing resistance of cotton key pests against old insecticides and to test side effects of studied compounds on the associated natural predators; the tested pests were the sap sucking pests; aphids, *Aphis gossypii* Glov.; white flies (*Bemisia tabaci* Gen.); leafhoppers (*Empoasca* spp.) plant spider mite (*Tetranychus* spp.) , cotton leaf worm (*Spodoptera litoralies* (Boisd.)) and green stink bug (*Nezara veridula* L.). The field-laboratory technique was used to evaluate latent effects of tested compounds on biological aspects of cotton leafworm.

MATERIALS AND METHODS

These studies carried out during 2013-2014 season on cotton plants variety Giza 86 at Zagazig region, Sharkia Governorate. Two experiments were conducted, the first one was only field evaluatation of tested compounds; i.e. parathion-methyl, spinosad, azadirachtin and dinotefuran that against, aphids, whitefly, leafhopper, stink green bug, spider mites; *Bacillus thuringensis kurstaki* (*Btk*) as Dipel DF was added to

the previous compounds against cotton leafworm.

The second experiment was carried as field-laboratory technique for evaluation of parathion-methyl, spinosad, dinotefuran and *Bacillus thuringensis kurstaki* (*Btk*) as Dipel DF presented different new groups of new pesticides that against the second larval instars in laboratory.

Used compounds:

Prompt, parathion-methy 500 EC at rate of 65 ml/ 100 litter water.

Tracer, spinosad 24% sc at rate of 50 ml/ 100 litter water.

MTI 446, dinotefuran 20 % sg at rate of 25 g/ 100 litter water.

Neemix ,azadirachtin 4.5% at rate of 75 ml/ 100 litter water.

Dipel DF *B. thuringiensis* subsp. *kurstaki* 6.4 % WP at rate of 200 g/ fedd.

Field Trials:

Experiments Design::

The experimental cotton area about one feddan planted at the first week of April 2013 and last week of March 2014, by cotton variety Giza 86 was divided to four blocks each 1/6 fed. Each divided in completely randomized plot design to five treatments presented compounds and control (check). The tested compounds were sprayed at the 3rd week of June of 2013 and 2014 seasons using knap sack motor sprayer (20 litter sizes). The experiment area received all recommended agric. practices throughout these trials.

Sampling technique and data analysis:

Sample of 25 leaves presented cotton plant canopy were chosen randomly and inspected actually in the field the three replicates of treatments and control, that just before spraying, at 48hr (conventional insecticides) and 3 days (biocides), 7 and 10 days after spraying for aphids and whitefly; while at 24 hr. (conventional insecticides) and 3 days (biocides), 7and 10 days after spraying for leafhoppers, stink green bug and Egyptian cotton leafworm. In case of, two spotted spider mites the randomized samples of 20 leaves / replicate were collected in paper bags and transferred to laboratory to examine using binocular stereo microscope.

The numbers of different stages of inspected pests were recorded actually in the field or in the lab. In regard to the numbers of cotton leafworm larvae and sting green bug stages were recorded as number/plant. The reduction percentages of pests population were deduced using Henderson and Tilton (1955) formula:

Statistical analysis:

The obtained results of the two study seasons were subjected to analysis of variance as Litll and Hills (1975) to clear the significant of variation between treatments.

Field-laboratory trials:

Samples of treated cotton leaves were collected randomly from different levels of cotton plants at zero time, 3, 7and 10 days after spraying, presented each of treatments and control plots; the samples were kept in paper bags then transferred to laboratory to provide to 2nd *S. litoralies* instar of laboratory strain larvae as follows:

Three replicates of 10 second instar larvae for each treatment as well as control were put in glass jars. The tested larvae fed on treated cotton leaves for 24 hr. (of each samples in considered times) of tested compound and fed on untreated castor leaves tell pupation, as well as the larvae of control. All biological aspects of *S. litoralies* were investigated and recorded. A mortality percentage of treated and untreated larvae was calculated and corrected using Abbot 1925 formula.

RESULTS AND DISCUSSION

Main effects on some cotton key pests in cotton field:

Cotton aphids, *Aphis gossypii*:

The obtained results in Table (1) showed highest initial effects on *A. gossypii* of 95.73 and 89.17 % recorded

with dinotefuran and azadirachtin compounds during 2013 and 2014 seasons; while the lowest effect of 62.96 and 61.84 % recorded with spinosad compound in 2013 and 2014 seasons, respectively. In case of residual mean, the highest effects of 77.27 and 74.36 % were recorded with azadirachtin and parathion-methyl compounds during 2013 and 2014 seasons; while the lowest residual effects of 25.12 and 36.34 % recorded with spinosad compound in 2013 and 2014 seasons, respectively. The results of general mean revealed that the highest effect of 81.85 % was recorded with dinotefuran insecticide followed by 79.80, 76.13, and 37.73 % with azadirachtin, parathion-methyl and spinosad compounds, respectively, in the first season. In the second season the highest effect of 77.40 % was recorded with parathion-methyl followed by 76.40, 71.78 and 44.42% for dinotefuran, azadirachti and spinosad compounds, respectively.

Cotton whitefly, *Bemisia tabaci*:

The present data in Table (1) showed the highest initial effects (after 24 hr. from treatment) on *B. tabaci* were 92.22 and 85.71 % recorded with parathion-methyl in both of 2013 and 2014 seasons, respectively; followed by dinotefuran (85.90 and 81.40 %), azadirachtin (80.56 and 78.30 % after 3 days from treatment) and spinosad (65.43 and 64.29%) during the two seasons, respectively. The highest reduction percentage of residual effect on *B. tabaci* were 73.90 and 70.84 % recorded with parathion-methyl in both of 2013 and 2014 seasons, while the lowest were 51.08 and 39.07% recorded with azadirachtin and spinosad compounds in both of 2013 and 2014 seasons, respectively.

Table 1: Efficiency of some insecticides against some pests infesting cotton fields during 2013 and 2014 seasons.

Tested compounds	season	*Aphis gossipii*					*Bemisia tabaci*					*Empoasca* sp.				
		Initial effect	Residual effect		Residual mean	General mean	Initial effect	Residual effect		Residual mean	General mean	Initial effect	Residual effect		Residual mean	General mean
			7 day	10 day				7 day	10 day				7 day	10 day		
Parathion-methyl	2013	81.48	77.10	69.80	73.45	76.13b	92.22	86.00	61.82	73.91	80.01a	80.00	77.78	66.67	72.22	74.82a
Spinosad		62.96	27.53	22.71	25.12	37.73c	65.43	61.11	43.43	52.27	56.66d	63.64	46.67	27.27	36.97	45.86c
Azadirachtin		84.85	80.23	74.31	77.27	79.80a	80.56	73.75	28.41	51.08	60.91c	80.00	73.33	44.44	58.88	65.92b
Dinotefuran		95.73	79.93	69.90	74.91	81.85a	85.90	79.00	44.10	61.55	69.67b	84.00	73.33	46.67	60.00	68.00b
LSD 0.05 values						3.26					3.39					3.39
Parathion-methyl	2014	83.49	78.33	70.39	74.36	77.40a	85.71	82.14	58.82	70.48	75.56a	81.28	80.9	66.67	73.78	76.28a
Spinosad		61.48	38.61	34.06	36.33	44.72c	64.29	54.46	23.68	39.07	47.48c	63.97	53.32	26.38	39.85	47.89c
Azadirachtin		89.17	75.63	50.54	63.08	71.78b	78.30	77.71	30.96	54.33	62.32b	83.52	79.00	50.00	64.50	70.84b
Dinotefuran		86.32	72.63	70.25	71.44	76.40a	81.40	72.00	40.20	56.10	64.53b	82.09	75.65	53.62	64.63	70.45b
LSD 0.05 values						2.49					2.97					3.39

In case of general mean reduction percentage, the highest reduction were 80.01 and 75.56 % recorded with Parathion-methyl in both of 2013 and 2014 seasons, followed by 69.67 & 64.53% , 60.91 & 62.32 % and 56.66 & 47.48 % recorded with dinotefuran, azadirachtin and spinosad compounds during the two study seasons, respectively.

Leafhoppers, *empoasica* sp.:

The obtained results in Table (1) cleared that, the highest initial effects of tested compounds on the jassid, *Empoasica* sp of 84.00 and 83.52 % were recorded for dinotefuran and azadirachtin compounds in 2013 and 2014 seasons, respectively; while the lowest of 63.64 and 63.97 % were recorded for spinosad compound in both of 2013 and 2014 seasons, respectively. parathion-methyl insecticide gave highest mean residual effect of 72.23 and 73.79 % in both of 2013 and 2014 seasons, respectively; on contrary, spinosad compound gave lowest residual effect of 36.97 and 39.85 % reduction in both study seasons, respectively. As general mean of reduction, the highest effect of 74.82 % was recorded for Parathion-methyl

insecticide in the first season followed by 68.00, 65.92 and 45.86 % for dinotefuran, azadirachtin and spinosad compounds in the first season, respectively. In the second season the highest general mean reduction of 76.28 % was recorded for parathion-methyl insecticide followed by 70.84, 70.45 and 47.89 % for azadirachtin, dinotefuran, and spinosad compounds, respectively.

Green bug, *Nezara viridula*:

Data in Table (2) cleared that, the highest reduction percentage of initial effect were 91.70 and 89.79 % recorded for dinotefuran after 24 hr. from treatment during 2013 and 2014 seasons, respectively; followed by 77.78 & 79.59 % for azadirachtin in the first season after 3 days from application and parathion-methyl after 24 hr. in the 2nd season, respectively. In the same trend, dinotefuran gave highest reduction percentage of residual effect mean with 50.00 and 63.49 % reduction, while spinosad gave lowest reduction of 37.5 and 51.04 % during the two seasons, respectively. Also, the highest reduction general mean of 63.90 and 72.26 % were recorded for dinotefuran, the lowest of 47.22 and 55.45 % were recorded for spinosad during 2013 and 2014 seasons, respectively.

Table 2: Efficiency of some insecticides against some pests infesting cotton fields during 2013 and 2014 seasons.

Tested compounds	season	*Nezara viridula*					*Tetranycus* spp.					*Spodoptera littoralis*				
		Initial effect	Residual effect		Residual mean	General mean	Initial effect	Residual effect		Residual mean	General mean	Initial effect	Residual effect		Residual mean	General mean
			7 day	10 day				7 day	14 day				7 day	10 day		
Parathion-methyl	2013	73.33	60.00	20.00	40.00	51.11**c**	75.00	56.25	21.43	38.84	50.89**b**	73.46	81.79	57.56	69.67	70.94**a**
Spi#nosad		66.67	50.00	25.00	37.50	47.22**d**	58.33	55.35	18.37	36.86	44.02**c**	60.04	54.40	31.49	42.94	48.64**b**
Azadirachtin		77.78	58.33	33.33	45.83	56.48**b**	51.38	47.91	34.52	41.21	44.60**c**	43.48	50.24	21.92	36.08	38.55**c**
Dinotefuran		91.70	75.00	25.00	50.00	63.90**a**	77.77	62.50	38.10	50.30	59.46**a**	50.87	56.07	25.12	40.59	44.02**b**
BTK		Not used										25.40	49.20	40.13	44.66	38.24**c**
LSD 0.05 values						**4.13**					**4.19**					**5.45**
Parathion-methyl	2014	79.59	76.19	42.86	59.52	66.21b	68.75	66.66	29.70	48.18	55.04a	78.92	87.06	61.75	74.40	75.91**a**
Spinosad		64.28	58.33	43.75	51.04	55.45c	67.85	64.28	19.60	41.94	50.58b	66.93	58.34	32.81	45.57	52.69**b**
Azadirachtin		76.19	62.96	41.67	52.31	60.27b	60.00	53.30	32.50	42.90	48.60b	38.45	40.64	22.70	31.67	33.93**c**
Dinotefuran		89.79	84.12	42.86	63.49	72.26a	65.38	61.53	43.75	52.64	56.89a	60.04	62.12	23.04	42.58	48.40**b**
BTK		Not used										37.70	34.89	30.34	32.61	34.31**c**
LSD 0.05 values						**3.39**					**3.76**					**3.63**

Two spotted spider mite, *Tetranychus* sp.:

The obtained results in Table (2) showed highest reduction of initial effect of 77.77% recorded for dinotefuran after 24 hr. in the first season, followed by 75.00, 58.33 and 51.38 % for parathion-methyl (after 24 hr. of treatment), spinosad and azadirachtin (after 3 days), respectively; while in the 2nd season, the highest reduction of 68.75 % was recorded for parathion-methyl after 24 hr of treatment. In case of residual mean and general mean reduction, data noticed modrate effects during the two study seasons.

Cotton leafworm, *Spodoptera littoralis*:

Data in Table (2) revealed that, the highest reduction of initial effect of 73.46 and 78.92% were recorded for parathion-methyl during 2013 and 2014 seasons, respectively; followed by 60.04 and 66.93 % for spinosad after 3 days, while the lowest of 25.4 and 37.7 % were recorded for *Btk* after 3 days during 2013 and 2014 seasons, respectively. The highest residual effect of 96.67 and 74.40% were recorded for parathion-methyl during the two study seasons, respectively. The lowest residual effect of 36.08 and 31.67% reduction were recorded after 3 days for azadirachtin during the two study seasons, respectively. The results of calculated general mean effects took the same trend of residual effects, where parathion-methyl recorded highest effects of 70.94 and 75.91 % reduction during the two study seasons, respectively.

Generally, the results of tested compounds on inspected pests revealed highly significant differences between reduction percentages as general reduction mean Tables (1 and 2) and

varied as compounds, pests, periods after treatment and season. The chemical pesticides provide highest reduction on pest's population followed by azadirachtin, while spinosad gave moderate to low reduction percentages. These results were found in agree with those of Ibrahim (2001), who found that organophosphorus compounds recorded relatively high effect on piecing-sucking insects except whitefly ranging 88.58-91.23 % followed by azadirachtin recorded reduction ranging 70.0 - 81.34 % on inspected insects. Rasha-Fergany *et al.,* (2009) stated that, the neonicotinoid compound, dinotefuran (Mti-446) 20% WP) gave 65.63 % reduction on whitefly adults and gave 73.73 % reduction in immature stages numbers, also, Ako, *et al.,* 2006 stated that, neonicotinoid insecticides affected *Tetranychus* spp. biology when used as foliar or seed dressing. Kumar *et al.,* 2017 reported that dinotefuran 20 SG gave effective control of leafhopper and thrips population on cotton. However, against whitefly, this insecticide was inferior as compared to standard check, ethion Stephens *et al.,* (2002) recorded that, spinosad is highly active against Lepidoptera but is reported to be practically nontoxic to insect natural enemies where it was little mortality on Larvae of *Chrysoperla carnea*; in the same trend, each of Baniameri and Sheikhi, 2006; Kunkur *et al.,* 2007 stated that, the neonicotinoid insecticides are highly efficient in controlling important pests such as aphids and whiteflies. Al shannaf (2012) mentioned that, the natural insecticide spinosad proved to have a powerful activity against *S. litoralies* and conserve the natural enemies. Singh and Jaglan (2005) stated that, the parathion-methyl gave low reduction % on *B. tabaci* and return that to build up of resistant to pesticide while the leafhoppers found more susceptible to this compound; in added to that, Trichilo *et al.,* (1990) found *Tetranychus* species less dominant, and significantly lower in relative abundance in plots treated with parathion-methyl than in dicofol-treated plots. Hilal Aydin and Rkan (2006) suggest that spinosad is potentially important in the control of *S. littoralis*. Ghelani *et al*., (2014) reported that, azadirachtin was found moderate effective and Dinotefuran found more effective against major sucking pests of cotton In case of toxicity of insecticides on predators (Coccinellids and *Chrysoperla*) of sucking pests, the bio-pesticides was found safer to predators, while chemical pesticides was found moderate to higher toxic to predators on cotton. Amin and Gergis (2006) indicated that the biological program use *Bacillus thioringensis*, spinosad and trichogramma (egg parasitoid) Enhanced population density of predators, gave high value for reduction of sucking pests (83-87 %) and 91.3 for cotton leafworm.

Side effects on predators associated with ctton pests in cotton field:

Ladybird, *Coccinella* spp.:

The obtained data in Table (3) showed the highest hazard effect of 85.00 and 75.00 % reduction in *Coccinella* spp was recorded by parathion-methyl after 24 and 3 days, while the lowest reduction of 7.14 % was recorded for spinosad after 10 days in the 1st season. In the 2nd season, the highest effect of 83.00 % was recorded for dinotefuran after 24 hr from treatment. In regard to general mean of effects, the highest mean of 68.05 was recorded for dinotefuran in the 2nd season; while the lowest reduction of 21.47 % was recorded for azadiracht in during 2014 season.

Green lacewing, *Chrysoprella carnae*:

The present results in Table (3) cleared that, the highest hazard effect of 82.82 and 81.17 % reduction in *Ch. carnae* were recorded for Parathion-methyl compound after 24 hr. and 3 days from treatment in the 2nd season. Also, Parathion-methyl compound gave highest general mean effects effect of 70.03 %.

The spinosad was the safer compound on *Ch. Carnae* recorded lowest general mean reduction of 28.43 and 43.07 % reduction during the two study seasons, respectively.

***Scyminus* sp.:**

Data in Table (3) revealed that the highest hazard initial effect on *Scyminus* sp of 85.90 and 100.00 % were recorded with parathion-methyl in both 2013 and 2014 seasons, respectively; also recorded highest general mean of 71.88 at 2nd season. On contrary, the lowest initial effect of 48.18 % and general mean of 32.19 % were recorded for spinosad compound during 2013 and 2014 seasons, respectively.

Table 3: Side Effects of some insecticides against some predators associated with pests on cotton fields during 2013 and 2014 seasons.

Tested compounds	season	*Coccinella* spp.					*Chrizoprella carnae*					*Scyminus* sp.				
		24h	3day	7 day	10day	mean	24h	3day	7 day	10day	mean	24h	3day	7 day	10day	mean
Parathion-methyl	2013	85.00	75.00	46.43	35.71	60.54a	43.13	41.31	37.95	30.94	38.33c	85.90	79.70	59.40	50.70	68.90a
Spinosad		40.00	33.33	14.29	7.14	23.69c	48.00	44.02	40.91	39.33	43.07b	48.18	39.06	30.67	14.88	33.20c
Azadirachtin		55.00	37.50	14.30	8.93	28.93b	64.25	60.27	48.00	43.67	54.05a	74.87	63.88	42.22	38.10	54.77b
Dinotefuran		80.00	70.833	57.14	42.86	62.71a	69.70	51.90	37.00	26.33	46.21c	77.39	67.50	51.47	31.90	57.07b
LSD $_{0.05}$ values						**2.97**					**3.99**					**5.15**
Parathion-methyl	2014	83.00	70.57	44.22	38.97	59.19b	82.89	81.17	69.20	46.87	70.03a	100.0	88.75	55.00	43.75	71.88a
Spinosad		38.61	38.24	29.17	22.51	32.13c	41.81	29.13	21.45	1.29	28.43c	65.00	32.50	25.00	6.25	32.19c
Azadirachtin		36.25	34.61	10.35	4.647	21.47d	63.63	54.28	41.82	39.00	49.69b	78.18	67.27	12.73	7.95	41.53b
Dinotefuran		83.00	78.20	57.50	53.50	68.05a	7.03	56.69	35.69	30.73	50.04b	100.0	82.00	52.00	43.75	69.44a
LSD $_{0.05}$ values						**4.70**					**4.54**					**3.64**

Pedurus alferii:

As the data in Table (3) the numbers of *Pedurus alferii* were reduced significantly by 86.36 % as initial effect of dinotefuran, while parathion-methyl rcorded highest residual effect of 57.80 % reduction at 7 days after treatment during the 2nd season and highest general mean of 68.11% during 1st season. The lowest effect of 19.83 % was recorded by spinosad during 2013 season.

***Orius* sp.:**

The results in Table (4) showed highest initial effect of 85.10 % after 24 hr of treatment recorded for parathion-methyl during 2014 season; while the lowest of 54.16 % was recorded with spinosad after 24 hr. after application during the 1st season. In case of residual effects, parathion-methyl insecticide recorded highest reduction percent of 63.33 % after 7 days of treatment during the 1st season; while the lowest residual effect of 8.73 % reduction was recorded for spinosad after 10 days from treatment during the 2nd season. In the same trend Parathion-methyl recorded highest general mean of 65.43 %, while spinosad gave lowest general mean effect of 35.50 % during the 2nd season.

True spider mite species:

The tabulated data in Table (4) showed highest initial effect of 100.00 % was recorded for dinotefuran at 24 hr during the two study seasons, while the lowest initial effect of 26.47 % was recorded for spinosad compound at 10 days after treatment in the 2nd season. The highest general mean of 88.46% was recorded for dinotefuran during 2013 season, while the lowest mean of 59.22 recorded for spinosad compound in the 2nd season also.

Generally, the results of tested compounds on inspected predators revealed highly significant differences between reduction percentages as general reduction mean Tables (3 and 4) and varied as compounds, predator species, periods after treatment and season. The chemical pesticides provide harmful effect on predator's population, while the other compounds gave moderate to low effects. These results were found in agree with those of Ibrahim (2001), who found that organophosphorus compounds

recorded relatively high effect on predators ranging 84.17-98.81 %, while azadirachtin recorded low reduction ranging 60.6-79.3 %; also, El-Wakeil and Saleh (2007) indicated that, azadirachtin was not so harmful on abundance of the following species of predators which present in reasonable numbers: *Chrysoperla carnea* (Steph) (larvae), *Orius* spp. (nymphs & adults), *Coccinella* spp. (larvae & adults) and *Scymnus* sp. (adults) and added, the reduction percent on *Coccinella* spp. was 15.3, % and 16.28% on *Scymnus* sp. and Elzen (2001) who showed, the nionicotinoid compound, Imidacloprid, and Spinosad were significantly less toxic to male and female of orius bug. *Orius* spp. than Chlorfenapyr, Endosulfan. Beije 1993, stated that, parathion-methyl found affected *Chrisoprella* species more than synthetic pyrothroid. Fadare and Amusa (2004) indicated that the bacterial compound dipel, *Bacillus thuringiensis* allowed the survival of the predators species but caused the mortality of the destructive pests in cotton fields.

Table 4: Side Effects of certain insecticides against some predators associated with pests in cotton fields at zagazig region during 2013 and 2014 seasons.

Tested compounds	season	*Pedurus alferii*					*Orius* sp.					truspiders				
		24h	3day	7day	10day	mean	24h	3day	7day	10day	mean	24h	3day	7day	10day	mean
Parathion-methyl	2013	84.00	76.26	57.14	55.00	68.11a	77.08	71.35	63.33	48.54	65.08a	100.0	95.00	73.08	72.50	85.14a
Spinosad		40.00	25.92	7.143	6.25	19.83d	54.16	50.89	45.71	42.11	48.22c	87.50	70.00	53.80	50.00	65.34b
Azadirachtin		53.33	45.68	38.10	33.33	42.61c	68.10	55.20	44.30	26.20	48.45c	83.30	73.30	53.80	36.70	61.79b
Dinotefuran		80.00	77.78	50.00	31.25	59.76b	80.90	77.08	60.00	29.24	61.81b	100.0	94.29	82.42	77.14	88.46a
LSD $_{0.05}$ values						**3.76**					**2.71**					**3.99**
Parathion-methyl	2014	81.30	71.90	57.80	43.80	63.67a	85.1	78.20	56.70	41.70	65.43a	100.0	93.75	63.54	59.56	79.21b
Spinosad		40.00	37.00	10.00	10.00	24.25d	64.16	47.67	21.42	8.73	35.50d	100.0	62.50	47.92	26.47	59.22c
Azadirachtin		56.25	47.50	25.00	25.00	38.44c	55.73	53.82	44.83	31.55	46.48c	100.0	66.67	44.44	36.27	61.85c
Dinotefuran		86.36	75.455	38.64	18.18	54.66b	84.80	74.10	47.83	36.10	60.73b	100.0	92.86	76.19	66.39	83.86a
LSD $_{0.05}$ values						**5.80**					**3.98**					**3.99**

Effects of tested compounds on some biological aspects of *S. littoralis*:

The results in Table (5) presented biological effects of tested compounds as field-laboratory technique on cotton leafworm, *S. littoralis* during season of 2014.

Mortality percentages:

The results cleared that the all tested compounds affected the 2nd instar larvae with highly significant variance where the highest mortality percentage of 86.67 % was recorded for parathion-methyl at zero time of treatment, while the lowest mortality percentage of 20.0 % recorded for Diple DF, *Bacillus thuringensis kurstaki* (*Btk*) compound compared with 0.00 % for control. After 7 days dinotefuran recorded zero effect as same as spinosad.

Larval duration:

The all tested compounds affected the 2nd instar larvae duration slightly with insignificant variance where the longest larval duration of 12.25 and 12.21 days was recorded for larvae fed on cotton leaves of parathion-methyl treatment at zero time and 3 days, while the shortest duration of 12.0 days was recorded for spinosad at zero time and *Btk* compound at zero time and 3 days, in compared with 12.98 days for control. At 7 and 10 days, all treatments were shortest larval duration in comparable with control.

Pupation percentage:

The obtained results detected that there is highly significant variance in pupation percentages of tested compounds where, the highest percentages of 100.0 and 100.0 % were recorded for *Btk* at 7 and 10 days, respectively; as same as control. The lowest pupation percentage of 13.33 % was recorded for parathion-methyl treatment at zero time only compared with 100.0 % for control.

Pupal duration:

The resulted data revealed insignificant variance in duration of pupae resulted from treated 2nd instar larvae of tested compounds where the pupal duration was prolonged at the most tested compounds reach to 8.18 days in comparison with control 7.30days, while *Btk* compound was shortened pupal duration to 7 days.

Table 5: Biological effects of some bio and conventional insecticides on cotton leafworm using Field-Laboratory technique during 2014 season.

Tested compounds	Time After Treatment	% Mortality	Larval duration	Pupal duration	% Pupation	Pupal weight (g/pupa)	% Emergence	longevity ♀	longevity ♂	Eggs No./ female
Parathion-methyl	Zero time	86.67	12.25	8.18	13.33	0.2719	75.00	8.17	7.56	581.67
	3 days	63.33	12.21	8.12	36.67	0.2757	81.82	8.32	7.66	840.0
	7 days	30.00	12.57	8.09	70.00	0.2821	90.47	8.46	7.85	1055.0
	10 days	6.67	12.75	8.01	93.33	0.2836	96.43	8.69	7.89	1279.0
Spinosad	Zero time	60.00	12.00	7.73	40.00	0.2835	83.33	8.64	8.11	655.17
	3 days	50.00	12.15	7.61	50.00	0.2850	86.67	8.60	8.32	1053.33
	7 days	10.00	12.33	7.33	90.00	0.2879	92.59	8.75	8.67	1190.0
	10 days	0.00	12.36	7.33	100.0	0.2882	93.33	8.90	8.74	1246.67
Dinotefuran	Zero time	50.00	12.13	7.99	50.00	0.2886	86.67	8.73	8.19	754.17
	3 days	50.00	12.14	7.85	50.00	0.2889	86.67	8.93	8.37	1140.0
	7 days	3.33	12.36	7.51	96.67	0.2899	93.10	9.40	8.56	1328.33
	10 days	0.00	12.42	7.42	100.0	0.2900	96.67	9.61	8.84	1493.33
Bucilus thuringensis kurstaki	Zero time	20.00	12.00	7.00	80.00	0.2976	62.50	8.23	8.10	841.67
	3 days	6.67	12.00	7.00	93.33	0.2985	75.00	8.36	8.17	1038.33
	7 days	0.00	12.20	7.10	100.0	0.2993	83.33	8.46	8.21	1326.67
	10 days	0.00	12.20	7.20	100.0	0.3015	90.00	8.67	8.30	1501.0
control		0.00	12.98	7.30	100.0	0.3189	100.0	10.56	9.13	1670.67
LSD 0.05 values	Zero times	3.72 ***	ns	ns	2.57***	0.01**	3.72 ***	ns	ns	2.69***
	3 days	3.64***	ns	ns	3.64***	0.004***	3.99***	ns	ns	18.82***
	7 days	2.82***	ns	ns	3.26***	0.001***	4.51**	ns	ns	9.17***
	10 days	1.08***	ns	ns	2.82**	0.009*	4.80*	ns	ns	3.64***

Pupal weight:

The lowest pupal weight (highest effect) of 0.2719, 0.2757, 0.2821 and 0.2836 g/pupa were recorded for parathion-methyl treatment at zero time, 3, 7, 10 days, respectively; in comparison with 0.3189 g/pupa for control. The highest pupal weight (lowest effect) of 0.2976 g/pupa was recorded for *Btk* at zero time compared with 0.3189 g/pupa for control.

Emergence percentage:

Highly significant variance was resulted between emergence percentages of treatments along tested period, where the highest effect Emergence percentage recorded as least percentage of 62.50 for *Btk* at zero time in comparable to 100.0 % in control. While the lowest effect recorded as highest percentage of 96.67% in dinotefuran treatment at 10 days in comparable to 100.0 % with control.

Adult longevity period:

The longest longevity period of 9.61 and days recorded for dinotefuran treatment at 10 days in comparison with 10.56 and 9.13 days for control for female and male, respectively. The shortest female longevity period of 8.17and 7.56 day recorded for parathion-methyl treatment at zero time in comparison with 10.56 and 9.13 days for control for female and male, respectively.

Egg numbers/ female:

The highest effect on the eggs numbers was recorded for females emerged from parathion-methyl treatment at zero time, which laid lowest numbers of 581.67 egg/female in comparison with 1670.67 egg/female in control treatment. The lowest effect on the eggs numbers was recorded for females emerged from *Btk* treatment at 10 days, which laid highest numbers of 1501.0egg/female in comparable with 1670.67 egg/female in control treatment.

Generally, the results of tested compounds on inspected cotton leafworm, *S. litoralies* biological aspects revealed highly significant differences between the effects as Table (5) except for larvae, pupae duration and longevity of adults. Also, the results were varied as inspected biological characters and time throughout bioassay period. These results were found in agree with those of Hashem *et al*., 1994 and El-Meniawi (1999) who cleared, the fruit extract of *Melia azedarachta* caused significant abnormalities in the ovaries of the treated group of 4th instar larvae of leafworm and Reduced both fecundity and fertility of the parent, the first generation and life-span of moths and number of normal spermatophores. Van Leeuwen *et al.* (2006) recorded high mortality percentage for spinosad against 3rd instar larvae of the cotton leafworm *S. littoralis* stated

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ARABIC SUMMERY

كفاءة بعض المبيدات الكيماوية والحيوية ضد الافات الثاقبة الماصة ودودة ورق القطن والمفترسات المصاحبة في حقول القطن بمحلفظة الشرقية – مصر

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تم اجراء تجربتين في حقول القطن صنف جيزة ٨٦ في مركز الزقازيق محافظة الشرقية –مصر وذلك خلال موسمي ٢٠١٣ و ٢٠١٤ لتقييم كفاءة بعض المركبات الكيماوية والحيوية ضد بعض افات القطن وتاثيراتها الجانبية علي المفترسات المصاحبة . في التجربة الاولى تم اختبار مركبات البرمبت والاسبينوساد والنيمكس وال ام تي اي ٤٤٦في الحقل فقط ضد الافات الثاقبة الماصة (حشرات المن – الذبابة البيضاء – نطاطات الاوراق – البقة الخضراء والكاروسات) والمفترسات المصاحبة واضيف مركب البكتيري الديبل دي اف بالاضافة للمركبات السابقة ضد دودة ورق القطن . اما في التجربة الثانية فقد تم اختبار كلا من البرمبت والاسبينوساد وال ام تي اي ٤٤ و مركب البكتيري الديبل دي اف بنظام التجارب الحقلية المعملية لتقييم التاثيرات البيولوجية للمركبا المختبرة علي يرقات العمر الثاني لدودة ورق القطن.

اوضحت النتائج للتجربة الحقلية ان كفاءة المركبات المختبرة قد اختلفت تبعا لاختلاف الافة والموسم والوقت بعد التطبيق . وسجل اعلى متوسط عام للتاثير ٨١.٨٥ و ٧٢.٢٦ و ٥٩.٤٦ % خفض في التعداد في القطع التجريبية المعاملة بمركب الداينوتفيوران وذلك علي حشرات المن خلال الموسم الاول والبقة الخضراء خلال الموسم الثاني والاكاروسات خلال الموسم الاول علي الترتيب. وعلي الجانب الاخر فقد سجل اعلى متوسط عام للتاثير ٨٠.٠١ و ٧٤.٨٢ % خفض في التعداد في القطع التجريبية المعاملة بمركب الباراثيون-مثيل علي ذبابة القطن البيضاء ونطاطات الاوراق خلال الموسم الاول علي الترتيب . وفي حالة دودة ورق القطن سجل اعلى متوسط عام للتاثير ٧٥.٩١ % خفض في التعداد في القطع التجريبية المعاملة بمركب الباراثيون-مثيل.

بخصوص التاثيرات الجانبية علي المفترسات المصاحبة لافات القطن نجد ان مركب الداينوتيفيران قد سجل اعلي متوسط تاثير عام للخفض ٦٨.٠٥ و ٨٨.٤٦ % وذلك علي خنافس ابي العيد والعناكب الحقيقية خلال الموسم الثاني من الدراسة علي التوالي . وعلي الجانب الاخر فقد سجل مركب الباراثيون-مثيل اعلي متوسط تاثير عام للخفض ٧٠.٠٣ و ٧١.٨٨ و ٦٥.٤٣ % علي اسد المن والاسكمنس والرواغة خلال الموسم الثاني وسجل ٦٨.١١ % خفض في تعداد الاوريس خلال الموسم الاول علي الترتيب .

اوضحت نتائج التاثيرات البيولوجية للمركبات المختبرة بنظام التجارب الحقلية المعملية وذلك علي يرقات العمر الثاني لدودة ورق القطن ان اعلي متوسط نسبة موت ٨٦.٦٧ % واطول فترة للطور اليرقي ١٢.٢٥ يوم واقل نسبة تعذر ١٣.٣٣ % قد سجلت في المعاملات التي تغذت فيها يرقات العمر الثاني علي اوراق معاملة بمركب الباراثيون-مثيل عند الوقت صفر بعد الرش. كما ادي المركب البكتيري الي قصر مدة طور العذراء فترة عمر الاناث المنبثقة في المعاملة مقارنة بالكنترول والمركبات المختبرة الاخرى .كما سجل اقل وزن عذارى ٠.٢٩٧٦ جرام/ عذراء واقل نسبة خروج للحشرات الكاملة ٦٢.٥٠ % في معاملات المركب البكتيري ايضا عند الوقت صفر من الرش. وفي النهاية وجد ان اقل عدد بيض ٥٨١.٦٧ بيضة/انثى قد سجل للاناث في معاملة مركب الباراثيون-مثيل عند الوقت صفر من الرش ايضا. لذلك يمكن القول بان المركب البكتيري قد سجل تاثير جيد علي الصفات البيولوجية لدودة ورق القطن متبوعا بمركب الباراثيون- مثيل.

الكلمات المفتاحية: افات القطن الثاقبة الماصة ، المبيدات الحشرية ، المبيدات الحيوية ، بيولوجي دودة ورق القطن