

## TOXICITY EVALUATION OF CERTAIN BIO-CHEMICAL INSECTICIDES AND INSECT GROWTH REGULATOR ON COTTON LEAF WORM, *SPODOPTERA LITTORALIS* (BOISD,) AND SOME ASSOCIATED PREDATORS IN MAIZE FIELDS IN BEHIRA GOVERNORATE

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### Abstract

Field experiments were carried out in Etay Elbroud districts, El Behira governorate In summer plantation (mid July) sowing of maize plant throughout (2016/2017) seasons to study the efficacy of insect growth regulator (Nova) biopesticides (Absolute and Diple<sup>2x</sup>) and chemical pesticides (Jito, Coragen and Contradio) against *Spodoptera littoralis* and on some accompanied predators (family *coccinilidae*). The results indicated that the percentage initial effect of the tested compounds reduction of infestation for being (85.1, 77.2, 73.3, 52.7, 50.1 and 39.2%) in the first season (86.2, 73.7, 67.7, 60.00, 49.3 and 46.2%) in the second season for Jito, contrado, Nova, Coragen, Absolute and Diple<sup>2x</sup> respectively. The general mean of residual effect for Jito compound caused the servent effect recorded 88.7 and 88.55% as reduction percentage in both seasons 2016 and 2017, respectively. biopesticides recorded the least effect on predators being 26.6, 26.8 and 23.7% in the first season and also in the second season recorded 35.5 and 33.3% for Nova, Absolute and Diple<sup>x2</sup> respectively while, the chemical pesticides Jito caused the highest mortality against predators.

### INTRODUCTION

Maize is one of the most important grain crop in Egypt and it is considered a basic food for the majority of the Egyptian farmers. It plays, also an important role in several industries important to Egypt economy. The noctuid *Spodoptera littoralis* (Boisd) is a most important polyphagous pest, and it is considered widely distributed all over the world Nasar *et al.* (2010). and Azab *et al.* (2001). This destructive polyphagous pest causing substantial loss of different plants of cotton plantations could result in corn maize yield reduction up to 50% (Russell *et al* 1993). *S.littoralis* (Boisd) is one of the important cotton pests in Egypt (willcocks and Bahgat 1973): *S.littoralis* Larvae can feed on 90% economically important plant species belonging to families and the rate of development has a strong nutrition on all component Brown and Dewhurst (1975). It is considered dangerous pests for cotton plants and other field crops and vegetables. Many studies are focused on the new and untraditional classes of insecticides, which are effective against *S.littoralis* and jubstantially reduce import on humase, domestic animals and natural enemies for example insect growth

regulates (IGRS) plants extracts and bioinsecticide (khedr 2002). The wide and misuse of insecticidal or pesticide chemical compounds resulted in great damage for beneficial insect and bockkeeping all over the world. (Toscana *et al.* 1974). The goal on this study was to evaluate the toxicity and effective reduction percentages of Jito Contrado, Novo, Absolute, Coragen, Diple<sup>2x</sup> on *S.littoralis* and these associated predators in maize fields.

## MATERIALS AND METHODS

### Insecticides:

The Insecticides tested

- 1- Common name: methomyl 1  
Jito 90% sp rate of 300g/f
- 2- Common name : Chlorantraniliprole  
Coragen 20%sc, rate of 600ml/f
- 3- Common name : fipronil  
Contrado 5%wp rate of 400g /f
- 4- Common name : Flufenoxuron  
NOVO 10%DC rate of 200ml/f distributed by solitaire company Egypt.
- 5- Common name : Emamect in benzoate  
Absolute 5% me rate of 75ml/f
- 6- *Bacillus thuringiensis* sub species kurstaki  
Diple<sup>2x</sup> : 6.4% rate of 200g/f

### Field experiments:

Field experiments were carried out of Etay Elbaroud Behira Governorate, Egypt during the two maize seasons 2016 and 2017 experiments area of ½ feddan was divided into seven treatments including the control, replicated three times were randomly distributed over plots the experiments area was cultivated with maize variety Giza 2. Maize plants were sprayed with tested compounds bioinsecticides, IGRs, and conventional insecticides on *S.Littoralis* and some predators *coccinella* spp. Samples of maize plants / replicate was inspected in the field, all instars larvae of *S.Littoralis* and the different stages of *coccinella* spp. Were counted and recorded just before spraying and after 1,3,7 and 10 days for conventional insecticides, after 3,7 and 10 day for IGR and bio insecticides.

The efficacy tested compounds was estimated as reduction percentages of cotton leafworm, *S.Littoralis* and *coccinella* spp. Population according to Henderson and Tilton equation 1955.  $\text{Reduction\%} = 1 - (A/BXC/D) \times 100$

A = NO of alive larvae in the treatment after spraying.

B = NO of alive larvae in the treatment before spraying.

C = NO of alive larvae in the Control before spraying.

D = NO of alive larvae in the Control after spraying.

## RESULTS AND DISCUSSION

### 1- Initial activity of tested insecticides against *Spodoptera littoralis*

**Data in table (1).** The initial effect of the tested compounds, the presented data obvious indicated that Jito was the most potent compound which caused the highest reduction 85.1% followed by 77.2% (after one day) and 73.3% (after 3 days) recorded with Contradio and NOVO, while the moderate reduction were 52.7% (after one day) and 50.1% recorded with Coragen and Absolute compounds. On the contrary, the least effective compound was Diple<sup>2x</sup> recorded 39.2% reduction percentage after 3days.

**In the same table (1)** the result of general mean rate reduction could be arranged descendingly according to than efficacies on Jito (88.7%) Contradio (85.8%) Nova (83.1%) Coragen (75.5%) Absolute (70.3%) Diple<sup>2x</sup> (61.0%) in respectively.

### 2- Field laboratory evaluation of the tested insecticides against *S.littoralis*

Date presented in table (2), clearly indicated that, the initial and residual activity of the tested insecticides and bioinsecticides, against, 4<sup>th</sup> instar larvae of the cotton leafworm, *S.littoralis* the results presented in table (2), indicate that the initial effect of Jito compound recorded 86.2% as the highest reduction followed by 73.7% and 60.0% after one day from treatment, while the bioinsecticides Nova recorded 67.7% as the highest reduction after 3 days from treatment, but the Absolute and Diple<sup>2x</sup> compound recorded the lowest reduction were 49.3 and 46.2% after 3 days from treatment, respectively.

#### Residual effect

Percent of reduction in the rate of *S.littoralis* infestation after seven days of spray recorded the highest (87,86,83.7,78.5,66.1 and 61.5) for Jito, Contradio, Nova, Coragen, Absolute and Diple<sup>2x</sup> respectively. Table (2).

Table 1. Reduction Percentage of tested Compounds against cotton leafworm, *S.littoralis* in maize fields during 2016 season.

Treatments		Precount	Initial		Residual			General mean	
			1 day	3 days	7days	10 days	mean		
Jito	No	133	21	52	14	9	93.6	88.7	
	Red %		85.1	82.4	92	95.3			
Cantradio	No	129	31	28	13	11	93.2	85.82	
	Red %		77.2	79.7	92.4	94			
Coragen	No	125	62	43	18	13	90.80	75.5	
	Red %		52.7	67.7	89	92.7			
Nova	No	139		39	22	19	88	83.1	
	Red %			73.3	86.4	89.6			
Absoluto	No	137		72	39	26	80.5	70.36	
	Red %			50.1	75.5	85.5			
Dipel <sup>2x</sup>	No	120		77	47	35	72	61.06	
	Red %			39.2	66.3	77.7			
Control	No	127	133	135	147	165			

Table 2. Reduction Percentage of tested Compounds against cotton leafworm, *S.littoralis* in maize fields during the second season 2017.

Treatments		Precount	Initial		Residual			General mean	
			1 day	3 days	7days	10 days	mean		
Jito	No	129	19	17	22	14	89.9	88.55	
	Red %		86.2	88.2	87	92.8			
Cantradio	No	136	38	36	25	16	89.1	82.02	
	Red %		73.7	76.2	86	92.2			
Coragen	No	153	65	63	43	33	82.05	71.75	
	Red %		60	62.9	78.5	85.6			
Nova	No	143		49	29	23	85.75	79.73	
	Red %			67.7	83.7	87.8			
Absoluto	No	147		79	62	51	69.8	62.96	
	Red %			49.3	66.1	73.5			
Dipel <sup>2x</sup>	No	163		93	78	57	67.4	60.33	
	Red %			46.2	61.5	73.3			
Control	No	122	129	138	151	159			

### **After 10 days**

It is obvious that from the results obtained presented in table (2) that the reduction percentages in of *S.littoralis* infestation due to treatment of the tested compounds, Diple<sup>2x</sup> Absolute, Coragen, Nova, Contradio and Jito recorded 73.3, 73.5, 85.6, 87.8, 92.2 and 92.8% respectively . the general mean rate of reduction in the *S.littoralis* as resulted to Jito, Contradio, Nova, Coragen, Absolute and Diple<sup>2x</sup> applied recorded (88.5, 82.0 , 79.7, 62.9 and 60.3 respectively. Bieicher *et al*, (1990) found that selective insecticides (Dimilin at 13 159 trichlorfen at 138 1789 endosuffan at 394g and *B. thuringiensis* at 14- 21g/ha) were as effective as non- selectve (parathion methyl at 187g/h and showed abetter residual effect than the standard insecticide, these results in are agreement with salama and salem (1999) who found that the mortality of *S.littoralis* larvae resulted BT. Diple<sup>2x</sup> was varied between 36.9- 67.2% in soya been field. date in tables (3) showed the initial and residual effects of Jito, Contradio, Nova, Coragen, Abslut, and Diple against the common *coccinilidae* the given initial effect of terato pesticides was 40.42, 35.5, 45.4, 34.3 and 33.3 in respectively. Initial and residual activity of tested compounds against associated predators family: coccinilidae spp): 1. throughout 2016 seasons.

**Data in table (3)** showed the initial and residual effects of Jito, Contradio, Nova, Coragen, Absolute and Diple against the common *Coccinilidae*

#### **A: Initial effect (after 1 day)**

The results indicated that the initial effect of the chemical compounds expressed as the reduction percentage of infestation recorded 33.2, 43 and 25.1% in the first season 2016 for Jito, Contradio and Coragen respectively.

#### **A.2 Bioinsecticides and IGR**

##### **B: Initial effect (after 3 days) :**

The result indicated that the initial effect of the bio insecticide compounds expressed as the reduction percentage of infestation recorded 26.6, 26.8 and 23.7 in the first season 2016 for Nova, Absolute and Diple<sup>2x</sup> respectively.

#### **C. Residual effect**

##### **1- Chemical pesticides**

The results in Table (3) indicated that the chemical *contradio* and pesticides Jito caused the highest reduction percentage of coccinilidae predators being (74.5 and 77.6%) after 7 days and 10 days respectively. As general mean of residual 60.37%

Table 3. the mean numbers of *Conccinilidae* SPP before and after treatment with different in maize field during 2016 season at Etay El-baroud districts, El-Rehira Governorate.

Treatments		Precount	Initial		Residual			General mean	
			1 day	3 days	7days	10 days	mean		
Jito	No	39	28	23	15	13	73.9	59.3	
	Red %		33.2	56.3	70.2	77.6			
Cantradio	No	36	22	18	12	11	75	60.37	
	Red %		43	48.5	74.5	75.5			
Coragen	No	29	23	20	13	10	69.95	51.2	
	Red %		25.1	39.8	65.2	74.7			
Nova	No	33		26	14	10	70.85	56.1	
	Red %			26.6	65.2	76.5			
Absoluto	No	42		33	27	25	50.5	42.6	
	Red %			26.8	47.2	53.8			
Dipel <sup>2x</sup>	No	44		36	31	29	45.25	38.06	
	Red %			23.7	42.1	48.4			
Control	No	42	45	45	51	54			

Reduction. The chemical pesticides compound followed it Jito and Coragen as general mean of residual effect 59.3 and 51.2% reduction respectively.

### **C.2. Bio insecticides and IGR**

The results in table (3) indicated that the bio insecticides Nova caused the highest reduction percentage of *Coccinilidae* predators being 65.2 and 76.5 after 7 and 10 days respectively. As general mean of residual effect 56.1% reduction the Bio insecticides compound followed it absolute and Diple<sup>2x</sup> as general mean of residual effect 42.6 and 38.06% reduction respectively.

#### **4.2.1.1 Chemical pesticides**

##### **A. Initial effect (after 1 day)**

The results indicated that the initial effect of the chemical compounds expressed as the reduction percentage of infestation recorded 40, 42 and 45.4% in the second season 2017 for Jito, Contradio and Coragen respectively.

#### **4.1.2 Bio insecticides and IGR**

##### **B: Initial effect (after 3 days):**

The results indicated that initial effect of the bioinsecticides compounds expressed as reduction percentage of infestation recorded 35.5, 34.3 and 33.3 in the second season 2017 for Nova, Absolute and Diple<sup>2x</sup> respectively.

##### **C: Residual effect**

#### **C1: Chemical pesticides**

The result in table (4) indicated that the chemical pesticides Coragen caused the highest reduction percentage of *Coccinilidae* predators being (69.2 and 78.3) after 7 and 10 days respectively, as general mean of residual 61.90% reduction. The chemical pesticides compound followed it (Jito and Contradio) as general mean of residual effect 57.6 and 58.02% reduction respectively.

### **C.2. Bio insecticides and IGR**

The results in table (4) indicated that the bioinsecticides (Nova) caused the highest reduction percentage of *Coccinilidae* predators being 58.1 and 72 after 7 and 10 days respectively as general mean of residual effect 55.2% reduction the bioinsecticides compound followed it Absolute and Diple<sup>2x</sup> as general mean of residual effect 45.8 and 45.1% reduction respectively.



Table 4. the mean numbers of *Conccinilidae* SPP before and after treatment with different in maize field during 2017 season at Etay El-baroud districts, El-Rehira Governorate.

Treatments		Precount	Initial		Residual			General mean	
			1 day	3 days	7days	10 days	mean		
Jito	No	43	27	22	18	15	68.7	57.62	
	Red %		40	53.1	63.9	73.5			
Cantradio	No	35	22	18	14	13	68.6	58.02	
	Red %		42	52.9	65.4	71.8			
Coragen	No	42	24	22	15	12	73.75	61.97	
	Red %		45.4	55	69.2	78.3			
Nova	No	37		25	19	12	65.05	55.2	
	Red %			35.5	58.1	72			
Absoluto	No	39		28	24	21	51.6	45.83	
	Red %			34.3	49.7	53.5			
Dipel <sup>2x</sup>	No	48		33	29	27	51	45.1	
	Red %			33.3	50.6	51.4			
Control	No	45	47	49	55	52			

As for the residual effect, on pesticides recorded 57.6, 58.0, 61.9, 55.2, 45.8 and 45.1 in while the table (4) as for the residual effect of pesticides on *Coccinilidae* spp. 33.2, 43, 26.6, 25.1, 26.8 and 23.7 as for the residual effects on pesticides on pesticides recorded 57.9, 64, 59.5, 52.4, 46.4 and 24.1 in respectively. And reev and Atansova (2005). the toxicity of chlorpyrifos methyl, to predatory ladybird was highly toxic to ladybird adults. The results are in agreement with those obtained by salam et. Al (1990) and salam. (1991) who found that, plant feeding stimulants, host plant extracts leaf powders or oils and potassium carbonate proved sever as adjuvant (surfactants) and increased the effectiveness of *B.thuringiensis* against *S.littoralis* in the field moreover, salama (1991) reported that the higher concentration of petroleum ether extract of maize and cotton leaves increased the effectiveness of *B.thuringiensis* against *S.littoralis* than other surfactants in the field.

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## تقييم سمية بعض المبيدات الحيوية الكيميائية ومنظم النمو الحشري على دودة ورق القطن وعلى بعض المفترسات المرتبطة بها في حقول الذرة بمحافظة البحيرة

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معهد بحوث وقاية النباتات - دقي - جيزة - مصر.

أجريت هذه التجارب الحقلية بمحافظة البحيرة بمنطقة إيتاي البارود خلال الموسم الصيفي لمحصول الذرة الشامية منتصف يونية. خلال عامي 2016، 2017 لدارسة كفاءة بعض المبيدات الحيوية مثل (أبسليوت ودابيل x2)، والمبيدات الكيماوية مثل (جيتو، كونترادو، كوراجن) ومنظم النمو الحشري مثل (نوفو) على دودة ورق القطن وبعض المفترسات المصاحبة لها. وأشارت النتائج إلى أن التأثير الأولي للمركبات المختبرة معدل النسبة المئوية لنقص الإصابة كانت 85.1، 85.1، 77.2، 73.3، 52.7، 50.1، 39.2 في الموسم الأول خلال عام 2016. وكانت 86.2، 73.7، 67.6، 60.0، 49.3، 26.20% في الموسم الثاني 2017 للمعاملات الأتية جيتو، كونترادو، كوراجن، نوفو، أبسليوت ودابيل x2 على الترتيب. وبلغ المتوسط العام للإصابة بالموسمين أشارت إلى أن جيتو (المبيد الكيماوي) حقق أعلى تأثير في موسم 2016 (89%) كنسبة نقص للإصابة أيضاً أشارت النتائج إلى أن التأثير الأولي للمبيدات الكيماوية (كوراجن) حقق نسبة خفض للإصابة بدودة ورق القطن بلغ 52.7% في الموسم الأول بينما بلغت نسبة الخفض 65% في الموسم الثاني بلغت نسبة الخفض في المتوسط العام للإصابة للموسمين (86.5%) للإصابة بدودة ورق القطن موسم 2017. بينما سجلت المبيدات الحيوية أقل تأثير على المفترسات المصاحبة وبلغت 26.6، 26.3، 23.7، موسم 2016 وكانت 35.5، 45.4، 33.3 موسم 2017 للمبيدات الأتية على الترتيب نوفو، أبسليوت، دابيل x2 على الترتيب بينما حقق المركب الكيماوي جيتو أعلى متوسط و فرق معنوي متبقي للعامين بينما المبيد الحيوي دابيل x2 حقق أقل نسبة موت على المفترسات المصاحبة.