

## EVALUATION OF THE EFFECTIVENESS OF SOME COMPOUNDS ON THE PINK AND SPINY BOLLWORMS IN COTTON FIELDS

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### ABSTRACT

Experiments were conducted in cotton fields in the village of Bahr El-Baker, Sharkia Governorate during 2011 and 2012 cotton seasons to study the effect of Indoxacarb 105ml, Methomyl 300g and Spinosad at rates 50,75 and 100 ml/feddan"} on the pink and spiny bollworms. Results showed that Methomyl caused the highest reduction percentage on the pink bollworm 70.24%, followed by Spinosad 100,75 and 50ml with 57.01, 47.56 and 41.36%, respectively, during the two seasons. The least reduction percentage was 31.69% in Indoxacarb. The results, also indicated that Spinosad at rate 100 ml/ feddan caused the highest reduction percentage in the spiny bollworm where it was 69.50%, followed by Spinosad 75ml then Methomyl and Spinosad 50 ml where it was 58.99, 51.03 and 50.91%, respectively. Indoxacarb recorded the lowest reduction percentage 30.96%. Methomyl caused highest reduction percentage for the pink and spiny bollworms where it was 66.04%, followed by Spinosad 100,75 and 50 ml which recorded 61.95, 50.90 and 44.65%, respectively. Indoxacarb recorded the lowest reduction percentage 25.61%.

**Keywords:** Indoxacarb, Methomyl, Spinosad , pesticide, pink bollworm and spiny bollworm

### INTRODUCTION

In Egypt, cotton is one of the most important cash crops and represents more than half the income of two million small-scale farmers. Cotton is attacked by many insect species. Cotton bollworms are the most destructive pests infesting cotton plants. The pink bollworm (PBW), *Pectinophora gossypiella* (Saund.) and the spiny bollworm (SBW), *Earias insulana* (Boisd.) infest many cotton producing areas of the world and cause a severe reduction in cotton yield and quality (Lohag and Nahyoon, 1995). Chemical control is still adopted as one of the major techniques for combating these serious pests. Bollworms cause about 30 to 40% losses of yield of seed cotton [Haque 1991]. The larvae of *Earias* spp. attack terminal bud of main stem, flower buds and bolls [Munro 1987]. To overcome the losses and to increase the yield, pesticides application is the most important. Previous investigation about the evaluation of different insecticides for the control of cotton bollworms were conducted by Patil, *et al.* (1990). It is important to compare the efficacy of insecticides against pests for effective pest management and to reduce the indiscriminate use of insecticides. Yousif-Khalil, *et al.* (2008) recorded relative effectiveness of Spinosad against the pink bollworm *P. gossypiella*. The seasonal average reductions attained 63.62 and 57.76 % in 2004 and 2005 cotton seasons, respectively.

Thus, the present study was conducted to evaluate Methomyl, Indoxacarb and Spinosad for their efficacy against bollworms complex..

## MATERIALS AND METHODS

### 1. Experimental design:

The experimental area (three feddan) was divided into five treatments and untreated check during 2011 and 2012 cotton seasons at Bahr-El-Baker, Sharkia. The treatments were divided into four replicates and it were arranged in a complete randomized block design. Two sprays were applied at two weeks intervals for Indoxacarb, Methomyl and Spinosad using dorsal solo motor, 20 litter in capacity and started at 3% infestation of green cotton bolls. The two sprays of the insecticides were applied against the pink bollworm (*P. gossypiella*) and spiny bollworm (*E. insulana*) on cotton fields at 1<sup>st</sup> and 15<sup>th</sup> of August during 2011 season and the two sprayers were applied at 4<sup>th</sup> and 18<sup>th</sup> of August during 2012 season.

### 1.2. Sampling techniques:

Weekly samples of 100 green cotton bolls were collected (25 bolls from each replicate). The number of pink and spiny bollworms were counted by externally and internally inspected. Samples were collected directly before spraying and then after one and two weeks. The reduction percentages of the pink and spiny bollworms were counted according to Henderson and Tilton (1955).

### 1. 3. Insecticides used:

a-Indoxacarb, (Steward 15 % EC), used at rate of 105ml /fed.

b- Methomyl , (Lannate,90 % SP), used at rate of 300g/fed.

c-Spintor, (Spinosad , 24 % SC) used at rates of 50,75 and 100ml/fed.).

## RESULTS AND DISCUSSION

### Effectiveness of the tested compounds against cotton bollworms:

#### 1-Effect on the pink bollworm:

Data in Table (1) showed that the reduction percentages in the number of the pink bollworm larvae were differed due to the tested insecticides. All tested insecticides increased the reduction percentages of the bollworms larvae with repeating the application every two weeks, the mean average reduction of the first and second spray recorded ;(37.50 and 26.43 %) for Indoxacarb; (63.86 and 80.81 %) for Methomyl and (42.71 and 52.68 %) and (50.52 and 58.17%) and (63.31 and 67.51 %) for Spinosad 50,75 and 100ml/feddan, respectively after the 1<sup>st</sup> and 2<sup>nd</sup> interval time of applications in season 2011. While they were (36.48 and 26.36%) for Indoxacarb; (67.04 and 69.28%) for Methomyl and (39.36 and 30.72 %); (44.53 and 37.04 %) and (51.55 and 45.68 %) for Spinosad at 50,75 and 100ml/fed., respectively in season 2012.

Insecticides	Season	Rate/f.	% reduction	%
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			1 <sup>st</sup> spray			2 <sup>nd</sup> spray			Season mean/weeks	
			1 <sup>st</sup> week	2 <sup>nd</sup> week	Mean	1 <sup>st</sup> week	2 <sup>nd</sup> week	Mean		
Indoxcarb	2011	105ml	31.25	43.75	37.50	23.53	29.33	26.43	31.96	31.69
	2012		37.93	35.03	36.48	36.66	16.06	26.36	31.42	
Methomyl	2011	300g	62.89	64.84	63.86	81.62	80.00	80.81	72.33	70.24
	2012		61.06	73.01	67.04	66.09	71.58	69.28	68.16	
Spinosad	2011	50 ml	51.39	23.61	42.71	47.71	51.11	52.68	47.69	41.36
	2012		46.69	31.93	39.36	11.52	49.51	30.72	35.04	
	2011	75 ml	63.54	37.50	50.52	60.78	55.56	58.17	54.34	47.56
	2012		49.22	39.84	44.53	20.82	53.25	37.04	40.78	
	2011	100 ml	75.54	51.08	63.31	74.43	60.58	67.51	65.41	57.01
	2012		56.03	47.06	51.55	32.26	59.09	45.68	48.61	

**Table (1): Reduction percentages of the pink bollworm larvae after treated with different insecticides during 2011 and 2012 seasons.**

The highest reduction percentage of season mean/weeks in the two experimental seasons were obtained with Methomyl which recorded (72.33 and 68.16%) in the two seasons, respectively followed by Spinosad 100ml which recorded 65.41% in season 2011, but the lowest reductions were recorded 31.96 and 31.42% with Indoxcarb during the two seasons.

Considering the general mean of the two seasons showed that the highest reduction percentages were 70.24 % for Methomyl followed by 57.01 % reduction for Spinosad 100ml. The lowest reduction percentage recorded 31.69, 41.36 and 47.56 % for Indoxcarb, Spinosad 50ml and Spinosad 75ml, respectively.

**2-Effect on the spiny bollworm:**

Data in Table (2) showed that the reduction percentages in the number of Spiny bollworm larvae were different due to the tested insecticides. All tested insecticides increased the reduction of bollworm larvae with repeating the application every two weeks, recorded (40.50 and 26.67 %) for Indoxcarb; (66.84 and 56.00%) for Methomyl and (64.14 and 49.68%); (66.38 and 67.41 %) and (80.22 and 78.28 %) for Spinosad 50, 75 and 100ml/fed., respectively, after the 1<sup>st</sup> and 2<sup>nd</sup> interval time of applications in season 2011. While they were (31.50 and 26.19%) for Indoxcarb; (26.87 and 54.41%) for Methomyl and (46.75 and 43.10 %); (52.50 and 49.71%) and (59.57 and 59.94%) for Spinosad 50, 75 and 100ml/fed., respectively, in season 2012.

The highest reduction of season mean/weeks in the two experimental seasons were obtained with Spinosad 100ml (79.25 % ) and Spinosad 75ml (66.89%) followed by Methomyl which recorded 61.42% in season 2011. The lowest season mean/weeks were 33.58 and 28.34 % for Indoxcarb during seasons 2011 and 2012, respectively.

Generally, results showed that the highest reduction percentages were obtained with Spinosad (100 and 75 ml/f.) and Methomyl which recorded (69.50, 58.99 and 51.03%) during the two seasons, followed by Spinosad 50 ml/f. which recorded 50.91%, Meanwhile the lowest means were obtained with Indoxcarb which recorded 30.96%.

**Table (2): Reduction percentages of the spiny bollworm larvae after treated with different insecticides during 2011 and 2012 seasons.**

Insecticides	Season	Rate/f.	% reduction							% seasonal reduction
			1 <sup>st</sup> spray		Mean	2 <sup>nd</sup> spray		Mean	Season mean/ weeks	
			1 <sup>st</sup> week	2 <sup>nd</sup> week		1 <sup>st</sup> week	2 <sup>nd</sup> week			
Indoxcarb	2011	105 ml	47.62	25.56	40.50	33.65	19.68	26.67	33.58	30.96
	2012		35.00	28.00	31.50	25.11	27.27	26.19	28.34	
Methomyl	2011	300 g	80.00	53.68	66.84	60.89	51.11	56.00	61.42	51.03
	2012		43.75	10.00	26.87	48.94	59.89	54.41	40.64	
Spinosad	2011	50 ml	72.55	55.73	64.14	48.24	51.11	49.68	56.91	50.91
	2012		47.50	46.00	46.75	43.83	42.37	43.10	44.92	
	2011	75ml	77.78	54.97	66.38	67.41	67.41	67.41	66.89	58.99
	2012		53.57	51.43	52.50	51.37	48.05	49.71	51.10	
	2011	100ml	92.59	67.84	80.22	89.14	67.41	78.28	79.25	69.50
	2012		60.87	58.26	59.57	57.82	62.06	59.94	59.75	

**3-Effect on the pink and spiny bollworms:**

Data in Table (3) showed that the reduction percentages in the number of pink and spiny bollworms larvae differed according to the tested insecticides. All tested insecticides increased the reduction percentages of bollworm larvae with repeating the application every two weeks, recorded (37.82 and 25.71 %) for Indoxcarb; (64.51 and 74.45%) for Methomyl and (50.62 and 49.18%); (55.18 and 57.88%) and (70.84 and 71.29%) for Spinosad (50,75 and 100ml), respectively. after the 1<sup>st</sup> and 2<sup>nd</sup> interval time of applications in season 2011, while they were (26.09 and 12.85%) for Indoxcarb; (62.15 and 63.08 %) for Methomyl and (41.99 and 36.83%); (47.46 and 43.08%) and (54.61 and 51.10%) for Spinosad, 50,75 and 100 ml/F., respectively in season 2012.

The highest reduction of season mean/weeks in the two experimental seasons were obtained with Spinosad 100ml and Methomyl, during 2011 season which recorded 71.06 and 69.48% followed by Methomyl in 2012 recorded 62.61 %, while the lowest reduction were recorded for Indoxcarb (31.76 and 19.47%) in seasons 2012 and 2011, respectively.

Generally, results showed that the highest reduction percentages in the two experimental seasons were obtained with Methomyl and Spinosad 100 ml which recorded 66.04 and 61.95% reduction, respectively. The lowest reduction was obtained with Indoxcarb which recorded 25.61%.

**Table (3): Reduction percentages of the pink and spiny bollworms larvae after treated with different insecticides during 2011 and 2012 seasons.**

Insecticides	Season	Rate/	% reduction						
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			1 <sup>st</sup> Spray		Mean	2 <sup>nd</sup> Spray		Mean	Season mean/ weeks	% seasonal reduction	
			1 <sup>st</sup> week	2 <sup>nd</sup> week		1 <sup>st</sup> week	2 <sup>nd</sup> Week				
			<b>Indoxcarb</b>	2011		105ml	39.17				36.47
	2012	27.43	24.84	26.09	24.32		1.37	12.85	19.47		
<b>Methomyl</b>	2011	300g	66.15	62.86	64.51	77.22	71.67	74.45	69.48	66.04	
	2012		63.93	60.36	62.15	64.96	61.20	63.08	62.61		
<b>Spinosad</b>	2011	50ml	61.23	40.00	50.62	48.35	50.00	49.18	49.90	44.65	
			2012	46.26	37.71	41.99	29.08	44.58	36.83		39.41
		2011	75ml	66.71	43.64	55.18	64.56	51.22	57.88	56.53	50.90
		2012		50.36	44.56	47.46	37.39	48.76	43.08	45.27	
		2011	100ml	82.66	59.02	70.84	81.85	60.73	71.29	71.06	61.95
	2012	57.52		51.69	54.61	46.15	56.05	51.10	52.85		

These results are in accordance with those obtained by many authors; Donald, *et al.* (2000) showed that control of *Heliothis* cotton pests using Indoxcarb and Spinosad alone, appear to have great promise as effective control measures. Brickle, *et al.* (2001) evaluated Spinosad and thiodicarb against *Helicoverpa zea*. Data indicated that reduced rates of Spinosad and thiodicarb could be used for control of *H. zea*. Aslam, *et al.* (2004) found that Tracer 24% SC (Spinosad) was most effective up to 7 days and caused 59.60 and 76.47% mortality after 3 and 7 days from treated American bollworm larvae, while thiodicarb (Larvin 80DF) attained 77.33% mortality in ABW larvae after 7 days from treated larvae. Tariq, *et al.* (2005) found that Tracer 24% SC was the most toxic insecticide effect for the control of *H. armigera* in the cotton field. Dhawan, *et al.* (2006) stated that the effect of both Spinosad 45 SC (Spinosyn A 50% minimum and Spinosyne D50% maximum) at 50, 75 and 100g a.i./ha, and Indoxcarb (Avant 14.5 SC at 75g a.i./ha) resulted in lower pink and spiny bollworms incidence on intact and shed fruiting bodies. Achalek, *et al.* (2009) they found that Spinosad biocide were the most toxic compound against *Earias* spp. While Indoxcarb and leueneron were less effective in controlling *Helicoverpa armigera* in the cotton fields. Sheeba (2010) field conducted to evaluate the efficacy of abamectin 1.9 EC / 22.5 comparing with Spinosad 45 SC against cotton bollworms at different concentrations. Results clearly showed that abamectin 1.9 EC / 22.5 and 18.5g a / ha<sup>-1</sup> was found to be more effective in controlling cotton bollworms. The order of relative efficacy was abamectin 1.9 EC / 22.5 > 18.5 > Spinosad 45 SC / 75g a i ha. Patil, *et al.* (2011) evaluated the effect of indoxcarb 14.5 SC against cotton bollworm complex. Found the compound to be effective in reducing the bollworm infestation. Zidan, *et al.* (2012) found that the Methomyl insecticide caused 68.92% reduction on the pink bollworm which infested cotton.

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تقييم فعالية بعض المركبات على دودتي اللوز القرنفلية والشوكية في حقول القطن  
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أجريت التجارب في حقول القطن في قرية بحر البقر -محافظة الشرقية خلال موسمي 2011 و 2012 لدراسة تأثير المركبات الآتية (أندوكسيكارب بمعدل 105مللى /فدان ،ميثيوميل بمعدل 300 جرام/فدان،سبينوساد "بمعدلات 50،75،100مللى/فدان") على دودتي اللوز القرنفلية والشوكية.أوضحت النتائج أن مبيد الميثوميل سبب اعلي نسبة خفض لدودة اللوز القرنفلية حيث كان 70.24 % يليه مبيد سبينوساد 75،100 و 50 مللي سجل (57.01، 47.56 و 41.36 % على التوالي خلال الموسمين ، كان اقل نسبة خفض لمبيد أندوكسيكارب 31.69%). أشارت النتائج أن مبيد سبينوساد 100مللى/فدان سبب أعلى نسبة خفض لدودة اللوز الشوكية حيث كان 69.50 % ، يليه سبينوساد 75 مللي ثم الميثوميل وسبينوساد 50 مللي حيث كانت 58.99، 51.03 و 50.91 % على التوالي .وسجل مبيد أندوكسيكارب أقل نسبة خفض 30.96%.  
أوضحت النتائج أن مبيد الميثوميل سبب اعلي نسبة خفض لدودتي اللوز القرنفلية والشوكية حيث كانت 66.04 % يليه مبيد سبينوساد 100 ، 75 و 50 مللى/فدان سجل 61.95، 50.90 و 44.65% على التوالي. سجل مبيد أندوكسيكارب اقل نسبة خفض 25.61%.

قام بتحكيم البحث

كلية الزراعة – جامعة المنصورة  
مركز البحوث الزراعيه

أ.د / سلوى السعيد نجم  
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