

Effect of the Bio-insecticide, Bio-gard (*Bacillus thuringiensis*) and the Insecticide Agrothweet on *Palpita unionalis* Hb. (Lepidoptera: Pyralidae) at Olive Groves in Rafah Region, North Sinai, Egypt

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ABSTRACT

A study to evaluate the efficacy of the bio-insecticide, Bio-Gard (*Bacillus thuringiensis*) and the insecticide Agrothweet, on *Palpita unionalis* Hb. was carried out in olive groves at Rafah region, North Sinai Governorate, Egypt for two seasons; 2005 and 2006. In season 2005 when the Bio-Gard (B.t.) was used, percentage of infestation varied from 3.94 to 53.6%, with an average of 26.43 % and a percent of reduction reached 47.07%. When the Agrothweet was used, percentage of infestation varied from 8.68 to 39.54%, with an average of 20.86% and a percent of reduction reached 64.07%. In season 2006, percentage of infestation in case of B.t. varied from 5.1 to 57.69%, with an average of 27.35% and a percent of reduction reached 47.28% while in case of the insecticide, it varied from 8 to 33.92%, with an average of 15.96%.

Key Words: *Palpita unionalis*, Olive groves, Bio-insecticide. Insecticide, Egypt.

INTRODUCTION

In Egypt, successful efforts have been made to increase the growing areas of olive, especially in the newly reclaimed areas, particularly in Western desert, Oases and in several Governorates. The olive leaf moth, *Palpita unionalis* Hb. (Lepidoptera: Pyralidae) has been recorded as one of the major olive pests in Egypt. In nurseries, larvae may devour both young leaves and apical buds causing "stunt growth" of the infested seedlings. In permanent orchards, attacked flower buds drop before setting, fruits are also liable to be attacked. Many trials in several countries used chemical and bio-insecticides (*Bacillus thuringiensis*) against *P. unionalis* to reduce larval population of the pest (Eid, 2003). The olive moth, *Prays oleae* (Bern.), and the jasmine moth, *P. unionalis* (Hubner), are serious pests in modern olive plantations in Egypt, causing significant yield loss by fruit fall as well as by damage on leaves, flowers and fruits (El-Kifl *et al.*, 1974 and Hegazi *et al.*, 2007. Nasr *et al.*, (2002) isolated *B. thuringiensis* from the larvae of both *P. unionalis* and *P. oleae*, at Giza and Borg El-Arab, Alexandria, Egypt. Foda *et al.* (1976) used sprays of insecticides for the control of *P. unionalis*. El-Hakim and Hanna (1982) and Ghoniemy *et al.* (1998) used *B. thuringiensis* biocides against *P. unionalis*. They found that the percentage of egg hatching was slightly affected by the egg treatment, while the resultant larvae were strongly affected. In Italy, Triggiani (1971); Pinto and Salerno (1995) and Mori (1995) found that *P. unionalis* caused considerable damage to olive in the region of Puglia in Italy, especially near Toronto, and Sicily, destroying the

leaves on newly planted young trees in nurseries, also new plantations and on the suckers of old trees. Albanese *et al.* (2000) evaluated efficacy of *B. thuringiensis* subsp. *kurstaki* against *P. unionalis* compared with azinphos-methyl and hexaflumuron, and found that *B. thuringiensis* reduced the population of *P. unionalis* larvae on shoots, and was more effective if applied twice, and sprayings are spaced at 7-10 days. In Greece, Vassilaina and Santorini (1973) recorded that *P. unionalis* is a pest of olive and jasmine (*Jasminum* sp.) in Greece, feeding on the leaves of the young growths, and has also been reported from several tropical and subtropical parts of Asia, Africa, Europe and Australia.

The aim of the present work is to evaluate the efficacy of the bio-insecticide, Bio-Gard (*Bacillus thuringiensis*) and the insecticide Agrothweet against the olive leaf moth, *Palpita unionalis* Hb.

MATERIALS AND METHODES

Field trials were carried out during the two successive seasons 2005 and 2006 in olive groves at Rafah region, North Sinai Governorate. Part of the grove was divided into two plots both were divided to long sections, every section contained three lines, and every line contained ten olive trees. Each plot was considered as a treatment. The remaining part of the grove was used as control. One treatment was sprayed with the bio-insecticide, Bio-Gard (*B. thuringiensis* *kurstaki*) and the other was sprayed with the insecticide, Agrothweet 40% EC. Sampling

was taken from the two treatments at weekly intervals.

Tested Materials:

1- Agrothweet 40% EC O, O Dimethyl- (S-methylcarbamotmethyl) Phosphorothoate. Active material: Dimethoate 400 gr.a.i./ L. The production produced by Agrochem. The product was used at a rate of 150 ml / 100 L water.

2- Bio- Gard 20 million I.U.'s/g.

The product is based on *B. thuringiensis kurstaki* bacteria. It was produced by Bio, Egypt. The product was used at a rate of 500g/100 L water.

Percentage of infestation:

At the beginning of the season, weekly ten olive trees were randomly chosen from each treatment and control. Four newly branches were chosen randomly from each sample tree, one from each direction to estimate the number of infested leaves. The number of infested leaves related to the whole number of leaves in the four branches was used to estimate percentages of infestation in the bio-insecticide, the chemical insecticide treatment and control. Average percentage of infestation was estimated by applying the following formula:

$$\% \text{ Infestation} = \frac{\text{No. of infested leaves}}{\text{Total no. of examined leaves}} \times 100$$

$$\% \text{ Percentage of reduction} = \frac{A - B}{A} \times 100$$

A= No. of infested leaves in control.

B= No. of infested leaves in treatment.

It is noteworthy to mention that Agrothweet spray delayed to 16/6/2005 due to the delay of receiving the product therefore, no data could be recorded.

RESULTS AND DISCUSSION

Percentage of infestation:

In season 2005, percentage of infestation ranged between 3.94 and 53.6 %, with an average of 26.43% and a percent of reduction reached 47.07%. Infestation with *P. unionalis* showed six peaks; the 1st (11.77%) occurred on April 17, the 2nd (11.30%) on May 4, the 3th (44.55%) on June 13, the 4th (53.6%) on July 14, the 5th (43.3%) on August 11, and the 6th (17.54%) on August 28, when the bio-insecticide, Bio-Gard was used. In case of the Agrothweet, the infestation percentages ranged between 8.68 and 39.54%, with an average

of 20.86%, and a percent of reduction reached 69.24%. Infestation with *P. unionalis* showed four peaks; the 1st peak (38.37%) on July 14, the 2nd (33.91%) on August 11, the 3rd (25.42%) on August 25 and the 4th (30.56%) on October 5, In the control area, the percentage of infestation ranged between 23.88 and 72.22 %, with an average of 49.01%. The number of peaks showed eight peaks; 63.08 , 72.22 , 63.39 , 71.55, 70.61 , 70.83, 48.34 and 45.37% on the dates of May, 11th, June, 8th, June, 22nd, July, 6th, July, 22nd, August, 10th, September, 7th and September 21st, respectively (Table 1).

In season 2006, the percentage of infestation ranged between 5.1 and 57.69%, with an average of 27.35%, and a percent of reduction reached 47.28%. Infestation with *P. unionalis* showed five peaks; the 1st peak (8.33%) occurred on April 20th, the 2nd (52.70%) on June 15th, the 3th (57.69%) on July 13th, the 4th (40.94%) on August 10th and the 5th (25.42%) on September 7th, when the bio-insecticide, Bio-Gard was used. In case of the Agrothweet, the infestation percentages ranged between 8 and 33.92%, with an average of 15.33%, and a percent of reduction reached 66.96%. Infestation with *P. unionalis* showed five peaks; the 1st peak (10.56%) occurred on May 11th, the 2nd (33.92%) on June 8th, the 3rd (30.25%) on July 13th, the 4th (28.38%) on August 10th and the 5th (17.37%) on August 31st, In the control area, the percentage of infestation ranged between 20.40 and 71.55%, with an average of 46.12%. The number of peaks showed four peaks; the 1st peak (58.65%) occurred on June 1st, the 2nd (71.55%) on June 29th, the 3rd (59.87%) on July 27th and the 4th (47.24%) on August 27th (Table 2).

Field observations showed that some predatory species such as, *Chrysoperla carnea* Steph. and *Coccinella septempunctata* L. were found associated with the pest on the olive trees in the two treatments during the two seasons of the study.

From the abovementioned results, it could be concluded that the chemical insecticide Agrothweet was more effective on *P. unionalis* than the bioinsecticide Bio-Gard as treatments with the insecticide led to lower percentage of infestation and higher reduction rates. Although the bio-insecticide gave lower reduction rates about 29.4% than the chemical insecticide, its safety to the environment may give it a privilege compared with the insecticide.

Table (1): Percentages of infestation with *P. unionalis* on leaves (10 trees per sample) using Bio-Gard and Agrothweet at Rafah region, North Sinai in season 2005.

Sampling date	Bio-Gard			Control			Agrothweet		
	Infested	Un infested	% Infestation	Infested	Un infested	% Infestation	Infested	Un infested	% Infestation
27/3/2005*	0	16	0	0	18	0			
3/4	0	32	0	0	35	0			
10/4	0	42	0	0	40	0			
17/4	8	60	11.77 *	20	45	30.77			
27/4*	11	95	10.38	24	52	31.58			
4/5	13	102	11.30 *	27	58	31.77			
11/5*	14	130	9.72	35	62	63.08 *			
18/5	14	129	10.85	29	117	24.79			
25/5	23	130	15.03	44	100	30.56			
1/6	42	129	24.56	58	90	39.19			
8/6	50	121	41.32	65	90	72.22 *			
16/6 **	98	122	44.55 *	160	167	48.93	85	130	39.54
22/6	55	75	42.31	116	67	63.39 *	36	116	23.68
29/6	52	118	30.59	100	71	58.48	22	159	12.15
6/7*	109	120	47.6	171	68	71.55 *	54	164	24.77
13/7**	119	103	53.6 *	163	83	66.26	62	100	38.37 *
20/7	83	221	27.3	185	77	70.61 *	21	221	8.68
27/7	42	129	24.56	115	75	60.53	25	218	10.29
3/8	55	124	30.73	88	68	56.4	36	128	21.69
10/8***	98	128	43.3 *	153	63	70.83 *	59	115	33.91 *
17/8	51	132	27.87	98	68	59.87	32	144	18.18
24/8**	48	136	26.09	81	85	48.8	45	132	25.42 *
31/8	38	107	26.20	42	80	34.43	29	95	23.39
7/9	27	124	17.88	73	78	48.34 *	15	145	9.38
14/9	5	122	3.94	32	102	23.88	17	140	10.83
21/9	17	91	15.74	49	85	45.37 *	20	130	13.33
28/9	20	94	17.54 *	47	68	40.87	24	110	17.91
5/10**	11	89	11	53	88	37.59	44	100	30.56 *
12/10	7	101	6.48	69	82	45.69	19	100	15.96
Total	1110	3090	26.43	2097	2182	49.01	645	2447	20.86

* = Peak of infestation rate

** = Date of spraying bio-insecticide, Bio-Gard

*** = Date of spraying insecticide, Agrothweet

Note: The insecticide, Agrothweet was first applied on 16/6/2005.

Table (2): Percentages of infestation with *P. unionalis* on leaves (10 trees per sample) using Bio-Gard and Agrothweet at Rafah region, North Sinai in season 2006.

Sampling date	Bio-Gard			Control			Agrothweet		
	Infested	Un infested	% Infestation	Infested	Un infested	% Infestation	Infested	Un infested	% Infestation
16/3/2006	0	19	0	0	20	0	0	22	0
23/3	0	24	0	0	22	0	0	29	0
30/3	0	55	0	0	57	0	0	61	0
6/4	0	64	0	0	77	0	0	80	0
13/4	5	93	5.1	22	100	18.03	8	92	8
20/4*	9	99	8.33*	27	102	20.93	10	112	8.20
27/4	12	133	8.28	31	121	20.40	13	142	8.39
4/5*	12	150	7.41	43	136	24.02	14	143	8.92
11/5**	16	142	10.13	52	101	33.99	17	144	10.56*
18/5	19	140	11.95	71	93	43.29	13	148	8.07
25/5	25	133	15.82	80	85	48.49	17	162	9.5
1/6	40	106	27.40	142	66	58.65*	25	178	12.32
8/6	49	98	33.33	99	99	50	100	195	33.92*
15/6	88	79	52.70*	115	71	51.80	75	277	21.31
22/6	70	100	41.18	169	69	71.01	26	175	12.94
29/6	65	92	41.40	166	66	71.55*	20	170	10.53
6/7 X #	99	81	55	160	90	64	37	123	23.13
13/7	105	77	57.69*	100	79	55.87	49	113	30.25*
20/7	92	85	51.98	90	69	56.60	17	172	8.99
27/7	53	121	30.46	91	61	59.87*	20	190	9.52
3/8	45	120	27.27	79	71	52.67	23	181	11.27
10/8***	70	101	40.94*	80	80	50	42	106	28.38*
17/8	63	92	40.65	47	79	37.30	37	118	23.87
27/8	40	105	27.59	77	86	47.24*	29	170	14.57
31/8	31	99	23.85	50	87	36.50	33	137	17.37*
7/9	30	88	25.42*	45	99	31.25	14	159	8.09
14/9	18	96	15.79	40	80	33.33	18	152	10.59
21/9	12	80	13.04	52	70	42.23	21	139	13.13
28/9**	7	100	6.54	59	77	43.38	29	131	18.13
5/10	10	110	8.33	71	91	43.83	40	105	27.58
Total	1085	2882	27.35	2058	2404	46.12	747	4126	15.33

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