J. Agric. Sci. Mansoura Univ., 31 (12): 8003 - 8010, 2006

TOXICITY EVALUATION OF SOME DIFFERENT PESTICIDES AGAINST COTTON LEAFWORM *Spodoptera littoralis* (BOISD) AND APHIDS *Aphis gossypii* (GLOV.) UNDER LABORATORY CONDITIONS.

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ABSTRACT

Laboratory experiments were conducted to determine the efficiency of different pesticides belonging to various biological and synthetic chemical groups against 2nd instar larvae of cotton leafworm *S.littoralis* (Boisd) and *Aphis gossypii* (Glover).

Results revealed that LC_{50} and toxicity index of the tested compounds against 2nd instar larvae of cotton leafworm were (1.54,4.17 and 10.55 ppm) and (100, 36.88 and 14.56 %) for Betacyfolathrin, Fenpropethon and Es-Fenvolerate, respectively. Although for the Bio-compounds, Spinosad and Abamactin the obtained values of the two tested compounds were 21.40 and 150.88 ppm) and (100and 14.18 %) respectively.

In case of Aphids pest values of LC_{50} and toxicity index were (0.015, 0.026, 0.042, 0.171, 0.29 and 0.503 ppm) and (100, 57.69, 35.71, 8.77, 5.17 and 2.98 %), for Beta-Cyoflathrin, Es-Fenvolerat, Chloropyrifos, Profenfos, Fenpropathrin, and Methomyl, respectively, while it were (17.512, 68.522 and 0.156 ppm) and (100, 0.89, and 0.23) for *Beauvaria basciana* ,Abamectin and Spinosad biocides, respectively.

Co-toxicity factors of the binary mixture of (Beta-Cyfoluthrin + Abamectin) and (Beta- Cyfoluthrin + Spinosad) at LC_{25} levels against 2nd instar larvae of cotton leafworn and *A.gossypii* were (- 28.57 and – 100) and (- 37.14 and – 72.97) respectively.

INTRODUCTION

Cotton is one of the major economic crops in Egypt. Throughout cotton growth season its attack by many pests, from seedling to harvest causing different degrees of damage. Among these pests, cotton leafworm *S. littoralis*, it is attacks not only cotton plant leaves, but also the fruiting parts (flowers and green bolls).also, the aphid pest *A. gossypii* has several overlapping generation on cotton crop and causes considerable losses either directly by sucking plant juice or indirectly as a vectors of virus diseases.

The efficiency of the conventional and Biocides against cotton leafworm and sucking pests were studied by Sukhore (1987). Murry (1997), Hala *et al* .,(2002), Saied *et al.*, (2002), Abd El-Mageed *et al.*, (2005), and Anwar (2006).

Therefore the purpose of the present study is to evaluate the insecticidal activity of some synthetic and Biopesticides against cotton leafworm larvae and aphids. Also, threw the light on the antagonism effects of the binary mixtures of the pronounced compounds against the tested pests.

MATERIALS AND METHODS

The present study was carried out at plant protection Research Institute Dakahlia Branch in order to study the effect of different pesticides either alone or in combination with each other using recommended doses against 2nd instar larvae of cotton leafworm *S.littoralis* and *A.gossypii*.

1- Tested pesticides :

The following formulated insecticides were evaluated throughout the present study. The common, trade, chemical names and tested rates are as follows:

1.1 chemical insecticides :

1.1.1 Chlorpyrifos (Dursban 48 % EC)

O,o diethyl o-(3,5,6 trichloro- 2 Pyridylphosphosphorothiate

Rate : 1 litter / feddan.

1.1.2 Profenofos (Curacron 72 % EC)

O,4-(bromo 2-chlorophenyl) o-ethyl- s-propyl

Rate : 750 cm^3 / feddan.

1.1.3 Beta cyfolathrin (Buldock 12.5 %)

Cyano (4-fluoru – 3- phenoxyphenyl) methyl 3-(2,2 di-chloroethenyl) -2,2-diethyl cyclopropane carboxylate.

Rate : 150 cm^3 / feddan.

1.1.4 Fenpropathrin 30 % SC. (Danitol)

Cyano (3- phenoxy phenyl) methyl 2,2,3,3 tetramethyl cyclopropane carboxylate.

Rate: 500 cm^3 / feddan.

1.1.5 Es-fenvolerate (Sumi-gold) 20 % .

[S-(R,R)]- cyano (3-phenoxy phenyl) methyl 4- chloro- z- (1- methyl ethyl) benzenoacetate.

Rate: 150 cm^3 / feddan.

1.1.6 Methomyl (Lannate 90 % SP)

S, - methyl N-(methylcarbamoyloxy) thioacetimidate.

Rate : 500 gm / feddan.

1.2- Biocides

1.2.1 Abamactin (Vertimec 1.8 % EC)

A mixture containing minimum of 80 % a vermectin B_{1a} (5-o diethyl avermectin a,b) and maximum of 20 % avermectin B, b (5-o- dimethyl -25 de-(1-methyl propyl-2, 5-(1-methyl) avermectin A_{1a}

Rate :40 cm^3 / feddan.

1.2-2 Spinosad (Tracer 24 % SC).

It is a naturally occurring mixture of two active (Spinosyn A and D) producted by the fermentation of the soil actinomycetets Saccharopolyspora .

Rate: 50 cm3 /feddan.

1.2.3 *Beauvaria bassiana* (Biover 10 %).

Beauvaria bassiana (32000 viabk spore / mg) Active ingredient 10 %, inert ingredient 90 % .
Rate : 300 gm / feddan .

2- Tested insects

2.1 Cotton leafworm *Spodoptera littoralis*

Laboratory strain of the cotton leafworm *S.littoralis* was maintained under conditions of 25 ± 1 °C and 70 5 % R.H. which reared on castor bean leaves according to the methods described by El-Defrawi *et al.* (1964).

2-2 *Aphis gossypii*

Aphids of *Aphis gossypii* individuals were collected from cotton fields near in Mansoura district Dakahlia Governorate, Egypt. The collected individuals were reared in the laboratory on cotton seedlings under 25 ± 2 °C and 65 ± 5 % relative humidity for 2 months using the technique adopted by Norman and Sutton (1967).

3- Assessment of insecticidal activity:

Serial concentrations of the tested pesticides in water were prepared. Castor bean leaves were dipped for 15 second in each test solution of the pesticide under investigation, then left to dry before being offered to the tested insects which starved for 4 – 6 hours. Ten 2nd instar larvae of cotton leaf worm were exposed to each treated leaf for 24 hours in glass jar covered with muslin cloth held by rubber bands. After 24 hours the treated leaves were replenished with untreated leaves. Each concentrations included 3 replicates. Leaves in untreated check was only treated with water (Merdan, 1968). Mortality were recorded for two days post-treatment, mortality percentages were estimated and corrected for natural mortality according to Abbott's formula (1925) then subjected to probit analysis by Finney's method (1971). For *Aphis gossypii* the same steps were adopted except that the individuals were exposed to tested compounds on cotton discs in 10 cm petri dish diameter. To evaluate the joint effect for the pairs of the tested toxicants, the equation of Mansour *et al.* (1966) was used as the following:

$$\text{Co-toxicity factor} = \frac{\text{Observed \% Mortality} - \text{Expected M \%}}{\text{Expected \% Mortality}} \times 100$$

RESULT AND DISCUSSION

The insecticidal activity of the tested compounds against 2nd instar larvae of cotton leafworm are summarized in Tables (1 and 2). Table (1), shows the potency of the synthetic compounds, while table (2) presents those of the biocides. From Table (1) it is clear that Beta-Cyfluthrin was the most effective insecticides against 2nd instar larvae followed by Fenpropathrin and Es-fenvolerate respectively. The LC_{50} values were (1.54, 4.17 and 10.55 ppm) respectively. Toxicity index values of Beta-Cyfloathrin, Fenpropathrin

and Es-fenvolerate against 2nd instar larvae were 100, 36.88 and 14.56 % based on LC_{50} of Beta-cyfloathrin , respectively.

Data presented in Table (2), revealed that Spinosad was the most effective biocide against 2nd instar larvae followed by Abamectin. The LC50 values were (21.40 and 150.88 ppm) respectively. The toxicity index values of Spinosad and Abamectin against 2nd instar larvae were (100and 14.18 %) respectively based on LC_{50} of Spinosad 100 %).

It can concluded that Beta-cyfolathrin was the most effective against 2nd instar larvae of cotton leaf worm followed by Fenpropathrin, Es-fenvolerat, Spinosad while Abamectin was the least one Tables (1and 2). This results are in agreement with those obtained by Mohamed *et al.* (1994), who found that Methomyl was the most toxic insecticides followed by Danitol (Fenpropathrin) and Sumicidin (Fenvalerate) on 3rd instar larvae of *S.littoralis*. Also, Murray (1997) indicated that Spinosad was applied 8 times in comparsoin with 13 insecticidal applications in a conventional treatment, Spinosad provided satisfactory control during most of the season, whereas conventional treatment did not.

Abd El-Mageed *et al.* (2005), found that Chloropyrifos proved to be the most effective insecticides against 2nd instar larvae of the cotton leafworm *S.littoralis* laboratory strain followed by profenofos, Beta-cyfluthrin, thiodicarb, Fenproathrin and Carbaryl, respectively. The showing LC_{50} values of 0.572, 4.308, 5.083, 23.894, 25.250 and 1341.649 ppm respectively. Also, our results are supported by the finding of Anwar (2006) who found that Chloropyrifos (OP) was the most effective insecticides against 2nd and 4th instar larvae of laboratory cotton leafworm strain followed by Chlorofluazuron and Abamectin. LC_{50} values were (0.21, 4.22 and 7.12 ppm) respectively.

Table (1): Toxicity effect of some pyrethroides insecticides against 2nd instar larvae of *S.littoralis* (Boisd) under laboratory condition.

Tested compounds	LC_{25}	LC_{50} ppm at 95 % confidence limit.	LC_{90} ppm at 95 % confidence limit.	Slope	Toxicity index at LC_{50}
Beta-cyfolathrin	0.54	1.54	11.168	1.487 ± 0.886	100
Fenpropathrin	2.12	4.17	182.3	4.78 ± 0.204	36.88
Es-fenvolerate	4.14	10.55	786.998	5.68 ± 0.21	14.56

Table (2): Toxicity effect of some biocides against 2nd instar larvae of *S.littoralis* (Boisd) under laboratory condition.

Tested compounds	LC_{25}	LC_{50} ppm at 95 % confidence limit.	LC_{90} ppm at 95 % confidence limit.	Slope	Toxicity index at LC_{50}
Spinosad	6.22	21.40	223.96	1.25 ± 0.27	100
Abamactin	18.84	150.88	815.18	0.74 ± 0.29	14.18

Regarding *Aphis gossypii* adult insects, data in Table (3) indicated that Beta-cyfolathrin was the most effective insecticides followed by Es-fenvolerate, Chloropyrifos, Profenfos, Fenpropathrin and Methomyl respectively. The LC_{50} values were (0.015, 0.026, 0.042, 0.171, 0.29 and 0.503 ppm) respectively. Toxicity index values were 100, 57.69, 35.71, 8.77, 5.17, and 2.98 % respectively. (Based on LC_{50} of Beta-cyfolathrin).

Table (3): Toxicity effect of some insecticides against *Aphis gossypii* under laboratory condition.

Tested compounds	LC_{25}	LC_{50} ppm at 95 % confidence limit.	LC_{90} ppm at 95 % confidence limit.	Slope	Toxicity index at LC_{50}
Beta-cyfolathrin	0.004	0.015	0.228	1.076 ± 0.47	100
Es-fenvolerate	0.005	0.026	0.313	0.913 ± 0.284	57.69
Chloropyrifos	0.004	0.042	0.401	0.647 ± 0.36	35.71
Profenfos	0.057	0.171	1.368	1.42 ± 0.28	8.77
Fenpropathrin	0.052	0.29	1.607	0.906 ± 0.33	5.17
Methomyl	0.141	0.503	5.618	1.223 ± 0.33	2.98

On the other hand the effect of some biocides against aphids insects were tabulated in Table (4) which indicated that *Beauvaria bassiana* was the most effective against *A. gossypii* followed by Abamectin and Spinosad. The LC_{50} values were (0.156, 17.512 and 68.585 ppm). Respectively. The toxicity index values were (100, 0.89 and 0.23) % respectively, based on LC50 of *Beauvaria bassiana*). The obtained results are in agreement with those of YorKulov (1986) who mentioned that the use of effectiveness of Boverin (*Beauveria bassiana*) against white fly and aphids gave a good levels of effectivenes. Also Sunkhove (1987) reported that the effectivenes of the biological control of greenhouse pests including insects and mites in USSR. Showed good results with *Beauveria bassiana* which gave 98 % control of white fly and aphids.

Table (4): Toxicity effect of some biocides against *Aphis gossypii* under laboratory condition.

Tested compounds	LC_{25}	LC_{50} ppm at 95 % confidence limit.	LC_{90} ppm at 95 % confidence limit.	Slope	Toxicity index at LC_{50}
Spinosad	18.522	68.585	825.077	1.186 ± 0.22	0.23
Abamactin	4.986	17.512	191.82	1.233 ± 0.25	0.89
Beauvaria bassiana	0.011	0.156	25.379	0.579 ± 0.45	100

Also, Abu-Kahla *et al.* (1992) mentioned that sequence which contain organophosphorus compounds had the higher effects, against *Empoasca lybica* and *A. gossypii*. On the other hand Murad *et al.* (1994) reported that the Cyfluthrin, Dmethoate, Monocrotophos and Cypermethrin were the most effective insecticides against cotton aphids, *A.gossypii*. Anwar (2001) found

that Chloropyrifos reduced the population density of aphids with 92.86, 78.57, 75.89, 57.14 and 51.09 % after 2, 5, 8, 11, and 14 days, also Cyflothrin treatment in the 2nd spray gave the same result and reduced aphid population to 93.33 % whereas the 3rd spray by Thiodicarb gave 90 % reduction in population density of *A.gossypii*. whereas Said et al.(2002), reported that vertimec gave 47.97 % reduction after 2 days in *A.gossypii* population density. Sharaf, *et al.* (2002) reported that Curacron (OP) and Larvin (Carbamate) had high initial effect on aphids.

In addition , according to the obtained results, the toxicity of binary mixtures of the superior tested compound against *A.gossypii* and 2nd instar larvae of cotton leafworm were investigated.

Data presented in Table (5) show that the binary mixtures of (Beta-cyflouthrin + Spinosad) gave the most antagonism effect against 2nd instar larvae of *S.littoralis* and *A.gossypii* followed by (Beta-cyflouthrin + Abamectin). Co-toxicity factor were (-100 and – 72.97) and (- 28.57 and – 37.14) respectively. It is clear that the resulted joint action values of the tested mixtures depending on the tested compounds, chemical structure, mode of action and the tested ratio.

It could be concluded that the Pyrethroid insecticides Beta-cyfolathrin mixing with Spinosad or Abamectin gave antagonism effect while each compound alone gave a good results against 2nd instar larvae *S.littoralis* and *A.gossypil* under laboratory condition. Abou Yousef, *et al.* (2005) indicated that Abamectin at the different concentration caused a high mortality after 14 days against 2nd instar larvae of the three tested field strain of cotton leafworm *S.littoralis* under laboratory condition. Also, Watson *et al.* (1979) working on the biological effects of some citrus oils on S.littoralis. the authers found that the three oils citral, nerol and geraniol proved to be toxic to the 4th instar larvae LD50's 430, 480 and 740 µg / larvae respectively. Ramadan, (1987) reported that twelve citrus oils were tested topically at LC25 in binary mixtures of 5 conventional insecticides and 12 citrus oils at three ratios namely 1:1, 1:5 and 1:10 (wt / wt) against 1-day old 4th instar larvae of *S.littoralis* . The results showed that in case of Fenvalerate / citrus oils out of 36 citrus oils cases of synergism and 20 cases of antagonism were observed while the mixture of Fenpropathrin and citrus oils, gave 25 cases of synergism, 4 cases of additive effect and 7 cases antagonism effect .

Table (5) : Joint action of effect of binary mixture of some tested compounds against 2nd instar larvae of *S.littoralis* and *A.gossypii* at LC_{25} level.

Tested compounds	Expected mortality %		Observed mortality %		Co-toxicity factor		Combined effects	
	2nd instar larvae	*A.gossypii*	2nd instar larvae	*A.gossypii*	2nd instar larvae	*A.gossypii*	2nd instar larvae	*A.gossypii*
Beta-cyflothrin + Abamectin	14	35	10	22	-28.57	-37.14	Antagonism	
Beta-cyflouthrin + Spinosad	17	37	0	10	-100	-72.97	Antagonism	

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تقييم سمية بعض المبيدات المختلفة على دودة ورق القطن ومن القطن معمليا .

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دراسة معملية لاختبار سمية بعض المبيدات المختلفة على العمر اليرقى الثانى لدودة ورق القطن وعلى آفة من القطن واختيار أفضلها ودراسة تأثير خلطه مع المبيد الحيوى التريسر ٢٤ % EC والفرتيمك ١,٨ % EC وقد أظهرت النتائج المتحصل عليها ما يلى :

١- قيم الجرعة النصفية ضد يرقات العمر اليرقى الثانى لدودة ورق القطن كانت (١,٥٤ ، ٤,١٧ ، ١٠,٥٥ جزء فى المليون) لكل من المركبات بيتا سيفلوثرين ، فينبروباثرين و اس فنفليرات على الترتيب. بينما كانت قيم الجرعة النصفية القاتلة للمركبات وسبينوساد والأبامكتين هى: ١,٤٠ و ١٥٠,٨٨ جزء فى المليون على الترتيب.

٢- أظهرت الدراسة تأثير ٦ مركبات من المبيدات المختلفة وثلاث مركبات حيوية أخرى على آفة من القطن كانت نتائج الجرعة النصفية القاتلة هى : ٠,٠١٥ ، ٠,٠٢٦ ، ٠,٠٤٢ ، ٠,١٧١ ، ٠,٢٩ ، ٠,٥٠٣ جزء فى المليون للمركبات الآتية بيتا سيفلوثرين ، اس فنفليرات ، كلوروبيروفوس ، بروفينوفوس ، فينبروثرين والميثوميل على الترتيب بينما كانت نتائج الجرعة النصفية القاتلة للمركبات الحيوية بيوفاريا باسيانا ، أبامكتين و سبينوساد هى: ٠,١٥٦، ١٧,٥١٢ ، ٦٨,٥٨٥ جزء فى المليون على من القطن.

٣- وقد أوضحت الدراسة التأثير المشترك لمبيد البيروثروويد ، بيتا سيفلوثرين عند خلطه مع الأبامكتين أو سبينوساد كمركبات حيوية على كل من العمر اليرقى الثانى لدودة ورق القطن ومن القطن كانت كما يلى :(– ٢٨,٥٧ ، – ٣٧,١٤) و (– ١٠٠ ، – ٧٢,٩٧) للمركبات (بيتا سيفلوثرين + أبامكتين) و (بيتا سيفلوثرين + اسبينوساد) على الترتيب . وكان دليل السمية للمركبات المختبرة كما يلى٣٦,٨٨ ، ١٤,٤٦ % ضد يرقات العمراليرقى الثانى على التوالى منسوبا الى قيم الجرعة النصفية لمركب بيتا سيفلوثرين ، ١٤,١٨ % لمركب الأبامكتين على اعتبار قيم الجرعة النصفية لمركب سبينوساد . وقد كان دليل السمية للمبيدات المختبرة على آفة المن كما يلى : (٥٧,٦٩ ، ٣٥,٧١ ، ٨,٧٧ ، ٥,١٧ و ٢,٩٨ %) على الترتيب . منسوبا الى قيم الجرعة النصفية القاتلة للمركب بيتا سيفلوثرين . بينما كانت هذه القيم لمركبات الأبامكتين وسبينوساد وبيوفاريا باسيانا (٠,٨٩ ، ٠,٢٣ %) على الترتيب منسوبا الى بيو فاريا باسيانا.

لذلك لا ينصح بخلط مبيد البيروثروويد بيتا سيفلوثرين مع المركبات الحيوية الأبامكتين وسبينوساد لأنه يعطى تأثيرا تضاديا للمركبات المخلوطة فى حين أن كل مركب بمفرده يعطى تأثيرات جيدة تحت الظروف المعملية .