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, 36.86 and 14.56 %) for Betacyfluthrin, Fenpropathrin and Es-Fenvalerate, respectively. Although for the Bio-compounds, Spinosad and Abamectin the obtained values of the two tested compounds were 21.40 and 150.88 ppm (100 and 14.18 %) respectively.

In case of Aphids pest values of LC$_{50}$ end 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-Cyfluthrin, Es-Fenvalerat, Chloropyrifos, Profenos, Fenpropatrin, and Methomyl, respectively, while it were (17.512, 66.522 and 0.156 ppm) and (100, 0.89, and 0.23) for *Brevicoryne brassicae*, Abamectin and Spinosad biocides, respectively.

Co-toxicity factors of the binary mixture of (Beta-Cyfluthrin + Abamectin) and (Beta-Cyfluthrin + Spinosad) at LC$_{25}$ levels against 2nd instar larvae of cotton leafworm 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, aid seedling crops and 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 bolts). 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 Bioicides against cotton leafworm and sucking pests was studied by Sukhore (1987), Murry (1997), Hala et al. (2002), Said 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 Biocides 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 Chloropyrifos (Dursban 48 % EC)

O,O-diethyl O-(3,5,6-trichloro-2-pyridyl)phosphorothionate

Rate: 1 liter / feddan.

1.1.2 Profenofos (Curacron 72 % EC)

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

Rate: 750 cm³ / feddan.

1.1.3 Beta cyfluthrin (Buldoc 12.5 %)

Cyan (4-fluoro-3-phenoxyphenyl) methyl 3-(2,2 dichloroethenyl) -2,2-diethyl cyclopropane carboxylate.

Rate: 150 cm³ / feddan.

1.1.4 Fenpropathrin 30 % SC. (Danitol )

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

Rate: 500 cm³ / feddan.

1.1.6 Es-fenvolurate (Sumigold ) 20 %

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

Rate: 150 cm³ / feddan.

1.1.6 Methomyl (Lannate 90 % SP)

S - methyl N-(methylcarbamoyloxy) thioacetimidate.

Rate: 500 gm / feddan.

1.2 - Biocides

1.2.1 Abamectin (Vertimec 1.8 % EC)

A mixture containing minimum of 80 % a avermectin B₁a

(5-O-diyiavermetin a,b) and maximum of 20 %

avermectin B₁, b (5-O-dimethyl-25 de-(1-methyl propyl)-2

5-(1-methyl) avermetin A₁a

Rate: 40 cm³ / feddan.

1.2-2 Spinosad (Tracer 24 % SC).

It is a naturally occurring mixture of two active

(Spinosyn A and D) produced by the fermentation of the soil

actinomycetes Saccharopolyspora .

Rate: 50 cm³ / feddan.

1.2.3 Beauveria bassiana (Blover 10 % ).
Beauvaria bassiana (32000 viable 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 leafworm 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:

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

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 Fenpropothrin and ES-fenvalerate respectively. The LC50 values were (1.54, 4.17 and 10.55 ppm) respectively. Toxicity index values of Beta-Cyfluthrin, Fenpropothrin
and Es-fenvalerate against 2nd instar larvae were 100, 36.88 and 14.56 % based on LC50 of Beta-cyfluthrin, 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 (100 and 14.18 %) respectively based on LC50 of Spinosad 100 %.

It can concluded that Beta-cyfluthrin was the most effective against 2nd instar larvae of cotton leaf worm followed by Fenpropatrin. Es-fenvalerate, 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 (Fenpropatrin) and Sumicide (Fenvalerate) on 3rd instar larvae of S. littoralis. Also, Murray (1997) indicated that Spinosad was applied 8 times in companion 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 leaf worm S. littoralis laboratory strain followed by profenofos, Beta-cyfluthrin, thiocarb, Fenpropatrin and Carbaryl, respectively. The showing LC50 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. LC50 values were (0.21, 4.22 and 7.12 ppm) respectively.

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

<table>
<thead>
<tr>
<th>Tested compounds</th>
<th>LC50 ppm at 95 % confidence limit.</th>
<th>LC50 ppm at 95 % confidence limit.</th>
<th>Slope</th>
<th>Toxicity index at LC50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beta-cyfluthrin</td>
<td>0.54</td>
<td>1.54</td>
<td>11.168</td>
<td>1.487 ± 0.986</td>
</tr>
<tr>
<td>Fenpropatrin</td>
<td>2.12</td>
<td>4.17</td>
<td>182.3</td>
<td>4.78 ± 0.204</td>
</tr>
<tr>
<td>Es-fenvalerate</td>
<td>4.14</td>
<td>10.55</td>
<td>786.998</td>
<td>5.68 ± 0.21</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Tested compounds</th>
<th>LC50 ppm at 95 % confidence limit.</th>
<th>LC50 ppm at 95 % confidence limit.</th>
<th>Slope</th>
<th>Toxicity index at LC50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spinosad</td>
<td>6.22</td>
<td>21.40</td>
<td>223.96</td>
<td>1.25 ± 0.27</td>
</tr>
<tr>
<td>Abamectin</td>
<td>18.84</td>
<td>150.88</td>
<td>815.18</td>
<td>0.74 ± 0.29</td>
</tr>
</tbody>
</table>
Regarding *Aphis gossypii* adult insects, data in Table (3) indicated that Beta-cyfluthrin was the most effective insecticides followed by Esfenvalerate, Chlorpyrifos, Profenofos, Fenpropathrin and Methomyl respectively. The LC50 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 LC50 of Beta-cyfluthrin).

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

<table>
<thead>
<tr>
<th>Tested compounds</th>
<th>LC50</th>
<th>LC50 ppm at 95% confidence limit</th>
<th>LC95 ppm at 95% confidence limit</th>
<th>Slope</th>
<th>Toxicity Index at LC50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beta-cyfluthrin</td>
<td>0.004</td>
<td>0.015</td>
<td>0.228</td>
<td>1.076 ± 0.47</td>
<td>100</td>
</tr>
<tr>
<td>Esfenvalerate</td>
<td>0.005</td>
<td>0.026</td>
<td>0.313</td>
<td>0.913 ± 0.284</td>
<td>57.69</td>
</tr>
<tr>
<td>Chlorpyrifos</td>
<td>0.004</td>
<td>0.042</td>
<td>0.401</td>
<td>0.647 ± 0.36</td>
<td>35.71</td>
</tr>
<tr>
<td>Profenofos</td>
<td>0.057</td>
<td>0.171</td>
<td>1.368</td>
<td>1.42 ± 0.28</td>
<td>8.77</td>
</tr>
<tr>
<td>Fenpropathrin</td>
<td>0.052</td>
<td>0.29</td>
<td>1.607</td>
<td>0.906 ± 0.33</td>
<td>5.17</td>
</tr>
<tr>
<td>Methomyl</td>
<td>0.141</td>
<td>0.503</td>
<td>5.818</td>
<td>1.223 ± 0.33</td>
<td>2.98</td>
</tr>
</tbody>
</table>

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 LC50 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 (*Beauvaria bassiana*) against white fly and aphids gave a good levels of effectiveness. Also Sunkhove (1987) reported that the effectiveness of the biological control of greenhouse pests including insects and mites in USSR. Showed good results with *Beauvaria bassiana* which gave 98 % control of white fly and aphids.

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

<table>
<thead>
<tr>
<th>Tested compounds</th>
<th>LC50</th>
<th>LC50 ppm at 95% confidence limit</th>
<th>LC95 ppm at 95% confidence limit</th>
<th>Slope</th>
<th>Toxicity Index at LC50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spinosad</td>
<td>18.522</td>
<td>66.585</td>
<td>625.077</td>
<td>1.186 ± 0.22</td>
<td>0.23</td>
</tr>
<tr>
<td>Abamectin</td>
<td>4.986</td>
<td>17.512</td>
<td>191.82</td>
<td>1.233 ± 0.25</td>
<td>0.89</td>
</tr>
<tr>
<td>Beauvaria</td>
<td>4.986</td>
<td>17.512</td>
<td>191.82</td>
<td>1.233 ± 0.25</td>
<td>0.89</td>
</tr>
<tr>
<td>bassiana</td>
<td>0.011</td>
<td>0.156</td>
<td>25.379</td>
<td>0.579 ± 0.45</td>
<td>100</td>
</tr>
</tbody>
</table>

Also, Abu-Kahla *et al.* (1992) mentioned that sequence which contain organophosphorus compounds had the higher effects, against *Empoasca lycba* and *A. gossypii*. On the other hand Murad *et al.* (1994) reported that the Cyfluthrin, Dimethoate, Monocrotophos and Cypermethrin were the most effective insecticides against cotton aphids, *A. gossypii*. Anwar (2001) found
that Chlorpyrifos 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 Cyfluthrin 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 Verimec 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-cyfluthrin + Spinosead) gave the most antagonism effect against 2nd instar larvae of S. litoralis and A. gossypii followed by (Beta-cyfluthrin + 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-cyfluthrin mixing with Spinosead or Abamectin gave antagonism effect while each compound alone gave a good results against 2nd instar larvae S. litoralis and A. gossypii 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. litoralis under laboratory condition. Also, Watson et al. (1979) working on the biological effects of some citrus oils on S. litoralis. the authors 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. litoralis. 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 Fenpropatrin 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. litoralis and A. gossypii at LC25 level.

<table>
<thead>
<tr>
<th>Tested compounds</th>
<th>Expected mortality %</th>
<th>Observed mortality %</th>
<th>Co-toxicity factor</th>
<th>Combined effects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2nd instar larvae</td>
<td>2nd instar larvae</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A. gossypii</td>
<td>A. gossypii</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beta-cyfluthrin + Abamectin</td>
<td>14 35</td>
<td>10 22</td>
<td>-28.57 -37.14</td>
<td>Antagonism</td>
</tr>
<tr>
<td>Beta-cyfluthrin + Spinosead</td>
<td>17 37</td>
<td>0 10</td>
<td>-100 -72.97</td>
<td>Antagonism</td>
</tr>
</tbody>
</table>
REFERENCES


بحث

دراسة مماثلة لاختيار سمية بعض المبيدات المختلطة على الاسميا البيض موزع في المنازل EC %
وعلى أفة من القطن ونظير لواضح، ودراسة تأثير خصائص بعض النباتات الأوروبية الفضول. 
وقال إن مصطلح concentrate، مصطلح MC (EC 18.4 %)
1- في الجريدة الصغيرة ضد نباتات الاسميا البيض من القطن كانت [1] 14.54 على المليون
0.15%، للجذور، والطياح على النبات، بينما كانت نتائج الجريدة الصغيرة للArgsConstructor 14.52، 17.12، 14.54، 12.41، 8.53 على المليون من القطن
2- للإطار الدسمات تأتي 3 محركات من الدراسات المختلطة وتصل مكونات حيوية أخرى على آفة من القطن
0.15%، للجذور، والطياح على النبات، بينما كانت نتائج الجريدة الصغيرة لل acompaña و (EC 28.15 %).
و(EC 28.15%)، و(EC 28.15%)، و(EC 28.15%)، و(EC 28.15%)، و(EC 28.15%)، و(EC 28.15%)، و(EC 28.15%)، و(EC 28.15%)، و(EC 28.15%)
(37.97 - 27.12، و(37.97 - 27.12)، و(37.97 - 27.12)، و(37.97 - 27.12)، و(37.97 - 27.12)، و(37.97 - 27.12)، و(37.97 - 27.12)]