BIOLOGICAL AND TOXICOLOGICAL STUDIES ON THE
PARASITOID MICROPLES RUFIVENTRIS KOK.

ESMAT A. KARES1, ALY A. EL-MOURSÝ2, NAWAL ZOHDY2, AMINA M. ABDEL-
RAHMAN2 AND MONA B. R. EL-MANDARAWY1

1 Plant Protection Research Institute, Agricultural Research Centre, Dokki, Giza.
2 Faculty of Science, Department of Entomology, Cairo University.

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Abstract

The average incubation period of eggs of the parasitoid Microplitis rufiventris was about 1.23 days, the first larval instar 3.02, the second 2.47 and the third instar 1.28 days, whereas the preupal and pupal stages lasted on the average about 0.43 and 6.89 days, respectively.

During the first 48 hours after parasitism, slight differences occurred in the body length, body weight and the amount of food eaten by the healthy and parasitized S. littoralis larvae. This could be attributed to the fact that the parasitoid was still in the egg stage and both the parasitized and unparasitized larvae consumed approximately the same quantity of castor bean leaves. From the 3rd to 7th days of parasitism, the body length, body weight and the amount of food eaten by parasitized larvae gradually increased till the emergence of the parasite, but not with the same degree as compared to unparasitized larvae. However, the parasitized larvae ceased feeding on the eighth day after the larvae of parasite became full grown till the host died. The ratio of the amount of food eaten by the parasitized and unparasitized larvae was 1:3.16.

Adults of parasitoid were fed on 15% sucrose solution contaminated with 10, 15, 20, 25, 50 and 75 ppm of baythroid for 24 hours. The LC50 values were 19.0 ppm for males and 21.0 ppm for females.

When males and females were fed on 15% sucrose solution contaminated with 4, 8, 12, 16, 20 and 24 × 10\(^4\) S.U. of a delphin negative relationship was observed between their longevity and the concentrations of the bioinsecticides.

Males and females fed on the contaminated solution of 4, 8, 12, 16, 20, and 24 × 10\(^4\) S.U. of delphin each combined with 9.2 ppm (LC10 level of baythroid) the longevities gradually decreased by increasing the concentrations of insecticides.

Generally, there were positive relationships between the present mortality of the treated adults of parasitoid and the different concentrations of delphin, baythroid and combinations of both of them. Also, females were more tolerant than males of the same age and at the same concentrations. Baythroid caused more damage for males and females of the parasitoid than delphin or a mixture or both of them.
INTRODUCTION

One of the important cotton leafworm, *S. littoralis* parasitoids is the solitary internal larval parasitoid *Microplitis rufiventris* Kok. (Hymenoptera: Braconidae). Also, it parasitizes the lesser cotton worm *Spodoptera exigua* Hbn. and the american bollworm *Heliothis armigera* Hbn.

The biology of *M. rufiventris* has been studied by many authors (Hammad et al., 1965; Shalaby, 1968; Gerling, 1971; Ibrahim, 1974; Tawfik, 1977; Tawfik et al., 1977; El-Minshawy and Hegazi, 1980).

Body size, body length and body weight of the host larvae after parasitism studied by Watanabe (1938), Hafez (1951), Shalaby (1968) and Lewis (1970). The amount of food consumed by parasitized host larvae in comparing to unparasitized ones observed by Rahman (1970), Ahmad et al. (1978), Brewer and King (1978), Kares (1991) and El-Shaikh et al. (1993).

The effect of *B. thuringiensis* on the adult parasitoids examined by Dunbar et al. (1973), Iman et al. (1986) and Morallo-Rejesus et al. (1992). Several authors studied the susceptibility of the adult parasitoids to different insecticides (Cate, et al., 1972; Kares, 1978; Varner, 1980; Rosenheim and Hoy, 1988; Chiang and Sun, 1991; Stark et al., 1992).

Several authors tested the additive effects of *B. thuringiensis* with different chemical insecticides on adult parasitoids. Hamilton and Attia (1977) mixed dipel with seven pesticides against *Thraeaella collaris* the parasitoid of *P. xylostella*. Iman et al. (1986) used *B. thuringiensis* with pyrethroids against *Diacrcoa eucerephaga* the parasitoid of *P. xylostella* and Shalaby et al. (1993) combined banythroid with delphin against six parasitic species *M. rufiventris*, *Z. chloropthalma*, *Z. nigricornis*, *Exeristes robarator*, *Tachina larvarum* and *Periboea orbata*.

This work was carried out in order to study the duration of the immature stages of the parasitoid, *Microplitis rufiventris* and the effect of parasitization on body length, body weight and the amount of food eaten by *S. littoralis* larvae. Also, the effect of the bioinsecticide (delphin), the chemical insecticide (banythroid) and a combination of different delphin concentrations with LC10 level of banythroid on adults of *M. rufiventris* were studied.
MATERIALS AND METHODS

Rearing of the cotton leafworm, *Spodoptera littoralis* (Boisd.)

The rearing technique described by Ibrahim (1974) was followed in this investigation.

Rearing of the parasitoid, *Microplitis rufiventris* Kok.

Second instar larvae of *S. littoralis* were put in transparent plastic container (4 x 8.5 cm) with plastic ring like cup fittings cut in a spacial way to hold silky mesh cloth covering tightly on the cup. At the edge of these containers 1 cm diameter circular hole was made (the hole is just about 0.5-1 cm from the container edge). An aspirator was used to introduce the adult of the parasitoid through the opening hole in the container.

Parasitoid cocoons of *M. rufiventris* and adults were collected from cotton fields and kept under laboratory conditions, cocoons and adults were isolated in glass vial (10 x 3.5 cm in diameter). Droplets of bee honey were scattered over the inner surface of the vials for nutrition of the adults. Vials were covered with muslin tied with a rubber band. The adults emerging from cocoons were left to their meal of honey for 24 hours and also for mating.

By using an aspirator eight fertilized adult females were sucked from the rearing vials, and introduced into the plastic container (through the circular hole) containing 200 second instar larvae of *S. littoralis*. The larvae were exposed to the parasitoid for six hours to ensure that parasitism took place, after which the female parasites were removed. Parasitized larvae of *S. littoralis* were transferred to a clean breeding jar and provided daily, as usual, with fresh and clean castor-bean leaves. The contents of the vial were examined daily to remove the unparasitized larvae whenever found otherwise, they were likely to attack the parasitized ones, on account of their cannibalistic habit. As soon as the last instar larvae of the parasitoid emerged from the host larvae, they pupated inside a cocoon and they were collected into new vials for the emergence of adults.

Individual parasitism of *S. littoralis* by *M. rufiventris*

For host larvae parasitized by *M. rufiventris*, the individual parasitism (to insure parasitism) was operated on *S. littoralis* larvae of second instar in glass vial (10 x 3.5 cm). The bottom of the vial was covered with a plastic cover, with a pore in the middle for allowing a brush to enter. The vial containing five parasitoid females (they changed from the rearing stock after the parasitism of 50 larvae indi-
vidually) was directed to a fluorescent lamp, and the host larvae mounted, individually, on a fine hair brush introduced inside the glass vial till reaching the adult females. The faeces of the host contaminated in the brush’s hair facilitate the attraction between the parasitoid females and the host to complete the parasitization.

Bioinsecticide (Delfin)

Delfin, a selective bacterial insecticide containing 53 x 10^6 Spodoptera Units (S.U.) of Bacillus thuringiensis var. Kurstaki / g of product was used.

Chemical insecticide (Baythroid)

Baythroid 5% E.C. Formulation: Emulsifiable concentrare containing 50g. a.i./liter.

Mixture: Combination of different concentrations of bioinsecticide and LC10 of chemical insecticide

Different concentrations of delfin were prepared and mixed with the sublethal concentration LC10 of baythroid.

Tests

Duration of immature stages of M. rufiventris

For studying and estimating the duration of the immature stages of parasite about 200 (2nd instar) larvae of S. littoralis were exposed daily to 6 mated females of M. rufiventris, kept in the plastic container. The exposed larvae were transferred to rearing vials. A group of 30 exposed host larvae were dissected twice a day and the incubation period, and the larval stadia were sorted and recorded.

Effect of parasitization on S. littoralis body length, body weight and the amount of food eaten by the larvae

Body length, body weight and the amount of food eaten by S. littoralis larvae parasitized with M. rufiventris were determined daily from the first day of parasitization till the death of the host larvae (due to the emergence of the parasitic larvae), and at the same age for unparasitized S. littoralis larvae (from 5 to 13 days old).

Thirty leaves of castor-bean (small, fresh, clean, and 1gm weight) were put each in a glass vial of (10.5 x 3.5cm), ten unparasitized larvae were introduced to each of the first ten vials, and ten parasitized larvae were put in each of the other
ten glass vials, while the last group of ten vials was left without any treatment as control. The opening of each glass vial was covered with towel paper and tied with a rubber band. The leaf in each vial was weighed before introducing the host larvae, then weighed again every 24 hours after being cleaned from the larval feaces. The decrease in weight in the last ten leaves showed the amount of loss in moisture. Consequently, the mean loss in moisture for every leaf could be calculated.

Also, in the same experiment the ten unparasitized and the ten parasitized larvae were weighed and the body length determined every 24 hours till the death of the host parasitized larvae.

**Effect of bioinsecticide, chemical insecticide and the combination of both of them on adults of *M. rufiventris***

1. Males and females of *M. rufiventris* which had been isolated as cocoons were treated with the different concentrations of delfin, baythroid and the combinations of different concentrations of delfin and LC<sub>10</sub> of baythroid.

2. For delfin, sugar solution (12% sucrose) contained the same concentrations as for the larvae were used. For baythroid, volumes of 2, 3, 4, 5, 6 and 7 ml of stock solution (500 ppm) were diluted with a constant volume of 100 ml of sugar solution to obtain the concentrations of 10, 15, 20, 25, 30 and 35 ppm. Males and females were treated with the combination of different concentrations of delfin (4, 8, 12, 16, 20 and 24 x 10<sup>6</sup> S.U.) and LC<sub>10</sub> baythroid (of each male and female) in 12% sugar solution.

3. For each treatment, replicates of ten females or males of the parasitoid *M. rufiventris* were placed in a glass vial (10 x 3.5 cm) containing 10 droplets of sugar solution containing the desired insecticide concentration scattered on the inner surface.

4. Exposure period to the toxic food lasted for 24 hours (for chemical insecticide) and for 48 hours (for bioinsecticide) after which the survived adult parasitoids were transferred to new vials containing droplets of uncontaminated sugar solution. Mortality counts were recorded daily until the death of all parasitoids.

5. The control tests were conducted using droplets of uncontaminated sugar solution.

These experiments were conducted under laboratory conditions of 28 ± 1°C and 65 ± 4 % R.H.

**RESULTS AND DISCUSSION**

**Duration of immature stage of *M. rufiventris***

The incubation period of eggs average about 1.23 days, the first larval instar
3.02, the second 2.47 and the third instar 1.28 days. Whereas the propupal and pupal stages lasted on the average about 0.43 and 6.89 days, respectively at 65 ± 4% R.H., Table 1.

Table 1. Duration of immature stages of *M. rufiventris* at 28±1°C and 65±4% R.H.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Duration (days)</th>
<th>Average ± S.E.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimum</td>
<td>Maximum</td>
</tr>
<tr>
<td>Egg stage</td>
<td>1.00</td>
<td>1.50</td>
</tr>
<tr>
<td>Larval stage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First larval instar</td>
<td>2.60</td>
<td>3.50</td>
</tr>
<tr>
<td>Second larval instar</td>
<td>2.10</td>
<td>2.80</td>
</tr>
<tr>
<td>Third larval instar</td>
<td>1.00</td>
<td>1.75</td>
</tr>
<tr>
<td>Total larval instar</td>
<td>6.70</td>
<td>9.55</td>
</tr>
<tr>
<td>Prepupa</td>
<td>0.35</td>
<td>0.50</td>
</tr>
<tr>
<td>Pupal stage</td>
<td>6.50</td>
<td>7.25</td>
</tr>
<tr>
<td>Total developmental period</td>
<td>13.55</td>
<td>17.30</td>
</tr>
</tbody>
</table>

Effect of parasitization on the body length, body weight and the amount of food eaten by *S. littoralis* larvae

Table 2 indicates that slight differences in body length, body weight and the amount of food eaten among the healthy and parasitized *S. littoralis* existed throughout the first 48 hours of treatments. This could be attributed to the fact the parasitoid was still in the egg stage and that both the unparasitized and parasitized larvae consumed approximately the same quantity of castor bean leaves. The higher body weight of the parasitized *S. littoralis* larvae than the unparasitized ones, may be due to the eggs laid by the parasitoid female inside the host. These results agree with Kares (1991) who reported that both the parasitized and unparasitized *Phthorimaea operculella* larvae consumed approximately the same quantity of food when the parasitoid *A. leucipes* var. operculella was still in the egg stage inside the host.

From the third to the seventh days of parasitization (the age of host ranged from seven to eleven days), the body length, body weight and the amount of food eaten showed either significant or highly significant difference between the healthy and parasitized *S. littoralis* larvae.

The results show clearly that the body length and body weight of the parasi-
Table 2. The effect of parasitization on body length, body weight and the amount of food eaten by *S. Littoralis*.

<table>
<thead>
<tr>
<th>Days after parasitization</th>
<th>Length (cm)</th>
<th>weight (cm)</th>
<th>Enter castor-bean leaves (g/day) by larvac</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unparasitized larvac</td>
<td>Parasiitized larvac</td>
<td>T-test</td>
</tr>
<tr>
<td>1</td>
<td>0.37±0.02</td>
<td>0.38±0.03</td>
<td>N.S.</td>
</tr>
<tr>
<td>2</td>
<td>0.50±0.02</td>
<td>0.48±0.03</td>
<td>N.S.</td>
</tr>
<tr>
<td>3</td>
<td>0.70±0.04</td>
<td>0.59±0.03</td>
<td>S.</td>
</tr>
<tr>
<td>4</td>
<td>1.01±0.03</td>
<td>0.90±0.02</td>
<td>S.</td>
</tr>
<tr>
<td>5</td>
<td>1.15±0.05</td>
<td>0.95±0.05</td>
<td>S.</td>
</tr>
<tr>
<td>6</td>
<td>1.29±0.08</td>
<td>1.09±0.02</td>
<td>H.S.</td>
</tr>
<tr>
<td>7</td>
<td>1.70±0.04</td>
<td>1.08±0.03</td>
<td>H.S.</td>
</tr>
<tr>
<td>8</td>
<td>2.06±0.02</td>
<td>1.06±0.03</td>
<td>H.S.</td>
</tr>
<tr>
<td>9</td>
<td>2.57±0.02</td>
<td>1.06±0.02</td>
<td>H.S.</td>
</tr>
<tr>
<td>Total</td>
<td>1.599±0.14</td>
<td>0.443±0.16</td>
<td>13:16</td>
</tr>
</tbody>
</table>

N.S. : Insignificant difference  
S: Significant difference  
H.S. : Highly significant difference
tized larvae gradually increased till the emergence of the parasitoid, but not with the same degree as compared to unparasitized larvae. Our results agree with those recorded by Watanabe (1938), Hafez (1951), Shalaby (1968) and Lewis (1970) who found that parasitized host larvae of *P. similis* (Fuessly) by *M. berceae*, *S. littoralis* by *M. demoleitor*, *S. littoralis* by *M. rufiventris* and *H. zea* by *M. croceips*, respectively had small body size, body length and body weight. Rahman (1970) indicated that the larvae of *P. rapae* parasitized by the solitary endoparasitoid *A. rubecula*, ate less than half of the quantity taken by the unparasitized larvae. Ahmad et al. (1978) found that *L. dispar* parasitized by *A. melanosecelus* between the 3rd and the 17th day, consumed less diet than the unparasitized ones. Brewer and King (1978) observed that *D. saccharalis* larvae parasitized by *L. diatraecae* consumed less food and gained less weight than unparasitized ones. Kares (1991) reported that the parasitized *P. operculicella* larvae between the 5th and 14th days ate less food than the unparasitized ones. Also, El-Sheikh et al. (1993) indicated that *M. loreyi* (Dup.) larvae parasitized by *M. gryator* consumed less food and gained less weight than healthy ones after 5 days, 7 days and 9 days old larvae.

Table 2 also, indicates that the two days after emergence of full grown larval parasitoid, the body length, body weight and the amount of food eaten were higher and different significantly between the healthy and parasitized *S. littoralis* larvae. However, the parasitized larvae ceased feeding on the eighth day after emergence of full grown larval parasitic till the host died. Our findings agree with those of Swan (1964) who indicated that the gypsy moth *L. dispar* larvae parasitized by *A. melanosecelus* ceased feeding before death. Rahman (1970) noticed that when *P. rapae* larvae were parasitized by *A. rubecula*, consumption index started declining above 2 days before the parasite emerged. El-Sheikh et al. (1993) showed that *M. loreyi* parasitized by *M. gryator* stopped feeding about 1-2 days before the parasitoid's emergence.

Also, from our results the total ratio of the amount of food eaten between the parasitized *S. littoralis* larvae by *M. rufiventris* and the unparasitized ones was 1: 3.16, Table 1.

**Effect of delfin, baythroid and the combination of them on the adult parasitoids of *M. rufiventris***

Males and females of the parasitoid, *M. rufiventris* were treated after the 1st
day of their emergence from cocoons with delfin, baythroid and combination of different concentrations of delfin with calculated LC10 level of baythroid.

a. Effect of baythroid against the adult parasitoids

The corrected mortality of adult parasitoids fed on 15% sucrose solution contaminated with baythroid and the data are presented in Table 3.

Table 3. The effect of baythroid against adult parasitoids (males and females) of M.rufiventris.

<table>
<thead>
<tr>
<th>Concentration</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>6.66</td>
<td>3.33</td>
</tr>
<tr>
<td>10</td>
<td>14.29</td>
<td>13.33</td>
</tr>
<tr>
<td>15</td>
<td>32.14</td>
<td>30.00</td>
</tr>
<tr>
<td>20</td>
<td>53.57</td>
<td>50.00</td>
</tr>
<tr>
<td>25</td>
<td>67.86</td>
<td>63.33</td>
</tr>
<tr>
<td>30</td>
<td>78.57</td>
<td>73.33</td>
</tr>
<tr>
<td>35</td>
<td>89.29</td>
<td>80.00</td>
</tr>
<tr>
<td>LC50</td>
<td>19.0 ppm</td>
<td>21.0 ppm</td>
</tr>
<tr>
<td>Slope</td>
<td>1.75</td>
<td>1.8</td>
</tr>
<tr>
<td>Confidence limits at (P=0.05)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LC50</td>
<td>21.28 : 16.96</td>
<td>23.73 : 18.58</td>
</tr>
<tr>
<td>Slope</td>
<td>1.18 : 1.06</td>
<td>1.19 : 1.07</td>
</tr>
</tbody>
</table>

Computed from 24 hours of the mortality data.

Similar to our results, Cate et al. (1972) indicated that monocrotrophos aldichlor and disulfoton (applied topically and orally) were toxic to the adult parasitoid Campoplexis perdistinctus. Kares (1978) found that the oral administration of tamanox, cyclohexane and toluene in sugar solution was toxic at all the tested concentrations to females of the larval parasitoid M.rufiventris and the egg, larval parasitoid C.lanitis, the parasitoids of S.jittoralis. While Zaki et al. (1987) proved that dimilin and dcox 439 reduced the adult longevity of the braconid Bracon brevicornis, the parasitoid of S.exigua. Also, Rosenhein and Hoy (1988) mentioned that organophosphorous compounds reduced the longevity of the parasitoid Aphytis melinus De Bach by 73-85% and depressed progeny production. Chiang and Sun (1991) indicated that both A.plutellae and Diadegma semicalus, the parasitoid of P.xylostella were
susceptible to malathion and methyl parathion. In addition, Moralio Rejesus et al. (1992) found malathion, metamidophos, cartap and deltamethrin were toxic to Cotesia plutellae and D. semiclausum, the parasitoid of P. gossypiella. Deji et al. (1992) found that D. eucarpophaga treated with sublethal doses of nomolt (25 ppm) was significantly lower than the untreated one, but was not significantly different as compared to that treated with 20 ppm of cypermethrin.

b. Effect of delfin on adult longevities

Data presented in Table 4 indicate that adult males and females fed on 15% sucrose solution contaminated with different concentrations of delfin showed insignificant effect as compared to control at low concentrations of 4, 8, 12 and 16x10^4 S.U. The longevities were 7 ± 0.47, 6.6 ± 0.16, 6.4 ± 0.16, and 5.8 ± 0.22 days for males and 8.6 ± 0.16, 8.6 ± 0.27, 8.4 ± 0.16 and 8.4 ± 0.27 days for females at the same concentrations, respectively.

Table 3. Effect of delfin and conlination of both delfin concentrations and LC10 laythroid on the longevity of adult parasitoids.

<table>
<thead>
<tr>
<th>Concentration</th>
<th>Adult Parasitoid longevity (days)</th>
<th>Bioinsecticide</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Males Average ± S.E.t-Test*</td>
<td>Females Average ± S.E.t-Test*</td>
</tr>
<tr>
<td>(S.U.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.00</td>
<td>7 ± 0.76</td>
<td>8.8 ± 0.13</td>
</tr>
<tr>
<td>4x10^4</td>
<td>7 ± 0.47 N.S.</td>
<td>8.6 ± 0.16 N.S.</td>
</tr>
<tr>
<td>8x10^4</td>
<td>6.6 ± 0.16 N.S.</td>
<td>8.6 ± 0.27 N.S.</td>
</tr>
<tr>
<td>12x10^4</td>
<td>6.4 ± 0.16 N.S.</td>
<td>8.4 ± 0.16 N.S.</td>
</tr>
<tr>
<td>16x10^4</td>
<td>5.8 ± 0.22 N.S.</td>
<td>8.4 ± 0.27 N.S.</td>
</tr>
<tr>
<td>20x10^4</td>
<td>5.2 ± 0.13 S.</td>
<td>7.8 ± 0.39 S.</td>
</tr>
<tr>
<td>24x10^4</td>
<td>5.0 ± 0.21 S.</td>
<td>7.4 ± 0.45 S.</td>
</tr>
</tbody>
</table>

S.U.+ppm Combined effect of delfin + LC10 baythrroid

|               |                                 |                |
| 0.00          | 7 ± 0.76                        | 8.8 ± 0.13      |
| 4x10^4 + 9.2  | 5.8 ± 0.22 N.S.                 | 8.2 ± 0.33 N.S. |
| 8x10^4 + 9.2  | 5.6 ± 0.27 N.S.                 | 8.0 ± 0.42 N.S. |
| 12x10^4 + 9.2 | 4.2 ± 0.77 S.                   | 7.6 ± 0.45 S.   |
| 16x10^4 + 9.2 | 4.2 ± 0.65 S.                   | 7.0 ± 0.76 S.   |
| 20x10^4 + 9.2 | 3.6 ± 0.17 H.S.                 | 6.0 ± 1.10 S.   |
| 24x10^4 + 9.2 | 3.2 ± 0.42 H.S.                 | 4.8 ± 0.98 H.S. |

* t-Test between the average of control and that of each concentration.
The male and female longevities decreased gradually by increasing the delfin concentrations. At higher concentrations of 20 and 24 x 10^4 S.U., the longevities were significantly different as compared to 5.2 ± 0.13 and 5.0 ± 0.21 days for males and 7.8 ± 0.39 and 7.4 ± 0.45 days for females, respectively.

The data clearly indicate that females had longer life spans than males at the same age and the same concentrations of treatment. Consequently, the females are more tolerant than males under the same conditions.

Dunbar et al. (1973) found that the Bacillus was non toxic to A. melanocephalus (the parasitoid of the gypsy moth L.dissipar). Also, Thoms and Watson (1986) indicated that the mean duration of the pupal and adult stages for Hypoxystis exiguae emerging from Bacillus treated host larvae of Heliothis virescens were generally not significantly different from those of the control, thus B.thuringiensis did not appear to be pathogenic to the parasitoids. Morallo-Rejesus et al. (1992) observed that B.thuringiensis var. Kurstaki was relatively non toxic to both Cotesia plutellae and Diadema semiclausum the parasitoids of P.xylostella.

c. Effect of the combinations of delfin with LC10 of baythroid on adult longevities

The longevities of males and females fed on contaminated solution with the mixture of delfin and LC10 baythroid were insignificantly different as compared to the control at the two low concentrations of 4 and 8 x 10^4 S.U. + 9.2 ppm. The longevities were 5.8 ± 0.22 and 5.6 ± 0.27 days for males; 8.2 ± 0.33 and 8.0 ± 0.42 days for females at the same concentrations, respectively. While at the concentrations of 12 and 16 x 10^4 S.U. + 9.2 ppm, the longevities were significantly different as compared to the control (4.2 ± 0.77 and 4.2 ± 0.65 for males; 7.6 ± 0.45 and 7.6 ± 0.76 for females, respectively). At higher concentrations of 20 and 24 x 10^4 S.U. + 9.2 ppm, the longevities for males were highly significantly different as compared to the control. Their were 3.6 ± 0.17 and 3.2 ± 0.42 days, respectively. However, females showed significant differences at the concentration of 20 x 10^4 S.U. + 9.2 ppm and highly significant differences at 24 x 10^4 S.U. + 9.2 ppm. The longest life spans were 6.0 ± 1.10 and 4.8 ± 0.98 days, respectively, Table 4.

Iman et al. (1986) observed that a mixture of pyrethroids with the microbial insecticide had a less adverse effect on D.eucerophaga the parasitoid of P.xylostella.

Generally, the above mentioned results prove the existence of a positive relationship between the present mortality of the treated adult parasitoids and the dif-
ferent concentrations of delfin, baythroid and the combination of them. Also, fe-
males were more tolerant than males of the same age and at the same concentration. Additionally, baythroid caused more damage to male and female parasitoids than del-
fin or the mixture of both of them.

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دراسات بيولوجية وسمية على طفيل ميكروكولينتيس روفينيتروس

عمرت عبد الملك كارس 1، نوال زهدي 2 على الرسوم

أسماء محمد عبد الرحمن 3، مهى يسوم رمزي المدراوي

1 مستشفى بحوث وقاية النباتات - مركز البحوث الزراعية - النبئي، مصر.

2 كلية العلوم - قسم علم الحشرات - جامعة القاهرة.

كان متوسط فترة النضج لبيض طفيل ميكروكولينتيس روفينيتروس 92 يومًا تقريبًا، بينما كان العمر البلقي الأول 2 يومًا بينما الثاني 47 يومًا كما كان متوسط العمر البلقي الثالث 178 يومًا بينما كان متوسط إعداد مراحل ما قبل الفضول والعضول 18 يومًا بينما كان متوسط عدد تراكمات ما قبل الفضول والعضول 18 يومًا بينما كان متوسط عدد تراكمات ما قبل الفضول والعضول 18 يومًا.

وذكرت دراسة جراحية وفقرة وذاتي وزنكية زائف دوارة ورق القرمش سوياً، كبرت المطيش على النقطة أو المطيش عليه، وظهرت هذه النقطة والنقطة أو المطيش عليه، وظهرت هذه النقطة في مراحل البضاعة تستاهل البضاعة لرحلة عبر النقطة وظهرت هذه النقطة في مراحل البضاعة تستاهل البضاعة لرحلة عبر النقطة وظهرت هذه النقطة في مراحل البضاعة تستاهل البضاعة لرحلة عبر النقطة وظهرت هذه النقطة في مراحل البضاعة تستاهل البضاعة لرحلة عبر النقطة.

وتبين أن النقطة الأولى هي النقطة السفلى من النقطة فوق تراكم البضاعة، كما أن النقطة الثانية هي النقطة الأعلى من النقطة فوق تراكم البضاعة.

وأظهرت دراسات جراحية أن البضاعة استهلت البضاعة في النقطة الأولى، وظهرت هذه النقطة في النقطة الثانية، وظهرت هذه النقطة في النقطة الثالثة، وظهرت هذه النقطة في النقطة الرابعة.

وقد أظهرت دراسات جراحية أن النقطة الأولى هي النقطة السفلى من النقطة فوق تراكم البضاعة، كما أن النقطة الثانية هي النقطة الأعلى من النقطة فوق تراكم البضاعة.

وأظهرت دراسات جراحية أن البضاعة استهلت البضاعة في النقطة الأولى، وظهرت هذه النقطة في النقطة الثانية، وظهرت هذه النقطة في النقطة الثالثة، وظهرت هذه النقطة في النقطة الرابعة.

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