EFFICIENCY OF CERTAIN PLANT EXTRACTS AGAINST
CERATITIS CAPITATA (WIED.) AND BACTROCERA ZONATA
(SAUNDERS) (DIPTERA: TEPHRITIDAE)

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(Manuscript received 12 August 2007)

Abstract

Extracts of six wild plants of Ambrosia maritima, Allium
salvium, Mentha spicata, Myoporrum pictum, Nerium oleander and
Rosa gallica were examined as contact toxic substances against 3-
day old pupae and 2-day old adults of both Ceratitis capitata and
Bactrocera zonata. Extracts of R. gallica leaves and A. salvium
buds/leaves were the most efficient against pupae of C. capitata and B.
zonata, respectively. On the other hand, leaves extract of N.
oleander was the most effective against adults of both C. capitata
and B. zonata recording the highest cumulative mortality (after 72
hours) of 93.93 and 90.00%, consecutively. As a general trend,
adults of B. zonata were more susceptible to the tested extracts
than that of C. capitata.

Key words: Plant extracts, Ceratitis capitata, Bactrocera zonata,
Plant extracts.

INTRODUCTION

Fruit flies such as C. capitata and B. zonata cause serious damage in fruits of
several hosts especially citrus, apricot, peach, mango and guava causing severe
reduction in both quantity and quality of infested fruits in Egypt and in many
countries.

Generally, fruit flies (allover the world) were controlled with the chemical
pesticides that caused many healthy, environmentally and economically problems for
man, natural enemies and fruit-producer countries. For this reasons many researchers
used the plant extracts as naturally-safe materials for controlling insects (Rajendran &
1985, Chan & Tam, 1985, Guirguis et al., 1989, Kelany et al., 1991, El-Abgy et al.,
Dolosh & El-Sherif, 2005 and Fetoh et al., 2005).

The aim of this work is to evaluate the insecticidal activity of certain plant
extracts against both pupal and adult stages of the two species of tephritid fruit flies
C. capitata and B. zonata.
MATERIALS AND METHODS

1- Insect Used

   The two stages of pupae and adult used for treatments were obtained from cultures of the laboratory strains of both *C. capitata* and *B. zonata* that mass reared according to Awadallah and El-Hakim (1983) and Afia et al. (2005), respectively.

2- Plant Extracted

   The insecticidal effect of aqueous dilutions of certain parts of six wild plant species (Table, 1) was tested against the two stages of the studied insects. The parts of the tested plants collected from the field of Horticulture Research Institute were air-dried under laboratory conditions of 25 ± 3°C and 70 ± 5% R.H. After that, 20 gm of each were ground with ethanolic extraction (300 ml of commercial ethanol alcohol 75% for each plant) using Sockeheh unit.

<table>
<thead>
<tr>
<th>Scientific name</th>
<th>Family</th>
<th>Common name</th>
<th>Used part</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ambrosia maritima</td>
<td>Compositae</td>
<td>Alashte</td>
<td>Flowers</td>
</tr>
<tr>
<td>2. Allium sativum</td>
<td>Liliaceae</td>
<td>Garlic</td>
<td>Bulbs</td>
</tr>
<tr>
<td>3. Mentha pulegium</td>
<td>Labiateae</td>
<td>Spearmint</td>
<td>Leaves</td>
</tr>
<tr>
<td>4. Matricaria arvensis</td>
<td>Lamiaceae</td>
<td>Bariumia</td>
<td>Flowers</td>
</tr>
<tr>
<td>5. Nerium oleander</td>
<td>Apocynaceae</td>
<td>Nerium</td>
<td>Leaves</td>
</tr>
<tr>
<td>6. Rosa gallica</td>
<td>Rosaceae</td>
<td>Rosa</td>
<td>Leaves</td>
</tr>
</tbody>
</table>

3- Procedure

   Thirty individuals replicated three times (10 individuals/replicate) of both pupal (3-day old) and adult (2-day after emergence) stages of the two tephritid species were sprayed with 0.5 ml of different aqueous concentrations of the tested extracts using an atomizer instrument. Three concentrations (5, 10 and 20%) were used for adults, sprayed in tubes (10 cm in length and 2 cm in diameter), whereas pupae were treated in Petri dishes (9 cm in diameter) with four concentrations of 25, 50, 75 and 100 %. The individuals of untreated control were sprayed with tap water. After 3 hours of treatment, pupae were put in clean Petri dishes to emergence, whereas adults, were transferred by an aspirator to clean small cages provided with sugar and water for feeding and examined after 24, 48 and 72 hours of treatment. For both pupae and adults, the dead individuals were recorded. Pupel mortality was corrected with Abbott's formula (1925). Both LC95 and LC10 values of the tested extracts were obtained from dosage-mortality regression lines drawn according to the method of Bliss (1938). The relative efficiency as toxicity index was calculated according to Sun
(1959). On the other hand, the cumulative mortality during 72 hours after treatments was calculated for adults. Analysis of variance was conducted to test significance between treatments using "F" test and L.S.D. values according to Snedecor (1957).

RESULTS AND DISCUSSION

1- Toxicity against Pupae

Data in Table (2) and Figs. (1 and 2) indicate the contact toxic effect of the six tested plants to 3-day old pupae of both C. capitata and B. zonata. Based on LCG0 and LC90 values, leaves extract of R. gallica was the most potent against pupae of C. capitata recording the lowest values of 46 and 74%, respectively. Whereas leaves extract of M. pictum was the least effective showing LCG0 and LC90 values of 81 and 88%, consecutively. The other extracts had intermediate values of LCG0 and LC90 that ranged between 52-81 and 77-88, successively. The slope values of the toxicity lines reveal that M. pictum had the steepest toxicity line and M. spicata had the flattest one. As shown in Table (2), the toxicity index of the tested plant extracts ranged between 56.79-97.87% (at LCG0) and 84.09-96.10% (at LC90) from leaves extract of R. gallica that was considered the standard.

Respecting the toxic effect on B. zonata, the bulbils extract of A. sativum was the standard recording the lowest values of both LCG0 and LC90 of 28 and 42, successively. The efficiency of the other tested extracts was descendingly arranged as N. oleander, A. maritima, R. gallica, M. pictum and M. spicata. The values of both LCG0 and LC90 were 40, 62, 62, 68, 46, 70, 61, 74 and 78, 92, respectively. The corresponding values of toxicity index were 70.00, 67.74, 66.67, 61.76, 60.87, 60.00, 45.90, 56.76 and 35.90, 54.65% of the standard extract of A. sativum, consecutively. The slope values of toxicity lines of the six examined extracts ranged between 6.49-18.18 indicated that M. spicata had the steepest toxicity line, but A. maritima had the flattest one.

Based on LCG0 and LC90 values, B. zonata was more susceptible to A. maritima, A. sativum, M. pictum and N. oleander than C. capitata, but the reverse was true with M. spicata. The response of the two tephritid species to R. gallica was equal and nearly equal according to values of LCG0 and LC90 consecutively. In this respect, Rajendran and Gopalan (1979) stated that A. sativum had insecticidal properties against larvae of Spodoptera litura.
Table 2. Toxicity of certain plant extracts against 3-day old pupae of both *ceratitis capitata* and *B. zonata*

<table>
<thead>
<tr>
<th>Plant extract</th>
<th><strong>C. capitata</strong></th>
<th></th>
<th><strong>B. zonata</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LC50</td>
<td>LC90</td>
<td>Slope</td>
<td>Toxicity index (%)</td>
</tr>
<tr>
<td><em>A. maritima</em></td>
<td>72</td>
<td>78</td>
<td>6.05</td>
<td>82.46</td>
</tr>
<tr>
<td><em>A. sativum</em></td>
<td>79</td>
<td>88</td>
<td>33.97</td>
<td>58.23</td>
</tr>
<tr>
<td><em>M. gossypium</em></td>
<td>47</td>
<td>86</td>
<td>5.94</td>
<td>97.87</td>
</tr>
<tr>
<td><em>M. puncus</em></td>
<td>81</td>
<td>88</td>
<td>36.51</td>
<td>56.70</td>
</tr>
<tr>
<td><em>N. oleander</em></td>
<td>62</td>
<td>77</td>
<td>13.18</td>
<td>74.19</td>
</tr>
<tr>
<td><em>R. gallica</em></td>
<td>46</td>
<td>74</td>
<td>6.28</td>
<td>100</td>
</tr>
</tbody>
</table>

2- Cumulative Mortality of Adults

The cumulative mortality of 2-day old adults of both *C. capitata* and *B. zonata* sprayed with the examined plant extracts was shown in Table (3). Statistical analysis of variance of the obtained data revealed that there were high significant differences between the treated and untreated individuals. In case of *C. capitata* the differences between the six tested extracts were insignificant, but in case of *B. zonata*, the extract of *A. maritima* significantly varied with the others. Leaves extract of *N. oleander* was the most efficient to newly emerged adults of both *C. capitata* and *B. zonata* showing the highest values of cumulative mortality (after 72 hours) of 55.93 and 90.00%, whereas flowers extract of *A. maritima* recorded the lowest % cumulative mortalities of 45.19 and 57.41, respectively. The other extracts showed intermediate values of cumulative mortality that ranged between 46.29-49.26% (in case of *C. capitata*) and 79.63-87.41% (in case of *B. zonata*). Data in Table (3) showed that adults of *C. capitata* were more tolerant to the tested extracts than that of *B. zonata*, where the grand averages of cumulative mortality for the six tested extracts were lower with *C. capitata* than that recorded with *B. zonata*. In this respect Barakat et al. (1985) reported that the acetone extract of black pepper was the most effective against *C. capitata* adults. Recently, Fetoh et al. (2005) evaluated different concentrations of ethanolic- leaves extract of *Cactospis procera* against adults of *Dacus citri* and *B. zonata*. They stated that the extract was effective against the two species and *B. zonata* was more susceptible than *D. citri*. 
Fig. 1. LC-P Lines of six plant extracts against 3-day pupae of Ceratitis Capitata.
Fig. 2. LC-P lines of six plant extracts against 3-day pupae of *Bactrocera zonata*.
Table 3. Cumulative mortality of 2-day old adults of both *Ceratitis capitata* and *Bactrocera zonata* sprayed with certain plant extracts.

<table>
<thead>
<tr>
<th>Plant extract</th>
<th>Conc.</th>
<th>5</th>
<th>10</th>
<th>20</th>
<th>50</th>
<th>Grand aver.</th>
<th>10</th>
<th>20</th>
<th>50</th>
<th>Grand aver.</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>A. martima</em></td>
<td>24</td>
<td>46.67</td>
<td>66.67</td>
<td>74.13</td>
<td>57.41B</td>
<td>30.00</td>
<td>50.00</td>
<td>96.67</td>
<td>60.00</td>
<td>96.67</td>
</tr>
<tr>
<td><em>A. zanesci</em></td>
<td>24</td>
<td>30.00</td>
<td>60.00</td>
<td>60.00</td>
<td>96.67</td>
<td>30.00</td>
<td>50.00</td>
<td>96.67</td>
<td>60.00</td>
<td>96.67</td>
</tr>
<tr>
<td><em>M. spicata</em></td>
<td>24</td>
<td>30.00</td>
<td>50.00</td>
<td>96.67</td>
<td>57.59B</td>
<td>30.00</td>
<td>50.00</td>
<td>96.67</td>
<td>60.00</td>
<td>96.67</td>
</tr>
<tr>
<td><em>M. pichii</em></td>
<td>24</td>
<td>30.00</td>
<td>50.00</td>
<td>96.67</td>
<td>57.59B</td>
<td>30.00</td>
<td>50.00</td>
<td>96.67</td>
<td>60.00</td>
<td>96.67</td>
</tr>
<tr>
<td><em>N. indica</em></td>
<td>24</td>
<td>30.00</td>
<td>50.00</td>
<td>96.67</td>
<td>57.59B</td>
<td>30.00</td>
<td>50.00</td>
<td>96.67</td>
<td>60.00</td>
<td>96.67</td>
</tr>
<tr>
<td><em>R. gallica</em></td>
<td>24</td>
<td>30.00</td>
<td>50.00</td>
<td>96.67</td>
<td>57.59B</td>
<td>30.00</td>
<td>50.00</td>
<td>96.67</td>
<td>60.00</td>
<td>96.67</td>
</tr>
<tr>
<td>Control</td>
<td>24</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0C</td>
<td>24</td>
<td>0</td>
<td>0</td>
<td>0C</td>
</tr>
</tbody>
</table>
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the pumpkin fly, Dacus oleae Loew and the peach fruit fly, Bactrocera zonata
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كفاءة بعض المستخلصات النباتية ضد ذبابة فاكهة البحر المتوسط وذبابة ثمار الخوخ

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1. معهد بحوث وحماية النباتات- المساحة الإسطنبولية

2. معهد بحوث وحماية النباتات- مركز البوموت الزراعية

تم اختبار تأثير مستخلصات 6 نباتات برية في اليابانية- القلم- الرياح البري- النسيم- التلة- قبرة الاداري الأحمر- عمود نباتية بالماء، ضد الحشرات مستخلصات أوراق الوردة الكاملة لتربتي ذبابة فاكهة البحر المتوسط وذبابة ثمار الخوخ. كانت مستخلصات أوراق الوردة الأحمر ومساكن الوردة الأكثر فعالية ضد ذبابة ذبابة البحر المتوسط وذبابة ثمار الخوخ على الترتيب. ومن جهة أخرى كان مستخلصات أوراق التلة الأكثر فعالية ضد الحشرات الكاملة لذبابة فاكهة البحر المتوسط وذبابة ثمار الخوخ حيث سجل أعلى قيمة للنسبة التركيبي (نسبة 93% على التوالي، وكانت الحشرات الكاملة لذبابة الذبابة الذبابة الأحمر展示了 مستخلصات المستخلصات المختلفة منها لذبابة فاكهة البحر المتوسط.