ORIGINAL ARTICLES

Field evaluation of plant extracts and certain insecticides against *Bemesia tabaci* (Gennadius) on tomato plants and *Myzus persicae* (Sulzer) on pepper plants

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ABSTRACT

Four insecticides and two commercial plant extracts were evaluated for their efficiency for the control of *Bemesia tabaci* on tomato plants and three insecticides with the same commercial plant extracts for control *Myzus persicae* on pepper plants. Results showed significant differences on the mean number of *B. tabaci* and *M. persicae* recorded from different treatments under field conditions. The results also showed a good efficacy of plant extracts against *B. tabaci* and *M. persicae*. Thiacloprid gave highly reduction in the mean number of *B. tabaci* (1.33 nymph/leaf) than Thiamethoxam (1.82 nymph/leaf) and Dinotefuran was more effect than Thiacloprid in reduction of the mean number of *M. persicae* (1.3 and 1.85/leaf, respectively) due to the dose of treatment. Imidacloprid gave a good reduction in the mean number of *B. tabaci* and *M. persicae* (0.97 and 1.22, respectively).

Key words: Plant extracts- Insecticides- *Bemesia tabaci* – *Myzus. Persicae*

Introduction

Tomato (*Lycopersicon* spp.) is economically one of the most important vegetables (Polston & Anderson, 1999). Its productivity could even be higher if this crop would not be susceptible to the attack of a large number of insects and microorganisms (França and Branco, 1987). The sweet potato whitefly *Bemisia tabaci* (Gennadius) is one of the most damaging pests of numerous crops world-wide. *Bemisia tabaci* is a plant sap-sucking insect belong to family Aleurodidae in the superfamily Aleyrodida. It is broadly polyphagous, feeding on an estimated 600 plant species. *Bemisia tabaci* is also a vector of 111 plant viruses in the genera *Begomovirus* (*Geminiviridae*), *Crinivirus* (*Closteroviridae*) and *Carlavirus* or *Ipomovirus* (*Potyviridae*) (Jones, 2003). *Begomoviruses* are the most numerous of *B. tabaci* transmitted viruses and can cause crop yield losses of between 20 and 100% (Brown & Bird, 1992).

*B. tabaci* was mainly known as a pest of field crops in tropical and sub-tropical countries. *B. tabaci* had a composite range of around 300 plant species within 63 families (Mound & Halsey, 1978).

The green peach aphid *Myzus persicae* (Sulzer) (Hemiptera: Aphididae) is a worldwide distributed insect pest causing both direct and indirect damage on several crops (Blackman and Eastop, 2000). Green peach aphids can attain very high densities on young plant tissue, causing water stress, wilting, and reduced growth rate of the plant. Prolonged aphid infestation can cause appreciable reduction in yield of root crops and foliage crops (Petitt and Smilowitz 1982). The major damage caused by green peach aphid is through transmission of plant viruses. Indeed, this aphid is considered by many to be the most important vector of plant viruses throughout the world. Nymphs and adults are equally capable of virus transmission (Namba and Sylvester 1981). Kennedy *et al.* (1962) listed over 100 viruses transmitted by this species.

Great efforts and a lot of money spent yearly to get several synthetic pesticides, which soon become more commonly used for controlling the different pests. Pesticides produced from natural products have been recently attracting the attention of many scientists to avoid the problems caused by synthetic compounds they are deeply interested in their chemical constituents and biological properties (Abou-Yousef *et al.*, 2010). Chemical control tactics have been the primary method for managing infestations, but this strategy has become less effective due to development of insecticide resistant populations (Siebert, *et al.* 2012).

The present study was carried out to evaluate the efficacy of plant extracts and certain chemical insecticides against *Bemesia tabaci* on tomato crop and *Myzus persicae* on pepper crop in open field.

Material And Methods

The present study was conducted at Shibin Al Qanatir, Kalyobiya Governorate.
Chemical insecticide:

1-Imidacloprid 35 % SC:

Chemical structure:

![Chemical structure of Imidacloprid](image)

**Applied at:** 300ml / feddan for the control of *B. tabaci* and *M. persicae.*

2-Thiacloprid 48 % SC:

Chemical structure:

![Chemical structure of Thiacloprid](image)

**Applied at:** 120 ml / feddan for the control of *B. tabaci* and *M. persicae.*

3-Thiamethoxam 25 % WG:

Chemical structure:

![Chemical structure of Thiamethoxam](image)

**Applied at:** 80 gm / feddan for the control of *B. tabaci*

4-Etofenprox 10 % SC:

Chemical structure:

![Chemical structure of Etofenprox](image)

**Applied at:** 178.5 ml / feddan for the control of *B. tabaci*

5-Dinotefuran 20 % SG:

Chemical structure:
Four insecticides and two commercial plant extracts were evaluated for their efficiency for the control of

*Benesia tabaci* on tomato plants and three insecticides with the same commercial plant extracts for control

*Myzus persicae* on pepper plants. Two feddan at Shibin Al Qanatir, Kalyobiya Governorate was planted with
tomato, variety Fayroz and pepper, variety Balady. The normal agricultural practices were carried out. The field
was divided into 32 plots, each measuring 42m² for treatments of *B. tabaci* and 28 plots for treatments of *M.
persicae*. Each 4 plots were considered for each applied treatment.

The first application to control *B. tabaci* was after 45 days at the appearance of the tomato seedlings.
Similarly, to control of *M. persicae* the first application was after 65 days at the appearance of the pepper
seedlings.

Five plants were randomly collected from each plot, 5 leaves from each plant were examined and the
number of alive nymphs of *B. tabaci* or *M. persicae* were counted after 1, 3, 7 and 14 days of treatment.

**Analysis of data:**

Data obtained were submitted to analysis of variance (ANOVA) using F test and means were compared
by Tukey’s Standardized Range Test at 0.05 probability level.

**Results:**

At the initiation of the experiment, in the control plots, mean number of alive nymphs of *B. tabaci* was 7.21
then increased to 7.78, 7.91 and 8.03 after 3, 7, 14 days of application, respectively. Mean number of *B. tabaci*
on tomato leaves in the different experimental plots ranged between 0.53 to 1.82 nymph/ leaf (Table1).
Generally, the considered plant extracts were most effective to control *B. tabaci* than the other chemical
insecticides. Berna mixed with Sortem exhibited the highest toxic effect on *B. tabaci* after 14 days following
by Berna then Sortem. These effects were concentration dependant and with elapse of time (Table 1).
Mean reduction in number of B. tabaci nymphs was 0.53, 0.81 and 0.97 after application of Berna mixed with Sortem, Berna and Sortem at 1000+500, 1600 and 1000ml, respectively. Of the tested insecticides after the application, Thiamethoxam at 8 ml gave the lowest efficacy as mean number of B. tabaci was 1.82 nymph/ leaf.

Of the tested insecticides, Imidacloprid at 300 ml exhibited the highest efficiency in reducing the mean number of B. tabaci on tomato plant leaves to 0.97 followed by Etofenprox at 178.5 ml (1.22), Thiacloprid at 120ml (1.33) then Thiamethoxam at 8ml (1.82).

As seen in Table 2, at the initiation of the experiment, the mean number of M. persicae on pepper leaves was 4.05 nymphs/ leaf in the control plot. This number gradually, increased to 5.75 nymphs/ leaf after 7 days post treatment.

Meanwhile, in the plots treated with plant extract or chemical insecticides, there was a marked gradual decrease in number of M. persicae. This effect was the most evident post spraying by Berna mixed with Sortem at 1000+500ml following by Berna at 1600ml, Sortem at 1000ml, Imidacloprid at 300ml and Dinotefuran at 200g, then least toxic effect was Thiacloprid at 120ml.

The first effective insecticide was Imidacloprid ; it reduced the number of M. persicae from 3.4 to 1.95 after 14 days of treatment. The chemical insecticide, Thiacloprid at 120 ml showed low toxic effect on M. persicae compared with the other treatments, it reduced the number of insect from 3.35 to 2.8 after 14 days of treatment.

**Table 1:** Mean number of Bemisia tabaci alive nymphs/ leaf on tomato plants

<table>
<thead>
<tr>
<th>Treatments / feddan</th>
<th>Pre-spraying</th>
<th>1-Day</th>
<th>3-Day</th>
<th>7-days</th>
<th>14-Days</th>
<th>Mean±Sd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant extracts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Berna + Sortem (1000+500 ml)</td>
<td>6.81</td>
<td>0.36</td>
<td>0.46</td>
<td>0.56</td>
<td>0.76</td>
<td>0.53±0.1</td>
</tr>
<tr>
<td>Berna (1600 ml)</td>
<td>7.14</td>
<td>0.63</td>
<td>0.75</td>
<td>0.79</td>
<td>1.08</td>
<td>0.81±0.2</td>
</tr>
<tr>
<td>Sortem (1000 ml)</td>
<td>7.24</td>
<td>0.73</td>
<td>0.88</td>
<td>1.03</td>
<td>1.25</td>
<td>0.97±0.2</td>
</tr>
<tr>
<td>Chemical insecticides</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Imidacloprid (300 ml)</td>
<td>6.99</td>
<td>0.58</td>
<td>0.65</td>
<td>1.19</td>
<td>1.47</td>
<td>0.97±0.2</td>
</tr>
<tr>
<td>Etofenprox (178.5 ml)</td>
<td>6.98</td>
<td>0.71</td>
<td>1.44</td>
<td>2.06</td>
<td>2.2±0.3</td>
<td></td>
</tr>
<tr>
<td>Thiacloprid (120 ml)</td>
<td>6.8</td>
<td>1.02</td>
<td>1.02</td>
<td>1.55</td>
<td>1.75</td>
<td>1.33±0.2</td>
</tr>
<tr>
<td>Thiamethoxam (80 ml)</td>
<td>7.09</td>
<td>1.33</td>
<td>1.35</td>
<td>2.00</td>
<td>2.61</td>
<td>1.82±0.2</td>
</tr>
<tr>
<td>Control</td>
<td>7.21</td>
<td>7.78</td>
<td>7.78</td>
<td>7.91</td>
<td>8.03</td>
<td>7.87±1.1</td>
</tr>
</tbody>
</table>

F value interaction 14.3

**Table 2:** Mean number of Myzus persicae alive nymphs/ leaf on pepper plants

<table>
<thead>
<tr>
<th>Treatments / feddan</th>
<th>Pre-spraying</th>
<th>1-Day</th>
<th>3-Day</th>
<th>7-days</th>
<th>14-Days</th>
<th>Mean±Sd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant extracts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Berna + Sortem (1000+500 ml)</td>
<td>4.65</td>
<td>0</td>
<td>0.7</td>
<td>1.35</td>
<td>1.75</td>
<td>1.01±0.2</td>
</tr>
<tr>
<td>Berna (1600 ml)</td>
<td>3.65</td>
<td>0</td>
<td>0.95</td>
<td>1.35</td>
<td>1.75</td>
<td>1.01±0.2</td>
</tr>
<tr>
<td>Sortem (1000 ml)</td>
<td>3.50</td>
<td>0</td>
<td>1.05</td>
<td>1.55</td>
<td>2.05</td>
<td>1.16±0.3</td>
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<tr>
<td>Chemical insecticides</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Imidacloprid (300 ml)</td>
<td>3.4</td>
<td>0.4</td>
<td>1.0</td>
<td>1.55</td>
<td>1.95</td>
<td>1.22±0.4</td>
</tr>
<tr>
<td>Dinotefuran (200 gm)</td>
<td>4.2</td>
<td>0.7</td>
<td>1.04</td>
<td>1.05</td>
<td>2.45</td>
<td>1.31±0.3</td>
</tr>
<tr>
<td>Thiacloprid (120 ml)</td>
<td>3.35</td>
<td>0.95</td>
<td>1.38</td>
<td>2.3</td>
<td>2.8</td>
<td>1.85±0.4</td>
</tr>
<tr>
<td>Control</td>
<td>4.05</td>
<td>4.1</td>
<td>4.65</td>
<td>5.75</td>
<td>5.4</td>
<td>4.97±1.2</td>
</tr>
</tbody>
</table>

F value interaction 17.6

**Discussion:**

Results showed significant differences on the mean number of B. tabaci and M. persicae recorded from different treatments under field conditions. The differences can be attributed to different modes of action of the products and also the time after spraying. The results also showed a good efficacy of plant extracts against B. tabaci and M. persicae. Berna effect was an enhancer of many enzymes, stimulating their vegetative growth. It has translaminar and penetrating action of the cell membranes. Sortem, because of containing enzymes and L-glutamic, is an excellent chelating agent, and associated with Na acts in small concentrations on the central nervous system of the insect. Sortem is not a pesticide; it does not cause direct mortality which is why the incorporation of a biocide agent is necessary. It acts by contact on the physical barriers that possess insects to protect themselves. So for this reasons, plant extracts, Berna and Sortem products gave a higher reduction in mean number of B. tabaci and M. persicae.

Imidacloprid is a systemic insecticide with translaminar activity and with contact and stomach action, its gave a good reduction in the mean number of B. tabaci and M. persicae (0.97 and 1.22, respectively). Etofenprox, acts on the nervous system of insects, and disturbs the function of Insecticide with
mode of action neurons by interaction with the sodium channel. Thiacloprid, Thiamethoxam and Dinotefuran are the same effect, agonist of the nicotinic acetylcholine receptor, affecting the synapses in the insect central nervous system. Thiacloprid gave highly reduction in the mean number of B. tabaci (1.33 nymph/leaf) than Thiamethoxam (1.82 nymph/leaf) and Dinotefuran was more effect than Thiacloprid in reduction of the mean number of M. persicae (1.3 and 1.85/leaf, respectively) due to the dose of treatment.

Butler et al. (1991) observed a reduction of 62-75% in whitefly population with plant derived oil. In 1992, Butler and Henneberry documented that one or two applications of 1-2% plant derived oils (cotton seed oil and soybean oil) in water on cotton repelled or killed the adults and immature of B. tabaci up to 7 days and caused no significant phytotoxicity. Arif et al. (2009) reported the highest population suppression of B. tabaci with the application of mustard oil at 2 and 3% concentrations. Souza & Vendramim (2000; 2001) indicated that extracts of neem seeds and Trichilia pallida branches and leaves are effective to control eggs and nymphs of B. tabaci biotype B. Gómez et al. (1997) evaluated 27 plant species and verified that even though no material was considered repellent, low attraction occurred for plants sprayed with extracts from Ruta graveolens Linneu (Sapindales: Rutaceae), Cymbopogon citratus (D.C.) Stapf (Poales: Poaceae), and Gliricidia sepium (Jacq.) Steud (Fabales: Fabaceae).

Horowitz et al. (1998), Natwick (1999), Natwick and Deeter (2001), Parrish and Assail and Aslam et al. (2003) observed significant mortality of whitefly with the application of acetamiprid. Mustafa (2000) found that Mospilan, and confidor resulted almost 72.76% mortality of whitefly. Mohan and Katiyar (2000) who stated that confidor was the most effective in suppressing the whitefly population and its continuous use resulted in increased whitefly population due to development of resistance in this pest against imidacloprid. Amjad et al.,(2009) evaluated seven insecticides, Megasom, Actara, Polo, Sitara, Nighaban, Thiodan and Confidor at their field recommended doses for their efficacy against whitefly (Bemisia tabaci Genn.) on cotton. All the test insecticides caused significant mortality of whitefly up to 7 days after treatment. However, the most effective insecticides for whitefly, up to seven days were Megamos and Confidor, while Actara remained least effective and the others showed less than 50% mortality throughout the experiment.

Gonzalez et al.,(2011) showed that the extract of Furcraea hexapetala manifested technical effectiveness on the insect higher than 73% “in vitro” and 71% under field conditions as much in pepper as in potato. At 48 hours the fraction of the extract of F. hexapetala reached 100% of effectiveness. This confirmed that the insecticide effect of the plant is due to the present saponins in the ethanol-water extract and concentrated through successive processes in the n-butanol solvent.

Ochieng and Nderitu(2011) evaluate hard and soft chemical products in their ability to control Myzus persicae and their effects on aphid parasitoids. The evaluated treatments were dish washing soap with insecticidal properties, Teepol®, neem based insecticide, Achook® and a pyrethroid, Karate®. Efficacy was evaluated by taking aphid and parasitized aphid counts on 2 cm portion of the shoot tip/leaves of selected shoots before treatments, once a week for four weeks. The treatments were applied at the concentrations recommended by the manufacturers. The three insecticides controlled the aphids. There was no significant difference in aphid numbers between the three insecticides. The population of aphids on the control was high. Except for the Karate treatment, the other two insecticides tested did not have an adverse effect on aphid parasitoid. Teepol and Achook promise to be useful agents for controlling green peach aphids in garden peas and at the same time are friendly to the aphid parasitoid.

Syed et al. (2005) Studied the efficacy of different chemical insecticides against Myzus persicae L. (Homoptera: Aphididae) on tobacco crop. Results showed that the lowest mean pupation of aphid/leaf was recorded with confidor (20 aphid/leaf) and actara (18 aphid/leaf) treated plots, while highest mean population of aphid per leaf was recorded with methomyl (42 aphid/leaf) and tracer (39 aphid/leaf). Significant differences were not found in plant height (cm), number of leaves counted and fin leaf area (cm2) among the different treatments. Yield of tobacco was highest (2253.0 kg/ha) with confidor application, while lowest (1732.0 kg/ha) in Sundaphos treatment. Link et al. (2000) evaluated the efficacy of chemical control of M. persicae and concluded that the commercial formulation imidacloprid (confidor) was efficient in the control of this pest. According to Patil and Lingappa (2000) confidor was highly effective against M. persicae as compared to acephate and endosulfan so our chemical control results tally with the comparison of the above mentioned scientist.

References


