Abstract
Phytopesticides, micro- and macro-bioagents are significantly applied during last years in the Plant Protection Systems of vegetable crops. Careful selection of the products and their controlled application for disease and pest regulation provides for qualitative and healthy vegetable production. Investigations carried out in this direction are with phytopesticides NeemAzal T/S 0.3% and Trilogy 1%, which are produce by Neem Indian tree (Azadirachta indica). Phytofungicide Trilogy applied in concentration of 1% showed a very good efficacy against powdery mildew in cucumbers. NeemAzal T/S 0.3% is an effective acaricide suitable for including in the control management against spider mite (Tetranichus urticae). The good efficacy of Trilogy and NeemAzal T/S to powdery mildew, spider mite, aphids and larvae of greenhouse whitefly (Trialeurodes vaporariorum) make them suitable for application in the biological vegetable production systems.

Key words: phytopesticides, NeemAzal T/S, Trilogy – produce by Neem Indian tree (Azadirachta indica)

Introduction
In last years, the vegetable crop production is directed towards biological production. Phytopesticides, micro- and macro-bioagents are significantly applied in plant protection. Careful selection of the products and their controlled application for disease and pest regulation provides for qualitative and healthy vegetable production. New, non-traditional products are an alternative for prevention and overcoming of resistance to chemicals as well as for ecological plant protection. Nowadays the attention is emphasized on plant extracts which Neale (1997) addresses to biopesticides.

Phytopesticide properties of many plants are known long time ago. They are due to natural chemical compounds – alkaloids, esters, glycosides, etc, consisting in them (Vassina, 1978; Mateeva, 2000). Commercial bio-pesticides on plant base, with good fungicide and insecticide properties (Adis et al., 1997) are presently produced. Phytopesticide list continuously enlarges. Their successful application requires recognition of action and toxicity mode against useful species in agrocenoses. Application of plant origin products is an opportunity for successful control against diseases and pests in modern ecological technologies. Substances from phytopesticide group with a.i. azadirachtine (neemAzal T/S, azatine EC, trilogy, nimix, supernim, et al.) extracted from gains and vegetative mass of Neem tree (Meliaceae:Azadirachta indica A. Juss.) are already object of the industry. Extracts from different tree parts are used for disease and pest control. Good efficiency against Lepidoptera pests is reported from Isman et al. (1999), Gupta et al. (2001), as well as to Homoptera (Labanowski et al., 1999; Rabou, 2001; Tabatadze et al. 2001), Thysanoptera (Labanowski et al., 1999; Basha et al., 2001) consider that neemAzal T/S possesses high efficiency against Tetranichus urticae. Stüssi (2005) reported for a neemAzal T/S wide action rate and the possibilities for its application in Integrated Plant Management jointly with Encarsia, Aphidius, Amblyseius, Aphidoletes and Macrolophus.

The purpose of this investigations is to establish the neemAzal T/S and trilogy biological activity towards some harmful and useful species in greenhouse vegetable crops.
Material and Methods
Trials are carried out in glasshouses at the Maritsa Vegetable Crops Research Institute, Plovdiv. Standard methods from applied acarology, entomology and phytopathology are used for testing of the product biological activities. The formulas of Abbott and Henderson-Tilton are used in calculation of efficacy to pests and encarsia, as well as Mc Kinney to powdery mildew.

Control – untreated plants.

Studied products
Against pests
Trilogy 1% – contact biofungicide, a.i. 70% extract from Neem tree (Azadirachta indica).
NeemAzal T/S 0.3% – insecto-acaricide, a.i.1% azadirachtine A + 0.5% azadirachtine BVSD + 2.5% neem-substance.
Standard – Lirosekt 2 EC 0.12% (a.i. abamectin); Mospilan 20 SP 0.0125%-0.02% (a.i. acetamiprid)

Against powdery mildew
Trilogy 1% – triple introducing.
Poni 5 CK 0.05% (a.i. hexaconazol) + Vectra 10 CK 0.03% (a.i. bromuconazol) + Trilogy 1% in subsequent treatments.
Bayfidan 250 EC 0.02% (a.i. triadimenol) + two subsequent treatments with Trilogy 1%.
NeemAzal T/S 0.3% – triple treatments.
The trial is carried out in forth replication.
Control – untreated plants.

Test pests
Powdery mildew (Sphaerotheca fuliginea Pollacci); Glasshouse whitefly (Trialeurodes vaporariorum Westw.); Cotton aphid (Aphis gossypii Glov.); Spider mite (Tetranychus urticae Koch.)

Useful species
Encarsia formosa Gah. – a parasite of T. vaporariorum.

Results and Discussion
The results of investigations show a very good biological activity of studied phytopesticides. Triple treatment with phytofungicide Trilogy 1% show the highest efficacy to powdery mildew in cucumber – 97.72% (Table 1). The subsequent treatment with Poni 5CK, Vectra 10 CK and Trilogy manifest efficacy closed to this from Trilogy alone – 96.99%. The combination with Bayfidan 250 EC and two subsequent treatments with Trilogy also resulted a good protection of the plants. Their efficacy is 95.30%.

Powdery mildew agent in cucumber are high variable and easy become resistant to fungicides. Chemical rotation in the application of these schemes will prevent resistance manifestation. Phytopesticide implementation during the harvest period is a precondition for obtaining of an integrated production, safe for the consumer’s health.

NeemAzal T/S efficacy is lower than others – 74.98% but like a phytopesticide controlling powdery mildew it is a good efficacy. NeemAzal T/S biological activity to powdery mildew, spider mite and glasshouse whitefly make it suitable for application in the certified greenhouses for biological production as well as in the integrated pest management.

The active substance azadirachtine manifests a specific action to the pests – insects and mites. It disturb the main processes of the pests – metamorphose, nutrition, fertility.

NeemAzal T/S 0.3% already registered in many countries, including Bulgaria, in the recommended concentration 0.3% manifests a high efficacy to the different instars of spider mite (Figure 1). The ovo-cidal activity is not directed. Actually it is a result to the high mortality in the postembryonic instars and the strong reduction in their population.

NeemAzal T/S 0.3% is a effective acaricide suitable for including in the control management against spider mite (T. urticae) on the greenhouse vegetable crops.

NeemAzal 0.3% and Trilogy 1% manifest a very good efficacy against the glasshouse whitefly larvae, respectively 73.96% and 77.13%, closed to that of the standards Lirosekt 2 EK 0.12% - 76.36% and Mospilan 20 SP 0.02% - 73.31%. (Figure 2).

Table 1. Efficacy of phytopesticide application in cucumbers against powdery mildew

<table>
<thead>
<tr>
<th>Variant</th>
<th>Concentration, %</th>
<th>Index of defeat, %</th>
<th>Efficacy, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Trilogy – triple treatment</td>
<td>1.00</td>
<td>1.73</td>
<td>97.72</td>
</tr>
<tr>
<td>2. NeemAzal T/S – triple treatment</td>
<td>0.30</td>
<td>19.03</td>
<td>74.98</td>
</tr>
<tr>
<td>3. Poni 5CK + Vectra + Trilogy</td>
<td>0.05; 0.03; 1.00</td>
<td>2.29</td>
<td>96.99</td>
</tr>
<tr>
<td>4. Bayfidan + Trilogy + Trilogy</td>
<td>0.02; 1.00; 1.00</td>
<td>3.57</td>
<td>95.30</td>
</tr>
<tr>
<td>5. Control test untreated plants</td>
<td>–</td>
<td>76.08</td>
<td>–</td>
</tr>
</tbody>
</table>
NeemAzal 0.3% and Trilogy 1% manifest also a high efficacy and long-lasting action against Aphis gossypii in cucumbers. Maximum values in the efficacy are recorded in NeemAzal T/S 0.3% – 73.96%, the fifth day after spraying, in Trilogy 1% – 96.31%, on the third day after spraying (Figure 3).

Phytopesticides NeemAzal T/S 0.3% and Trilogy 1% are low toxic to Encarsia formosa Gah. Imago and they can be applied in the Integrated Plant Protection (Table 2).

**Table 2. Toxicity of some pesticides to Encarsia formosa Gah. Imago**

<table>
<thead>
<tr>
<th>Products</th>
<th>Toxicity group</th>
<th>Toxicity %</th>
</tr>
</thead>
<tbody>
<tr>
<td>NeemAzal T/S 0.3%</td>
<td>low toxic</td>
<td>20.69</td>
</tr>
<tr>
<td>Trilogy 1%</td>
<td>low toxic</td>
<td>26.67</td>
</tr>
</tbody>
</table>

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**Conclusion**

Phytocfungicide Trilogy applied in concentration of 1% showed a very good efficacy against powdery mildew in cucumbers – 97.72%.

Combined treatment with chemicals and phytofungicide Trilogy ensures a very good protection against powdery mildew in cucumbers (95.30% – 96.99%).

Insecto-acaricide NeemAzal T/S in concentration of 0.3% showed a good efficacy against powdery mildew – 71.52%. Its very good efficacy also to mites and to insects makes it suitable during harvest period.

NeemAzal T/S 0.3% is an effective acaricide suitable for including in the control management against spider mite (T. urticae) in the greenhouse vegetable crops.

NeemAzal T/S 0.3% and Trilogy 1% manifest a very good efficacy against the greenhouse whitefly larvae and cotton aphid (A. gossypii).

Phytopesticides NeemAzal T/S 0.3% and Trilogy 1% are low toxic to Encarsia formosa Gah. Imago and they can be applied in the Integrated Plant Protection.

The good efficacy of Trilogy and NeemAzal T/S to powdery mildew, spider mite, aphids and larvae of greenhouse whitefly and their low toxicity to the imago of Encarsia formosa Gah. make them suitable for application in the biological vegetable production systems.

**References**


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