INSECTICIDE PRODUCTS OF DIFFERENT GROUPS AGAINST
Plagionotus floralis Pall.

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Evgeniya D. ZHEKOVA¹, Ivelina M. NIKOLOVA²

¹Institute of Agriculture and Seed Science “Obraztsov chiflik”, 7007–Rousse, str. “Prof. Ivan Ivanov” №1, BULGARIA, e-mail: e.d.zhekova@abv.bg
²Institute of Forage Crops, 5800–Pleven, str. “Gen. VI. Vazov” №89, BULGARIA, e-mail: innikolova@abv.bg

Abstract. At IASS “Obraztsov chiflik”–Rousse during the period 2010–2015 the effectiveness of eight insecticide products of different groups were tested under laboratory conditions: Nurelle D, Actara 25 WG, Reldan 40 EC, Karate Zeon, Konfidor 70 WG, Decis 2.5 EC, Mospilan 20 SP and Kalypso 480 SC, against adults of Plagionotus floralis. Test Method for contact toxicity of preparations in application to substrate was used. It was found that the insecticides: Karate Zeon, Decis 2.5 EC and Kalypso 480 SC were characterized with rapid initial activity and high effectiveness against the adults of P. floralis and are suitable for control before oviposition. Neonicotinoids based on acetamiprid and thiamethoxam manifested unsatisfactory effectiveness. The Analysis of variance showed that the type of insecticide applied most strongly influenced on the effectiveness—46.3% of the total variation. The strength of the effects of duration was considerably less pronounced, but statistically significant—4.0%.

Keyword: Plagionotus floralis, insecticides, effectiveness.

Introduction

The control of the large number of insect pests is a serious problem in alfalfa growing [POPOVA, 1968]. At least 1000 species have been reported in alfalfa in the USA, as 100–150 of them cause damage to some degree [FLANDERS and RACCLIFFE, 2008].

Pimentel and Wheeler [PIMENTEL and WHEELER 1973] found the existence of 591 species of insects in the alfalfa fields of the state of New York. More than 100 species have been identified in Volga region [IVANOV and MEDVEDEV, 1970], and in Saudi Arabia–103 species, of which 48 % phytophaga [ALSUHAIBANI, 1996].

In Bulgaria Angelova and collab. [ANGELOVA et al., 2010] found 31 species of insects coleopters of seven families and 18 genera. The predatory aphydophag ladybugs are 10.5 %, related to 7 genera.

Because of the many insect pests that attack alfalfa, their control is essential [RINGLER et al., 1987; KULLAJ, 2005]. In recent years there has been an increase in the population density of Plagionotus floralis Pall. (Coleoptera: Cerambycidae), and the damage caused on alfalfa [PETKOVA et al., 2005; NIKOLOVA and KERTIKOVA, 2008, BOSTAN et al., 2013].

As a result of the damage, changes in the chemical composition of the root mass were observed, as the content of protein, fibres, calcium, magnesium and total phenols in the damaged roots by Lucerne longhorn beetle increase while the contents of soluble sugars decrease [PETKOVA et al., 2016]. The team determined an average negative correlation between the content of total phenols and sugars in the roots, damaged by P. floralis. However, studies on this pest in our country are scarce. The control of lucerne longhorn beetle may include agricultural, chemical, biological and other methods, after which the control is successful. Atanasova and collab. [ATANASOVA et al., 2010] recommended the use of yellow fluorescent traps VARb3z via which the outbreaks of the pests could be predicted and controlled.

The authors found that the density of the pest in an old (5 years) alfalfa is considerably higher than in younger (1 year) alfalfa. Imrei and collab. [IMREI et al., 2014] added that the establishment of the threshold for fluorescent yellow traps with floral baits to monitor the density of P. floralis will help in making decisions
Regarding the optimal application of the agro-technical practices.

According Djukic and Eric [DJUKIC and ERIC, 1995] the chemical control against *P. floralis* gives poor results. On the other hand, the most appropriate and the most effective is the chemical control, when the plants do not have resistance to certain insect species, especially to those whose larvae or adults feed on leaves, fruits or seed [YANKULOV, 1996]. By the chemical means of control it was found that Dimethoate (40%) provides an effective control over the pest [FU and XIE, 1986].

The subjective of the study was to assess the range of insecticides for control of the adult insect of the longhorn beetle before oviposition under laboratory conditions.

**Material and methods**

The experiments were conducted in the laboratory of entomology of IASS „Obraztsov chiflik”–Rousse during the period 2010–2015. The biological material originated in the natural population of the pest in the experimental fields of IASS „Obraztsov chiflik”–Rousse. For the adult pest control before oviposition eight preparations of several groups were tested (Table 1).

**Table 1.** Characteristics of the insecticide products

<table>
<thead>
<tr>
<th>Insecticides</th>
<th>Active substance, group</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurelle D</td>
<td>cypermethrin + chlorpyrifos–ethyl combined (pyrethroid + organophosphate)</td>
<td>50 ml/da</td>
</tr>
<tr>
<td>Actara 25 WG</td>
<td>thiamethoxam (neonicotinoid)</td>
<td>14 g/da</td>
</tr>
<tr>
<td>Reldan 40 EC</td>
<td>chlorpyrifos–methyl, organophosphate</td>
<td>120 ml/da</td>
</tr>
<tr>
<td>Karate Zeon</td>
<td>lambda cyhalothrin (pyrethroid)</td>
<td>30 ml/da</td>
</tr>
<tr>
<td>Konfidor 70 WG</td>
<td>imidacloprid (neonicotinoid)</td>
<td>15 g/da</td>
</tr>
<tr>
<td>Decis 2.5 EC</td>
<td>delfamethrin (pyrethroid)</td>
<td>80 ml/da</td>
</tr>
<tr>
<td>Mospylan 20 SP</td>
<td>acetamiprid (neonicotinoids)</td>
<td>15 g/da</td>
</tr>
<tr>
<td>Kalypso 480 SC</td>
<td>thiacloprid (neonicotinoids)</td>
<td>20 ml/da</td>
</tr>
</tbody>
</table>

The Method of testing of contact toxicity of the preparations in application to the substrate was used [DOCHKOVA, 1982; DOCHKOVA, 1987, BUTNARIU et al., 2014].

Circles of filter paper with the size of the bottom of the entomological petri dishes, in which the test was performed, were immersed in a solution of the preparation tested for 3–5 min.

After complete drying they were placed at the bottom of the petri dish. In each petri dish 10 insects, caught just before the test, were placed and the petri dish was covered with cheesecloth.

Once the insects stayed/crawled for an hour over the treated filter paper, they should be replaced to clean petri dishes that were preliminary covered with clean filter circles and cheesecloth. The reading was done after 1, 3, 5, 24 and 48 h.

The following characteristics were registered: numbers of alive, agonizing and dead individuals. The experiment was started in four replications with two controls–dry and wet. The control was an indicator of health status of the population. The effectiveness of the preparations was calculated by the formula of Abbott [ABBOTT, 1925]:

\[
E = \frac{X - Y}{X} \times 100
\]


**Results and discussion**

The results of the tests carried out by the eight insecticide preparations against adults of *P. floralis*, presented in Table 2; indicate that the synthetic pyrethroid Karate Zeon (100%) showed the fastest initial activity and superior effectiveness an hour after treatment, followed by Decis (82.5–90.0%) and neonicotinoids Kalypso (75.0–80.0%).

The last ones, at the third hour were aligned with Karate Zeon and retained 100% effectiveness 48 hours after their application.
Table 2. Effectiveness of some insecticides against imago of Plagionotus floralis, %

<table>
<thead>
<tr>
<th>Insecticides</th>
<th>Effective, %</th>
<th>1h.</th>
<th>3h.</th>
<th>5 h.</th>
<th>24 h.</th>
<th>48 h.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurelle D</td>
<td>50.0</td>
<td>60.0</td>
<td>65.0</td>
<td>80.0</td>
<td>75.0</td>
<td>95.0</td>
</tr>
<tr>
<td>Actara 25 WG (7 g da⁻¹)</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Actara 25 WG (14 g da⁻¹)</td>
<td>17.5</td>
<td>10.0</td>
<td>62.5</td>
<td>90.0</td>
<td>75.5</td>
<td>100.0</td>
</tr>
<tr>
<td>Reldan 40 EC</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Karate Zeon</td>
<td>10.0</td>
<td>26.0</td>
<td>25.0</td>
<td>50.0</td>
<td>80.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Decis 2.5 EC</td>
<td>90.0</td>
<td>82.5</td>
<td>90.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

It should be noticed that up to the fifth hour after the application of Karate Zeon, the pest was in a state of agony, as in the following hours, the percentage of mortality significantly increased and reached the highest value after 48 hours (Figure 1).

Legend: Al. – Alive individuals, D – Dead individuals, A – Agonizing individuals

**Figure 1.** Quantitative ratio between alive, dead and agonizing individuals Plagionotus floralis after treatment with insecticides
The trend was kept during the two years of study. Agony in *P. floralis*, treated with Decis lasted longer, up to 24 hours, after which the proportion of dead individuals increased sharply.

A similar trend was observed in Kalypso, but the percentage of dead individuals prevailed over those in agony 24 hours after the treatment and reached maximum values at the 48\textsuperscript{th} hour in both years. The Organophosphorus insecticide Nurelle D (50.0–60.0 \%) manifested slower initial activity than the previous products, but three hours after treatment the effectiveness significantly increased and reached the highest effectiveness (100\%) after 24 hours.

A similar trend was observed after using Reldan as its initial activity was within 10.0–17.5 \%. As a result of the application of Nurelle D, the agonizing adult individuals significantly prevailed, including and 48 hours after the treatment, as dead ones were found after the 24–\textsuperscript{th} hour. Reldan showed a toxic effect, stronger expressed at the 24–\textsuperscript{th} and 48–\textsuperscript{th} hour after its use, as during that period mainly dead individuals prevailed, unlike Nurelle D.

Neonicotinoids Mospylan and Actara showed unsatisfactory effectiveness from the first to the 24–\textsuperscript{th} hour. Double dose increase in Actara in 2011 did not affect the number of the pest and the effectiveness remained low.

The treatment with Mospylan was associated with the appearance of dead and agonizing individuals at relatively equal ratio after 24 and 48 hours.

Actara was characterized with the least toxic effect where dead individuals were found only 48 hours after its application, regardless of the dose used.

Via the analysis of variance made, in terms of the effectiveness (Table 3), it was found that the type of the insecticide applied has shown the strongest influence on that indicator–46.3\% of the total variation.

### Table 3.

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>Degrees of freedom, Df</th>
<th>Sum of squares, SS</th>
<th>Influence of factor, (%)</th>
<th>Mean square, MS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>79</td>
<td>123581.0</td>
<td>1564.3</td>
<td></td>
</tr>
<tr>
<td>Varieties</td>
<td>39</td>
<td>111733.3</td>
<td>9.7</td>
<td>2865.0</td>
</tr>
<tr>
<td>Factor A Insecticide</td>
<td>7</td>
<td>96003.9</td>
<td>46.3</td>
<td>13714.8</td>
</tr>
<tr>
<td>Factor B – 1 h. after treatment</td>
<td>4</td>
<td>4689.1</td>
<td>4.0</td>
<td>1172.3</td>
</tr>
<tr>
<td>AxB</td>
<td>28</td>
<td>11040.3</td>
<td>1.3</td>
<td>394.3</td>
</tr>
<tr>
<td>Pooled error</td>
<td>40</td>
<td>11847.6</td>
<td>296.2</td>
<td></td>
</tr>
</tbody>
</table>

It is due to the different mechanism of activity, the group of belonging and the active substance of the product used.

The strength of the effects of the duration was considerably less pronounced, but statistically significant–4.0\%. The interaction between the two factors: type of the insecticide applied and duration is insignificant, slightly pronounced and does not influence on the effectiveness–1.3\%.

### Conclusions

Insecticide products: Karate Zeon, Decis 2.5 EC and Kalypso 480 SC are characterized with rapid initial activity and high effectiveness against the adults of *Plagionotus floralis* and are suitable for pest control before oviposition.

The Neonicotinoids based on acetamiprid and thiamethoxam, manifested unsatisfactory efficacy.

The type of the insecticide applied, most strongly influenced on the effectiveness–46.3\% of the total variation. The strength of the effects of duration was considerably less pronounced, but statistically significant–4.0\%.

### References


