BIOECOLOGY AND CONTROL RESEARCHES CONCERNING THE LITTLE SPRUCE SAWFLY PRISTIPHORA ABIEITINA (CHRIST.) (HYMENOPTERA: TENTHREDINIDAE)

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Abstract. In the last years, the little spruce sawfly is producing outbreak on spruce out of ecological areas. The researches were carrying out in 2004-2005 period at stand Râşca, Suceava County. There were observed the dynamics of wasp development in function of spruce phenology, the wasp fly, deposed of eggs, larvae development and appearance of cocoons. It was analysed the cocoon density / sqm. and their parasitization degrees. Also, it was established the damage produced by larvae and evolution of outbreak.

Keywords: little spruce sawfly, bio ecology, entomophagous insects, chemical control

Introduction
Little spruce sawfly is a pest of 20-30 years old spruce stands out of ecological area localised. The defoliation of the top whorls influences height current increments of trees, annual shoots take an aspect of bayonets, broom of witch or multiply top of the trees. It is present in the central area of Europe, in the north countries and European Russian region. The young trees attacked can be destroyed. The cause of outbreak consists in artificial one-crop system out of ecological area, atmosphere pollution etc. The little spruce sawfly outbreaks were observed in many years and are difficult to control. In Romania, small attacks are reported in the west part (1986-1988) produced by Pristiphora saxesenii Htg. (Mihalciuc, 2000; Olenici & Olenici, 2005). Because the species Pristiphora sp. was in a poor density there are no scientific reports about the biology and the ecological factors which influenced the outbreaks. Also, there are no biological methods to control over-populations (Holuşă & Holuşă, 2002). In the last year over 500 ha were chemically treated in Suceava county.

Material and Methods
The researches were carried out in Forest District Râşca, U.P. Tiganca, in 2003-2004 periods. The type of forest is Abieto-Fagetum with null flora which covers 45% of surface and involved 37% of artificial spruce stand. The infestations were determined about 856.7 ha and biological observations in unit forest planning 11C were executed. For the whole stand defoliation, a scale with four levels was used (Holușa & Holușa, 2002): light damage – throughout the stand only a single shoot tree is consumed; medium damage – half of tree with one or two whorls consumed (little circle); heavy damage – more than half of the trees with three and more top whorls consumed (mid – size circle)
and stunted trees. In the year 2004, the density of the eggs and larvae on stems (three test trees) were analyzed, in the next year 210 shoots / six trees, respectively. For the fly wasp monitoring yellow sticky boards were used and took into account the critical value about 11 to 19 females per one sticky board (Holuša & Drápela, 2003). The density of cocoons in the soil was established by 32 samples / spruce stand (25/25/10 centimetres). The appearance of the adult wasps and parasitoids from cocoons took place in laboratory conditions. The parasitoid wasps were identified by Prof. Dr. Ionel Andreiescu and Prof. Dr. Constantin Pisciă (“Al. I. Cuza” University, Iași). In biological control it is used spinosad, a metabolite of *Sacharopolyspora spinosa* actinomycete, the first product within the Naturalyte class (Thompson et al., 1997). These attributes include: excellent efficacy against target pests; low human and environmental risk; excellent fit with integrated pest management systems and enhancement of resistance management. The treatment was applied on 2.VI.2005 (spruce stand Adâncata, UP VI, unit forest planning 57C) to second and the third larvae ages with swing fog apparatus (6 l diesel oil / ha). Before and after seven days after the treatment, tree stems from the top were analysed; the size of the plot was 0.2 ha.

**Results and Discussion**

Damages produced by the wasp.

First attack signal was confused in 2003 with early frozen and the area extended from 168 ha to 255.7 ha (2005) (Fig. 1). The great attack was registered in 2004; the next year negative climatic conditions influenced the increasing of the populations. In 2004, the average density of wasp developing stages / tree stems from the top whorls (three tree samples / unit forest planning 11C, 3B and 12G) were 16-31 eggs or 16-23 larvae. The average density of viable cocoons in the soil / sqm was 24 cocoons in 2003, 23 in 2004 and 19 in 2005.

![Figure 1. Attacks of little spruce sawfly *Pristiphora abietina* in 2003-2005 years period.](image-url)
Dynamics of the insect stages.

The appearance of the wasp adults is very phase and depends on the spring climatic conditions. Thus, in 2003, the beginning of the flight was registered in the third decade of April, apart from this in the next year at the beginning of May. There is a coincidence between sawfly swarming and bud break of spruce. In 2004, 314 adults were registered to the end of the flight on 11 yellow sticky boards, of these 62% were females and 38% males (on sticky board 29 adults were captured: 18 females and 11 males). In 2005, at the beginning of the flight, over 80% of females were in the oviposition stage. At the end of the fly on 6 yellow sticky boards, 123 adults were registered (on sticky board 21 adults were captured: 12 females and 9 males). An intense flight is in the second decade of May (Fig. 2).

The same results concerning the wasp flight were reported in other countries (Bernhard, 2000; Sommerauer, 2003). Also, the flight and development are affected by the excess of humidity and low temperatures (Holuša & Holuša, 2002), aspects noted in 2004. In the outbreak evolution a great attack was observed in 2004, when the average number of insects captured on yellow sticky boards was 18 females, a critical density to produce damages (Holuša & Drápela, 2003). In the next year, in spite of a critical female’s density (12), the damages were poor, because of the unfavourable meteorological conditions. Feeding period, retiring in the soil is the same as in other European reports (Gebert, 1995; Sommerauer, 2003).

**Figure 2.** Dynamics of the flight in 2005 (captures / 6 sticky boards).

**Figure 3.** Dynamics of the eggs laid in 2005 (210 shoots / 6 trees).
Figure 4. Dynamics of the number of larvae in 2005 (210 shoots / 6 trees).

Figure 5. Dynamics of the larval instars in 2005 (210 shoots / 6 trees).

Figure 6. Dynamics of the developing stages of Pristiphora abietina.

Figure 7. The parasitation of cocoons in 2003-2005.
Dynamics of the eggs laid.

In 2005, 210 buds were analysed weekly (from 6 sample trees). It resulted that the eggs were laid in May, but the maximum is located in the second decade, when the fly was rich (Fig. 3). In the previous year, because of early spring, the eggs were laid in the third decade of April and the end was in the second decade of May.

Dynamics of the number of larvae.

Because the developing time of the first and second stage is very short (some days) both are located at the beginning of May. Also, a large number of larvae of third instar was observed in 18-25 May period (Fig. 4). The population of larvae of fourth and fifth instars are significantly decreased due to unfavourable meteorological conditions. A great number of larvae is observed in the third decade of May when they are retired in the soil to form cocoons. In 2004, the larvae were retired more early in the third decade of May. Synthetically, in 2005, a great density developed in the second half of May (Fig. 5; 6).

Parasitoids bio cenosis.

After analyzing collected cocoons which were presenting specific leaving orifices by the parasitoid wasps, parasitization ratios of 29.5% (2003), 35.2% (2004) and 23% (2005) (Fig. 7), were observed. Out of 2004 autumn cocoons collected, 2% were attacked by chalcidoids (Family Pteromalidae: *Tritneptis* sp.) and 21% by ichneumonids (Subfamily Banchiniae: *Lissonota folii* Thomson, subfamily Cryptinae: *Agrothereutes* sp., *Endusys analis* Thomson, *E. testaceus* Taschenberg, *Sulcarius hellbrachi* Schmiedeknecht; subfamily Ctenopelmatinae: *Mesoleius ruficollis* Holmgren; subfamily Meschorinae: *Meschorus brevipetiolatus* Ratzburg; subfamily Tryphoninae: *Ctenochira flavicauda* Roman). In Adâncata spruce stand *Formica* sp. consumed over 50% of the larvae, five ant hills / ha. being recorded. Predators from the family Formicidae and parasitoid wasps are an important tool to maintain populations in low density (Olinici & Olinici, 2005).

Biological control.

The first product in the Naturalyte class which preserves beneficial insects and has a low risk to the environment was tested. All variants (spinosad a.i.) presented a good efficacy against the little spruce sawfly and excellently fit with integrated pest management (IPM) (Table 1).

**Table 1.** The mortality of larvae of *Pristiphora abietina* after the application of the biological product Laser 240 SC (spinosad).

<table>
<thead>
<tr>
<th>Variants</th>
<th>Doses ml/ha</th>
<th>Mortality after 7 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Laser 240 SC + Nu Film 17</td>
<td>50 + 250</td>
<td>100</td>
</tr>
<tr>
<td>2. Laser 240 SC + Nu Film 17</td>
<td>100 + 250</td>
<td>100</td>
</tr>
<tr>
<td>3. Laser 240 SC</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>4. Laser 240 SC</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>5. Untreated</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
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In accordance with Holuša & Drápelak (2003), an integrated pest IPM strategy was not established for the pest. For controlling the pest chemical treatments are used and thus the beneficial fauna is affected (Gebert, 1995; Bernhard, 2000; Baronio, 2004; Olinici & Olinici, 2005). No biological control is reported (Holuša & Drápel, 2003). It must be taken into consideration that the biological metabolite product Laser 240 SC (spinosad), could be introduced in IPM in the future.
Conclusions
- The little spruce sawfly *Pristiphora abietina* (Christ.) has produced an outbreak on spruce stand out of ecological area in Suceava county;
- The flight of the wasp took place in the period between the end of April and middle or the end of May. A large number of eggs was laid in the second decade of May and a high density of larvae was observed in the second half of May;
- Laser 240 SC. gave good results in the biological control of the larvae.

References

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