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CONTROL EXPERIMENTS OF THE DEFOLIATOR PRISTIPHORA ABIETINA CHRIST. (HYMENOPTERA: TENTHREDINIDAE) FROM SPRUCE STANDS OUTSIDE NATURAL SPREADING AREA IN IAŞI

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***Key words**: Pristiphora abietina, control, spruce stands*

INTRODUCTION

The small spruce fly (*Pristiphora abietina* Christ.) produced damages in the last few years which covered larger and larger surfaces (more than 5000 hectares), being identified in different region of the country (Olenici, 2005): Sălaj, Cluj, Mureş, Covasna, Vâlcea, Bacău, Botoşani, Suceava.

In Iaşi County the first damages were identified by silvical staff in the spring of 2004 in the forest district Paşcani (production units II Tătăruş and IV Sirețel).

MATERIAL AND METHOD

The researches were carried out using the method of observation and experiment.

There were undertaken analyses in different development stages of the pest in order to establish the level of infestation of young spruce stands spread outside of natural area.

The density of the larvae in cocoons was established in October 2004 and 2005, through soil samples of the size 1 x 1 m^2 under control trees.

In May was recorded the flight dynamic of the adults along with their density using sticky panels on the trunks of the trees (30 cm x 40 cm).

The densities in egg and larval stages were calculated in laboratory and field conditions, analyzing branches collected from the top third of the crown (one for each management unit).

Chemical treatments were undertaken from ground level using warm aerosols dispersing device (Swingfog), in batteries of 3 pieces, and aerial treatments with AN2 airplanes by ULV sprays with Micronair device.

In order to establish the dynamic of the mortality of *Pristiphora abietina* larvae after treatments we used capture surfaces (3 pieces of 1 m^2) under control trees; the dead larvae were counted daily for a 12 days period. The data were used for estimating treatments efficacy considering the larvae which entered the litter for pupation.

RESULTS AND DISCUSSIONS

Infestation level of spruce stands with *Pristiphora abietina* Christ.

The first damages produced by *Pristiphora abietina* Christ. observed in the field in spruce stands by forestry staff from Paşcani forest district were identified in the spring of 2004. The predicted defoliation resulted by analyzing pests cocoons varied between 0,7% in Trei Pietre forest up to 1,6 % in Broşteni forest and Iorcani (table 1); but the real values were certainly much higher, some spruce trees (over 30 years old) registered a 25 % defoliation in the crown top.

Table 1. The level of infestation with Pristiphora abietina depending on cocoons density into the soil Forest District Paşcani, 2004-2005

Production Unit	Forest	Compo-sition	Age -years-	Surface - hec-	Generation 2003/2004			Generation 2004/2005		
					Mean density Cocoons /m^2	Para-sition -%-	Mean defolia-tion 2004-%	Mean density Cocoons /m^2	Para-sitation -%-	Probable defolia-tion 2005-%
1	2	3	4	5	6	7	8	9	10	11
II Tătăruși	Broşteni	10 Mo	30	26,0	19,2	94,4	1,6	3,3	5,0	5,2
	Iorcani	10 Mo	30	88,0	4,5	79,9	1,6	15,0	9,5	22,6
IV Sirețel	Trei Pietre	10 Mo	30	226,0	3,3	87,4	0,7	1,2	2,4	3,9

It's interesting to emphasize the very high impact of parasitoids on the larvae inside the cocoons at the begining of the outbreak; parasited larvae percentage varied from 79,9% (Iorcani forest) to 94,4 % (Broşteni forest).

The next year, due to a low parasites activity (2,4 – 9,5 %), the population level of *Pristiphora* increased, defoliation prognosis by the cocoons analyses showed mean values between 3,9 % (Trei Pietre forest) to 22,6 % (Iorcani forest).

Because this pest is practically new for Romanian fauna (Olenici, 2005), there were not well established prognosis elements, we verified its presence in flight period using sticky panels and the density of the eggs on buds.

The analyzes of the branches collected in the third decade of May 2005 emphasized a level of buds infestation up to 25% in all three studied forests (table 2), the highest in Broşteni forest (37,5 %) and with similar values in Iorcani (28,5%) and Trei Pietre forests (25,5 %). These results confirmed that the used prognosis methods are not very accurate.

Regarding the mean density in egg stage, the value registered at 23.05.2005 varied from 56,2% up to 101 % (that means 2-3 eggs/bud) and a small part had been already hatched (0,4-2,2 %).

Table 2. Infestation level of spruce buds with eggs and larvae L_1 of Pristiphora abietina in the spring of 2005 before treatment

Forest	No. control trees	No.analised buds	Attacked buds -%-	Mean density no. eggs(larvae)/buds	
				eggs	larvae L_1
1	2	3	4	5	6
Broşteni	2	99	37,5	101,0	1,0
Iorcani	6	735	28,5	56,2	0,4
Trei Pietre	8	620	25,5	68,4	2,2

Control experiments of *Pristiphora* larvae using synthesis piretroids and chitin inhibitors

Experimental treatments took place in the period 28-31.05.2005, when the most of *Pristiphora* larvae were in L_2 instar. In Broşteni forest were treated 26 hectares with Sumi-Alpha 0,5 ULV with a doze of 3 l/ha mixed with Diesel oil 3 l/ha, using warm aerosols applied with Swingfog device (table 3). Meteorological conditions were favorable for the treatment in that period (28.05.2005).

Table 3. Experimental variants in control of Pristiphora abietina - O.S. Paşcani - 2005

Production Unit	Forest	Sur-face -hec-	Treatment date	Experimental variant	Apparatus	Larvae age	Meteorological conditions
1	2	3	4	5	6	7	8
II Tătăruş	Broşteni	26,0	28.05.2005	V_1- Sumi - Alpha, 0,5-ULV-3 l/hec diesel-fuel - 3 l/hec	Terestrial Swingfog	L_2	Favorable Without rains 3 days after treatment
	Iorcani	88,0	31.05.2005	V_2- Dimilin - SC 48 - 80 ml/hec water - 3 l/hec	Aerial Micronaire	L_2	Storm and weak rain at 8 hours after treatment Strong rain at 20 hours after treatment
IV Sireţel	Trei Pietre	226,0	31.05.2005	V_2- Dimilin - SC 48 - 80 ml/hec water - 3 l/hec		L_2	

In Iorcani forest (88 ha) and Trei Pietre (226 ha) were applied aerial treatments (31.05.2005) with the product Dimilin 48 SC (80 ml/ha in 3,0 l water) using Micronaire device (ULV sprayers). In this case the meteorological conditions were unfavorable (storm and rain at 8 hours after treatment and heavy rain after 20 hours).

The figures 1 and 2 show the dynamic of relative mortality on larval stages, the efficacy of treatments and the real defoliation.

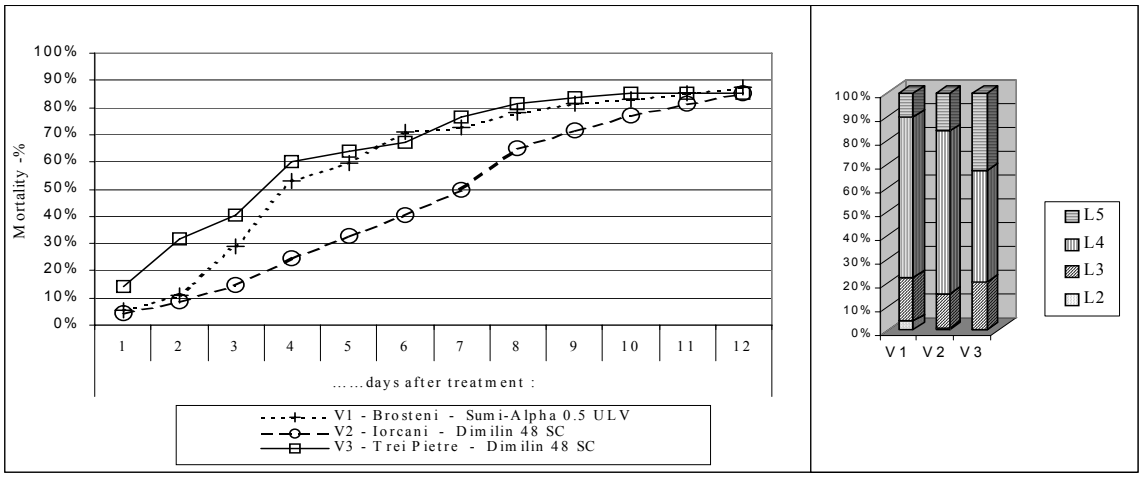

Fig. 1. Mortality dynamic of Pristiphora abietina larvae after treatments with Sumi-Alpha 0.5 ULV and Dimilin 48 SC. Forest District Paşcani

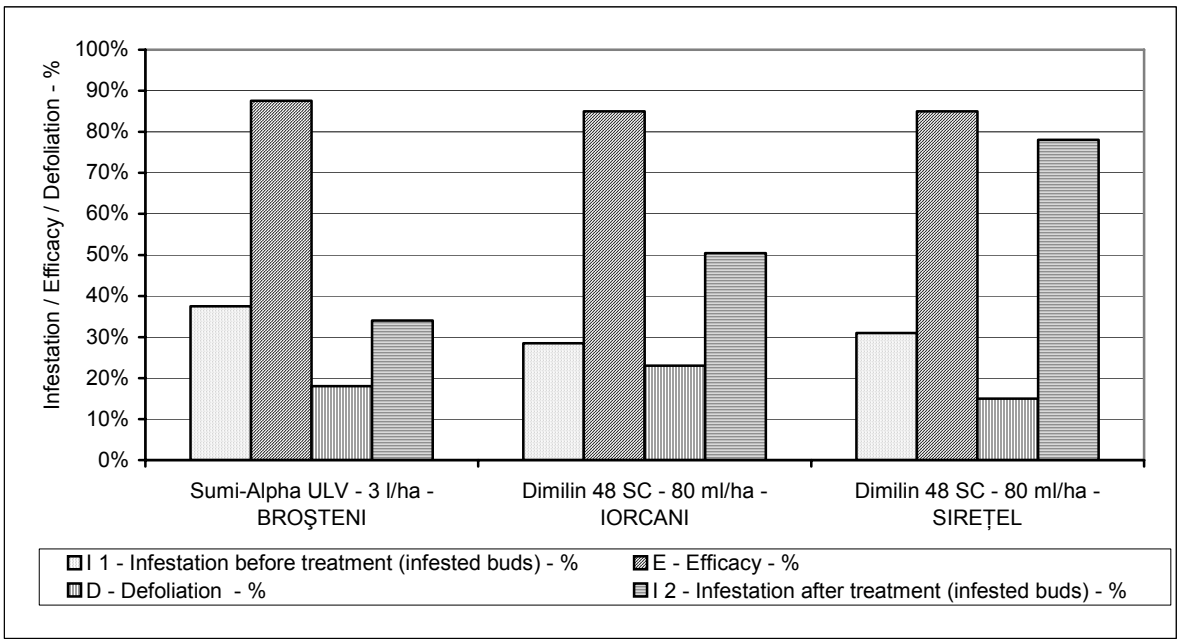

Fig. 2. Eficacy of treatments against Pristiphora abietina larvae - Forest District Paşcani - 2005

Thus, in Broşteni forest, treated from ground with Sumi-Alpha 0,5 ULV, the efficacy was 87,6 %, the highest mortality being registered in the 3-th and 4-th day after the treatment (21,4 % and 28,7 %). Real defoliation recorded a mean value of 18 %. With respect to the percentage of damaged buds, this was about the same (33-37%) after the treatments, the larvae attack did not extend in the crown (table 4).

Table 4. Procentage of attacked buds of Pristiphora abietina larvae after treatments

Forest	Atacked buds (%)			Statistical index			
	R_1	R_2	R_3	$\bar{x}$	s	s%	$N_{5\%}$
1	2	3	4	5	6	7	8
Broşteni	20,8	46,1	-	33,4	17,9	53,6	441
Iorcani	64,3	43,3	35,2	47,6	15,0	31,5	153
Trei Pietre	33,3	93,8	82,6	69,9	32,2	46,1	326

In the forests Iorcani and Trei Pietre, aerial treated with Dimilin, the mean value of efficacy was relatively low (both of 85 %), probably due to the unfavorable weather after the treatments. Larval mortality was slower, characteristic to chitin inhibitors, reaching the highest values in the 6-th day after the treatment.

Defoliation was 23 % in Iorcani forest and 15 % in Trei Pietre forest. The larvae presented a high mortality in the crown, the percentage of damaged buds increased after the treatment from 28,5 % up to 47,6% in Iorcani forest and from 25,5% up to 69,9% in Trei Pietre forest.

The figure 1 emphasizes that most of the larvae were dead in L_4 instar at Sumi-Alpha treatment (shock effect) and in L_4-L_5 instars at Dimilin treatment (slower effect).

Regarding the level of reinfestation with *Pristiphora*, out of the table 5 results that in the forests treated with synthesis piretroid the predicted defoliation recorded only 5 %, the outbreak trending to be naturally extinct, and in the stands treated with Dimilin, although sex ratio showed an imminent crises of pest population (31,8 %), predicted defoliation percentage is high (44,2 %). These results entail to more attentive analyzes of optimal ecological and economical methods to stop the attack.

Table 5. Reinfestation with Pristiphora abietina after treatments

Forest	Insecticide	No. cocoons/ m^2		Sex ratio [F/(F+M)]*100	Probable defoliation - %
		June	October		
1	2	3	4	5	6
Broşteni	Sumi-Alpha	9,0	3,3	56,6	5,0
Iorcani, Trei Pietre	Dimilin	25,7	25,3	31,8	44,2

CONCLUSIONS

The treatments with synthesis piretroid Sumi-Alpha ULV and chitin inhibitor Dimilin 48 SC didn't demonstrate the best efficacies in the control of *Pristiphora abietina* larvae in the spring of 2005 (mortalities of 85-87%; defoliation of 15-23 %).

The efficacy was influenced by climatic factors (rain after treatments with Dimilin) and probably technical (lack of adhesive).

Residual population of the pest is afterwards dangerous, especially in the stands treated with Dimilin, requiring further monitoring regarding the impact of some biotic limitative factors (parasitoids, predators) and their capacity to contribute to natural extinction of the outbreak.

REZUMAT

In ultimii ani, în arboretele de molid situate în afara arealului, în vârstă de 30-40 ani, s-au înregistrat gradații produse de viespea mică cu ferăstrău a acelor de molid (*Pristiphora abietina* Christ.).

În cadrul Direcției Silvice Iaşi, infestări puternice şi foarte puternice s-au înregistrat la ocolul silvic Paşcani, unde în primăvara 2005 au fost necesare intervenții cu tratamente chimice aplicate avio şi terestru. Tratamentele efectuate cu piretroizi de sinteză (Sumi - Alpha ULV - 3 l/ha) cu aparatură tip Sthil (26 ha) s-au dovedit mai eficiente decât cele aplicate cu produsul Dimilin 48 SC (inhibitor de sinteză a chitinei - 80 ml / ha) sub formă de stropiri ultrafine din avion (314 ha).

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