

NEW AGENTS FOR CONTROLLING LEAF MINING PESTS IN APPLE ORCHARDS

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A B S T R A C T

The studies on new agents for controlling pear leaf blister moth were conducted from 1999 to 2002 in commercial apple orchards in different regions of Poland. Control treatments were carried out when the first generation of caterpillars began to hatch. Agrola or Śleza tractor sprayers were used to deliver 500 to 700 liters of spraying liquid per hectare. Efficacy was estimated on the basis on the number of mines on the leaves.

Products containing neonicotinoid compounds such as thiacloprid (Calypso 480 SC) and acetamiprid (Mospilan 20 SP and Piorun 200 SL) are highly effective in controlling the pear leaf blister moth.

Key words: pear leaf blister moth (*Leucoptera scitella* Zell.), chemical control, neonicotinoid compounds, thiacloprid (Calypso 480 SC), acetamiprid (Mospilan 20 SP, Piorun 200 SL)

INTRODUCTION

Numerous outbreaks of leaf-mining insects causing damage to apple trees were reported in Poland from 1963 to 1965 (Goos, 1965ab). Outbreaks of varying intensity were also reported in the 1980s and 1990s, mainly involving the apple pygmy moth (*Stigmella malella* Stt.) and the pear leaf blister moth (*Leucoptera scitella* Zell.) (Maciesiak, 1996ab).

Synthetic pyrethroids are effective agents for controlling leaf-mining insects (Maciesiak and Dadej, 1984/85). Because synthetic pyrethroids are nonselective, acyl-urea compounds were evaluated in later experiments and were found to be effective insecticides (Maciesiak, 1996c and 1999). Synthetic pyrethroids and acyl-urea compounds have also been successfully used to control leaf-mining pests in other countries (Weires and Forshey, 1978; Ciglar, 1981; Injac, 1981; Injac and Dulic, 1983).

In the 1990s, new and safer neonicotinoid insecticides were synthesized. Because they are specific and relatively less toxic to beneficial insects, we have begun to study their potential usefulness in controlling the pear leaf blister moth, which was a common pest in some apple growing regions from 1998 to 2003.

MATERIAL AND METHODS

The studies were conducted from 1999 to 2002 in commercial apple orchards in different regions of Poland. Control treatments were carried out when the first generation of caterpillars began to hatch. Every product was applied on separate plot with an area of 0.3 to 0.5 hectares. Agrola or Śleza tractor sprayers were used to deliver 500 to 700 litres of spraying liquid per hectare. Efficacy was estimated on the basis of the number of mines on the leaves. One hundred leaves were collected from four trees growing in the middle of each experimental plot. Specimens were collected in June, when the first generation appeared, and in September, when the second generation appeared. The leaves were carefully examined in the laboratory for mines made by the pear leaf blister moth.

Data were statistically elaborated using ANOVA, followed by means separation using Duncan's multiple-range t-test at $P \leq 0.05$.

RESULTS AND DISCUSSION

Nicotinoid compounds were highly effective in controlling the pear leaf blister moth. Thiacloprid (Calypso 480 SC) and acetamiprid (Mospilan 20 SP and Piorun 200 SL) were particularly effective, about as effective as diflubenzuron (Dimilin 25 WP), alpha-cypermethrin (Fastac 100 EC) and lambda-cyhalothrin (Karate 025 EC) (Tab. 1 and 2). The high efficacy of neonicotinoids has subsequently been confirmed in fruit growing practice. Thiacloprid and acetamiprid are relatively less toxic to both predatory and parasitoid beneficial insects, which makes them particularly useful in Integrated Fruit Production orchards. Over the last few years, the numbers of the pear leaf blister moth and other leaf-mining pests has been steadily declining in apple orchards in Poland, at least partly because of the widespread use of neonicotinoids in controlling the apple fruit fly (*Hoplocampa testudinea*). Treatments against the apple fruit fly are usually carried out at the same time as recommended for treatments against the pear leaf blister moth.

Table 1. Effectiveness of several preparations in controlling the pear leaf blister moth

Product and active ingredient	Dose in l or kg/ha	Number of mines/100 leaves			
		Orchard 1		Orchard 2	
		generation			
		I	II	I	II
1999					
Thiacloprid (Calypso 480 SC)	0.1	0.0 a*	0.6 a	-	-
Diflubenzuron (Dimilin 25 WP)	0.4	0.2 a	1.5 a	1.2 a	7.8 a
Alpha-cypermethrin (Fastac 100 EC)	0.2	1.8 b	2.2 ab	1.2 a	18.9 b
Acetamiprid (Mospilan 20 SP)	0.2	4.1 b	11.5 b	13.1 b	31.4 b
Control (untreated)	-	113.1 d	123.1 d	563.9 d	388.7 d
2000					
Thiacloprid (Calypso 480 SC)	0.1	0.0 a	0.0 a	-	-
Diflubenzuron (Dimilin 25 WP)	0.4	0.0 a	0.0 a	-	-
Alpha-cypermethrin (Fastac 100 EC)	0.2	0.0 a	0.0 a	-	-
Acetamiprid (Mospilan 20 SP)	0.2	0.0 a	0.0 a	-	-
Control (untreated)	-	447.7 c	157.0 c	-	-

*Means followed by different letters are significantly different at P=0.05

Table 2. Effectiveness of several preparations in controlling the pear leaf blister moth

Product and active ingredient	Dose in l or kg/ha	Number of mines/100 leaves			
		Orchard 1		Orchard 2	
		generation			
		I	II	I	II
2001					
Diflubenzuron (Dimilin 25 WP)	0.4	-	-	0.0 a	0.0 a
Acetamiprid (Mospilan 20 SP)	0.125	-	-	0.0 a	7.8 b
Acetamiprid (Mospilan 20 SP)	0.2	1.9 b*	97.5 bc	-	-
Acetamiprid (Piorun 200 SL)	0.2	12.5 cd	99.7 bc	0.0 a	3.8 b
Control (untreated)	-	157.0 f	334.6 d	87.8 c	141.4 d
2002					
Diflubenzuron (Dimilin 25 WP)	0.4	1.4 b	7.4 c	21.7 b	97.4 c
Lambda-cyhalothrin (Karate 025 EC)	0.45	0.0 a	17.2 d	0.0 a	35.8 a
Acetamiprid (Mospilan 20 SP)	0.125	0.0 a	5.0 b	0.0 a	34.3 a
Acetamiprid (Mospilan 20 SP)	0.2	0.0 a	2.8 a	0.0 a	42.6 ab
Control (untreated)	-	168.6 c	227.6 e	351.4 c	324.7 d

*Explanation: see Table 1

CONCLUSIONS

Products containing neonicotinoid compounds such as thiacloprid (Calypso 480 SC) and acetamiprid (Mospilan 20 SP and Piorun 200 SL) are highly effective in controlling the pear leaf blister moth.

Neonicotinoid compounds broaden the array of agents available for controlling leaf-mining pests in apple orchards, which enables growers to effectively rotate control agents.

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NOWE MOŻLIWOŚCI ZWALCZANIA SZKODNIKÓW MINUJĄCYCH LIŚCIE W SADACH JABŁONIOWYCH

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S T R E S Z C Z E N I E

Badania nad zwalczaniem toczyka gruszowiaczka prowadzono w latach 1999-2002 w towarowych sadach jabłoniowych. Zabiegi zwalczające wykonywano na początku wylęgania się gąsienic pierwszego pokolenia szkodnika. Do wykonywania zabiegów użyto opryskiwacza ciągnikowego zużywając 500-700 l cieczy roboczej na hektar. Skuteczność zabiegów oceniano na podstawie liczby min pierwszego oraz drugiego pokolenia na liściach.

Badania wykazały, że preparaty z grupy neonikotynoidów zawierające tiachlopryd (Calypso 480 SC) i acetamipryd (Mospilan 20 SP i Piorun 200 SL) wykazują wysoką skuteczność w zwalczaniu toczyka gruszowiaczka

Słowa kluczowe: toczyk gruszowiaczek, chemiczne zwalczanie, preparaty neonikotynoidowe, Calypso 480 SC, Mospilan 20 SP, Piorun 200 SL