

POTENTIAL AGENTS FOR CONTROLLING THE
STRAWBERRY MITE (*Phytonemus pallidus* SSP.
fragariae ZIMM.) AFTER THE WITHDRAWAL
OF ENDOSULFAN

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A B S T R A C T

The strawberry mite is one of the most serious pests of strawberry plantations. It can be easily brought to new production plantations with young plants. Therefore it should be well controlled on mother plantations. This pest feeds on the youngest and folded leaves and causes serious damage to plant foliage. It has also an influence on the number and quality of new strawberry plants on mother plantations as well as on yield and fruit quality on fruiting plantations. Among new strawberry cultivars tested, none was found to be highly resistant to strawberry mite. For many years endosulfan (as Thiodan 350 EC and Thionex 350 EC) and amitraz (as Mitac 200 EC) have been used as standard insecticides to control the strawberry mite on strawberries. Both of these chemicals are due to be withdrawn soon and it is necessary to find other acaricides, which will give good results in controlling this pest.

Experiments conducted at the Research Institute of Pomology and Floriculture in Skierniewice showed that some new acaricides reduce the strawberry mite population, but their efficacy is not as high as of endosulfan. Propargite as Omite 570 EW has recently been registered to control the strawberry mite. Promising results were also obtained with spiroticlofen as Envidor 240 SC, fenazaquin as Magus 200 SC and fenpiroximate as Ortus 05 SC. Hopefully, some of them will be registered to control the strawberry mite on strawberries in the very near future.

Key words: strawberry, strawberry mite, *Phytonemus pallidus* ssp. *fragariae*, chemical control, endosulfan, propargite, spiroticlofen

INTRODUCTION

The strawberry mite has recently become a very serious pest on strawberry plantations in Poland (Łabanowska, 2000). It causes severe leaf

damage and reduces yield and fruit quality. Damaged fruits are small and sour, and do not conform to consumers expectations. On some plantations, the strawberry mite has reduced yields by 30 to 70%, depending on density of the mite population (Alford, 1972 and 1976). The strawberry mite feeds on young leaves, which have not yet unfolded. The mite can also reduce the number and quality of seedlings on mother plantations. The mite can be easily transported with young plants to new plantations, which means that it should be effectively controlled on mother plantations. In Poland, endosulfan (Thiodan 350 EC and Thionex 350 EC) and amitraz (Mitac 200 EC) have long been the standard agents used to control the strawberry mite. Both these agents are scheduled to be withdrawn soon. It is therefore extremely important to find other acaricides effective against the strawberry mite, especially because no new resistant cultivars are available in spite of extensive testing (Łabanowska, 2004; Łabanowska, in press). The aim of this study was to evaluate two new acaricides, propargite (Omite 570 EW) and fenpyroximate (Ortus 05 SC), in terms of their usefulness in controlling the strawberry mite.

MATERIAL AND METHODS

The experiments were carried out in 2001 and 2002 on two-to-three-year-old strawberry plantation planted with the cultivar 'Senga Sengana' in Sierakowice, Rowiska and Skierniewice, near the Research Institute of Pomology and Floriculture. In the summer, after harvest, the plantations were sprayed twice, seven days apart. Old leaves were usually mowed and removed from the plantations before spraying. The experiment was set up with four replicates. A Stihl knapsack motorized sprayer was used to deliver the equivalent of 750 liters of spraying liquid per hectare. Endosulfan and amitraz were used as the standards. Effectiveness was evaluated four or five times after the second treatment. Motile forms and eggs were counted separately in ten randomly selected leaves per replicate before treatment and one to four weeks after treatment.

Data were statistically elaborated using analysis of variance after transformation according to the formula $y = \log(x+1)$, where x equals the number of mites per ten leaves. The significance of the differences between means was evaluated using Duncan's multiple-range t-test at $P \leq 0.05$.

RESULTS AND DISCUSSION

Selected results are shown in Tables 1 and 2.

At Sierakowice, both propargite and fenpyroximate effectively reduced the strawberry mite population. They were about as effective as amitraz, although they were less effective than endosulfan. Propargite was more effective when used at 2.0 l/ha than at 1.5 l/ha (Tab. 1a).

Table 1. Number of strawberry mites (*Phytonemus pallidus* ssp. *fragariae* Zimm.) per leaf

Acaricide	Rate l/ha	Weeks after second treatment				
		1	2	3	4	5
a) Sierakowice 2001*						
Propargite (Omite 570 EW)	1.5	4.7 c	3.7 d	0.7 c	2.4 d	1.3 cd
Propargite (Omite 570 EW)	2.0	4.5 c	0.7 c	0.2 b	0.5 b	0.7 c
Fenpyroximate (Ortus 05 SC)	1.2	0.6 a	0.3 bc	1.4 d	0.1 a	1.2 cd
Endosulfan (Thiodan 350 EC)	2.5	1.2 b	0.0 a	0.0 a	0.1 a	0.0 a
Amitraz (Mitac 200 EC)	4.0	0.3 a	0.6 bc	1.0 cd	1.0 bc	0.1 b
Control (untreated)	-	11.3 d	4.9 d	5.7 e	6.3 e	5.9 e
b) Rowiska 2001**						
		Days after second treatment				
		3	10	16	23	
Propargite (Omite 570 EW)	1.5	1.5 b	0.9 b	2.6 c	1.6 d	
Propargite (Omite 570 EW)	2.0	1.3 b	1.3 b	0.9 b	0.6 c	
Propargite (Omite 30 WP)	2.25	0.8 b	0.3 a	0.9 b	0.2 b	
Endosulfan (Thiodan 350 EC)	2.5	0.0 a	1.9 bc	0.0 a	0.0 a	
Control (untreated)	-	5.1 c	3.8 c	6.1 c	5.5 e	
c) Skierniewice 2002***						
		Weeks after second treatment				
		1	2	3	4	
Propargite (Omite 570 EW)	1.5	2.0 c	0.4 b	1.7 c	0.6 b	
Propargite (Omite 570 EW)	2.0	0.4 b	1.9 c	4.1 d	1.9 c	
Endosulfan (Thiodan 350 EC)	2.5	0.1 a	0.1 a	0.1 a	0.1 a	
Amitraz (Mitac 200 EC)	3.0	0.5 b	1.4 c	0.5 b	0.7 b	
Control (untreated)	-	15.9 e	14.1 d	9.6 e	7.8 d	

*Treatments on July 30 and Aug. 6, 2001. Before treatments, 2 to 2.5 mites and 2.5 to 5.2 eggs per leaf were present.

**Treatments on Aug. 13 and Aug. 17, 2001. Before treatments, 1 to 2.5 mites and 2 to 3 eggs per leaf were present.

***Treatments on June 26 and July 3, 2002. Before treatments, 6 to 13 mites and 21 to 40 eggs per leaf were present.

At Rowiska, propargite effectively reduced strawberry mite populations whether applied as Omite 570 EW or Omite 30 WP (Tab. 1b).

At Skierniewice, propargite effectively reduced strawberry mite populations when applied as Omite 570 EW at 1.5 and 2.0 l/ha. Propargite was about as effective as amitraz, although it was less effective than endosulfan (Tab. 1c).

Propargite was a promising agent for controlling the strawberry mite, which confirms earlier results (Łabanowska, 2003). In previous experiments, promising results were also obtained with fenazaquin (Magus 200 SC), fenpyroximate (Ortus 05 SC), abamectin (Vertimec 018 EC) and pyridaben (Sanmite 20 WP) (Łabanowska, 1995 and 2003). In recent experiments, satisfactory results were obtained with spirodiclofen (Envidor 240 SC at 0.6 l/ha), which belongs to a new generation of acaricides (Łabanowska, 2003 and 2005). The new acaricides were less persistent than endosulfan.

Table 2. Number of strawberry mite eggs per leaf

Acaricide	Rate l/ha	Weeks after second treatment				
		1	2	3	4	5
a) Sierakowice 2001*						
Propargite (Omite 570 EW)	1.5	6.9 c	5.4 c	1.0 c	3.4 d	1.6 c
Propargite (Omite 570 EW)	2.0	5.1 c	1.0 b	0.1 b	0.6 b	0.6 c
Fenpyroximate (Ortus 05 SC)	1.2	0.4 b	0.3 b	1.1 c	0.1 a	0.8 c
Endosulfan (Thiodan 350 EC)	2.5	1.2 b	0.0 a	0.0 a	0.1 a	0.0 a
Amitraz (Mitac 200 EC)	4.0	0.3 a	0.9 b	1.2 c	1.3 c	0.2 b
Control (untreated)	-	15.0 d	6.5 c	8.6 d	9.4 e	7.9 d
b) Rowiska 2001**						
		Days after second treatment				
		3	10	16	23	
Propargite (Omite 570 EW)	1.5	1.8 c	0.8 a	2.8 c	2.4 c	
Propargite (Omite 570 EW)	2.0	1.1 bc	2.2 b	0.9 b	0.3 b	
Propargite (Omite 30 WP)	2.25	0.6 b	0.4 a	1.3 bc	0.1 ab	
Endosulfan (Thiodan 350 EC)	2.5	0.0 a	2.6 bc	0.0 a	0.0 a	
Control (untreated)	-	7.3 d	5.5 c	10.1 d	7.4 d	
c) Skierniewice 2002***						
		Weeks after second treatment				
		1	2	3	4	
Propargite (Omite 570 EW)	1.5	0.2 a	0.3 b	5.8 c	2.9 c	
Propargite (Omite 570 EW)	2.0	2.2 c	0.8 b	1.8 b	1.1 b	
Endosulfan (Thiodan 350 EC)	2.5	0.02 a	0.04 a	0.3 a	0.2 a	
Amitraz (Mitac 200 EC)	3.0	0.4 b	2.6 c	0.6 a	0.7 b	
Control (untreated)	-	34.1 d	27.9 d	18.4 d	15.2 d	

*Explanations see under Table 1

Endosulfan and amitraz have long been recommended for controlling the strawberry mite (Łęska and Golik, 1966; Stenseth and Nordby, 1976; Labanowska, 1992 and 1995). Control is most effective when two treatments are applied about a week apart. Treatment after harvest time is more effective than treatment before blossoming time. However, amitraz was removed from the list of registered agents in August 2005. Endosulfan will be removed from the list at the end of the 2006 season, and can be applied only once a year after the end of the harvest period.

The two agents registered for use in Poland are pyridaben (Sanmite 20 WP at 2.25 kg/ha) and propargite (Omite 570 EW at 2.0 l/ha). Propargite can only be applied in summer, after the end of the harvest period. When applied in the springtime, propargite is phytotoxic to young strawberry leaves. Both pyridaben and propargite are more effective when mite populations are low and less effective when mite populations are high.

Spraying technique is very important in controlling the strawberry mite. Mites on the surface of young, unopened leaves are more effectively killed than mites in places where the spray does not reach, such as the upper surface of curled leaves and attached leaves.

The best way to avoid strawberry mite plant infestation is by planting new plantations with healthy, pest-free plants. Plantations planted with only healthy, pest-free plants do not require any strawberry mite control for the first three years because the mite populations stay at a very low level (Łabanowska, 2004).

CONCLUSIONS

1. Promising results in controlling the strawberry mite were obtained with several new acaricides, including spirodiclofen (Envidor 240 SC), abamectin (Vertimec 018 EC), fenazaquin (Magus 200 SC) and fenpyroximate (Ortus 05 SC), but none of them has yet been registered for commercial use.
2. Pyridaben (Sanmite 20 WP) has been registered for use in spring and summer. Propargite (Omite 570 EW) can only be used in summer, either just after harvest or later on in the season.
3. The best way to avoid strawberry mite plant infestation is by planting new plantations with healthy, pest-free plants. Mother plants should be prophylactically treated with acaricides.

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POTENCJALNE MOŻLIWOŚCI ZWALCZANIA ROZTOCZA TRUSKAWKOWCA (*Phytonemus pallidus* ssp. *fragariae* ZIMM.) PO WYCOFANIU ENDOSULFANU

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

Roztocz truskawkowiec jest jednym z najważniejszych szkodników truskawki w Polsce. Może on być łatwo przenoszony z sadzonkami na nowe plantacje, dlatego też powinien być skutecznie zwalczany w matecznikach. Roztocz żeruje na najmłodszych, jeszcze zwiniętych liściach truskawki i powoduje poważne uszkodzenie roślin. Ma to wpływ na ilość i jakość sadzonek w matecznikach oraz na plon na plantacjach produkcyjnych. Spośród nowych testowanych odmian truskawki żadna nie wykazywała pełnej odporności na zasiedlenie przez szkodnika. Przez wiele lat do zwalczania roztocza stosowano standardowo endosulfan (Thiodan 350 EC i Thionex 350 EC) oraz amitraz (Mitac 200 EC). Związki te są wycofywane i konieczne jest wprowadzenie innych, skutecznych akarycydów do zwalczania roztocza.

W doświadczeniach prowadzonych w ISK w Skierniewicach wykazano, że niektóre akarycydy istotnie redukują populację roztocza, ale żaden nie jest tak skuteczny jak endosulfan. Ostatnio do zwalczania roztocza zarejestrowano propargit (Omite 570 EW). Obiecujące wyniki uzyskano także stosując: spirodiclofen jako Envidor 240 SC, fenazachinę – Magus 200 SC i fenpiroksymat – Ortus 05 SC. Mam nadzieję, że będą one zarejestrowane do zwalczania roztocza truskawkowca.

Słowa kluczowe: truskawka, roztocz truskawkowiec, możliwości zwalczania, propargit, endosulfan, spirodiclofen, *Phytonemus pallidus*