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EFFICACY OF SPIROTETRAMAT IN THE CONTROL OF PEAR PSYLLA (*Cacopsylla pyri* L.) ON PEAR TREES IN POLAND

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A B S T R A C T

The effectiveness of spirotetramat in the control of pear psylla (*Cacopsylla pyri*) on pear trees was investigated in five field experiments, carried out in years 2009-2011. One or two treatments were applied in June; the first treatment in the early stage of larvae hatching from eggs deposited by females from the summer generation, whilst the second application was carried out about two weeks later. In all the experiments, spirotetramat as Movento 100 SC applied at a dose of 2.25 l/ha effectively reduced the pest population after only a single application (total reduction of larvae after one week post-treatment 75.3-91.4%, and 83.7-97.6% at two weeks post-treatment). Movento 100 SC applied after a single application at a lower dose of 1.8 l/ha had a slightly worse effect (the total reduction of larvae at one week post-treatment was at the level of 58.4-91.3%, and two weeks after application at the level of 56-92.6%) - but in this case only a few larvae at stages L_4 and L_5 were found on pear shoots. The effectiveness of spirotetramat at both doses after two applications was very high.

In comparison with standard insecticides the efficacy of spirotetramat was higher or not significantly different. In two experiments the application of standard compounds such as diflubenzuron and novaluron was not effective in controlling pear psylla and therefore did not prevent damage to pear trees. This may suggest that local populations of the pest are resistant to these measures, especially since they have been used for many years to control other pests of pear trees.

Key words: *Cacopsylla pyri*, diflubenzuron, novaluron, pear psylla, pear tree, spirotetramat, thiamethoxam

INTRODUCTION

In Poland, the control programme for pear psylla (*Cacopsylla pyri*) presently requires a few treatments. The most important periods of treatment are at the time when eggs are laid by females as well as during the egg hatching and the larvae appearance of the first generation. These periods usually take place about two-three weeks after the flowering of the pear tree. In Polish weather conditions, females of this generation may lay up to 1000 eggs each, mainly in the second half of May and in June, with various intensity (depending on the weather). The eggs hatch gradually. The first larvae appear in late May and early June, and many larvae show up in the first half of June. In orchards where chemical control is applied, one or two treatments against pear psylla are recommended (depending on the threat), to avoid damage caused by the pest. At this period, pear psylla may be controlled using well-known products such as: Actara 25 WG (thiamethoxam), Dimilin 480 SC (diflubenzuron), or Rimon 100 EC (novaluron). The new product, introduced in the season 2011, is Acaramic 018 EC (abamectin). The effectiveness of such active substances in the studies was generally high (Jaworska et al., 1997 and 2001; Stamenkovic et al., 2001; Jaworska and Olszak, 2002 and 2011, Erler and Cetin, 2005), however in practice, the control of pear psylla using Actara 25 WG, Dimilin 480 SC, and Rimon 100 EC is not always at the satisfactory level.

One of the reasons may be the low sensitivity of local populations of pear psylla to these products. The products have also been applied in pear production orchards for many years to control other pests. The problem of *Psylla* sp. resistance, including pear psylla, to commonly used insecticides has been known for a long time (Harries and Burts, 1965; Bues et al., 1999; Kocourek and Stara, 2006). Therefore, there is a constant need to test new formulations in order to control this pest effectively. As far as pear production is concerned, new products containing spirotetramat were studied and registered for the control of harmful pests such as thrips, nematodes, leaf midges, spider mites, aphids, scale insects, and others, including psyllas (Kay and Herron, 2010; Mansour et al., 2010; Marcic et al., 2011; Page-Weir et al., 2011; Smiley et al., 2011). The aim of this study was to evaluate the efficacy of spirotetramat − Movento 100 SC used to control pear psylla on pear trees in Poland.

MATERIAL AND METHODS

The three experiments were carried out in the 22-24 year old pear section of the Experimental Orchard in Dąbrowice located near Skierniewice (N 510 55.345 'E 200 05.785'). The study was conducted during the 2009-2011 growing seasons. Two additional experiments were carried out in privately owned orchards. One trial was established in a 26 year old orchard in Lubomin located near the city of Izbica Kujawska (N 520 27.11 'E 180

49.37') in 2009. The second trial was in 2011, in the 4-year-old orchard in Brochocin near the city of Płock (N 520 57.901 'E 190 74.923'). The experiments were established in a randomized block design, with four repetitions. In the orchard in Dąbrowice, one subplot repetition in subsequent years included three trees of 'Lukasówka', five trees of 'Faworytka' and three trees of 'Conference'. All varieties were grafted on seedlings of 'Caucasian' pear (*Pyrus caucasica*) and planted at a distance of 2.5-3.0 m x 4.0 m. In the experiment in Lubomin, each plot included five trees of 'Bartlett' and 'Lukasówka' grafted on quince, and growing at a distance of 0.9-1.5 m x 5.0 m. In the experiment in Brochocin, each plot included three 'Conference' trees grafted on quince and growing at a distance of 1.3 x 3.0 m.

The motorized knapsack sprayer "Stihl SR 420" with a spray volume of 750 l/ha. Spirotetramat as Movento 100 SC was used to apply the treatment doses: 1.8 l/ha and 2.25 l/ha. Three insecticides were used as standard reference products. They were Dimilin 480 SC (diflubenzuron) at a dose of 0.375 l/ha and either Rimon 100 EC (novaluron) at a dose of 0.75 l/ha or Actara 25 WG (thiamethoxam) at a dose of 0.2 kg/ha. In the first two years, pear trees were sprayed twice at an interval of about two weeks, and in the third season only once. The pest control started in the first decade of June, at the beginning of larvae hatching, from eggs deposited by females of the first summer generation. The list of experimental objects in each experiment and after treatment are given in the tables.

The efficacy of treatments was assessed on the basis of the number of eggs and live larvae stages L_1-L_3 and L_4-L_5 of pear psylla counted on about a 20 cm long shoot using a binocular microscope. Shoots (5 pieces in 2009 and 2011, 10 pieces in 2010) were collected randomly from each experimental plot before treatment and after treatment (one, and two or three weeks after each treatment). Dates of the observations in each experiment are given in the tables.

The results were analysed statistically using analysis of variance on data transformed by logarithmic transformation ($y = \log(x + 1)$ or square root ($y = V (x = 0.5)$. The significance of differences between means was assessed using a test with the Newman-Keuls' at a significance level of 5%.

The efficacy of treatments was calculated according to Abbott's formula ab/a x 100 [%], where a and b denote the total number of live larvae or larvae stage L_4-L_5 in the control and treated plots in subsequent periods of observation.

RESULTS AND DISCUSSION

The results regarding the number of eggs and larvae of spotted pear psylla on pear shoots in individual experiments are given in Tables 1-5. The reduction of the total number of larvae and older larval (stage L_4-L_5) are shown on Figures 1-10.

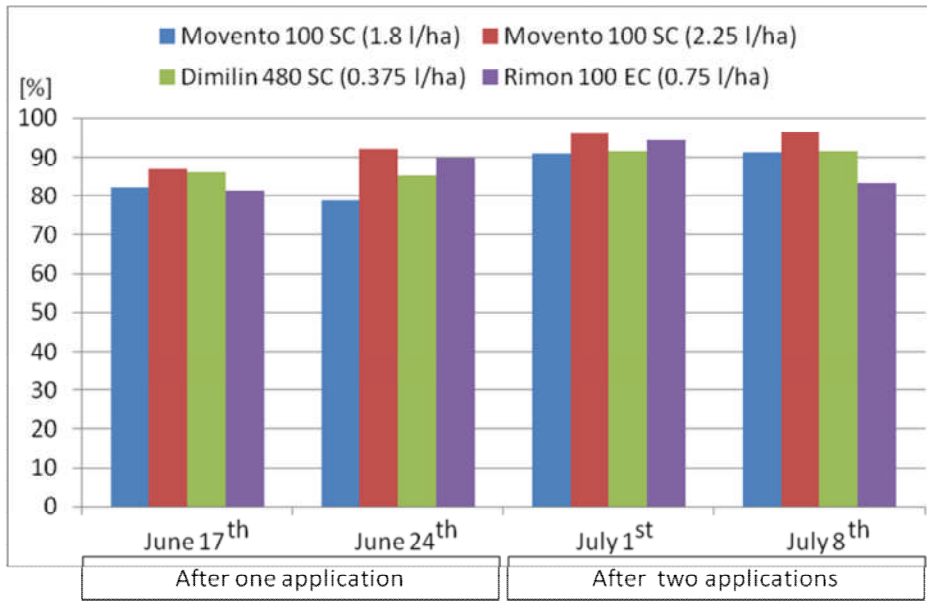

Figure 1. Reduction of the total number of larvae expressed as % according to Abbott's formula − Dąbrowice, 2009. (Dates of treatments: June 10th and June 24th)

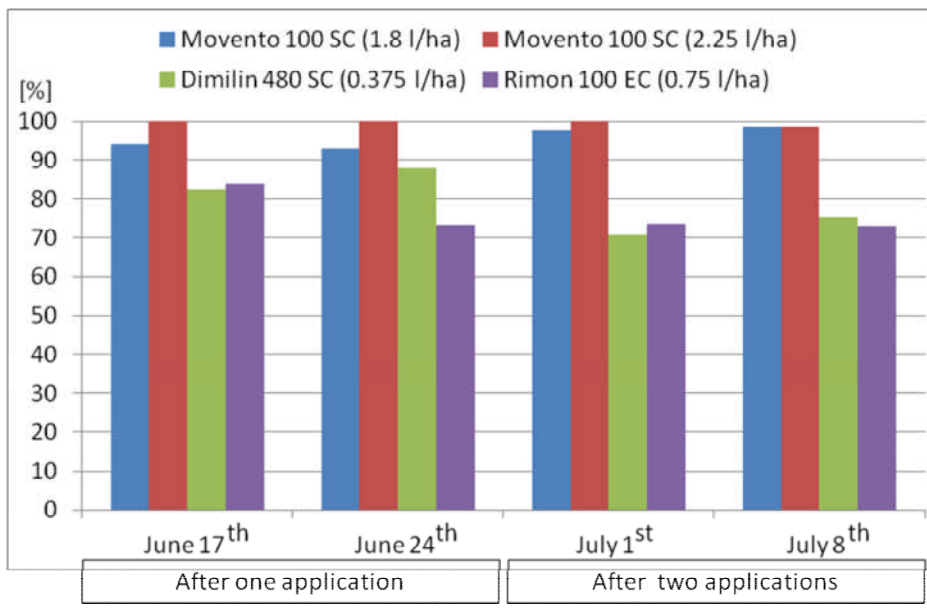

Figure 2. Reduction of L_4 and L_5 larvae expressed as % according to Abbott's formula − Dąbrowice, 2009. (Dates of treatments: June 10th and June 24th)

Table 1. The efficacy of some insecticides used to control the pear psylla (*C. pyri*), expressed as the number of eggs and larvae on 5 shoots, in the Dąbrowice orchard, 2009

Treatment*	Dose [l/ha]	Before application	After one application		After two applications	
		June10th	June 17th	June 24th	July 1st	July 8th
Number of eggs per five shoots**						
Untreated check	-	848.1 a	866.3 b	406.9 a	156.8 a	96.5 ab
Movento 100 SC	1.8	757.8 a	370.9 a	382.5 a	59.1 a	78.3 ab
Movento 100 SC	2.25	843.5 a	528.2 ab	348.1 a	56.4 a	58.1 a
Dimilin 480 SC	0.375	600.5 a	582.3 ab	218.7 a	50.4 a	64.6 a
Rimon 100 EC	0.75	598.8 a	618.8 ab	272.9 a	71.6 a	181.0 b
Total number of larvae per five shoots**						
Untreated check	-	144.8 a	495.3 b	464.5 b	210.8 b	203.3 c
Movento 100 SC	1.8	135.4 a	87.8 a	77.9 a	18.2 a	14.3 ab
Movento 100 SC	2.25	183.8 a	62.7 a	30.5 a	7.9 a	6.6 a
Dimilin 480 SC	0.375	169.4 a	67.7 a	40.9 a	16.4 a	15.3 ab
Rimon 100 EC	0.75	142.3 a	84.8 a	38.3 a	9.8 a	34.1 b
Number of larvae of stages L_1-L_3 per five shoots**						
Untreated check	-	144.2 a	485.1 b	417.7 b	183.0 c	175.0 c
Movento 100 SC	1.8	133.1 a	87.4 a	75.5 a	17.6 b	13.3 ab
Movento 100 SC	2.25	182.9 a	62.7 a	30.5 a	7.9 b	6.3 a
Dimilin 480 SC	0.375	161.1 a	66.4 a	37.0 a	8.6 b	9.1 ab
Rimon 100 EC	0.75	142.1 a	83.3 a	27.7 a	2.8 a	25.7 b
Number of larvae of stages L_4-L_5 per five shoots**						
Untreated check	-	0.4 a	6.8 a	43.0 b	27.0 c	27.9 c
Movento 100 SC	1.8	1.8 a	0.4 a	3.0 a	0.6 a	0.4 a
Movento 100 SC	2.25	0.4 a	0.0 a	0.0 a	0.0 a	0.4 a
Dimilin 480 SC	0.375	4.8 a	1.2 a	5.2 a	7.9 b	6.9 b
Rimon 100 EC	0.75	0.2 a	1.1 a	11.4 a	7.1 b	7.5 b

*Date of treatments: June 10th and June 24th

**Means (followed by the same letter in each column are not significantly different (Newman-Keuls' test, p = 0.05)

The density of the pear psylla population (both eggs and larvae on shoots) was not significantly different in each of the experimental plots before the treatment. Differences at the significant level regarding the larvae numbers between treated and untreated objects were observed as a result of the control treatments which were carried out. Additionally, there was also a small variation in the number of eggs on treated and untreated trees.

In all experiments, spirotetramat as Movento 100 SC (at doses of 1.8 l/ha and 2.25 l/ha) strongly reduced the pear psylla (*C. pyri*) population. On the treated trees, significantly fewer live larvae were observed after just one treatment as well as after a week, two weeks and even three weeks after the treatment (Tab. 1-5). The second treatment increased the effectiveness of the pest control, which was particularly marked in experiments conducted in 2009 in Lubomin, and in 2010 in Dąbrowice. At these locations, the pear psylla population had been

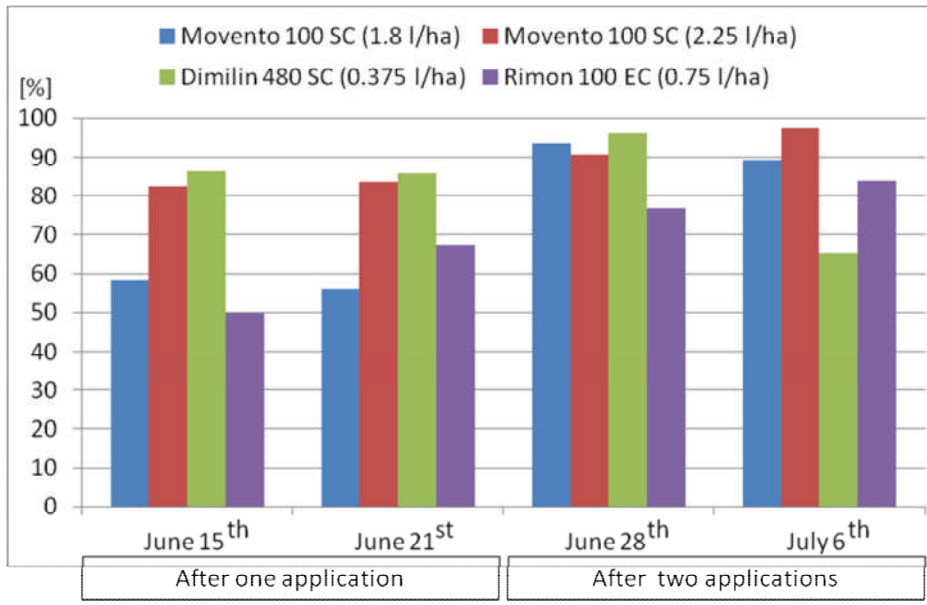

Figure 3. Reduction of the total number of larvae expressed as % according to Abbott's formula − Lubomin, 2009. (Dates of treatments: June 8th and June 21st)

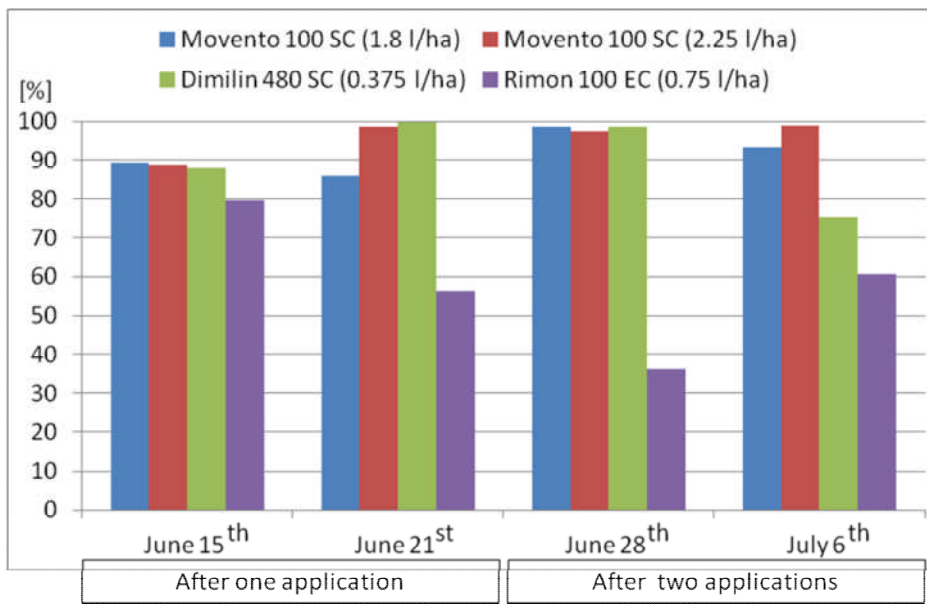

Figure 4. Reduction of L_4 and L_5 larvae expressed as % according to Abbott's formula − Lubomin, 2009. (Dates of treatments: June 8th and June 21st)

Table 2. The efficacy of some insecticides used to control the pear psylla (*C. pyri*), expressed as the number of eggs and larvae on 5 shoots in the Lubomin orchard, 2009

Treatment*	Dose [l per ha]	Before application	After one application		After two applications	
		June 8th	June 15th	June 21st	June 28th	July 6th
Number of eggs per five shoots**						
Untreated Check	-	2987.3 a	3187.4 a	2477.1 ab	308.6 a	70.0 a
Movento 100 SC	1.8	2840.5 a	2955.8 a	3021.7 b	708.5 a	218.7 b
Movento 100 SC	2.25	3021.7 a	2014.7 a	2264.3 ab	578.5 a	160.3 ab
Dimilin 480 SC	0.375	2387.2 a	2098.9 a	1672.7 a	961.5 a	313.6 b
Rimon 100 EC	0.75	2888.5 a	3711.4 a	1788.9 a	303.4 a	125.4 ab
Total number of larvae per five shoots**						
Untreated Check	-	342.7 a	959.2 c	2078.9 d	1387.0 d	625.1 d
Movento 100 SC	1.8	346.1 a	389.0 b	940.3 c	85.6 ab	52.9 b
Movento 100 SC	2.25	321.2 a	163.6 a	355.2 ab	119.9 b	13.7 a
Dimilin 480 SC	0.375	262.4 a	129.9 a	293.2 a	53.3 a	203.5 c
Rimon 100 EC	0.75	301.7 a	388.7 b	606.0 bc	321.5 c	95.9 bc
Number of larvae of stages L_1-L_3 per five shoots**						
Untreated Check	-	342.7 a	942.9 c	1830.7 c	1012.5 b	563.4 d
Movento 100 SC	1.8	346.1 a	386.9 b	892.0 b	78.9 a	49.0 b
Movento 100 SC	2.25	321.2 a	161.8 a	351.7 a	106.1 a	12.9 a
Dimilin 480 SC	0.375	262.4 a	127.7 a	292.6 a	48.4 a	189.2 c
Rimon 100 EC	0.75	301.2 a	386.2 b	508.3 ab	93.5 a	68.9 b
Number of larvae of stages L_4-L_5 per five shoots**						
Untreated Check	-	0.0	14.2 a	239.4 c	352.7 b	62.1 d
Movento 100 SC	1.8	0.0	1.5 a	33.6 ab	4.7 a	4.2 ab
Movento 100 SC	2.25	0.0	1.6 a	3.4 a	9.2 a	0.6 a
Dimilin 480 SC	0.375	0.0	1.7 a	0.4 a	4.2 a	15.2 bc
Rimon 100 EC	0.75	0.2	2.9 a	104.3 bc	224.5 b	24.5 c

*Dates of treatments: June 8th and June 21st
**Explanation: see Table 1

extremely high. The shoots of the trees were sprayed with Movento 100 SC at both tested doses. A significant decrease in the number of larvae in relation to the untreated check was observed. Density of the pest before the second treatment was also noted (Tab. 2-3). The effect of the treatment with spirotetramat as Movento 100 SC at a dose of 1.8 l/ha, however, was slightly weaker than the treatment using a higher dose – 2.25 l/ha. On shoots of trees treated with a product at a lower dose, more live larvae were found in comparison with shoots on trees sprayed with insecticide at a higher dose. The found larvae were mainly of younger stages L_1-L_3, but also a bit of older larvae stages L_4-L_5 were present.

Movento 100 SC at a dose of 2.25 l/ha in all five experiments, showed a high efficiency in the control of pear psylla after just a single application (Fig.1, 3, 5, 7, 9). However, single use in a lower dose − 1.8 l/ha was not always as effective. For example, in the experiment carried out in the Lubomin orchard, the pest population was only reduced, but not

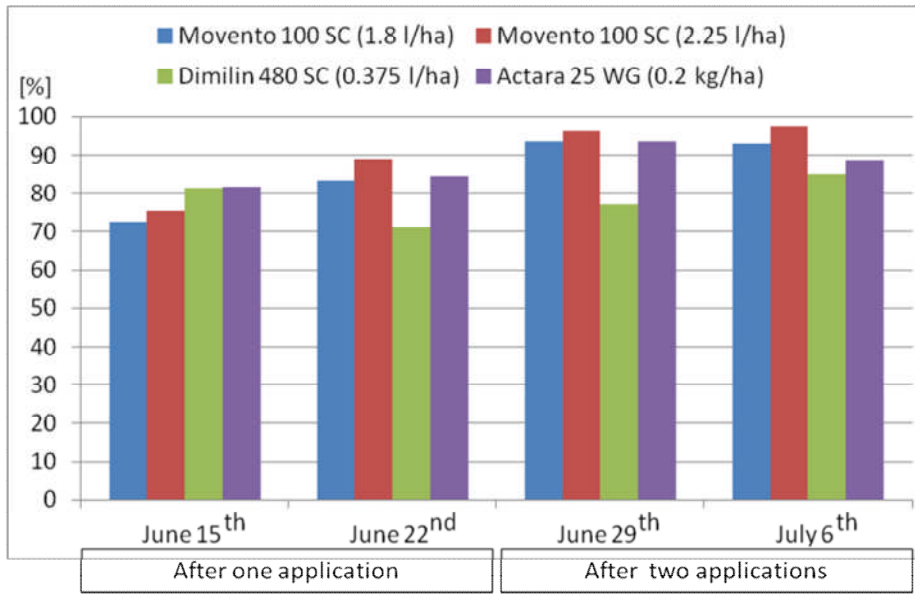

Figure 5. Reduction of the total number of larvae expressed as % according to Abbott's formula − Dąbrowice, 2010. (Dates of treatments: June 8th and June 22nd)

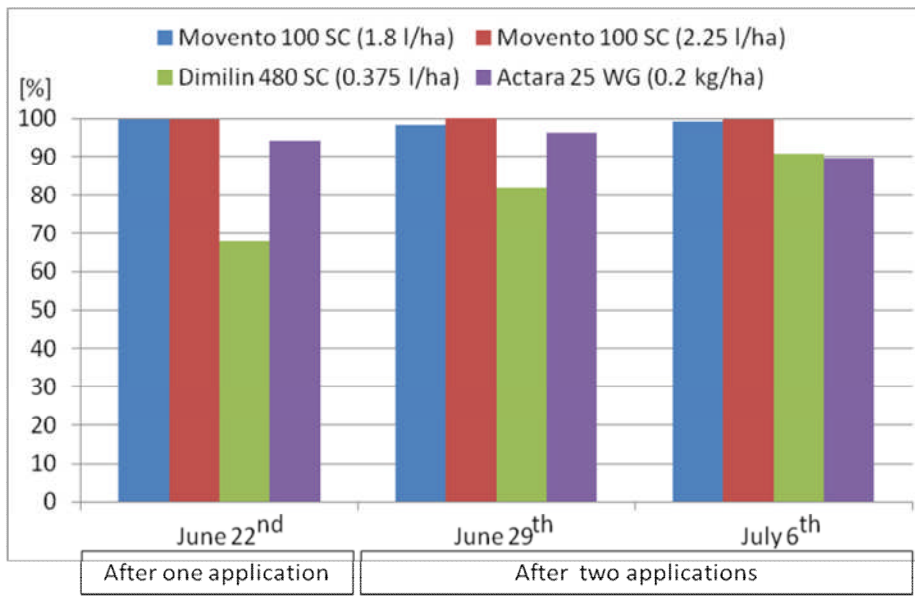

Figure 6. Reduction of L_4 and L_5 larvae expressed as % according to Abbott's formula − Dąbrowice, 2010. (Dates of treatments: June 8th and June 22nd

Table 3. The efficacy of some insecticides used to control the pear psylla (*C. pyri*), expressed as the number of eggs and larvae on 5 shoots in the Dąbrowice orchard, 2010

Treatment*	Dose [l or kg per ha]	Before application	After one application		After two applications	
		June 8th	June 15th	June 22nd	June 29th	July 6th
Number of eggs per five shoots**						
Untreated check	-	1863.9 a	2082.2 d	1312.5 b	598.6 b	295.7 a
Movento 100 SC	1.8	1430.3 a	732.4 bc	575.1 a	357.3 a	519.3 a
Movento 100 SC	2.25	1577.9 a	583.5 b	547.0 a	320.5 a	349.6 a
Dimilin 480 SC	0.375	1510.8 a	1232.1 cd	1013.0 ab	726.3 b	506.9 a
Actara 25 WG	0.2	1556.0 a	291.1 a	544.3 a	220.9 a	337.9 a
Total number of larvae per five shoots**						
Untreated check	-	161.0 a	1247.3 b	1881.0 c	1537.5 c	890.4 e
Movento 100 SC	1.8	182.6 a	342.1 a	291.3 ab	95.5a	61.0 b
Movento 100 SC	2.25	160.8 a	302.8 a	188.5 a	41.7a	23.9 a
Dimilin 480 SC	0.375	144.5 a	207.2 a	526.6 b	332.7 b	135.2 d
Actara 25 WG	0.2	181.2 a	204.9 a	292.0 ab	78.8 a	99.3 c
Number of larvae of stages L_1-L_3 per five shoots**						
Untreated check	-	159.2 a	1240.1 b	1722.5 c	1267.8 c	587.1 c
Movento 100 SC	1.8	176.5 a	342.1 a	291.0 ab	91.4 a	58.6 b
Movento 100 SC	2.25	160.6 a	302.7 a	187.9a	41.5 a	23.6 a
Dimilin 480 SC	0.375	143.4 a	202.9 a	473.1 b	271.2 b	106.3 b
Actara 25 WG	0.2	1799 a	204.3 a	281.9 ab	73.1 a	70.2 b
Number of larvae of stages L_4-L_5 per five shoots**						
Untreated check	-	1.7 a	4.0 a	149.1 d	267.9 d	299.0 d
Movento 100 SC	1.8	3.7 a	0.0 a	0.3 a	3.2 b	2.2 b
Movento 100 SC	2.25	0.2 a	0.1 a	0.2 a	0.1 a	0.2 a
Dimilin 480 SC	0.375	1.0 a	2.2 a	50.3 c	44.3 c	28.2 c
Actara 25 WG	0.2	1.4 a	0.5 a	9.7 b	4.2 b	26.3 c

*Dates of treatments: June 8th and June 22nd

**Explanation: see Table

completely eliminated. A week after the treatment, the total number of larvae decreased only by 58.4%, and after two weeks – by 56.0% (Fig. 3). However, in other experiments, and after a double application of Movento 100 SC and at a lower tested dose of 1.8 l/ha, the efficiency of pear psylla population reduction was high (Fig. 1, 3, 5, 7, 9).

It should be underlined that on shoots of pear trees treated with spirotetramat we have observed very few older larval stages. The observed larvae were mainly small. Most larvae were inhibited in development in comparison with larvae collected from the untreated control shoots or shoots taken from other experimental objects. In the larvae L_1-L_5 group, the reduction level was very high and ranged from 86% to 100%, respective of the dose and the number of treatments (Fig. 2, 4, 6, 8, 10). In all experiments where pear trees were sprayed with Movento 100 SC, there were no symptoms of contamination of shoots, leaves, and fruit with honeydew. A similar relationship between the application of spirotetramat and honeydew production was earlier observed by Page-Weir et al. (2011) in

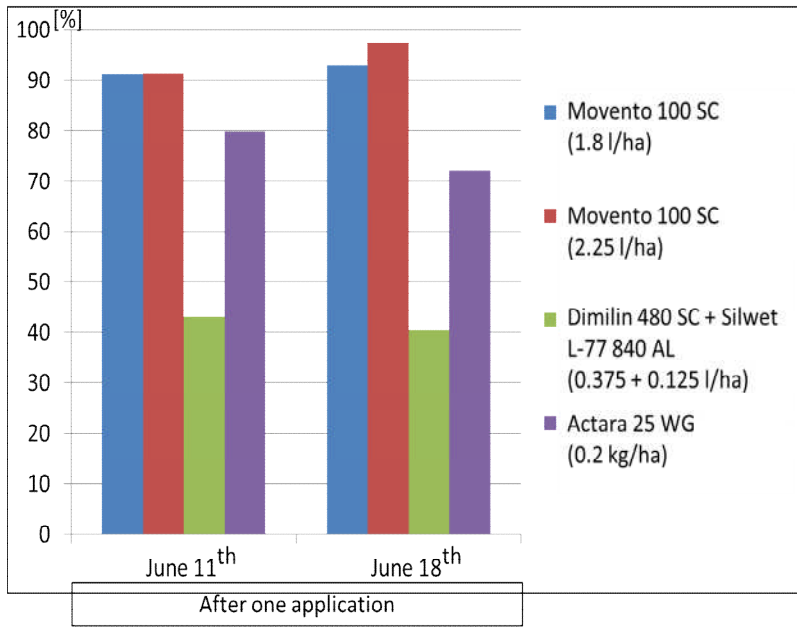

Figure 7. Reduction of the total number of larvae expressed as % according to Abbott's formula − Brochocin, 2011. (Date of treatment: June 4th)

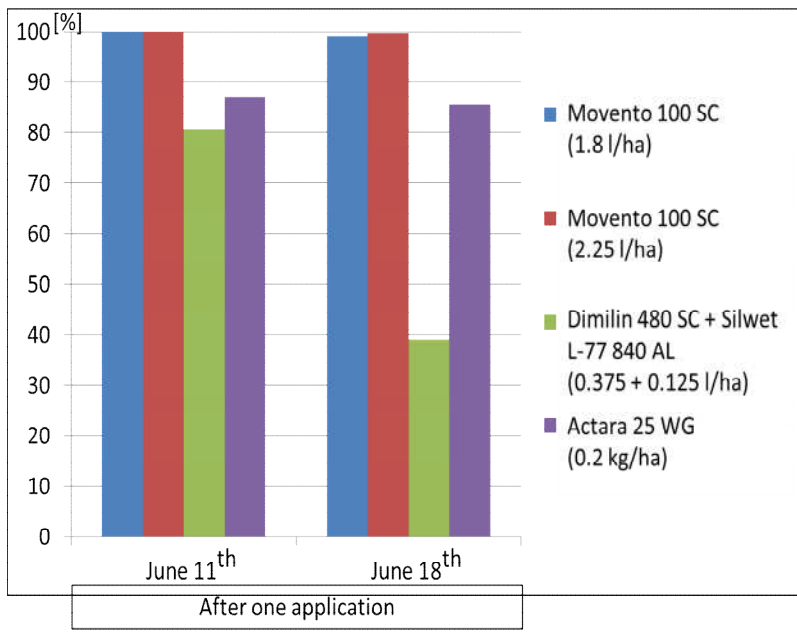

Figure 8. Reduction of L_4 and L_5 larvae expressed as % according to Abbott's formula − Brochocin, 2011. (Date of treatment: June 4th)

Table 4. The efficacy of some insecticides used to control the pear psylla (*C. pyri*), expressed as the number of eggs and larvae on 5 shoots in the Brochocin orchard, 2011

Treatment*	Dose [l or kg per ha]	Before application	After one application	
		June 4th	June 11th	June 18th
Number of eggs per five shoots**				
Untreated check	-	700.4 a	1190.5 a	750.5 b
Movento 100 SC	1.8	974.5 a	656.4 a	362.2 ab
Movento 100 SC	2.25	762.7 a	495.6 a	215.9 a
Dimilin 480 SC + Silwet L-77 840 AL	0.375 + 0.125	712.4 a	687.7 a	559.5 b
Actara 25 WG	0.2	810.1 a	623.2 a	814.1 b
Total number of larvae per five shoots**				
Untreated check	-	104.2 a	817.7 c	704.0 d
Movento 100 SC	1.8	154.2 a	58.1 a	39.4 b
Movento 100 SC	2.25	148.2 a	68.3 a	16.9 a
Dimilin 480 SC + Silwet L-77 840 AL	0.375 + 0.125	121.6 a	432.4 c	430.3 d
Actara 25 WG	0.2	102.6 a	149.6 b	182.2 c
Number of larvae on stages L_1-L_3 per five shoots**				
Untreated check	-	103.9 a	768.2 b	511.9 d
Movento 100 SC	1.8	152.9 a	58.1 a	38.6 b
Movento 100 SC	2.25	148.2 a	68.3 a	16.7 a
Dimilin 480 SC + Silwet L-77 840 AL	0.375 + 0.125	121.6 a	421.9 b	311.3 d
Actara 25 WG	0.2	102.6 a	143.7 a	159.9 c
Number of larvae on stages L_4-L_5per five shoots**				
Untreated check	-	0.2 a	47.8 c	186.2 c
Movento 100 SC	1.8	1.2 a	0.0 a	1.0 a
Movento 100 SC	2.25	0.0 a	0.0 a	0.4 a
Dimilin 480 SC + Silwet L-77 840 AL	0.375 + 0.125	0.0 a	9.3 b	97.7 c
Actara 25 WG	0.2	0.0 a	6.2 b	17.2 b

*Date of treatment: June 4th

**Explanation: see Table 1

the studies of the tomato/potato psyllid (*Bactericera cockerelli*) control method. In those experiments, spirotetramat effectively controlled the pest. The number of larvae was reduced by 90% within two weeks, and there was a 100% reduction after six weeks.

In comparison to the standard insecticides, the efficacy of Movento 100 SC was higher or not significantly different. Dimilin 480 SC as the reference product, successfully controlled pear psylla in most experiments. The number of larvae was reduced by 62.6% to 96.2%. In the experiment carried out in the private orchard in Brochocin (2011), a very weak efficacy of spirotetramat in larvae reduction was found. The efficacy only slightly exceeded 40% (Tab. 4, Fig. 7-8) and shoots were covered with honeydew at a similar level as the shoots of the untreated plots. This was probably caused by the resistance of the local pest population to diflubenzuron. Such a cause appears especially true since Dimilin 480 SC was used during the same season and at the same time in the Dąbrowice experimental orchard and showed a high efficiency (Tab. 5, Fig. 9-10). Also, Rimon 100 EC – the second reference product – applied

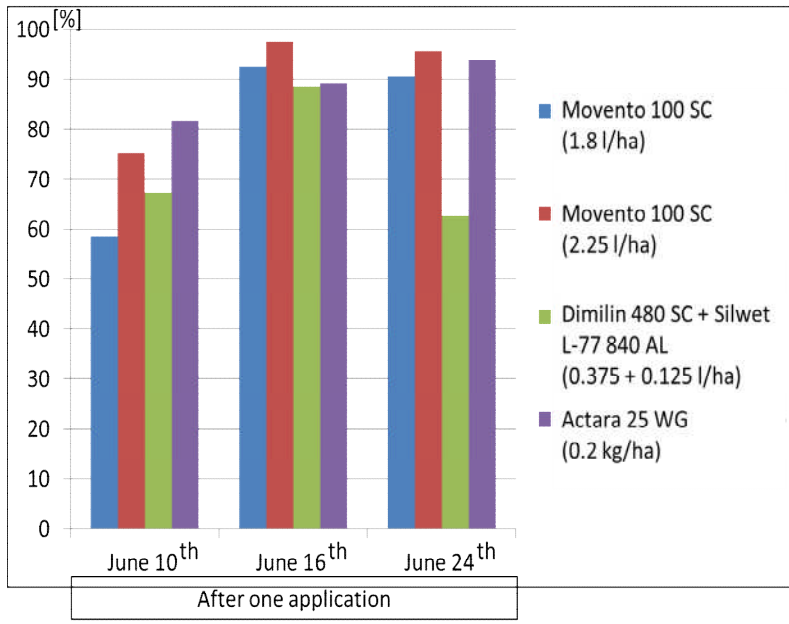

Figure 9. Reduction of the total number of larvae expressed as % according to Abbott's formula − Dąbrowice, 2011. (Date of treatment: June 3rd)

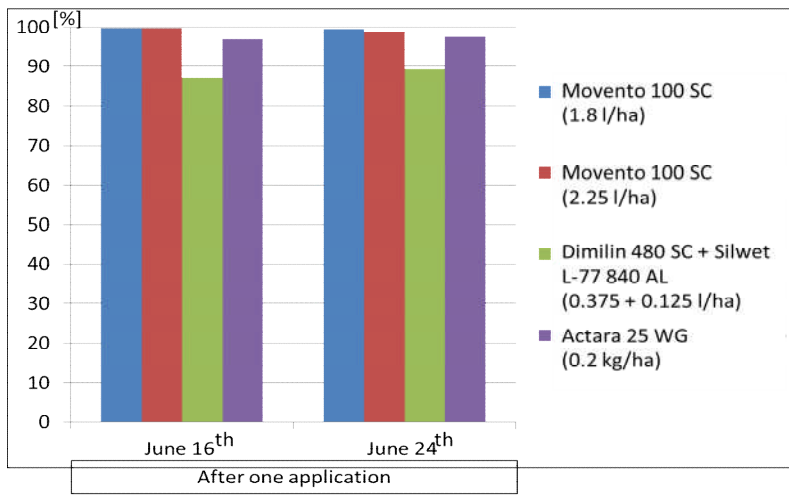

Figure 10. Reduction of L_4 and L_5 larvae expressed as % according to Abbott's formula − Dąbrowice, 2011. (Date of treatment: June 3rd)

Table 5. The efficacy of some insecticides used to control the pear psylla (*C. pyri*), expressed as the number of eggs and larvae on 5 shoots in the Dąbrowice orchard, 2011

Treatment*	Dose [l or kg per ha]	Before application	After one application		
		June 3	June 10th	June 16th	June 24th
Number of eggs per five shoots**					
Untreated check	-	324.3 a	402.3 b	486.5 b	105.2 a
Movento 100 SC	1.8	470.0 a	264.1 ab	176.0 a	160.1 ab
Movento 100 SC	2.25	417.2 a	156.5 a	167.8 a	215.2 ab
Dimilin 480 SC + Silwet L-77 840 AL	0.375 + 0.125	405.7 a	319.7 ab	438.5 b	326.9 b
Actara 25 WG	0.2	549.7 a	155.6 a	176.4 a	107.2 a
Total number of larvae per five shoots**					
Untreated check	-	19.6 a	216.9 c	775.3 c	404.7 b
Movento 100 SC	1.8	28.9 a	97.0 b	53.4 b	36.4 a
Movento 100 SC	2.25	40.3 a	48.2 a	17.4 a	18.5 a
Dimilin 480 SC + Silwet L-77 840 AL	0.375 + 0.125	37.9 a	71.9 ab	93.6 b	147.3 b
Actara 25 WG	0.2	31.1 a	38.4 a	85.3 b	28.7 a
Number of larvae of stages L_1-L_3 per five shoots**					
Untreated check	-	19.6 a	213.4 c	687.4 c	273.0 b
Movento 100 SC	1.8	28.9 a	97.0 b	53.2 b	35.4 a
Movento 100 SC	2.25	40.3 a	48.2 a	17.2 a	17.4 a
Dimilin 480 SC + Silwet L-77 840 AL	0.375 + 0.125	37.9 a	67.9 ab	81.2 b	134.5 b
Actara 25 WG	0.2	31.1 a	38.2 a	83.1 b	24.8 a
Number of larvae of stages L_4-L_5per five shoots**					
Untreated check	-	0	2.4 a	84.7 c	126.5 b
Movento 100 SC	1.8	0	0.0 a	0.2 a	0.9 a
Movento 100 SC	2.25	0	0.0 a	0.2 a	1.1 a
Dimilin 480 SC + Silwet L-77 840 AL	0.375 + 0.125	0	3.7 a	10.3 b	11.8 a
Actara 25 WG	0.2	0	0.2 a	1.7 a	2.3 a

*Date of treatment: June 3rd

**Explanation: see Table 1

in 2009 in the private orchard in Lubomin, was less effective (Tab. 2, Fig. 3-4) than that used in the Dąbrowice experimental orchard (Tab. 1, Fig. 1-2). In the Lubomin experiment, despite two control treatments, the number of larvae on the shoots was very high. The result was a heavy contamination not only of shoots and leaves but also fruits, to a similar extent as in the check. Actara 25 WG applied in 2010-2011 as the third reference product. effectively controlled pear psylla both in the experiments carried out in Dąbrowice as well as in the private orchard in Brochocin. The effectiveness of this product, expressed as a reduction in the total number of larvae, ranged from 72.2% to 93.8%, while the decrease of L_4 and L_5 larvae was from 85.7% to 97.6%.

Differentiation of the number of eggs on the shoots between individual experimental orchards and between tested insecticides seems to be fairly random and difficult to clearly explain. It could be caused by the plant protection products used (both directly and indirectly) but also by other factors which are impossible to determine. The number of eggs is

given mainly for a fuller assessment of the size of the pest population and to emphasize that the eggs as well as the larvae were present on the leaves of pear trees throughout the study period.

Spirotetramat used as Movento 100 SC can be successfully used for controlling pear psylla (*C. pyri*). It is not only effective against the pest, but also, as other studies of Kumar and Kuttalam (2009) and Mansour et al. (2011) have shown, it is a relatively safe product for predators and parasitoids. In Polish conditions, predators and parasitoids plays a significant role in reducing the number of pear psyllas as demonstrated by Jaworska et al. (2002).

CONCLUSIONS

1. Spirotetramat as the active ingredient of the Movento 100 SC insecticide at a dose of 2.25 l/ha, showed a high efficiency in controlling pear psylla (*Cacopsylla pyri*) hatching larvae after just a single treatment.
2. Spirotetramat as Movento 100 SC at a dose of 1.8 l/ha was slightly less effective than used at a dose of 2.25 l/ha.
3. Reference products such as Dimilin 480 SC and Rimon 100 EC were effective in the pear psylla control, however in two experiments they showed a low efficiency. Such results may suggest resistance of local populations of pear psylla to diflubenzuron and novaluron.
4. The effectiveness of spirotetramat as Movento 100 SC at both tested doses (1.8 l/ha and 2.25 l/ha), in the control of pear psylla, was similar or higher than the efficacy of the reference products.

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SKUTECZNOŚĆ SPIROTETRAMATU W ZWALCZANIU MIODÓWKI GRUSZOWEJ PLAMISTEJ (*Cacopsylla pyri* L.) NA GRUSZY W POLSCE

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

Badania przeprowadzono w latach 2009-2011. Obejmowały one pięć doświadczeń polowych zlokalizowanych w doświadczalnej kwaterze grusz w Sadzie Doświadczalnym w Dąbrowicach oraz w dwóch prywatnych sadach gruszowych w Lubominie k. Izbicy Kujawskiej i w Brochocinie k. Płocka. Spirotetramat jako Movento 100 SC badano w dwóch dawkach − 1,8 l/ha i 2,25 l/ha. Zabiegi wykonywano w pierwszej dekadzie czerwca na początku wylegania się larw z jaj złożonych przez samice pierwszego pokolenia formy letniej. W pierwszych dwóch sezonach opryskiwanie powtarzano po około 14 dniach.

Spirotetramat jako Movento 100 SC w dawce 2,25 l/ha we wszystkich pięciu doświadczeniach wykazał wysoką i bardzo wysoką skuteczność w zwalczaniu miodówki gruszowej plamistej już po jednokrotnym zastosowaniu. Po tygodniu liczba larw ogółem zmniejszyła się o 75,3% do 92,1%, a po dwóch tygodniach o 83,7% do 97,6%. Preparat ten zastosowany jednorazowo w dawce niższej (1,8 l/ha) nie zawsze był tak skuteczny. Na przykład w doświadczeniu w Lubominie jedynie ograniczył liczebność szkodnika (redukcja larw ogółem po tygodniu wyniosła zaledwie 58,4%, a po dwóch tygodniach 56,0%). Jednakże w większości doświadczeń oraz po dwukrotnym zastosowaniu preparat Movento 100 SC także w dawce 1,8 l/ha wykazał wysoką i bardzo wysoką skuteczność zwalczania (89,4-93,5%). Na pędach grusz opryskiwanych spirotetramatem (Movento 100 SC) stwierdzano głównie larwy drobne, mało wyrośnięte, zahamowane w rozwoju w porównaniu z larwami obserwowanymi w kontroli i w kombinacjach z zastosowaniem preparatów standardowych. Na gruszach opryskiwanych tym środkiem redukcja larw w stadiach L_4-L_5 wynosiła od 86% do 100%, niezależnie od dawki i liczby zabiegów. W żadnym z doświadczeń na drzewach opryskiwanych preparatem Movento 100 SC nie stwierdzono zanieczyszczenia pędów i liści oraz owoców „rosą miodową".

W porównaniu z preparatami standardowymi (Dimilin 480 SC − diflubenzuron, Rimon 100 EC − novaluron i Actara 25 WG − tiametoksam) spirotetramat jako preparat Movento 100 SC wykazał skuteczność wyższą lub nie różniącą się istotnie. Niska skuteczność preparatów Dimilin 480 SC – diflubenzuron i Rimon 100 EC – novaluron w doświadczeniach w sadach prywatnych może sugerować odporność lokalnych populacji miodówek na te środki.

Słowa kluczowe: grusza, miodówka gruszowa plamista, *Cacopsylla pyri*, spirotetramat, diflubenzuron, tiametoksam, nowaluron