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EFFICACY OF DIFFERENT INSECTICIDES FOR THE CONTROL OF GREEN PEACH APHID (*Myzus persicae* SULZER) IN NECTARINE ORCHARDS

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Three-year field trials were conducted to examine the efficacy of insecticides of different modes of action in the control of green peach aphid (*Myzus persicae* Sulzer) on nectarines, at the localities of Smederevo and Topola in Serbia. Insecticides from the group of neonicotinoids exhibited high efficacy in the control of *M. persicae*. The efficacy of imidacloprid ranged between 92.09% and 99.86%, while the efficacy of thiamethoxam was between 53.95% and 94.15%. During the entire trial period, organophosphate insecticides exhibited very low efficacy in the control of green peach aphid. The efficacy of dimethoate was poor in each evaluation term, ranging between -0.41% and 20.60%, while the efficacy of chlorpyrifos was between -17.24% and 30.96%. Deltamethrin and lambda-cyhalothrin, from the group of pyrethroids, also exhibited poor efficacy, which ranged from -41.94 to 60.68% and from -39.68 to 35.38%, respectively. Pymetrozine had poor initial efficacy (54.13%), although it was very good at later evaluations (98.48% and 99.14%). Similarly, the initial efficacy of flonicamid was poor (66.01 – 69.38%), while it was high at later evaluations (95.96 – 99.88%). Sulfoxaflor, a novel compound from the group of sulfoximines, exhibited high efficacy in the control of the green peach aphid in all evaluation terms (90.17 – 99.95%). According to the results of this research, flonicamid, pymetrozine, sulfoxaflor and neonicotinoids can provide effective protection of nectarine trees against *M. persicae* while the use of organophosphates and pyrethroids is not justified due to their very poor efficacy.
Keywords: Nectarine, aphids, predators, parasitoids, insecticide efficacy, resistance development

INTRODUCTION

Green peach aphid (*Myzus persicae*) is a polyphagous pest that feeds on over 400 plants from 40 families (Blackman and Eastop, 2000). It is a very significant pest of peach and nectarines being primary hosts. The secondary hosts of this pest are various crops, vegetable and ornamental plants and weeds. On peach and nectarine trees, it infests flowers, reverse sides of leaves and shoot tops, on which it feeds by sucking plant juices. Its presence, result in twisting of the plant organs that lag behind in growth, while affected fruits remain small and lose their market value. Moreover, the excretion of honeydew supports the formation of sooty mould on affected organs, which reduces the assimilation surface of leaves and additionally diminishes the market value of the fruits (Blackman and Eastop, 2000). Green peach aphid is also a vector of more than 100 non-persistent viruses (Kennedy and Stroyen, 1959; Bwye *et al.*, 1997).

The control of green peach aphid implies the implementation of integrated pest management. It includes the application of all available measures, both chemical and non-chemical (agrotechnical and biological), while the basic measure is planting of tolerant varieties (Pascal *et al.*, 2002). Agrotechnical measures include controlled nitrogen fertilizers and optimal irrigation in order to reduce the lushness of fruit trees. The control of weeds that can host this pest is also a required measure. Predators and parasitoids, as its natural enemies, play an important role in regulating the number of green peach aphids. The most important predators belong to the families Coccinellidae, Syrphidae, Cecidomyiidae, Chrysopidae and Miridae, while the most important parasitoids are from the family Braconidae (Stary, 1974). Nevertheless, the use of insecticides is often an inevitable measure against aphids when their number exceeds the economic damage threshold. Insecticides registered in Serbia for the control of green peach aphid are from the groups of neonicotinoids, organophosphates, carbamates and pyrethroids, as well as pymetrozine and flonicamid. However, the experiences of peach and nectarine producers indicate that certain registered preparations have very poor effects at some localities, but so far there are not experimental results which prove these claims.

Poor efficacy of some insecticides may indicate the development of resistance in certain populations of green peach aphid. There are numerous reports in the world on resistance development of *M. persicae* to insecticides of different modes of action. During the 1970s, a certain level of resistance to organophosphates and pyrethroids was determined in Australia (Attia and Hamilton, 1978). Herron *et al*. (1993) confirmed the resistance to organophosphates and determined a low level of resistance to carbamates in *M. persicae* populations from various peach orchards. During

2010, a high level of resistance to pirimicarb was determined in two *M. persicae* populations in Western Australia (Mangano and Severtson, 2010). Investigations conducted in Greece, in the period 2004–2006, confirmed a low resistance level to imidacloprid in some *M. persicae* populations originating from peach and a high resistance level in populations originating from tobacco (Margaritopoulos *et al*., 2007). Van-Toor *et al*. (2008) determined a low resistance level to neonicotinoids in green peach aphid populations in New Zealand. The resistance of this pest to imidacloprid and thiacloprid was also determined in eastern France (Mottet *et al.*, 2016).

The aim of this three-year research was to determine the efficacy and the perspective of the use of insecticides of different modes of actions for the control of green peach aphid (*M. persicae*) in nectarine orchards.

MATERIALS AND METHODS

Trials were carried out according to the standard EPPO method PP 1/258(1) for testing the efficacy of insecticides in the control of aphids in orchards (Anonymous, 2007). This method proposes the following essential procedures: the trial should be set up where possible in homogenous orchards with regard to age, cultivar and rootstock; test product(s), reference product(s) and untreated control, arranged in a suitable statistical design; plot size (net): 2-4 trees per plot depending on the size of the trees and training of the orchard; the type of application should be as specified for the intended use; application(s) should be made with suitable equipment providing an even distribution of product on the whole plot; the product should normally be applied at the dosage specified for the intended use; assessments should be carried out in the net plot: the numbers of live aphids should be counted or estimated on at least 10 previously marked infested shoots per plot; time and frequency of assessment: 1st assessment, immediately before application, 2nd assessment, 1-3 days after application, 3rd assessment, 7-10 days after application and further assessments may be useful.

The general standard EPPO method, PP 1/152(4), was also applied (Anonymous, 2012). The type of the design was randomized complete block design (RCBD) where the blocks were laid out deliberately as the plots within them were as uniform as possible before application of treatments and each treatment appeared once, within each block, while the treatments were distributed randomly to the plots within the blocks, which acted as replicates. Statistical analysis followed a typical trial in which several test products were applied at a single dose and compared with a reference product, in the presence of an untreated control. Product efficacy was assessed by a measured quantitative variable. The purpose of the trial was to compare the test products with the reference product, and in particular to identify which are the most effective.

Our research was conducted in 2015, 2016 and 2017, in nectarine orchards at the localities of Smederevo – cultivar “Maria Lucia” (GPS: N 44° 37' 25.133", E 20° 53' 31.49") and Topola – cultivar “Caldezi 2000” (GPS: N 44° 13' 33.575", E 20° 39' 39.306"), which were 7 and 5 years old, respectively. Trials were conducted according to the experimental design of completely random block system in four replications. The trial plot included three nectarine trees. Treatments were performed using a knapsack sprayer “Solo”, with the airflow of 590 m^3/h and the spray flow of 1.7 l/min. Formulations were applied at 1000 l of water per ha.

Insecticides were from the groups of neonicotinoids (imidacloprid, thiamethoxam), organophosphates (chlorpyrifos, dimethoate), pyrethroids (deltamethrin, lambda-cyhalothrin), sulfoximines (sulfoxaflor), as well as flonicamid and pymetrozine. Data about applied formulations, their concentrations, active ingredients, quantities of a.i. per ha and mode of action are given in Table 1.

Table 1. Insecticides examined in the experiment.

Active ingredient	Trade names of insecticides	Concentration of preparations %	Active ingredient kg/ha	Mode of action*
Imidacloprid	Confidor 200 SL	0.060	0.1200	nicotinic acetylcholine
Thiamethoxam	Actara 25 WG	0.018	0.0450	receptor (*nAChR*)
Sulfoxaflor	Transform 500 WG	0.005	0.0250	competitive modulators
Chlorpyrifos	Pyrinex 48 EC	0.150	0.7200	acetylcholinesterase
Dimethoate	Perfekthion	0.100	0.4000	(*AChE*) inhibitors
Deltamethrin	Decis 2,5-EC	0.050	0.0125	sodium channel
Lambda-cyhalothrin	Lamdex 5 CS	0.025	0.0125	modulators
Flonicamid	Teppeki 500 WG	0.014	0.0700	chordotonal organ modulators -undefined target site
Pymetrozine	Chess 50 WG	0.050	0.2500	chordotonal organ *TRPV* channel modulators
Control (untreated plot)	-	-	-	-

*According to IRAC mode of action classification scheme (Anonymous, 2018).

Table 2. Date of insecticides treatments and result evaluations.

Locality	**Smederevo**		**Topola**	
Year	**2015**	**2016**	**2016**	**2017**
Date of treatment	03 05	20 04	18 04	19 05
I evaluation	03 05 (IBT)*	20 04 (IBT)	18 04 (IBT)	19 05 (IBT)
II evaluation	05 05 (2DAT)*	22 04 (2DAT)	21 04 (3DAT)	21 05 (2DAT)
III evaluation	11 05 (8DAT)	28 04 (8DAT)	25 04 (7DAT)	27 05 (8DAT)
IV evaluation	18 05 (15DAT)	05 05 (15DAT)	02 05 (14DAT)	02 06 (14DAT)

*IBT: immediately before treatment; DAT: days after treatment

At each locality, one treatment was carried out at the time when the aphid colonies were developed. The results were evaluated in four terms: I – immediately before treatment (IBT); II – two/three days after treatment (2/3DAT); III – seven/eight days after treatment (7/8DAT); IV – 14/15 days after treatment (14/15DAT) (Table 2).

The main evaluation parameter was the number of living wingless aphids (Anonymous, 2007). Before the treatments, 10 shoots with aphids were marked in each trial plot. The number of aphids was determined on the marked shoots in all evaluation terms and treatment replications.

The data was recorded on average number of aphids per shoot and variations per treatment replications, as well as the comparison of mean values, i.e. the significance of differences between treatment effects, according to the Student's t-test. The analysis of variance was performed in Microsoft Excel. The average number of aphids per replication (x) was previously converted by statistical formula: $\sqrt{x + 0.5}$ and such data were used for the analysis of variance and the comparison of mean values (Gomez and Gomez, 1984). The efficacy of insecticides was determined using Henderson-Tilton formula:

$$\text{Efficacy } (\%) = [1 - \left(\frac{\text{Taf}}{\text{Kaf}}\right) \times \left(\frac{\text{Kbf}}{\text{Tbf}}\right)] \times 100$$

Tbf – number of aphids in the treatment before insecticides application; *Taf* - number of aphids in the treatment after insecticides application; *Kbf* - number of aphids in the untreated plot before insecticides application; *Kaf* - number of aphids in the untreated plot after insecticides application

RESULTS

The results of efficacy of different insecticides applied in the control of green peach aphid at the localities of Smederevo and Topola, in 2015, 2016 and 2017, are shown in Tables 3-6. At the locality of Smederevo, nectarine shoots were moderately infested immediately before treatment (IBT) in 2015, with moderate variations in number of aphids per treatment replications as compared to untreated plot with average number of aphids 67.5 per shoot (Table 3). The efficacy of thiamethoxam was 53.95% two days after treatment (2DAT), 68.21% eight days after treatment (8DAT) and 89.76% 15 days after treatment (15DAT); dimethoate; -6.70% (8DAT), 18.79% (15DAT) and 20.60% (2DAT); deltamethrin: -41.94% (15DAT), -18.65% (8DAT) and 56.73% (2DAT).

The results showed no significant difference between the effects of the treatments with thiamethoxam and dimethoate at 2DAT. However, significant differences ($P \leq 0.05$; $P \leq$

Table 3. The efficacy of thiamethoxam, dimethoate and deltamethrin for *M. persicae* control at locality of Smederevo during 2015.

Treatments	**Ms* ± Sd**			
	Efficacy %			
	IBT	**2DAT**	**8DAT**	**15DAT**
Thiamethoxam	70.3 ± 16.6	47.0a ± 21.0 53.95	39.9a ± 21.1 68.21	18.0a ± 5.6 89.76
Dimethoate	50.4 ± 13.4	58.1a ± 17.9 20.60	96.0bc ± 13.9 -6.70	102.3b ± 11.8 18.79
Deltamethrin	34.7 ± 6.9	21.8b ± 7.3 56.73	73.5cd ± 15.5 -18.65	123.1c ± 21.6 -41.94
Control (untreated plot)	67.5 ± 19.9	98.0c ± 12.7	120.5be ± 22.5	168.7d ± 21.3
$LSD_{0.05}$	-	0.9709	0.7742	0.4107
$LSD_{0.01}$	-	1.7831	1.4218	0.7542

*Data are expressed as mean values (Ms) of aphid number ± standard deviation (Sd) of four replications of each insecticide treatment; mean values followed by the same letter(s), within the same column, are insignificantly different ($P \leq 0.05$; $P \leq 0.01$) according to Student's *t* –test.

Table 4. The efficacy of flonicamid, imidacloprid, chlorpyrifos and lambda-cyhalothrin for *M. persicae* control at locality of Smederevo during 2016.

Treatments	Ms ± Sd Efficacy %			
	IBT	2DAT	8DAT	15DAT
Flonicamid	66.8 ± 11.9	25.9a ± 2.5 66.01	1.6a ± 1,2 98.33	0.2a ± 0.3 99.88
Imidacloprid	51.0 ± 6.3	4.6b ± 4.3 92.09	0.6a ± 0.4 99.18	0.7a ± 1.0 99.47
Chlorpyrifos	79.5 ± 16.7	62.6acd ± 25.6 30.96	123.5bcd ± 32.0 -8.04	177.0bc ± 44.7 14.25
Lambda-cyhalothrin	82.5 ± 10.2	60.8acd ± 29.2 35.38	93.0bc ± 38.7 21.60	142.8bcd ± 60.4 33.33
Control (untreated plot)	55.5 ± 29.5	63.3acd ± 31.9	79.8cd ± 34.5	144.1bc ± 47.7
$LSD_{0.05}$	-	1.7763	1.6383	1.4317
$LSD_{0.01}$	-	2.9392	2.7109	2.3690

Table 5. The efficacy of flonicamid, imidacloprid, chlorpyrifos and lambda-cyhalothrin for *M. persicae* control at locality of Topola during 2016.

Treatments	Ms ± Sd Efficacy %			
	IBT	3DAT	7DAT	14DAT
Flonicamid	39.8 ± 4.7	14.6a ± 2.1 69.38	0.6a ± 0.4 99.06	4.2a ± 0.5 95.96
Imidacloprid	45.3 ± 4.9	2.6b ± 0.9 95.21	0.1a ± 0.1 99.86	2.3b ± 0.7 98.06
Chlorpyrifos	42.0 ± 8.0	41.1c ± 7.9 18.31	79.0b ± 8.6 -17.24	82.5c ± 7.0 24.89
Lambda-cyhalothrin	36.0 ± 13.9	32.1d ± 13.4 25.56	55.2c ± 19.0 4.42	131.5d ± 28.4 - 39.68
Control (untreated plot)	27.8 ± 3.0	33.3d ± 4.1	44.6d ± 5.4	72.7e ± 9.1
$LSD_{0.05}$	-	0.2234	0.2708	0.2189
$LSD_{0.01}$	-	0.3697	0.4480	0.3622

0.01) were found among these two treatments along with deltamethrin. At 8DAT evaluation, statistically very significant differences were determined between the effects of the treatment with thiamethoxam and the treatment with dimethoate, as well as between the effects of the treatments with thiamethoxam and with deltamethrin. Statistically significant differences ($P \leq 0.05$; $P \leq 0.01$) were also determined between the control and the treatment with deltamethrin, with efficacy as negative (-18.65%). There were statistically significant differences ($P \leq 0.05$) between the effects of the treatments with dimethoate and with deltamethrin and between the effects of the treatment with dimethoate and the control. Again after 15DAT evaluation results were found significant, while the treatment with deltamethrin had negative efficacy (-41.94%).

At the locality of Smederevo, in 2016, the infestation of nectarine shoots immediately before treatments (IBT) was also moderate, with moderate variations of the aphid number per treatment replication as compared to untreated plot with average number of aphids 55.5 per shoot (Table 4). The efficacy of flonicamid was 66.01% (2DAT), 98.33% (8DAT) and 99.88% (15DAT); imidacloprid: 92.09% (2DAT), 99.18% (8DAT) and 99.47% (15DAT); chlorpyrifos: -8.04% (8DAT), 14.25% (15DAT) and 30.96% (2DAT); lambda-cyhalothrin: 21.60% (8DAT), 33.33% (15DAT) and 35.38% (2DAT).

Similarly, results at 2DAT showed highly significant differences between any two of the following treatments with flonicamid and imidacloprid, with imidacloprid and chlorpyrifos, with imidacloprid and lambda-cyhalothrin, as well as between the treatment with imidacloprid and the control. Statistically significant differences in effects ($P \leq 0.05$) were determined between the treatment with flonicamid and any of the treatments with chlorpyrifos and lambda-

Table 6. The efficacy of thiamethoxam, dimethoate, deltamethrin, pymetrozine and sulfoxaflor for *M. persicae* control at locality of Topola during 2017.

Treatments	Ms ± Sd			
	Efficacy %			
	IBT	2DAT	8DAT	14DAT
Thiamethoxam	78.3 ± 13.9	10.3a ± 2.2 88.14	6.28a ± 2.2 94.15	12.55a ± 1.6 87.13
Dimethoate	115.2 ± 16.0	115.8b ± 14.6 11.95	157.2b ± 25.2 0.41	120.7b ± 19.8 15.88
Deltamethrin	100.7 ±17.3	45.2c ± 5.6 60.68	55.9c ± 5.3 59.49	123.4b ± 14.0 1.61
Pymetrozine	42.2 ± 2.9	22.1d ± 2.3 54.13	0.5de ± 0.5 99.14	0.8c ± 0.7 98.48
Sulfoxaflor	110.5±10,6	12.4e ± 1.8 90.17	0.08e ± 0.1 99.95	0.5c ± 0.6 99.64
Control (untreated plot)	105.9 ± 24.4	120.9bf ± 23.2	145.1f ± 10.9	131.9d ± 3.3
$LSD_{0.05}$	-	0.1862	0.1818	0.1781
$LSD_{0.01}$	-	0.2920	0.2850	0.2792

cyhalothrin, as well as between the treatment with flonicamid and the control. There were no statistically significant differences between the effects of the treatments with chlorpyrifos and lambda-cyhalothrin, as well as between the effects of any of these two treatments and the control. At 8DAT results indicated no significant differences in effects between the treatments with flonicamid and imidacloprid. Same in case of chlorpyrifos and lambda-cyhalothrin, proved to be less effective. Statistically significant differences in effects ($P \leq 0.05$) were determined between treatments with chlorpyrifos and lambda-cyhalothrin and the control. Statistically very significant differences in effects ($P \leq 0.05$; $P \leq 0.01$) were determined between any of the treatments with flonicamid and imidacloprid and any of the other insecticide treatments, including the control. The results showed no significant difference between the effects of the treatments with flonicamid and imidacloprid, nor between the effects of the of very poorly efficient treatments with chlorpyrifos and lambda-cyhalothrin at 15DAT. Statistically significant differences in effects ($P \leq 0.05$) were determined between the treatments with chlorpyrifos and the treatment with lambda-cyhalothrin. Significant differences in effects ($P \leq 0.05$; $P \leq 0.01$) were found between any of the treatments with flonicamid and imidacloprid and any other insecticide treatment, including the control.

At the locality of Topola, the infestation of nectarine shoots was moderate immediately before treatments (IBT) in 2016, with moderate variations in the number of aphids per treatment replications as compared to untreated plot with average number of aphids 27.8 per shoot (Table 5). The efficacy of flonicamid was 69.38% (3DAT), 99.06% (7DAT) and 95.96% (14DAT); imidacloprid: 95.21% (3DAT), 99.86% (7DAT) and 98.06% (14DAT); chlorpyrifos: -17.24% (7DAT), 18.31% (3DAT) and 24.89% (14DAT); lambda-cyhalothrin: 25.56% (3DAT), 4.42% (7DAT) and 39.68% (14DAT).

The analysis of 3DAT results evaluation indicated statistically very significant differences in effects ($P \leq 0.05$; $P \leq 0.01$) between any two insecticide treatments, as well as between any of the treatments with flonicamid, imidacloprid and chlorpyrifos and the control. However, significant differences were not determined between the effect of the treatment with lambda-cyhalothrin and the control. The results showed no significant difference between the effects of the treatments with flonicamid and imidacloprid, while there were statistically significant and very significant differences between any two other insecticide treatments, as well as between each insecticide treatment and the control at 7DAT. The treatment with chlorpyrifos exhibited negative efficiency (-17.24%). At 14DAT results revealed very significant differences in effects ($P \leq 0.05$; $P \leq 0.01$) between any two insecticide treatments, as well as between each insecticide treatment and the control.

At the same locality, the infestation of nectarine shoots immediately before treatments (IBT) in 2017 was slightly higher than in 2016, while the average number of aphids in the untreated plot was 105.9 per shoot (Table 6). The efficacy of thiamethoxam was: 88.14% (2DAT), 94.15% (8DAT) and 87.13% (14DAT); pymetrozine: 54.13% (2DAT), 99.14% (8DAT) and 98.48% (14DAT); sulfoxaflor: 90.17% (2DAT), 99.95% (8DAT) and 99.64% (14DAT); dimethoate: 11.95% (2DAT), 0.41% (8DAT) and 15.88% (14DAT); deltamethrin: 1.61% (14DAT), 59.49% (8DAT) and 60.68% (2DAT).

Statistical analysis of the 2DAT results evaluation confirmed very significant differences in effects ($P \leq 0.05$; $P \leq 0.01$) between any two insecticide treatments, as well as between each insecticide treatment and the control, except for the differences between the treatment with dimethoate and the control, which were statistically significant ($P \leq 0.05$). The analysis of 8DAT results evaluation revealed statistically significant differences ($P \leq 0.05$) between the effects of the treatments with pymetrozine and sulfoxaflor, while there were statistically very significant differences ($P \leq 0.05$; $P \leq 0.01$) in effects between any two other insecticide treatments, as well as between each insecticide treatment and the control. Significant differences were not determined between the effects of the treatments with pymetrozine and sulfoxaflor and between the effects of the treatments with dimethoate and deltamethrin at 14DAT. Significant differences ($P \leq 0.05$) in effects were determined between the slightly less efficient treatment with thiamethoxam (87.13%) and any of the highly efficient treatments with pymetrozine and sulfoxaflor. There were also statistically very significant differences ($P \leq 0.05$; $P \leq 0.01$) in effects between the treatment with thiamethoxam and any of the very poorly efficient treatments with dimethoate and deltamethrin, as well as between each insecticide treatment and the control.

DISCUSSION

Insecticide resistance, toxicity and the problem of pesticide pollution of the environment are the main limiting factors of insecticides. However selective insecticides which have no adverse impact on the non-target organisms and environment play an important role in modern plant protection. These insecticides are novel aphicides, like flonicamid, pymetrozine, sulfoxaflor but also neonicotinoids. The green peach aphid, *M. persicae* has a high potential for the development of resistance to insecticides given its high reproductive potential and long-term use of certain compounds, especially organophosphates and pyrethroids. According to summarized data from different authors' studies, which were reported by Vea and Palmer (2015), thiamethoxam proved highly efficient in the control of green peach aphid on collard, lettuce and potatoes. Our experiment showed similar results for this compound. The efficacy of thiamethoxam in the control of green peach aphid was poor at 2DAT (53.95%), although it was better at later evaluations: 68.21% (8DAT) and 89.76% (15DAT) at the locality of Smederevo in 2015. The efficacy of dimethoate was poor at all evaluation terms, ranging from -6.70% (8DAT), through 18.79% (15DAT) to 20.60% (2DAT). In a research conducted in Serbia in 2008, a higher efficacy of dimethoate was determined (68% - 75%) in the control of this pest on peppers in a greenhouse (Marčić *et al.*, 2009). Deltamethrin, a representative of pyrethroids, exhibited very poor efficacy in the control of *M. persicae* at the locality of Smederevo: -41.94% (15DAT), -18.65% (8DAT) and 56.73% (2DAT).

At the locality of Smederevo in 2016, the efficacy of flonicamid in the control of *M. persicae* was poor (66.01%) at 2DAT evaluation, which could be explained by its mode of action as an anti-feeding agent. Its efficacy was good at 8DAT and 15DAT evaluations (98.33% and 99.88%, respectively). According to the data reported by Vea and Palmer (2015), flonicamid was highly efficient in the control of *M. persicae* on various vegetable plants, including cabbage, broccoli and potatoes. Unlike flonicamid, at the same locality, imidacloprid exhibited high efficacy in all evaluation terms in 2016: 92.09% (2DAT), 99.18% (8DAT) and 99.47% (15DAT). Chlorpyrifos, an organophosphate insecticide, had very poor efficacy in the control of *M. persicae*, ranging from -8.04% (8DAT), through 14.25% (15DAT) to 30.96% (2DAT). The efficacy of lambda-cyhalothrin, from the group of pyrethroids, was also poor at this locality: 21.60% (8DAT), 33.33% (15DAT) and 35.38% (2DAT). However, Vea and Palmer (2015) reported on high efficacy (>93%) of another pyrethroid insecticide, bifenthrin, in the control of green peach aphid on the ornamental plant *Verbena peruviana*.

The efficacy of flonicamid, at the locality of Topola in 2016, was on a similar level as at the locality of Smederevo and ranged from a poor initial value of 69.38% (3DAT) to high values of 99.06% (7DAT) and 95.96% (14DAT). Imidacloprid exhibited good efficacy in all evaluation terms: 95.21% (3DAT), 99.86% (7DAT) and 98.06% (14DAT). In his research, Das (2013) also emphasized high efficacy of this compound (>87%) in the control of *M. persicae* on peppers. Our results indicate very poor efficacy of organophosphate and pyrethroid insecticides in the control of green peach aphid. The efficacy of chlorpyrifos ranged from -17.24% (7DAT), through 18.31% (3DAT) to 24.89% (14DAT) and the efficacy of lambda-cyhalothrin was 25.56% (3DAT), 4.42% (7DAT) and 39.68% (14DAT). Shengyun *et al*. (2005) reported on poor efficacy of chlorpyrifos (52.83%) in the control of *M. persicae* on radish, while its efficacy was high (99.83%) in the control of another aphid species, *Lipaphis erysimi*.

At the same locality (Topola), in 2017, the efficacy of thiamethoxam had satisfactory values of 88.14% (2DAT), 94.15% (8DAT) and 87.13% (14DAT). Similar to flonicamid in the previous year, pymetrozine, a pyridine azomethine derivate, had poor initial efficacy of 54.13% at 2DAT evaluation, while it was very good at later evaluation terms (8DAT: 99.14%; 14DAT: 98.48%). In a research conducted in Serbia in 2005, high efficacy of pymetrozine (95.00 – 99.70%) was determined in the control of *M. persicae* on peppers (Perić and Marčić, 2007). Sulfoxaflor, from the newest group of aphicides (sulfoximines), had good efficacy in all evaluation terms in 2017, with the values of 90.17% (2DAT), 99.95% (8DAT) and 99.64% (14DAT). In a research conducted in the period 2008-2011, sulfoxaflor proved highly efficient in the control of green peach aphid when applied at the rate of 25-50g a.s./ha (Castro *et al.*, 2011). The efficacy of dimethoate was very poor in the control of *M. persicae* at the locality of Topola in 2017 (2DAT: 11.95%; 8DAT: 0.41%; 14DAT: 15.88%). According to Perić and Marčić (2007) and Marčić *et al.*, (2007), dimethoate was significantly more efficient (71.7 – 83.9%) in the control of this pest on peppers. The efficiency of deltamethrin ranged from 1.61% (14DAT), through 59.49% (8DAT), to 60.68% (2DAT). Although deltamethrin was more efficient than dimethoate, the results of our research indicate that its application would not provide an effective control of this pest at the locality of Topola.

***Conclusion*:** Imidacloprid exhibited high efficacy in the control of *M. persicae* on nectarine, while the efficacy of thiamethoxam varied from poor to satisfactory, depending on the locality. Flonicamid and pymetrozine also exhibited high efficacy in the control of *M. persicae.* Sulfoxaflor had very good efficacy in the control of *M. persicae* in all evaluation terms. Insecticides from the groups of organophosphates and pyrethroids showed very poor efficacy in the control of *M. persicae* on nectarines throughout the entire trial period, at both the localities. Therefore, flonicamid, pymetrozine, sulfoxaflor and neonicotinoids can provide effective, selective and safe nectarine protection against the green peach aphid populations while the use of organophosphates and pyrethroids for this purpose has no justification due to their very poor efficacy and non-selectivity for beneficial organisms.

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