GREEN PEACH APHID (*MYZUS PERSICAE*) CAN BE A SERIOUS PEST PROBLEM FOR OILSEED RAPE CROP, IN THE SOUTH-EAST OF ROMANIA

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Abstract

In this paper, it has reported a high attack of the green peach aphid (*Myzus persicae*), in late autumn of the year 2018, at oilseed rape crop, in the south-east of Romania. This pest has a wide range of host plants, attacking more than 240 species from 64 different botanical families. The evolution of green peach aphids at oilseed rape crop, during autumn, was assessed in this paper. A field experiment was carried out at NARDI Fundulea, both in 2017 and 2018. It has assessed untreated and treated seeds variants with systemic insecticides. Also, it has recorded percentage of parasitized aphids by *Aphidius* spp. and *Praon* spp. In the weather conditions from autumn of the year 2017, green peach aphids density at oilseed rape crops was insignificant with a maximum of 2.25 aphids/leaf at untreated plants and 0.38 aphids/leaf at plants emerged from treated seeds. However, in 2018 it has registered a high density of this pest at oilseed rape crop with a maximum of 243.25 aphids/leaf at untreated plants and 29.38 aphids/leaf at plants emerged from treated seeds. In weather conditions of the year 2018, in the experimental field from NARDI Fundulea, highest population amount of green peach aphids at untreated oilseed rape plants it has recorded in late autumn, on 12 November. Possible explication for this is because of higher temperatures and drought recorded both in October and the first half of November. At the same time, in autumn of 2018, parasitized aphids percent was 5.15 % at untreated variant and between 4.74 and 5.00 % at treated variants. This situation occurred in autumn of 2018, in the south-east of Romania must be a warming for the farmers for the following years. Increasing the temperature and drought can have an effect of increasing the attack of aphids at oilseed rape crops, in autumn.

Key words: oilseed rape, aphids, attack, autumn

According to MADR data (2020), in 2017 and 2018, the area cultivated with oilseed rape in Romania was higher than 590000 ha, being one of the most important crops for this country. According to Popescu A. et Dinu T.A. (2020), in 2018, Romania had 633 thousand ha cultivated with rape and produced 1673327 tons of seeds, 2.8 times more than in 2009. The same authors mentioned that the largest surfaces cultivated with oilseed rape in Romania are situated in the South Muntenia (39.07%), South-East (24.69%) followed by South-West Oltenia (10.03%) and the Western part of the country (9.07%). The main reason for increasing the area cultivated with oilseed rape is the higher profitability of this crop (Lup A. *et al*, 2013; Chiriac A.R. *et al*, 2019). Also, oilseed rape is a good crop for rotation with wheat and barley (Roman G.V. *et al*, 2012; Hoffmann M.P. *et al*, 2015; Darguza M. et Gaile Z., 2019). Oilseed rape yield losses can occur because of the non-biotic stress such as frost from the flowering period, the draught from the emergence period, heavy frost during winter, storms before harvest, and biotic stress such as weeds, pathogens, or pests (Halmajan V., 2006; Rasnoveanu L., 2011a; Panaitescu L. *et al*, 2013; Hess L. *et al*, 2015; Barbulescu A. et al, 1993; 1997; 2001; Popov C. et al, 2002, 2007; Williams I.H., 2010; Heimbach U. et Müller A., 2013; Dewar A.M., 2017; Skellern M.P. *et al*, 2018). Data from the literature make in evidence that in Romania, the main pests of the oilseed rape crop, during the autumn period, are cabbage flea beetles (*Phyllotreta atra*, *Phyllotreta nemorum*, *Phyllotreta undulata*), cabbage-stem flea beetle (*Psylliodes chrysocephala*), turnip sawfly (*Athalia rosae*) while the main pests of this crop from spring and the beginning of the summer are cabbage stem weevils (*Ceutorhynchus napi* and *Ceutorhynchus quadridens*), pollen beetle (*Meligethes aeneus*), cabbage seedpod weevil (*Ceutorhynchus assimillis*) and cabbage aphid (*Brevicoryne brassicae*)(Trotus E. *et al*, 2001; Popov C. *et al*, 2004; Popov C. et Barbulescu A., 2007; Rasnoveanu L., 2010, 2011b; Bucur A. and Rosca I., 2011; Rasnoveanu L. and Burtea C.,

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2012; Buburuz A.A. *et al*, 2013; Buburuz A.A. and Trotus E., 2014; Trasca F. *et al*, 2019). The same authors mentioned that in the climatic conditions from Romania, the maximum peek of the oilseed rape pest populations are in autumn when plans are in early vegetation stages and spring when plants are in flowering stage. Regard of the aphids attack at oilseed rape crop, researches effectuated in Romania make in evidence that in some favorable years it has observed colonies of the cabbage aphids (*Brevicoryne brassicae*), on pods, mainly in May and June, when plants are in different maturity stage (Popov C. and Barbulecu A., 2007; Rasnoveanu L., 2010, 2011a; Trotus E. *et al.*, 2019). Other authors mentioned that cabbage aphids (*Brevicoryne brassicae*) could be occur during autumn too, when plants were in the early vegetation stage, in the case of high pest densities and drought, the effect of the attack at OSR crop and yield losses can be higher (Popov C. *et al*, 2006). According to the same author, the aphid densities in 2001 were, in some cases, of several thousand per plants, requiring chemical treatments on large areas. It is also necessary to correctly apply the seed treatment with systemic insecticides to reduce the drought influence on cabbage aphids attack. However, according to the data from recent years, in Romania, the level of the cabbage aphids populations at oilseed rape crop was low (Buburuz A.A. *et al*, 2013; Buburuz A.A. and Trotus E., 2014; Trasca F. *et al*, 2019). This is the only aphid species mentioned in the Romanian literature that is producing damages, in some years, at OSR crop, mainly at the early maturity stage of the plants. Green peach aphid (*Myzus persicae*,Suzler, 1776) is one of the most harmful aphid specie for peach and apricot in Romania (Trandafirescu M. *et al*, 2004; Fericean L.M. *et al*, 2011; Dinu M.M. *et al*, 2014). The aphids formed colonies on the lower side of the leaves where they feeding. Meng J. et al. (2014) mentioned that the green peach aphid causes direct damages to crop plants by sucking phloem and can transmit over 100 different plant viruses. *M. persicae* is usually heteroecious and holocyclic, with the winter sexual phase on peach trees (*Prunus persica*), and the parthenogenetic (asexual) summer generations on a wide number of secondary herbaceous summer hosts such as tomato, potato, alfalfa, pea, bean, oilseed rape (Rosca I. and Rada I., 2009). The same author mentioned that the green peach aphid is polyphagous with a host range higher than 240 plant species from 64 different botanical families. Other authors mentioned that *M. persicae* is a highly adaptable and polyphagous insect pest that feeds on more than 400 plant species (Domokos E. *et al*, 2015). In Romania, the green peach aphid is considered a pest without economic impact at oilseed rape crop, in some rare cases the insects can transmit an OSR virus that can have effect on decreasing of the yield (Buzdugan L. and Nastase D., 2013). This paper is first mention from the Romanian literature concerning a high attack of the green peach aphids at OSR crop, in late autumn, in the south-east of the country (Fundulea, Calarasi County). Until now it wasn't any references in the literature about high densities and attack of *M. persicae* at oilseed rape crop in the late autumn, in Romania.

MATERIAL AND METHOD

The field trials were carried out at Plants and Environment Protection Collective from National Agricultural Research and Development Institute (NARDI) Fundulea, Calarasi County (latitude: 44°46' N; longitude: 26°32 E'; alt.: 68 m a.s.l.), Romania, in 2017 and 2018. Over the course of the trial, the average temperatures and the rainfalls amount were recorded daily at automatic Pessl weather station, located at 100 m from the field trial. In 2017 oilseed rape was sowed on 8 September and plants emerged on 13 September while in 2018 oilseed rape was sowed on 3 September and plants emerged over 15 days, on 18 September. At the trial location from the NARDI Fundulea, the area of each experimental plot was of 2500 m^2. The experimental variants from this trial were: 1-Check (untreated); 2-seeds treated with imidacloprid (600 g/l) active ingredient, in the dose of 600 ml commercial product/100 kg of seeds; 3-seeds treated with clothianidin (400 g/l)+beta-cyfluthrin (80 g/l) a.i. in the dose of 1250 ml c.p./100 kg of seeds. Romania obtains derogations for the using these active ingredients for OSR seed treatment in autumns of 2017 and 2018. The assessments for the aphids were made each week after detecting the pests in the OSR field trial. On each variant it has established 10 assessment points on the plot diagonal. At each assessment point it has counted total numbers of the aphids per leaf and the number of the parasitized aphids by *Aphidius* spp. and *Praon* spp. species. For easy counting of the aphids, each assessed leaf was photographed with Panasonic Tz100 camera, then the images from the trial were downloaded on PC and the aphids were counted visualizing field image captures with OSR leaf on the screen. This new assessment method replaces classical counting of the aphids in the field with a magnifier glass (3x). The image capture of the lower side of the OSR leaf can be magnified on the PC screen; thus, each aphid can be individualized, and the precision of the assessments will increase. Also, according to with new assessment method, we can identify the number of parasitized aphids very precisely.

Statistical analysis. The results of the field observations were presented as the mean values for number of the green peach aphids (*Myzus persicae*) per OSR leaf and the parasitized aphids percentage, the standard deviation from the average values (SD) and the coefficient of variation (CV). Data were **statistically analyzed** using the Student-Newman-Keuls test (Student, 1927; Neuman D., 1939; Keuls M., 1952)

RESULTS AND DISCUSSIONS

Data from *tables 1* and *2* show that weather conditions registered in autumn, at NARDI Fundulea, during the assessments period were atypical. In 2017, the average air temperature from September, October and November was higher than the multiyear average with a higher positive deviation from the average in September and November. In 2018, the average air temperature recorded in September and October was higher compared with a multiyear average with a positive deviation of 1.8 and 2.2 °C while average air temperatures recorded in November were close to multiyear the average, the positive deviation was only 0.1 °C. However, both in 2017 and 2018 temperatures recorded in autumn months, when OSR crop are in early vegetation stages were higher with multiyear average, sometimes with positive deviation higher than 2.0 °C. In 2017, the rainfalls amount registered at NARDI Fundulea in September was lower compared with a multiyear average with a negative deviation of 35.1 mm while in October it has recorded higher rainfalls amount compared with multi-year average, with a positive deviation of 66.4 mm. Only in two days (7 and 8 October) it has recorded 81.6 mm, this level is almost two times higher then multi-year average. Rainfalls recorded in November were slightly higher then multi-year average, with a positive deviation of 5.7 mm. In 2018, the rainfalls amount registered at NARDI Fundulea was lower compared with multiyear averages in all three months of autumn. In October, it has registered the highest negative deviation from the multiyear average (-32.2 mm), while in September and November, negative deviation from the multiyear average ranged from -11.1 to -16.9 mm.

Table 1

Average air temperatures registered at NARDI Fundulea, during autumn, in 2017 and 2018

Year	Average air temperature (°C)						Deviation from the average (°C)		
	September		October		November		September	October	November
	Current year	Multiyear average	Current year	Multiyear average	Current year	Multiyear average			
2017	19.0	17.2	11.7	11.2	7.0	5.1	+1.8	+0.5	+1.9
2018	19.1	17.2	13.4	11.2	5.2	5.1	+1.9	+2.2	+0.1

Table 2

Rainfall amounts registered at NARDI Fundulea, during autumn, in 2017 and 2018

Year	Rainfall amounts (°C)						Deviation from the average (mm)		
	September		October		November		September	October	November
	Current year	Multiyear average	Current year	Multiyear average	Current year	Multiyear average			
2017	15.0	50.1	112.6	46.2	49.2	43.5	-35.1	+66.4	+5.7
2018	33.2	50.1	14.0	46.2	32.4	43.5	-16.9	-32.2	-11.1

Table 3

Level of the green peach aphid populations, at oilseed rape from the experimental field in 2017

Nr. crt.	Variant (active ingredients)	Number of the aphids/leaf									
		22.09.2017		29.09.2017		6.10.2017		13.10.2017		20.10.2017	
1	Check (untreated)	1.60	a	1.75	a	2.25	a	0	a	0	a
2	imidacloprid (600 g/l)	0.13	b	0.15	b	0.38	b	0	a	0	a
3	clothianidin (400 g/l)+ +beta-cyfluthrin (80 g/l)	0.10	b	0.13	b	0.30	b	0	a	0	a
LSD P=0.05		0.298		0.171		0.352		0		0	
Standard deviation (SD)		0.172		0.099		0.203		0		0	
Variation coefficient (C.V.)		28.340		14.610		20.870		0		0	

Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)

Table 4

Level of the green peach aphid populations, at oilseed rape from the experimental field in 2018

Nr. crt.	Variant (active ingredients)	Number of the aphids/leaf									
		29.10.2018		5.11.2018		12.11.2018		20.11.2018		27.11.2018	
1	Check (untreated)	24.45	A	160.48	a	243.25	a	175.93	a	161.00	a
2	Imidacloprid (600 g/l)	2.52	B	13.80	b	23.38	b	25.92	b	29.38	b
3	clothianidin (400 g/l)+ +beta-cyfluthrin (80 g/l)	1.33	B	12.80	b	17.65	b	14.88	b	19.67	b
LSD P=0.05		9.375		85.446		51.868		61.178		43.334	
Standard deviation (SD)		5.418		49.383		29.976		35.357		25.045	
Variation coefficient (C.V.)		57.440		79.190		31.630		48.94		35.77	

Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)

From climatic point of view, in this study, in autumn of the 2018 it has registered the most favorable conditions for aphids attack, especially in October (high temperatures and drought). Data from *table* 3 demonstrate that, in autumn of 2017, it has recorded a low population of the green peach aphid in OSR crop from this field trial located at NARDI Fundulea. Maximum pest density has registered at the control variant on 6 October (2.25 aphids/leaf) while at treated variants it has registered 0.30 aphids/leaf at plants from seeds treated with imidacloprid active ingredient, and 0.30 aphids/leaf at plants from seeds treated with clothianidin+beta-cyfluthrin active ingredients. After 6 October, it hasn't recorded aphids on OSR leaves. Possible explication for this is heavy rains occurred in 48 hours (7-8 October). Also, it hasn't observed aphides parasitized by *Aphidius* spp. or *Praon* spp. species. According Student-Newman-Keuls test, in this field trial, in autumn of 2017 it has registered significant statistical differences concerning aphids density at untreated (control) variant, compared with treated seeds variants ($p<0.05$).

In autumn of 2018, at the experimental field from NARDI Fundulea, it has registered a high population of green peach aphids at OSR crop. First aphids were observed in the field on 29 October. The untreated variant has registered 24.45 aphids on the lower side of the OSR leaf (*table* 4). Aphids density from the untreated plants increasing in the first 15 days of November, arriving at a maximum peak of 243.35 aphids/leaf on 12 November (*figure 1*).

Figure 1 **Greed peach aphids (*Myzus persicae*) on OSR lower side of the leaf, 12.11.2018**

Even if the average air temperatures decreasing after 15 November, however at assessments made on 20 and 27 November it has registered high populations of the green peach aphids at OSR plants from the untreated (control) variant (175.93 aphids/leaf on 20 November and 161.00 aphids/leaf on 27 November). The aphids at OSR crop was stopped after decreasing of the minimum air temperatures bellow -10.7 °C on 1 December. Data from *table* 4 ascertained that at treated variants from this field trial the maximum peak of aphids populations have registered on 27 November (29.38 aphids/leaf at variant treated with imidacloprid active ingredient and 19.67 aphids/leaf at variant treated with clothianidin+beta-cyfluthrin active ingredients). Compared with the untreated variant, when the maximum peak was registered on 12 November, at seed treated variants, it has registered a constant and slow growth of the green peach aphid populations until the end of November (*figure 2*).

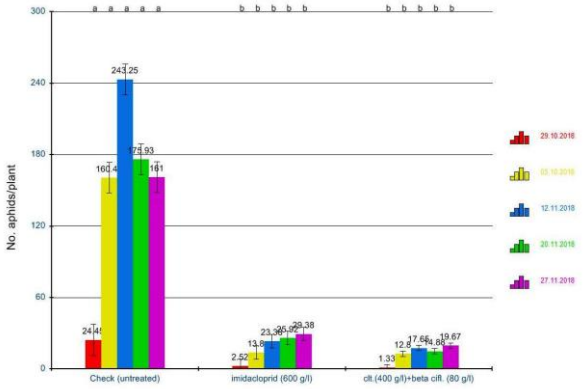

Figure 2 **Level of the green peach aphids (*Myzus persicae*) population at OSR crop, 12.11.2018**

However, in conditions of the high pest pressure from the experimental field in the autumn of 2018, it has registered significant statistical differences concerning aphids density at untreated variant, compared with treated seeds variants ($p<0.05$).

Data from *table* 5 reveals that in conditions of high pest pressure, registered in the

experimental field from the autumn of 2018, the maximum percentage of the parasitized aphids by *Aphidius* spp. or *Praon* spp. species has recorded on 20 November (5.15 % at untreated variant, and between 4.74 and 5.00 % at seed treated variants). On 12 November, when it has registered a higher level of the aphids on OSR leaves, the parasitized aphids percent was only 3.21 %.

Table 5

Percentage of the parasitized aphids, at oilseed rape from the experimental field in 2018

Nr. crt.	Variant (active ingredients)	Percent of the parasite aphids (%)									
		29.10.2018		5.11.2018		12.11.2018		20.11.2018		27.11.2018	
1	Check (untreated)	0.25	a	0.87	a	3.21	a	5.15	a	3.96	a
2	imidacloprid (600 g/l)	0	a	1.49	a	2.01	a	5.00	a	2.08	a
3	clothianidin (400 g/l)+ +beta-cyfluthrin (80 g/l)	0	a	0	a	2.56	a	4.74	a	4.11	a
LSD P=0.05		0.494		1.855		2.199		1.632		2.232	
Standard deviation (SD)		0.286		1.072		1.271		0.943		1.290	
Variation coefficient (C.V.)		346.410		136.420		49.010		19.000		38.170	

Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)

In the conditions of high pest pressure, registered in late autumn from 2018, at this field trial, green peach parasitoids couldn't control the pest population. Climate changes can have a consequence in increasing the populations of pests considered until now less important for OSR crops, such as green peach aphid. Until now, it wasn't any data from the literature concerning the high level of the *M. persicae* populations at OSR crop, recorded in late autumn (12 November) in Romania.

CONCLUSIONS

Weather conditions from autumn were favorable for green peach aphids (*M. persicae*), in 2018, in October and the first half of November.

In the autumn of 2017, at experimental field from NARDI Fundulea it was registered low level of the green peach aphids population at OSR crop.

In the autumn of 2018, at experimental field from NARDI Fundulea it was registered high level of the green peach aphids population at OSR crop with a maximum peak of 243.25 aphids/leaf, at untreated variant, registered on 12 November.

In condition of the high pest pressure from the autumn of 2018, parasitized green peach aphids percent was low, with a peak of 5.15 % at untreated variant, registered in late November.

These facts must be a warming signal for the farmers for the upcoming years.

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