

STUDY REGARDING THE APHIDOFAGOUS FAUNA STRUCTURE IN THE PEACH ORCHARDS FROM CONSTANTA COUNTY IN 2020

Andrei Chiriloaie-Palade¹, Mădălina Radulea¹, Gheorghe Lămureanu², Stefan Ion Mocanu², Maria Iamandei^{1*}

¹Research - Development Institute for Plant Protection Bucharest

²Research - Development Station for Fruit Growing Constanța

*correspondence address:

Research-Development Institute for Plant Protection
Ion Ionescu de la Brad 8, CP 013813, Bucharest, Romania
Tel.: 004-021-2693231 (32, 34)
Fax. 004-021-2693239
E-mail: maria_iamandei@yahoo.com

Abstract: The cosmopolitan aphid species *Myzus persicae* is a key pest of peach orchards in south and south-eastern Romania. The phenomenon of resistance induced by the intensive use of insecticides is a matter of concern for farmers and protectionists, making necessary integrated measure for the control of this pest. Conservation of natural enemy's populations is an essential component of any management system proposed for pest aphids. The aim of the study was to determine the structure of predatory insects associated with *Myzus persicae* populations in peach orchards. The research was carried out in three orchards from two localities from Constanta County, in peach plantations with Springcrest variety aged 7, 11 and 12 years. As a result of this study, there were determined a total of 15 predatory insect species belonging to eight systematic families: Coccinellidae, Chrysopidae, Hemerobiidae, Syrphyidae, Cecidomyiidae, Panorpidae, Nabidae and Forficulidae, which naturally contribute to the reduction of the green peach aphid populations.

Key words: *aphidofagous fauna, Myzus persicae, peach orchards, Springcrest*

INTRODUCTION

Myzus persicae (Sulzer, 1776) (Hemiptera: Aphididae), known as the green peach aphid or the peach-potato aphid, is a cosmopolitan species whose primary host is *Prunus persica* (peach tree), including var. *nectarine* and peach-almond hybrids. The list of secondary hosts is very wide, gathering more than 1600 species from over 40 botanical families, and includes many economically important cultivated plant as well as weed species commonly found in orchards, field and vegetable crops (Blackman & Eastop, 2006, 2007; Holman, 2009). *M. persicae* spring population on peach may cause wilts, severe leaf curling, and shoot distortion but the major damage caused is through transmission of plant viruses (Chan et al. 1991). Actually, many sources consider the green peach aphid to be the most economically important aphid pest throughout the world due to its ability to transmit more than 40 plant viruses (Romancer et al., 1994; van Emden & Harrington 2007; Ali et al. 2014; van Emden & Harrington 2007; Bass et al., 2014). Another special characteristic is represented by its ability to evolve mechanisms that avoid or overcome the toxic effect of insecticides, leading *M. persicae* to be nominated as one of the most widely and strongly resistant species worldwide (www.pesticideresistance.com). An extensive review published in 2014 (Bass et al., 2014) included details of the biochemical and molecular mechanisms of resistance in *M. persicae*, noticed since the first report in 1955 and up to 2014: (i) overproduction of carboxylesterases leading to resistance to organophosphate and carbamate insecticides, (ii) mutation of the acetylcholinesterase enzyme and insensitivity to dimethyl carbamate insecticides, (iii) mutation of the voltage-gated sodium channel involved in resistance to pyrethroid insecticides, (iv) duplication and mutation of the GABA receptor subunit gene that induce

resistance to cyclodiene insecticides, (v) overexpression of the cytochrome P450 CYP6CY3 and (vi) reduced penetration of insecticides through the cuticle and (vii) mutation of the nicotinic acetylcholine receptor (nAChR) involved in resistance induced after the use of nicotine and neonicotinoid insecticides. The way to reduce this phenomenon is to alternate various active compounds used for pest control.

In Romania, chemical control is the commonly management option for *M. persicae* control in peach orchards. Many environmental risks are associated to the use of conventional insecticides and the need to reduce the amount of plant protection products is crucial for the implementation of sustainable agricultural system. Conservation of natural enemy's populations is an essential component of any management system proposed for aphids given that the predatory insects could represent important biological control agents for *M. persicae* on peach crops. The data from literature in the county on predators associated with aphids in peach orchards refer to the area of southern Romania (Chireceanu et al., 2004, Paulian & Macarau, 1998).

The aim of this preliminary study was to determine the species composition of predatory insects associated with *Myzus persicae* colonies in peach orchards from south-eastern Romania in Constanta County where commercial plantations are widely distributed.

MATERIAL AND METHODS

The three peach orchards investigated in this study were located in Agigea (two orchards) and Valu lui Traian (one orchard) in the main peach growing areas of the south-eastern part of Romania in Constanta County, (Figure 1).

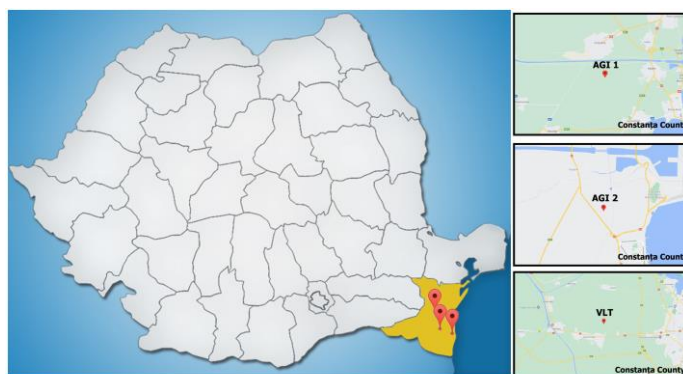


Figure 1. Locations of selected peach orchards in Constanta County, on Romanian map

For our intensive survey, three plots with “Springcrest” variety were selected in these peach orchards of various ages, which were managed with conventional agricultural practices and plant protection products as it presented in Table 1.

Table 1. The characteristics of the study orchards

Orchard ID code	Locality	Peach trees age (years)	Plant protection products applied from March to October 2020
AGI 1	Agigea	7	Bouillie Bordelaise WDG; Alcupral 50 PU; Score 250 EC; Topsin 70 WDG; Teppeki
AGI 2	Agigea	12	Bouillie Bordelaise WDG; Alcupral 50 PU; Chorus 75 WG; Score 250 EC; Topsin 70 WDG; Karate Zeon; Mospilan; Teppeki
VLT	Valu lui Traian	11	Bouillie Bordelaise WDG; Alcupral 50 PU; Chorus 75 WG; Score 250 EC; Topsin 70 WDG; Dithane M 45; Coragen; Cyperguard; Mospilan

Field observations, counts and collections were scheduled weekly between 15 of April and mid-July and also from the beginning of September to the end of October 2020. On each sampling date, the predators were evaluated on 100 naturally infested shoots, randomly selected on at least 20 trees in zigzag manner, in each orchard. All individuals of predators in adult stage which were easy to be identified were left in the orchards. The other individuals that could not be identified on site were placed in various recipients and transferred to the laboratory. The collected larvae were reared on fresh green peach aphid's colonies until they reached the adult stage for a proper identification. Predator's species composition was compared through the absolute abundance (the total number of predator specimens collected or observed), and the relative abundance in each taxon identified in 2020.

RESULTS AND DISCUSSIONS

A total of 3851 individuals belonging to aphidophagous fauna were collected in the three peach orchards investigated in 2020, members of eight insect families. Coccinellidae, Forficulidae, Chrysopidae and Syrphidae were the most common predator groups encountered in green peach aphid colonies, Coccinellidae being the most abundant (50.19%) of total (Figure 1).

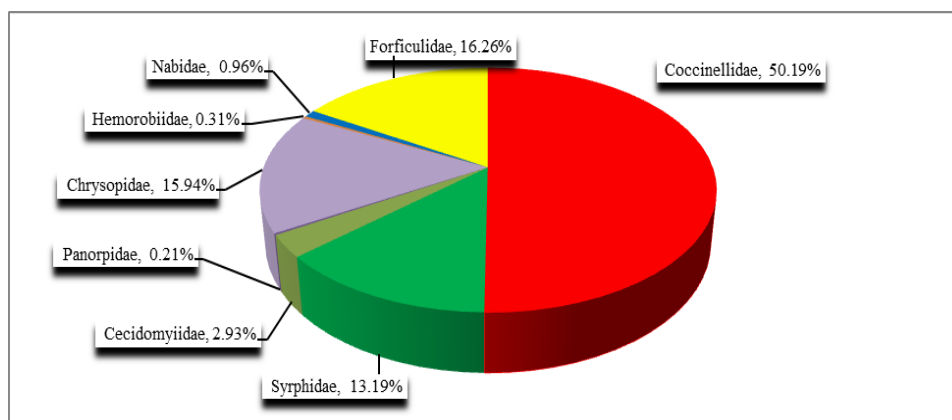


Figure 1. Prevalence of predator systematic families on peach orchards from Constanta County in 2020

The species complex of Coccinellidae found in green peach aphid colonies consisted of six species, three of them: *Coccinella septempunctata* (Linnaeus, 1758), *Adalia bipunctata* (Linnaeus, 1758) and *Harmonia axyridis* (Pallas, 1773) were present in all three research locations from Constanta county in 2020 (table 2). *C. septempunctata* was the most abundant species on AGI 1 orchard and VLT orchard while the neuropteran *Chrysoperla carnea* (Stephens, 1836) larvae were dominant in the third orchard AGI 2. A previous study of Paulian and Macarau (1998) that has been focused on the structure of the predator arthropods on peach orchards in Dabuleni (a province in southern Romania) showed 19 species of coccinellidae out of 40 species of beneficial fauna identified during the 6 years of research period. More recently, Chireceanu et al. (2004) reported 8 species of coccinellids associated with the complex of aphid's species colonizing peach orchards in Bucharest area, *A. bipunctata* and *C. septempunctata* being dominant.

The complex of coccinellidae revealed in our study in 2020 confirmed the presence in the Constanta peach orchards of the invasive species *Harmonia axyridis*. This species was first signalled in western part of Romania in 2009 (Ruicanescu & Alexandru, 2009; Markó &

Pozsgai, 2009), after that it spread rapidly throughout the country (Virteiu et al., 2015; Tudorache, 2020). Overall, it was the second species in term of coccinellidae abundance (9.22% of total).

The syrphids group was dominated by *Episyrphus balteatus* (De Geer, 1776) larvae, which were present in all analysed orchards, as well as the dermapteran species *Forficula auricularia* (Linnaeus, 1758). The highest number of species (13 species) was recorded in AGI 1 orchard where a minimum number of treatments were applied from April to October 2020, while the lowest number of species (7 species) was recorded in the orchard that received a program of classical intensive treatments.

Table 2. *Myzus persicae* predator species on peach orchards from Constanta County in 2020

Order / Family / Species	Abundance							
	AGI 1		AGI 2		VLT		Total	
	Abs. (nr)	Rel. (%)	Abs. (nr)	Rel. (%)	Abs. (nr)	Rel. (%)	Abs. (nr)	Rel. (%)
COLEOPTERA COCCINELLIDAE								
<i>Adalia bipunctata</i>	46	3.11	45	3.56	38	3.43	129	3.35
<i>Coccinella septempunctata</i>	621	42.04	345	27.27	287	25.88	1253	32.54
<i>Hippodamia variegata</i>	68	4.60	47	3.72	0	0.00	115	2.99
<i>Propylea quatordecimpunctata</i>	45	3.05	0	0.00	2	0.18	47	1.22
<i>Chilocorus bipustulatus</i>	34	2.30	0	0.00	0	0.00	34	0.88
<i>Harmonia axyridis</i>	53	3.59	106	8.38	196	17.67	355	9.22
DIPTERA SYRPHIDAE								
<i>Episyrphus balteatus</i>	234	15.84	102	8.06	167	15.06	503	13.06
<i>Scaeva pyrastris</i>	4	0.27	0	0.00	0	0.00	4	0.10
<i>Syrphus</i> sp.	1	0.07	0	0.00	0	0.00	1	0.03
DIPTERA CECIDOMYIIDAE								
<i>Aphidoletes aphidimiyia</i>	68	4.60	45	3.56	0	0.00	113	2.93
NEUROPTERA CHRYSOPIDAE								
<i>Chrysoperla carnea</i>	64	4.33	398	31.46	152	13.71	614	15.94
NEUROPTERA HEMEROBIIDAE								
<i>Hemerobius</i> sp.	0	0.00	12	0.95	0	0.00	12	0.31
MECOPTERA PANORPIDAE								
<i>Panorpa vulgaris</i>	0	0.00	8	0.63	0	0.00	8	0.21
HEMIPTERA NABIDAE								
<i>Nabis ferus</i>	24	1.62	11	0.87	2	0.18	37	0.96
DERMAPTERA FORFICULIDAE								
<i>Forficula auricularia</i>	215	14.56	146	11.54	265	23.90	626	16.26
Total	1477	100	1265	100	1109	100	3851	100

CONCLUSIONS

The results in this study, which is the first insight of the beneficial fauna present in peach orchards from Constanta County, showed presence of 15 predatory insect species belonging to eight families: Coccinellidae, Chrysopidae, Syrphyidae, Cecydomyiidae, Panorpidae, Geocoridae, Nabidae and Forficulidae, which naturally contribute to the reduction of *Myzus persicae* populations.

The species *Coccinella septempunctata* and *Chrysoperla carnea* were the most abundant.

Further researches are required to determine the natural enemies' dynamic and species composition under different climatic conditions from year to year and also to explore the contribution of the surrounding floral composition on the predator complex of *Myzus persicae*.

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