

NEW DATA REGARDING THE SPREADING OF THE INVASIVE SPECIES *Harmonia axyridis* (Pallas, 1773) (INSECTA: COLEOPTERA, COCCINELLIDAE) IN ROMANIA

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Abstract. The invasive species *Harmonia axyridis* (Pallas, 1773) is of Asian origin. It was first recorded in Romania in 2009 in Hunedoara County, Maramureș County and Bihor County, and a year later, in Bucharest and in the counties of Buzău, Prahova, Giurgiu. Beginning with the year 2011, we have identified the species in Dolj County. Our data come to complete the information on the area of this species. Surely its area is much more extensive in Romania.

Keywords: *Harmonia axyridis*, alien invasive species, Dolj County, enlargement of the area.

Rezumat. Noi date privind răspândirea speciei invazive *Harmonia axyridis* (Pallas, 1773) (Insecta: Coleoptera: Coccinellidae) în România. Specia invazivă *Harmonia axyridis* (Pallas, 1773) este de origine asiatică. A fost semnalată pentru prima dată în România în anul 2009 din județele Hunedoara, Maramureș și Bihor, fiind identificată un an mai târziu în județele Buzău, Prahova, Giurgiu și municipiul București. Începând din anul 2011, am identificat specia în județul Dolj. Datele noastre vin să completeze informațiile privind arealul speciei. Cu siguranță arealul ei este mult mai extins în România.

Cuvinte cheie: *Harmonia axyridis*, specie alogenă invazivă, județul Dolj, extindere areal.

INTRODUCTION

The alien invasive species are a major threat more and more acute to the native biodiversity in Europe. They can also have economic and social repercussions on human health, fishery, agricultural and food production. Their spread has been accelerated by the increased trade, tourism and cross-border transport of goods. The EU has recently developed proposals for a pan-European strategy to combat the invasive species. Since 1950, every year there is at least one new such species found in Europe and there are no signs that there is any change in this respect.

The DAISIE Inventory (Delivering Alien Invasive Species Inventories for Europe) sums up to 10 822 non-native species in Europe, of which 10-15% are a potential threat to the biodiversity in Europe (<http://www.europealiens.org/>). The European Environment Agency has drawn up a list of 163 invasive alien species, the most harmful of which are a real threat to the biodiversity of the ecosystems in Europe.

The Asian ladybird beetle *Harmonia axyridis* (Pallas, 1773) is included in this list. It is a predatory aphidophagous species of Asian origin useful in the biological control of aphids (Homoptera). It was introduced in eastern America in 1916, where it settled very quickly and expanded in almost all the United States (KOCH, 2003).

Starting with 1982, *Harmonia axyridis* was also introduced in Europe: France (1982), Portugal (1984-2007), Italy (1990 to 2006), Spain (1995-2007), the Netherlands (1996-2004), Switzerland (1996 - 2007), Germany (1997 and 1998), the Great Britain (2004), Austria, Denmark, Luxembourg, Norway (2006), Lichtenstein, Sweden (2007) (BROWN et al., 2008; KLAUSNITZER 2002/3, 2004) where it also adapted very quickly and expanded its areal in other European countries: Poland (2007) (PRZEVOŹNY et al., 2007, cit. MARKÓ & POZSGAI, 2009), Hungary (2008), Serbia (2009), Ukraine (2009), Slovakia (2009) (MARKÓ & POZSGAI, 2009), Bosnia and Herzegovina (2010) (KULIJER, 2010).

In Romania, this species was signalled in 2008 in Hunedoara County and a year later (2009) in Maramureș County (RUICĂNESCU & ALEXANDRU, 2009) and in Bihor County (MARKÓ & POZSGAI, 2009).

Two years after the first recording of this species in Hunedoara County, it has been identified in Bucharest and the counties of Buzău, Prahova, Giurgiu (STAN, 2011).

Our data will complete this information regarding the knowledge about the habitat of this species in Romania.

MATERIAL AND METHODS

The analysed material comes from research conducted in several sites in Dolj County. The observations were made during the years 2011-2016.

As methods for collecting and identifying this species we used mowing with entomological net of the spontaneous vegetation at the edge of the forests near the settlements Bratovoști, Teasc and Obedin and direct observation accompanied by periodic photo shootings of the specimens found on the plants cultivated in our private garden from Secui locality, Dolj County.

Taking into account their contribution to the destruction of aphids, we did not collect specimens from our garden. All four sites are located in the area near the Jiu River.

RESULTS

The data in the literature published between the years 2009 and 2011 report *Harmonia axyridis* in ten sites in Romania.

Previously published data in Romania: Băița, Hunedoara County (2008 și 2009); Baia Mare, Maramureș County (2009) (RUCĂNESCU & ALEXANDRU, 2009); Oradea and Gurani Bihor County (2009) (MARKÓ & POZSGAI, 2009); Valea Seacă, Pătărlagele, Buzău County (2010); Mehedința, Podenii Noi, Prahova County (2010), Bucharest (2010); Adunații Copăceni, Giurgiu County (2010) (STAN, 2011).

Our research led to the identification of this species in four sites in the Dolj County. We mentioned that it was found in both natural and anthropogenic ecosystems, on spontaneous vegetation as well as on cultivated plants (Table 1).

Table 1. Sites and collecting dates for *Harmonia axyridis*, in Dolj County.

No.	Sit	Coordinates	Collecting data/ observation data	Host plants
1.	Bratovoesti	N - 44°7'40", E - 23°53'57"	June 23, 2015 July 8, 2015	herbaceous vegetation
2.	Obedin	N - 44°21'55", E - 23°41'23"	May 22, 2013 April 23, 2015	herbaceous vegetation
3.	Secui	N - 44°11'36", E - 23°51'39"	April 23, 2011	black currant (Fig. 1)
			April 28, 2012	black currant (Fig. 2)
			April 23, 2015	black currant (Figs. 3 and 4)
			June 17, 2015	plum tree
			April 24, 2016	black currant (Fig. 5)
			May 7-13, 2016	peach-tree (Fig. 6)
			May 20, 2016	peach-tree (Fig. 7)
4.	Teasc	N - 44°10'41", E - 23°52'08"	April 26, 2011 June 15, 2015	herbaceous vegetation

DISCUSSIONS

Previous studies on the species *Harmonia axyridis* mentioned its great adaptability, the rapid expansion in its area, the variability of morphological characters, the species biology, its importance in natural and anthropogenic ecosystems (KOCH, 2003; RUCĂNESCU & ALEXANDRU, 2009, STAN, 2010; MARKÓ & POZSGAI, 2009; BOTEZATU et al., 2013 etc.).

If in some European countries the species was introduced deliberately for aphid control since 1982, in other countries, it penetrated through migration. Thus, after 26 years, in 2008, it appeared in Hungary, where only two specimens were collected, and the next year it was identified in almost all areas of Hungary. Apparently it came from the west and possibly from the north (MARKÓ & POZSGAI, 2009).

The same adaptability and rapid spread manifested in Romania. If in 2008, two specimens were collected in Hunedoara County, the following year many specimens were found in the counties of Hunedoara, Maramures and Bihor. Only two years after the first collecting of this species it was found in the counties of Buzau, Prahova, Giurgiu and Bucharest. We identified this species in Dolj county, between 2011 and 2016, in four sites located along the Jiu River.

At Bratovoesti, Obedin and Teasc we found it on herbaceous vegetation from the forest edge. At Secui, we found it on the plants grown in our personal garden, and this year (2016) we found four specimens on March 20, inside our house on the windowsill. Probably, they left their wintering place and wanted to get out. We found most of the specimens in 2015 on the leaves of plum (*Prunus* spp.) and of black currant (*Ribes nigrum*) (Figs. 3 and 4). It is interesting that on these plants we did not find *Coccinella septempunctata* Linnaeus, 1758, which we found on the leaves of Nectarine (*Prunus persica* var. *nucipersica*) (Fig. 8), chrysanthemum (*Chrysanthemum* spp.), and later on the leaves of potato (*Solanum tuberosum*) (Fig. 9), located in another part of the garden. This year (May 7, 2016) we have identified the species on the leaves of the peach-tree (*Prunus persica*), eight specimens of *Harmonia axyridis* and one specimens of *Coccinella septempunctata* (Fig. 10). For a week we noticed these specimens on the same peach-tree twigs, but the number of *Harmonia axyridis* varied from day to day.

Harmonia axyridis is an invasive species that multiplies very quickly and exhibits the phenomenon of cannibalism (consuming insect larvae and even their own larvae). It may affect the populations of aphidophagous insect late in summer, when aphid populations are reduced. The Asian ladybird also feeds on soft sweet fruit thus affecting the quality of fruit (apples and pears). They also can hide in bunches of grapes and due to the alkaloids contained in these insects they can affect the quality of wine, if they remain in the bunches of grapes that are used in producing wine (BOTEZATU, 2013).

Since the species was first identified in Hunedoara County, we consider that it is present in Gorj County, from where it probably came in Dolj County. It is possible that this species is present in all the counties of Oltenia, and in many other counties of Romania, where there have not yet been made any research on them. Further research will bring new data on this species area in Romania.

The rapid spreading of the species is due to easy flight of specimens between host plants, migration, lack of natural enemies, increased prolificacy and a very strong voracity.



Figure 1 and 2. *Harmonia axyridis* on the leaves of black currant (April 23, 2011 and April 28, 2012) (original).



Figure 3 and 4. *Harmonia axyridis* on the leaves of black currant (April 23, 2015) (original).



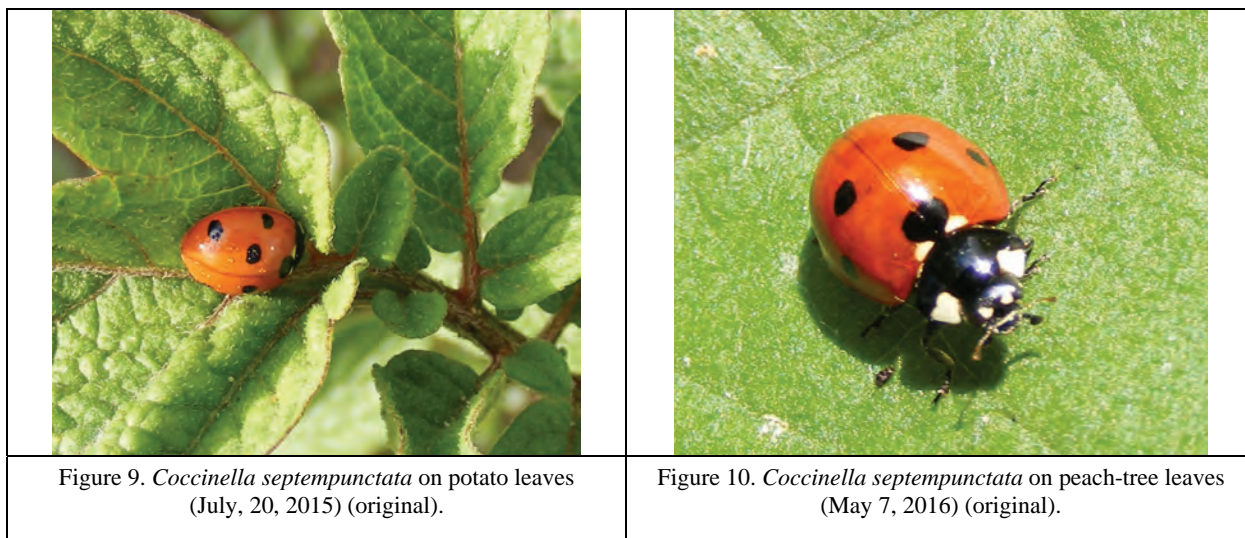
Figure 5. *Harmonia axyridis* on the leaves of black currant (April 24, 2016) (original).

Figure 6. *Harmonia axyridis* on the leaves of peach-tree (May 7, 2016) (original).



Figure 7. *Harmonia axyridis* on the leaves of peach-tree (May 20, 2016) (original).

Figure 8. *Coccinella septempunctata* on nectarine tree (April 17, 2014) (original).



CONCLUSIONS

Coccinella Harmonia axyridis is certainly present in the Romanian fauna in seven counties and Bucharest city. Given the distance between the first counties in which it was initially reported and the following counties where it was identified, we believe that its area is much more extensive in Romania.

Also taking into account its importance in maintaining the biodiversity of wildlife and the human economy, we believe that further research studies are needed on this species in other areas of Romania.

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