

## THE HAWTHORN FRUIT FLY, *ANOMOIA PURMUNDA* HARRIS - A LESS KNOWN SPECIES IN ROMANIA

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**Abstract:** The occurrence of the hawthorn fruit fly, *Anomoia purmunda*, was monitored using Tephri type traps placed on the *Crataegus monogyna* and *Ziziphus jujube* trees in Băneasa area (the Southern part of Romania) in 2014-2015 period. In this paper there are presented the results on abundance and adults' population dynamics collected in Tephri type traps. The flight period of adults lasted from June to October. The flies captured in the traps placed on hawthorn were more numerous than those in the traps placed on Chinese date trees. Only hawthorn fruits showed the larval infestation that reached the value of 52.2%. Original images and the morphological description of the species are also presented.

**Keywords:** *Anomoia purmunda*, hawthorn, population dynamics, fruit flies

### INTRODUCTION

The hawthorn fruit fly, *Anomoia purmunda* Harris 1780 is a picture-winged fly, member of the fruit pests group from the Tephritidae family, one of the largest in Diptera order. This species is found in the Caucasus region (Armenia, Azerbaijan, Georgia, Iran, Russia, Turkey), Asia (Kazakhstan, Lebanon, Syria, Israel, Jordan, Sinai Peninsula, Arabian Peninsula, Iraq, Mongolia, China, Korea, Japan) and Europe. It is considered a common species with widespread occurrence in Europe. In accordance with the Fauna Europe site, this species is present in many European countries, as follows: Austria, Belgium, British Isles, Bulgaria, Channel Islands, Corsica, Czech Republic, Jutland, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Lithuania, Norway, Poland, Central Russia, Slovakia, Spain, Sweden, Switzerland, Netherlands and Ukraine, but not in Romania.

*A. purmunda* has one annual generation in conditions of Europe (White, 1988; Han, 1999) and overwinters in the pupal stage in the soil. It is named the hawthorn fruit fly, after the fruits of tree species in which it is laying eggs and larvae develop.

The fruits of hawthorn plants (*Crataegus* sp. fam. Rosaceae) are commonly considered the main hosts for *A. purmunda*. The damages are caused by the adult females that introduce their eggs in the fruit and emerging larvae develop inside the fruits, consuming their pulp. It has also been detected on another rosaceous species such as *Cotoneaster sternianus*, *C. acutifolium*, *Pyracantha* sp., *Malus domestica*, *M. sylvestris*, *Pyrus* sp., *Sorbus aucuparia*, *S. intermedia*, *S. domestica*, *Prunus serotina*, *P. baccata*. There are also papers of literature and considerable web sites providing information on the range of plant species, herbaceous and woody, belonging to several botanical families such as: Berberidaceae (*Berberis* sp., *B. vulgaris*), Elaeagnaceae (*Hippophae rhamnoides*), Sapindaceae (*Acer pseudoplatanus*, *A. campestre*), Salicaceae (*Salix caprea*, *S. alba*, *Populus* sp.), Asteraceae (*Achillea filipendulina*), Malvaceae (*Tilia* sp.), Umbelliferae (*Heracleum mantegazzianum*, *Seseli libanotis*, *Silaum silaus*), Betulaceae (*Betula pendula*, *Corylus avellana*, *Alnus incana*),

Oleaceae (*Fraxinus excelsior*), Caprifoliaceae (*Lonicera xylosteum*), Fagaceae (*Quercus robur*, *Q. ilex*), Rhamnaceae (*Rhamnus frangula*) associated with presence or damages of the fly *A. purmunda* in different locations across the European territory (White, 1988; Merz, 1991; Baugnée, 2006; Pollini et al., 2014; Camaño et al., 2008; Meijer et al., 2012; Stalažs, 2014).

*A. purmunda* can be found in various places where its host plants are present, such as the periphery of forests, pastures and hayfields, fruit tree orchards as well as parks and house gardens (Baugnée, 2006; Camaño et al., 2008; Stalažs, 2014).

In Romania, the species was recorded and described by Nemeş in 1972 who collected adult specimens in two localities from Constanţa County in the South-Eastern part of the country (Perju & Ghizdavu, 2001). The relevant literature offers no information about its presence.

The purpose of the present paper was to obtain base data on the presence of fruit fly species in the southern part of Romania. There are presented the abundance and population dynamics of *A. purmunda* in Băneasa area (situated in northern part of Bucharest) recorded in Tephri traps, used for *Ceratitis capitata*, placed on hawthorn and jujube trees in 2014-2015. The level of larval infestation of hawthorn fruits is also recorded.

## MATERIALS AND METHODS

During the surveillance activities conducted by the team of entomologists from the Research and Development Institute for Plant Protection since 2012, to detect species of invasive exotic flies in horticulture areas in Romania, the captures of flies of *Anomoia purmunda* in the traps used for *Ceratitis capitata*, placed on *Crataegus monogyna* and *Ziziphus jujuba* in Băneasa area (South of Romania) have attracted much attention in 2014. The Băneasa district is an urban medium-size plain area developed in the northern part of Bucharest city that has become of a particular ecological importance for the great variety of plant species, cultivated and spontaneous, existing in domestic small orchards, parks, street alignments, house courtyards or green spaces between buildings, hosting a rich insect community of phytophagous and zoophagous species. Thus, a particular attention was paid to the hawthorn fruit fly, *Anomoia purmunda*, and the monitoring of its population was carried out in the above mentioned areas in 2015. The adult flies were captured using traps of the type Tephri Traps® (Sorygar, Madrid Spain) baited with 3 types of attractants: trimethylamine, ammonium acetate and putrescine, placed on an old and tall hawthorn tree (*C. monogyna*) with a dense canopy (Figure 1A), and on Chinese date (*Ziziphus jujuba*) trees (Figure 1B).

Two traps for each of the two plant species were placed approximately 2 m above the ground level inside the trees' canopy. The attractants were replaced every two months, and the insects were collected at seven to ten days intervals from June to October. A barberry bush (*Berberis vulgaris*) was detected in this area and a trap was placed on it as well in august 2015.



**Figure 1.** Tephri Traps set on *C. monogyna* (A) and on *Z. jujuba* (B)

The identification of the insects was performed following the ornamentation pattern on the wings and morphological characters of adult flies described in papers of White (1988) and Han (1999).

For obtaining the immature stages of *A. purmunda*, larvae and pupae, ripped fruits of hawthorn, Chinese date and barberry were collected in September 2015 and maintained under controlled temperature conditions (25°C, 60% RH) in the laboratory. Larval infestation of fruits was evaluated. All the fruits were checked at every two days, collecting the new larvae emerged from them.

The adult flies, larvae and pupae placed in ethanol 70% are deposited at the RDIPP Bucharest, laboratory of Entomology.

## RESULTS AND DISCUSSIONS

According to our data in this study, the presence of *A. purmunda* in association with the plants of two monitored fruit species, Hawthorn and Chinese date, was confirmed in Băneasa area, located in the southern part of Romania, during 2014-2015.

The pictures in Figure 2 (A, B, C) illustrate *A. purmunda* in the stages of development, adult, larva and pupa, obtained from the samples taken during the survey period.



**Figure 2.** *A. purmunda*, adult (A), larva (B) and pupa (C)

The adult of *A. purmunda* (Figure 2A) has a body length of 4-5 mm, predominantly black or brownish orange; head, scutellum and legs are yellow-orange. The adults display a distinctive pattern on wings. The larva has a whitish color (Figure 2B), is apodous and acephalous, characters typical of the Diptera, having a length of 4 mm when reaches complete development stage. The pupa (Figure 2C) is coarctate and has a white-yellowish color.

During the collection period in 2014-2015, a total of 267 flies of *A. purmunda* were captured in the Tephri type traps set up on Hawthorn and Chinese date trees in Băneasa area. Data are presented in Table 1.

**Table 1.** The total catches of *A. purmunda* flies in Tephri traps on Hawthorn and Chinese date trees, in Băneasa area in 2014 and 2015

Year	Number of <i>A. purmunda</i> flies	
	Hawthorn	Chinese date
2014	41	3
2015	178	45
Total	219	48

The abundance of *A. purmunda* flies on the two monitored species of trees varied among the years of trapping. In the first year of survey, the number of flies in the traps was smaller than in the second year on both species of trees. For both years, the traps placed on hawthorn captured more flies than those placed on Chinese date trees. If we analyze the total captures of 267 flies, most of the flies representing 82.02% were caught in the traps on hawthorn and only 17.98% flies were caught on Chinese date trees. The fact that only the fruits of hawthorn are known as being hosts for the flies of *A. purmunda* confirms the results found by us during the study.

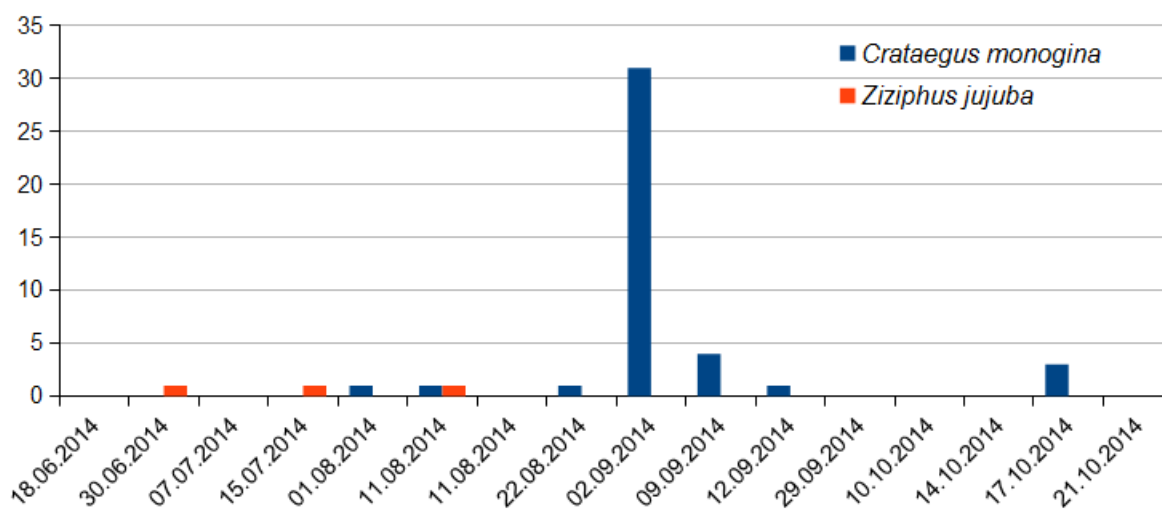
In addition to the data in Băneasa area, within the framework of the fruit flies surveillance in 2014, adult flies of *A. purmunda* were also captured in other Tephri-Traps placed in sweet cherry orchards in different fruit tree growing regions of the territory of Romania. Thus, 2 specimens were recorded in Dâmbovița County in the southern part of Romania, 9 specimens in Arad County in the western part of Romania and 2 specimens in Brăila County in the eastern part of Romania. These results show that the species is widespread in other parts of the country as well.

Although *A. purmunda* is reported as pest of fruits of barberry (White, 1988; Baugnée 2006) adults of this species were not captured in the trap placed on *Berberis vulgaris* bushes in Băneasa during the survey.

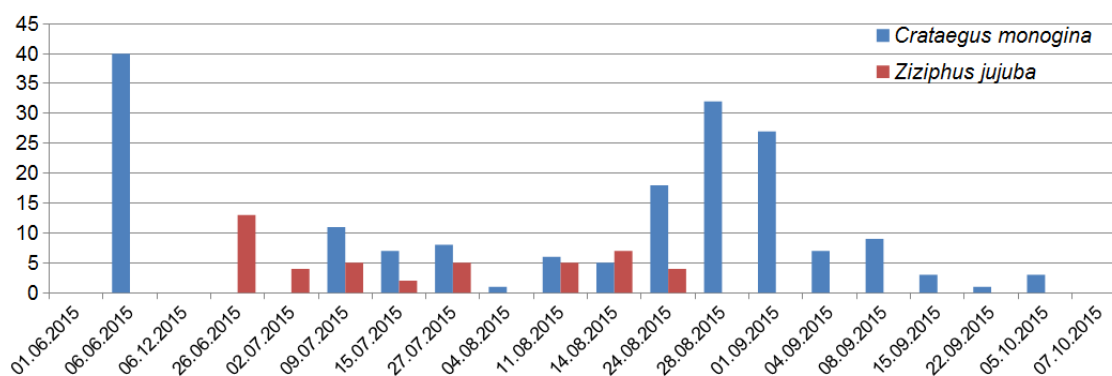
The data collected by traps on hawthorn and Chinese date trees in Băneasa area was used to appreciate the active period of *A. purmunda* adults for the two fruit tree species. The population dynamics of flies in Băneasa area during the 2-years period of monitoring is shown in figures (Figure 3 and Figure 4).

In accordance with the annual trapping data in these figures, the flight period of adults for each of the two tree species lasted from June to October in both years of survey. In both years the data on the trap catches have indicated moments when the presence of *A. purmunda* was not recorded. The fly population had a tendency to increase the following year, because the number of adults captured was consistently higher in 2015 compared to the previous year. In 2015, trapping data with Tephri traps more clearly showed the period of flight activity for *A. purmunda* adults for both monitored plant species (Figure 4).





**Figure 3.** Total catches of *A. purmunda* in two Tephri traps placed on hawthorn and Chinese date in Băneasa area in 2014



**Figure 4.** Total catches of *A. purmunda* in two Tephri traps for each species of trees, hawthorn and Chinese date, in Băneasa area in 2015

Presence of the first flies of *A. purmunda* in Băneasa area was recorded on 30 June (2014) with one adult captured in the traps on Chinese date (Figure 3) and on 6 June (2015) with 40 adults caught in the traps on hawthorn (Figure 4).

For hawthorn, in 2014, a total of 41 flies were recorded, from the first day of August to 11 September, and in 2015 the population was increased to 178 flies with a flight period from 6 June to 5 October.

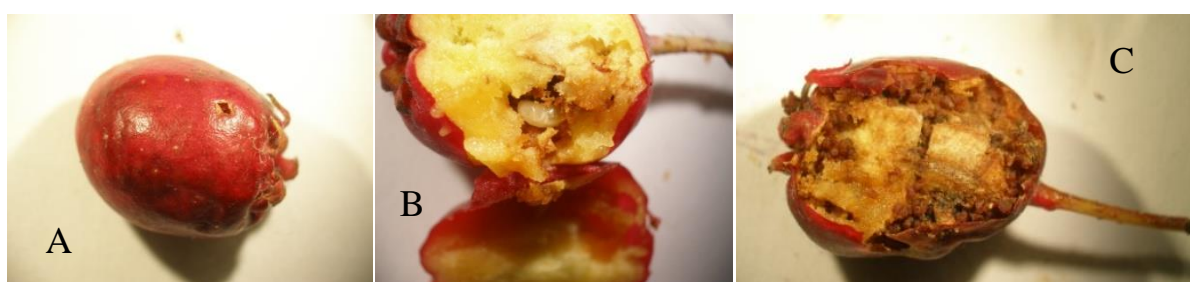
In case of the Chinese date, only 3 flies were captured in 2014, from 30 June to 11 August and 43 flies were captured from 26 June to 24 August in 2015.

In figure 4, one can see that the dynamics of adult flies in 2015 showed two maximum of trapped flies for both monitored plant species throughout the period from the beginning of June until the beginning of October. The first maximum of captured flies (40 flies) was in the first week of June, when the first emerging flies were noted, and the second maximum of captured flies (32 flies) was in the last week of August.

In terms of damages, the larval stage is the most important development stage of the hawthorn fruit fly *A. purmunda*, because emerging larvae feed with the fruits' pulp. Analyzing the fruits collected by us for larvae rearing, we found *A. purmunda* feeding only with fruits of hawthorn trees. No larva was resulted from the fruits of Chinese date or

barberry collected in the same period. Out of a total of 189 hawthorn fruits maintained in condition of laboratory and periodically analyzed, 95 of them have contained the larvae of *A. purmunda*, resulting in a level of infestation of 52.19%. From this reason we can appreciate that *A. purmunda* could become a serious pest for fruits of *Crataegus spp.* especially that these have important medicinal properties and widely are used for the treatment of different heart diseases. The fruits of hawthorn are rich in vitamin C, and are also used in culinary purposes for preparation of many food products, such as jams, jellies, syrups and wine.

All the fruits infested by *A. purmunda*, showed only one exit hole perforated by the larva leaving the fruit and down to the soil for overwintering (Figure 5A). Therefore, it is assumed that a single larva develops inside fruits (Figure 5B). Most of the infested hawthorn fruits presented larval galleries filled with excrements (Figure 5C).



**Figure 5.** Hawthorn fruit presenting an exit hole (A), a larva inside the hawthorn fruit (B) and galleries filled with excrements (C)

## CONCLUSIONS

Using the traps of the type Tephri Traps® for surveying of Mediterranean fruit fly *Ceratitis capitata*, the results achieved in this study confirm the presence of *A. purmunda* on the *Crataegus monogyna* and *Ziziphus jujube* fruit trees in Băneasa area situated in the Southern part of Romania.

The flight activity of adults started from the beginning of June until the beginning of October.

Larvae of *A. purmunda* were found feeding only inside the fruits of hawthorn. The level of infestation for hawthorn fruits reached a value of 52.19%, which leads to the conclusion that *A. purmunda* species could be a serious insect pest for the fruits of hawthorn bushes cultivated for commercial purpose for their medicinal and food qualities.

According to data we found in the existing literature in this area, we can consider that this work provides the first scientifically information on population dynamic of *A. purmunda*. Further investigations with expanding of the monitoring activities is needed in the future, to detect the presence and find the new host plant species associated with *A. purmunda* and other similar fruit flies members of the Tephritidae family.

## REFERENCES

- BAUGNEE, J. Y. (2006). Contribution à la connaissance des Tephritidae de Belgique (Diptera: Brachycera). Notes faunistiques de Gembloux, 59(2):63-113.  
CAMAÑO PORTELA, J.L.C., PEREZ, J.J.P., PEREZ, R.P., SILVA-PANDO, F.J. (2008). Contributions to the knowledge of Diptera in NW Spain. Boletín BIGA, 4, 91-94.

HAN, H.Y. (1999). Chapter 11. Phylogeny and behavior of flies in the tribe Trypetini (Trypetinae), pp. 253-297, In Aluja M and Norrbom AL (eds.), Fruit Flies (Tephritidae): Phylogeny and Evolution of Behavior. CRC Press, Boca Raton.

MEIJER, K., SMIT, C., BEUKEBOOM, L.W., SCHILTHUIZEN, M. (2012). Native insects on non-native plants in The Netherlands: curiosities or common practice. Entomologische Berichten, 72(6): 288-293.

MERZ, B. (1991). Die Fruchtfliegen der Stadt Zürich (Diptera: Tephritidae). Vierteljahrsschrift der Naturforschenden Gesellschaft in Zürich, 136(2): 105-111.

PERJU, T., GHIZDAVU, I. (2001). Dăunătorii plantelor cultivate, Tratat de zoologie agricolă, vol. V, 538 p, Editura Academiei Române București.

POLLINI, A., CRAVEDI, P. (2014). *Carpomya vesuviana* A. Costa (Diptera Tephritidae Trypetinae Carpomyini) from jujube tree in Emilia-Romagna (Northern Italy), REDIA, XCVII, 117-118.

STALAZS, A. (2014). New records of some dipterans (Diptera: Cecidomyiidae, Tephritidae) in North-eastern Lithuania. Zoology and Ecology, 24(1): 55–57.

STALAZS, A. (2014). New records of Tephritoidea (Diptera: Brachycera) for the fauna of Latvia. Zoology and Ecology, 24(4): 347-351.

WHITE, I. M. (1988). Tephritid Flies (Diptera: Tephritidae). Handbooks for the Identification of British Insects, 10(5a): 1–134.

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