

## PESTS OF APPLE LEAF AND FLOWER BUDS IN THE REGION OF EAST SARAJEVO

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### Abstract

Insect species that feed with leaf and flower buds of apple are significant pests in all areas where this kind of fruit-trees is cultivated. Feeding with buds as imago and/or larvae these insects make damages manifesting in buds drying, disturbing normal development of leaves and flowers, reduction in the yield and quality of fruits.

Exeminations were carried out in apple orchards in three locations on the region of East Sarajevo. Two extensive plantations over 40 years old were situated in the localities of Kasindo and Pale, while one intensive and youngish orchard with sorts Idared, Jonagold and Gold Delicious, was in the locality of Kula. Presence and harmfulness of buds pests was observed in the period of 2007-2008.

Seven species of harmful insects have been reared and determined on apple leaf and flower buds.

Six Lepidopterous species were from the families Tortricidae and Geometridae, and one Coleopterous species was from the family of Curculionidae.

Tortricidae was represented with four species: *Hedya nubiferana* Haworth, *Spilonota (Tmetocera) ocellana* Fab., *Archips podana* Scopoli and *Pandemis heperana* Den.et Schiff.

Two Geometrid species were *Hibernia defoliaria* Clerck and *Cheimatobia brummata* Linne.

Only one beetle from the family Curculionidae was *Anthonomus pomorum* Linne.

In extensive plantations the most numerous species on leaf buds during both years was *Ch. brummata*, but on flower buds it was *A. pomorum*. In intensive plantation on a leaf buds existed 3 species, but two of them (*P. heperana* and *H. defoliaria*) were more numerous, while on a flower buds dominated *A. pomorum* with almost equal representation in all sorts and in both years.

**Keywords:** insect pests, leaf buds, flower buds, apple, East Sarajevo

### Introduction

Apple as the most widespread and economically the most important fruit-tree is attacked by many harmful insects during whole growing season. These insects make damages on different overground organs such as trunk and branches, buds, flowers and fruits. The species which attack leaf and flower buds are very important. Feeding inside or outside of buds they disturb their normal development provoking reduction of growth and fruitfulness, as well quality of fruits. In case of an intensive permanently attack the fruitfulness may be completely absent (Batinica, 1996; Maceljki, 2002).

Presence and importance of insects and their damages on apple leaf and flower buds is not the same in all areas of their distribution.

The greatest number of such species belong to the family Tortricidae (Lepidoptera), from which the most important pests are *Archips rosana* Linnaeus, *Archips podana* Scopoli, *Spilonata (Tmetocera) ocellana* Fab., *Hedya nubiferana* Haworth, etc. Feeding with buds, leaves and flowers, their larvae

disturb the normal development of vegetative and generative organs, manifesting in reduction of growth and fruitfulness (Batinica, 1996; Maceljiski, 2002).

In Europe, *Archips podana* Scopoli is one of the most harmful leaf roller moths on apples and other fruit-trees, too (Alford, 1999; LaGasa et al., 2003). In Great Britain and North Ireland for example, it is one of three most important harmful leaf roller moth on apple leaves and flowers (Mowat and Clawson, 1996). In early spring larvae feed on buds first, and then on young leaves and fruits (Almaši et al., 2004).

A great damages in nurseries and young apple plantations are provoked by caterpillars of *Hedya nubiferana* Haworth. In Italy and Romania this species is a significant economic pest of buds with damages more than 60% (Rings, 1992; Diaconu et al., 2005). Also, *Spilonota (Tmetocera) ocellana* Fab. can destroy buds on major sprouts, especially in nurseries (Reichart, 1952).

Beside leaf roller moths, leaf and flower buds are usually destroyed by the earliest defoliators in spring, *Hibernia defoliaria* Clerk and *Cheimatobia brummata* Linne (Lepidoptera: Geometridae). In the years of high population densities their larvae can destroy more than 75% leaf and flower buds or provoke completely defoliation which has the negative effects for a fertility in the next year (Maceljiski, 2002).

One of the most important flower buds beetle in our country and enclosed countries is *Anthonomus pomorum* Linne (Coleoptera: Curculionidae). Overwintering adults make damages on closed flower buds during feeding period and oviposition, while larvae feed and development within the buds, provoking their drying and falling (Vukasovic et al., 1965; Maceljiski 2002, Almaši et al., 2004). The level of infestation and damages depend on pest population, length of flowering, fruitfulness and weather conditions during feeding period and oviposition. In some years damages are going up to 70-80% or even more (Maceljiski, 2002; Ciglar, 1998; Cosoveanu, Palagesiu 2010).

The data about pests on apple buds in the region of Sarajevo are relatively old. According to the available literature which data from more than 40 years ago, there were known nine species of leaf roller moths: *Pandemis ribeana* Huebner, *Pandemis heperana* Den. et Schiff., *Archips rosana* Linne, *Archips podana* Scopoli, *Ptycholoma lecheana* Linnaeus, *Croecia holmiana* Linnaeus, *Spilonota ocellana* Den. et Schiff., *Olethreutes variegana* H bner, and *Olethreutes pruniana* H bner (Batinica, 1966).

In East Sarajevo which is a part of Sarajevo's region, the data about harmful insect species on apple is pretty poor. Because of that, the goal of this examination was to establish their presence and number, as well as damages on leaf and flower buds.

### Material and methods

Presence and harmfulness of buds pests was observed in the period of 2007-2008., in field conditions and in laboratory of the Faculty of Agriculture, University of East Sarajevo.

Field experiments have been done in a different apple orchards. Two orchards were extensive, more than 40 years old and situated in localities of Kasindo and Pale. One intensive and youngish plantation with sorts of Idared, Jonagold and Golden delicious, was in the locality of Kula.

Plant material was sampled two times during April and May in bud swelling stage. Each time it was sampled 100 leaf and 100 flower buds in extensive plantations (total number was 200 per year), respectively 100 leaf and 100 flower buds by every sort per year in intensive plantation.

Examination of the presence and number of pests was carried out in laboratory. Sampled insects larvae and pupae were reared to eclosion adults. Rearing was done in a plastic pots with a layer of a cellulose wadding in a bottom which was watered because of bud's freshness. Determination of insect species was done according to morphological features of imago by using an existing keys and adequate entomological literature (Balachowsky, 1966; Hering, 1957).

## Results and discussion

In the region of East Sarajevo, on apple leaf and flower buds, seven insect species were determined. Six species belong to Lepidoptera and one to Coleoptera.

Among six Lepidoptera species, four species were from the family Tortricidae, and two from the Geometridae.

Tortricidae was represented with following species: *Hedya nubiferana* Haworth, *Spilonota (Tmetocera) ocellana* Fab; *Archips podana* Scopoli and *Pandemis heperana* Den. et Chiff.

Geometridae was represented with two species, *Hibernia defoliaria* Clerck and *Cheimatobia brummata* Linne.

From order Coleoptera, only one species, *Anthonomus pomorum* Linne, which belongs to family Curculinidae, was recorded.

In extensive apple orchard in the locality of Kasindo, six species were determined. Three species, *Hibernia defoliaria*, *Ch. brummata* and *Hedya nubiferana* were reared from leaf buds, while four species, *A. pomorum*, *Ch. brummata*, *S. ocellana* and *Archips podana*, from flower buds (Tab.1).

**Tab.1. Insect species and their abundance on apple buds in the locality of Kasindo**

Insect species	2007. year				2008. year			
	23. 04.		08. 05.		28. 04.		14. 05.	
	Leaf buds	Flower buds	Leaf buds	Flower buds	Leaf buds	Flower buds	Leaf buds	Flower buds
1. <i>A.pomorum</i>	0	68	0	17	0	43	0	8
2. <i>H.defoliaria</i>	9	0	5	0	8	0	3	0
3. <i>C.brummata</i>	12	6	8	0	19	9	8	0
4. <i>H.nubiferana</i>	11	0	4	0	6	0	3	0
5. <i>S.ocellana</i>	0	8	0	0	0	4	0	0
6. <i>A.podana</i>	0	5	0	0	0	3	0	0

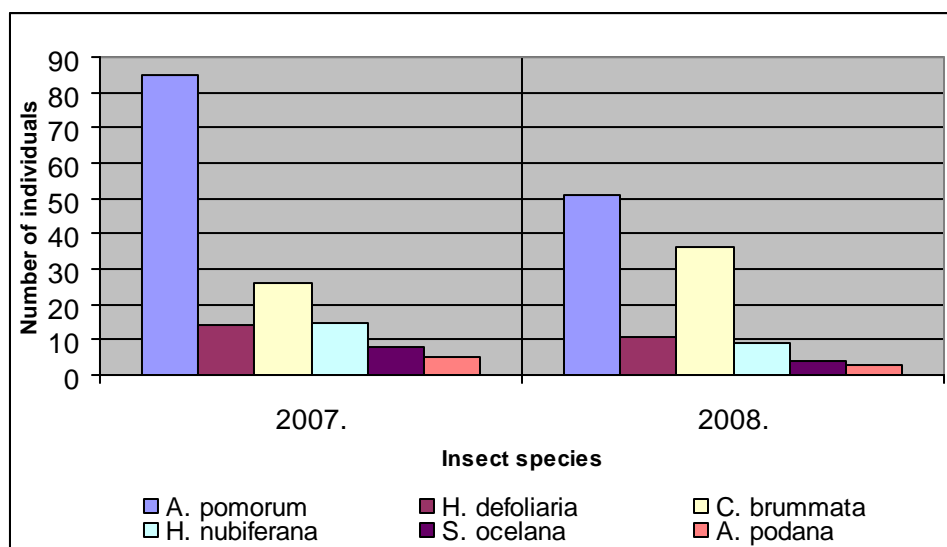
The most numerous species on leaf buds was *Ch. brummata* whose larvae were found in 20 buds in 2007., and 27 buds in 2008. during both sampling. According to 200 surveyed buds per year, damages were from 10% in 2007., to 13,5% in 2008. Greater number of this species in both years were found by first sampling which was done in the third week of April. Untill April 23<sup>th</sup> 2007. it was found in 12 leaf buds (12%), and untill April 28<sup>th</sup> 2008. in 19 buds (19%). In second sampling wich was done untill second half of May, it was less numerous and equal in both years.

The rest two species, *Hibernia defoliaria* and *Hedya nubiferana* were less numerous during both sampling, in both years.

On flower buds, the most numerous species in both years was *A. pomorum*. From 200 surveyed buds in 2007., 85 buds or 42,5% were damaged, respectively 51 buds or 25,5% in 2008. The grater number of this species in both years was in first sampling, at the end of April, before flowering. These results correspond to the literature data about the period of activities and harmfulness of *A. pomorum* which is connected with swelling buds stage (Ciglar, 1998; Maceljiski, 2002; Almaši i sar., 2004; Cosoveanu, Palagesiu, 2010).

The rest three species, *Ch. brummata*, *S. ocellana* and *A. podana*, were found in small number and only during the first sampling.

Total number of all found insects on leaf and flower buds in Kasindo was grater in 2007. related to 2008., except *Ch. brummata*. From all examined species the most numerous in both years were *A. pomorum* on flower buds and *Ch. brummata* on leaf buds predominantly. Following *Hibernia defoliaria* and *Hedya nubiferana* on leaf buds, and *Spilonota ocellana* on flower buds, while *A. podana* was found in the smallest number of flower buds (Graph.1).



Graph.1. The total number of insects on buds in the locality of Kasindo in 2007. and 2008.

In extensive apple orchard in the locality of Pale, six insect species were collected and reared. Three species were reared from leaf buds (*Ch. brummata*, *Hibernia defoliaria*, *Hedya nubiferana*), and four species from flower buds (*A. pomorum*, *Ch. brummata*, *S. ocellana*, *A. podana*). The number of these insects were not numerous as in the locality of Kasindo. More individuals were found in second sampling, actually in first decade of May (Tab. 2). This can be explained by the fact that in Pale an apple orchard is on higher altitude. Because of different climate conditions and lower temperatures, swelling of buds begin later.

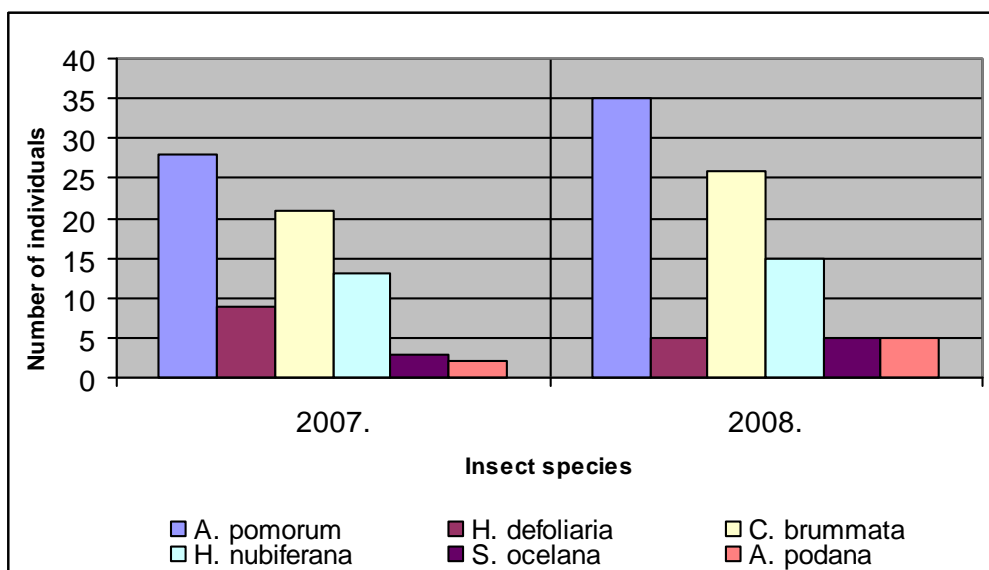
Table 2. Insect species and their abundance on apple buds in the locality of Pale

Insect species	2007. year				2008. year			
	20. 04.		07. 05		23.04		09.05.	
	Leaf buds	Flower buds	Leaf buds	Flower buds	Leaf buds	Flower buds	Leaf buds	Flower buds
1. <i>A. pomorum</i>	0	0	0	28	0	0	0	35
2. <i>H. defoliaria</i>	3	0	6	0	2	0	3	0
3. <i>Ch. brummata</i>	8	1	9	3	7	2	12	5
4. <i>H. nubiferana</i>	4	0	9	0	9	0	6	0
5. <i>S. ocellana</i>	0	3	0	0	0	5	0	0
6. <i>A. podana</i>	0	1	0	1	0	2	0	3

As in previous locality, in this orchard the most numerous species on leaf buds was *Ch. brummata*. According to 200 surveyed buds per year, damages were from 8,5% in 2007., to 9,5% in 2008.

On flower buds, *A. pomorum* exclusively dominated during second sampling in the first decade of May. From 200 surveyed buds in 2007., 28 buds or 14% were damaged, respectively 35 buds or 17,5% in 2008.

Total number of examined insect species on leaf and flower buds in Pale was numerous in 2008. than in 2007, except *H. defoliaria*. The most numerous species were *A. pomorum* and *Ch. brummata*. Following species were *Hedya nubiferana*, *Hibernia defoliaria* and *Spilonota ocellana*. Also in this case *A. podana* was found in smallest number with damages on a single flower buds (Graph. 2).



Graph. 2. The total number of insects on buds in the locality of Pale in 2007. and 2008.

In intensive orchard in the locality of Kula, seven insect species were determined. Four species were reared from leaf buds (*P. heparana*, *Ch. brummata*, *Hibernia defoliaria*, *Hedya nubiferana*) and two species from flower buds (*A. pomorum*, *Archips podana*) (Tab. 3).

Presence of species and their number varied according to different sorts. On Idared, all mentioned species were found on leaf buds, but only one on flower buds (*A. pomorum*). On Jonagold, two species (*Ch. brummata* and *Hedya nubiferana*) were reared from leaf buds, and also one (*A. pomorum*) from flower buds, while on Golden Delicious only one species, *Ch. brummata*, was found on leaf buds, and two species (*A. pomorum* and *Archips podana*) on flower buds.

The total number of specimens, on all sorts, were pretty low in both years. From 100 examined leaf buds of each sort and in every year, number of specimens were from zero to three, while on flower buds it was from two to eleven. The level of damaged flower buds by *A. pomorum* was nearly equal on all sorts, from 9 to 11% in 2007., respectively 6-8% in 2008.

Less insects number on leaf end flower buds in this area can be explained by the fact that this is an intensive plantation with often used agrotechnical, pomotechnical and especial chemical methods because of orchards protection from harmful bioagens.

Table 3. Insect species and their abundance on apple buds in the locality of Kula

Insect species	24. 04. 2007.						23. 04. 2008.					
	Leaf buds			Flower buds			Leaf buds			Flower buds		
	I	J	GD	I	J	GD	I	J	GD	I	J	GD
1. <i>A.pomorum</i>	0	0	0	11	9	10	0	0	0	7	8	6
2. <i>P.heparana</i>	2	0	0	0	0	0	0	0	0	0	0	0
3. <i>Ch.brummata</i>	0	2	0	0	0	0	1	2	3	0	0	0
4. <i>H.nubiferana</i>	1	1	0	0	0	0	0	0	0	0	0	0
5. <i>A.podana</i>	0	0	0	0	0	2	0	0	0	0	0	0
6. <i>H.defoliaria</i>	0	0	0	0	0	0	2	0	0	0	0	0

I- Idared; J-Jonagold; GD-Gold Delicious

## Conclusion

From apple leaf and flower buds seven insect species were collected and reared in the region of East Sarajevo. Determined species were: *Hedya nubiferana*, *Spilonota (Tmetocera) ocellana*, *Archips podana*, *Pandemis heperana*, *Hibernia defoliaria*, *Cheimatobia brummata* and *Anthonomus pomorum*.

In extensive orchard in the locality of Kasindo, the following species were reared from leaf buds: *Hibernia defoliaria*, *Ch. brummata* and *Hedya nubiferana*. The most numerous was *Ch. brummata*, with damages of leaf buds from 10% to 13,5%.

Among four species on flower buds (*A. pomorum*, *Ch. brummata*, *S. ocellana*, *Archips podana*), *A. pomorum* was most significant with damages from 25,5% to 42,5%.

In extensive orchard in the locality of Pale, from three species on leaf buds (*Ch. brummata*, *Hibernia defoliaria*, *Hedya nubiferana*), the most numerous was *Ch. brummata*, whose larvae were damaged 8,5% to 9,5% of leaf buds.

On flower buds, among four detected species (*A. pomorum*, *Ch. brummata*, *S. ocellana*, *A. podana*), the most numerous was *A. pomorum*, with damages 14%-17,5%.

In intensive plantation in the locality of Kula, there were four species on leaf buds (*P. heparana*, *Ch. brummata*, *Hibernia defoliaria*, *Hedya nubiferana*), and two species on flower buds (*A. pomorum*, *Archips podana*). All of them were found on a single buds of all sorts, except *A. pomorum*, which was the most numerous with nearly equal damages (6% -11%) on all sorts and in both years.

The abundance of registered insect species and their damages on leaf and flower buds were grater in extensive apple orchards than in intensive one.

In all plantations and localities, the most significant pests were *Cheimatobia brummata* on leaf buds, and *Anthonomus pomorum* on flower buds.

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