

HARMFUL INVERTEBRATE FAUNA OF HOP IN CLUJ-NAPOCA AREA

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Abstract

*The research concerning the hop's harmful invertebrate fauna was carried out between 1995-2010 in the ecological conditions of Cluj-Napoca, on the cultivated hop, in the Hop's Collection of Discipline of Field Crop and on spontaneous hop. The aim of the research was to study the harmful invertebrate fauna of hop (*Humulus lupulus* L.), following a classical methodology. The determination of the biological collected material was made in the Laboratory of Entomology/Zoology of USAMV Cluj-Napoca.*

INTRODUCTION

Although the cultivated hop surface has strong by decreased in Romania during the last years, hop remains the main raw material for beer industry [6].

Research concerning the harmful invertebrates of hop gardens was performed, both in different countries [3, 4] and in Romania [1, 2, 5, 6], which revealed the presence of some harmful species, on the subterranean and superterrestrial plant organs. Some species are specific to hops (ex. *Phorodon humuli*) while others are polyphagous.

Our research aimed to reveal, by particular methods of zoological/entomological investigation, the harmful invertebrate fauna structure and morphology, also the harmful potential in the studied ecosystems. The structure of harmful invertebrate complex was studied, respectively the population species in these ecosystems.

MATERIAL AND METHODS

The research concerning the harmful invertebrate fauna of hop, was carried out between 1995-2010, in the Collection of Hop at Discipline of Filed Crop at UASVM of Cluj-Napoca and on spontaneous hop. Following a standard methodology, observations and sample collectings were made. Every year there were made observations by visual control on the species from hop gardens. The biological material was collected both from the plants and soil.

To collect the superterrestrial biological samples, two methods were used: the direct collect of species by hand, using delicate brushes or fine pincers, from the

different organs (offshoots, stems, leaves, flowers, cones) of hop infected plants and the shaking-down of the host-plants on a tarpaulin, for a better objectiveness, by random collecting from plants, pursuing hereof and noting the observations. Often, the presence of pests was signaled by pronounced damages.

The invertebrates from soil were collected by assaying of soil samples, extracting the biotic part from a pail or a vase with water in which the sample was introduced.

The collected material was introduced in small bottles (with etilic alcohol 70% or formol 4%) or different bags, boxes (plastic, paper) which has been labeled and the identifying of the material was made in the Laboratory of Entomology-Zoology from Faculty of Agriculture at USAMV of Cluj-Napoca.

After the species identification, the collected material was prepared and conserved. The species identification was made aiding by literature descriptions, comparing with images and aiding by identification keys.

RESULTS AND DISCUSSION

a) PESTS OF SUBTERRANEAN ORGANS

After the analysis of collected material from the studied ecosystems, there were identified the following 8 species (Table 1):

❖ Phyll. *ARTHROPODA*

• Cls. *INSECTA*

➤ Ord. *COLEOPTERA*

- Fam. *MELOLONTHIDAE* - *Melolontha melolontha* Linné (larvae - white worms)

- Fam. *CURCULIONIDAE* - *Otiorrhynchus ligustici* Linné (alfalfa scout beetle)

- Fam. *ELATERIDAE* - *Agriotes* spp. (wireworms)

➤ Ord. *LEPIDOPTERA*

- Fam. *HEPIALIDAE* - *Triodia sylvina* Linné (the orange swift)

- Fam. *NOCTUIDAE* - *Agrotis (Scotia) segetum* Denis et Schiffermüller (the turnip moth); *Hydraecia micacea* Esper (the rosy rustic)

➤ Ord. *ORTHOPTERA*

- Fam. *GRYLLOTALPIDAE* - *Gryllotalpa gryllotalpa* Linné (the mole cricket)

➤ Ord. *DIPTERA*

- Fam. *ANTHOMYIDAE* - *Delia platura* Meigen (the seedcorn maggot)

Table 1

Harmful invertebrate fauna of hop's subteranean organs in studied ecosystems (Cluj-Napoca, 1995-2010)

Phyllum	Class	Order	Family	Species
ARTHROPODA	INSECTA	COLEOPTERA	MELOLONTHIDAE	<i>Melolontha melolontha</i> Linné
			CURCULIONIDAE	<i>Otiorrhynchus ligustici</i> Linné
			ELATERIDAE	<i>Agriotes</i> spp.
		LEPIDOPTERA	HEPIALIDAE	<i>Triodia sylvina</i> Linné
			NOCTUIDAE	<i>Agrotis (Scotia) segetum</i> Denis et Schiffermüller (the turnip moth); <i>Hydraecia micacea</i> Esper
		ORTHOPTERA	GRYLLOTALPIDAE	<i>Gryllotalpa gryllotalpa</i> Linné
		DIPTERA	ANTHOMYIDAE	<i>Delia platura</i> Meigen

b) PESTS OF SUPERTERRESTRIAL ORGANS

The study by analysis of collected material from cultivated and spontaneous hops, showed that the following 11 species were identified (Table 2):

❖ **Phyll. MOLLUSCA**

- **Cls. GASTROPODA**

➤ **Ord. STYLLOMATOPHORA**

- **Fam. AGRIOLIMACIDAE** - *Deroceras agreste* Linné (the field slug)

- **Fam. HELICIDAE** - *Helix pomatia* Linné (the Roman snail)

❖ **Phyll. ARTHROPODA**

- **Cls. ARACHNIDA**

➤ **Ord. ACARI**

- **Fam. TETRANYCHIDAE** - *Tetranychus urticae* Koch (the red spotted spider mite)

• **Cls. INSECTA**

➤ **Ord. HOMOPTERA**

- **Fam. APHIDIDAE** - *Phorodon humuli* Schrank (the damson-hop aphid)

- **Fam. ALEYRODIDAE** - *Trialeurodes vaporariorum* Westwood (the greenhouse whitefly)

➤ **Ord. COLEOPTERA**

- **Fam. HALTICIDAE** - *Psylliodes attenuata* Koch (the hemp flea beetle)

➤ **Ord. LEPIDOPTERA**

- **Fam. NOCTUIDAE** - *Mamestra persicariae* Linné (the dot moth); *Hypena rostralis* Linné (the buttoned snout moth)

- **Fam. PYRALIDAE** - *Ostrinia nubilalis* Hübner (the European corn borer)

- **Fam. TORTRICIDAE** - *Adoxophyes reticulana* Hübner (the summer fruit tortrix moth)

- **Fam. GEOMETRIIDAE** - *Operophtera brumata* Linné (the winter moth)

➤ **Ord. DIPTERA**

- **Fam. CECYDOMYIDAE** - *Contarinia humuli* Theobald (the hop strig maggot)

CONCLUSIONS

1. After the developed research between 1995-2010 on cultivated and spontaneous hops, in ecological area of Cluj-Napoca, it has been observed that the complex of harmful invertebrate fauna of these ecosystems is represented by 19 different species.
2. Following the observations made on the biological material, it found out the presence of some harmful species belonging to the Phylum **MOLLUSCA** and **ARTHROPODA**.
3. The most large harmful species are the insects (orders **HOMOPTERA**, **ORTHOPTERA**, **COLEOPTERA**, **LEPIDOPTERA**, **DIPTERA**), being separated in 2 categories: the pests of subterranean organs (8 species) and the ones of superterrestrial hop organs (8 species).

Table 2

Harmful invertebrate fauna of hop's superterrestrial organs in studied ecosystems (Cluj-Napoca, 1995-2010)

Phylum	Class	Order	Family	Species
MOLLUSCA	GASTROPODA	STYLLOMATO- PHORA	AGRIOLIMACIDAE	<i>Deroceras agreste</i> Linné
			HELICIDAE	<i>Helix pomatia</i> Linné
ARTHROPODA	ARACHNIDA	ACARI	TETRANYCHIDAE	<i>Tetranychus urticae</i> Koch
	INSECTA	HOMOPTERA	APHIDIDAE	<i>Phorodon humuli</i> Schrank
			ALEURODIDAE	<i>Trialeurodes vaporariorum</i> Westwood
		COLEOPTERA	HALTICIDAE	<i>Psylliodes attenuata</i> Koch
		LEPIDOPTERA	NOCTUIDAE	<i>Mamestra persicariae</i> Linné; <i>Hypena rostralis</i> Linné
			PYRALIDAE	<i>Ostrinia nubilalis</i> Hübner
			TORTRICIDAE	<i>Adoxophyes reticulana</i> Hübner
			GEOMETRIIDAE	<i>Operophtera brumata</i> Linné
		DIPTERA	CECYDOMYIDAE	<i>Contarinia humuli</i> Theobald

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