

## INFLUENCE OF THE GREEN COVER AS ECOLOGICAL INFRASTRUCTURE ON THE VINEYARD INSECT COMPLEX

Božena BARIĆ<sup>1</sup> – Jasminka KAROGLAN KONTIĆ<sup>2</sup> – Ivana PAJAČ<sup>1</sup>

<sup>1</sup> Department for Agricultural Zoology, Faculty of Agriculture, University of Zagreb, e-mail: baric@agr.hr

<sup>2</sup> Department for Viticulture and Enology, Faculty of Agriculture, University of Zagreb, Croatia

### Abstract:

Investigation of green cover as ecological infrastructure on vineyard insect complex was carried out in Jazbina vineyards (a facility of the Faculty of Agriculture). Fauna investigation was carried out by branch beating method during 2006 and 2007. The aim of investigation was to prove a connection between plant structure in green cover and insect structure depending on diet behaviour. Positive influence of green cover on soil structure, nutritive richness of soil and soil moisture regime are known. A negative impact of green cover might be in the insect structure like vector-appearance of phytoplasmas.

**Keywords:** green cover, ecological infrastructure, insect complex, vineyard

### Introduction

In the history of agriculture there has been discovered a poor management of monoculture production. The first problem with resistant pests and disease species was in large orchards and vineyards. Main reason was in low biodiversity. Investigation of the food chain management has an important role in sustainable agriculture.

In the agro-ecosystem, especially in monoculture, sustainability does not work because of a low number of species with high population (Diercks, 1983). Biodiversity has an important role in sustainable agriculture (Husti, 2006). Ecologically safer agriculture implies integrated food production aimed at enhancing biodiversity. Interaction between soil, plants and insects has become an important subject of investigation. The connection between safe-food, soil, agriculture implies a food chain (Várallyay, 2006) in that soil and bears an important role. In integrated viticulture the transformation of monocultures into more complex agro-ecosystems is made possible by a green-cover strategy (Boller and all, 2004). The green manure application research was conducted in many countries. The establishment of a green cover requires an additional nitrogen input (Csaba and all, 2006). Investigation of green cover impact in vineyards on soil quality and nutritive effect in Croatia was carried out by Karoglan-KontiĆ, 1999.

### Materials and methods

The investigation was carried out in an experimental vineyard in Zagreb owned by the Faculty of Agriculture. In one part of the vineyard (about 3 ha) a green cover was built in with mixed plants:

*Agrostis alba*, *Dactylis glomerata*, *Festuca rubra*, *Poa pratensis*, *Lotus corniculatus*, *Trifolium repens*.

The other part of vineyard had open soil. In the fauna research a branch beating method was used once per month during two years of research.

Identification of sampled insects was made in a laboratory using determination keys. The aim of the research was to determine a number of insect species on green cover and open soil in the vineyard and a structure of insects depending on diet behaviour.

### Results and discussion

Fauna investigation showed that the vineyard with green cover was richer and had better insect structure in both years of research.

In 2006 by a branch beating method more insect species were collected in the green cover area (18 different species) than in the open soil area (13 species). Depending on a diet behaviour, in the green cover area there were 9 antagonist species, 8 species of plant feeders and one indifferent (neutral).

Phytophage species were feeders on cereal (bugs from *Lygaeidae* family and the leafhopper from *Cicadellidae*). This is because of a grass-legume mixture used as a green cover. In the open soil area there were only 5 antagonist and 8 phytophage species (regular vineyard pests).

Table 1. Insect complex in vineyards with different ecological infrastructure, 2006

Diet -behaviour	Open soil Species	Green cover Species
phytophages	<i>Othiorhynchus sp.</i>	<i>Othiorhynchus sp.</i>
	JASSIDAE	JASSIDAE
	<i>Metopoplax origani</i>	<i>Metopoplax origani</i>
	Phasmatidae	<i>Euridema oleraceum</i>
	<i>Eurigaster maura</i>	<i>Agriotes lineatus</i>
	<i>Aphis sp.</i>	<i>Oulema lichenis</i>
	<i>Phyllotreta nemorum</i>	<i>Rhynchites auratus</i>
	<i>Apion nigra</i>	<i>Aelia acuminata</i>
antagonists	<i>Forficula auricularia</i>	<i>Forficula aricularia</i>
	ARANEA	ARANEA
	<i>Rhagonicha fulva</i>	<i>Subcoccinella 24-punctata</i>
	<i>Nabis feroides</i>	<i>Tachyporus hypnorum</i>
	<i>Coccinella septempunctata</i>	<i>Thea 22-punctata</i>
		<i>Carpocoris sp.</i>
		<i>Hymacerus apterus</i>
		<i>Orius sp.</i>
neutral		<i>Captosoma scutellata</i>
		<i>Corticaria gibosa</i>

In 2007 situation remained the same. By branch beating method 20 insects species were collected in the green cover area and only 6 insect species in the open soil area. The structure depended on diet behaviour as follows: 10 antagonist species, 7 pests on vineyards and cereals, and 3 neutral species. Pests were represented by the leafhopper from the *Cixiidae* family, known as phytoplasma vector on grapes, and bugs on cereals. Fauna structure in the open soil area of the vineyard included only 6 types of species: 4 antagonists and 2 neutral species.

Table 2. Insect complex in vineyard with different ecological infrastructure, 2007

Diet -behaviour	Open soil Species	Green cover Species
phytophages		<i>Cixius sp.</i>
		<i>Lygus rugulipennis</i>
		<i>Thrips tabaci</i>
		<i>Metopoplax origani</i>
		<i>Phyllotreta atra</i>
		<i>Dolycoris baccarum</i>
antagonists	ARANEA	ARANEA
	<i>Subcoccinella 24-punctata</i>	<i>Subcoccinella 24-punctata</i>
	<i>Himacerus apterus</i>	<i>Himacerus apterus</i>
	<i>Tachyporus hypnorum</i>	<i>Tachyporus hypnorum</i>
		<i>Stethorus punctillum</i>
		<i>Scimnus sp.</i>
		<i>Forficula auricularia</i>
		BRACONIDAE
		<i>Nabis feroides</i>
		<i>Panorpa communis</i>
neutral	FORFICIDAE	<i>Corticaria gibosa</i>
	MUSCIDAE	MUSCIDAE
		<i>Rhyparochromus alboacuminatus</i>

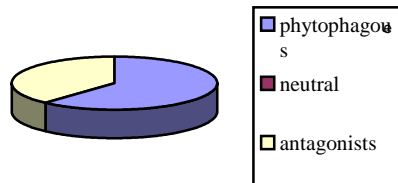


Fig. 1. Insect structures in open -soil , 2006

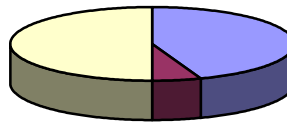


Fig. 2. Insect structures in green -cover, 2006

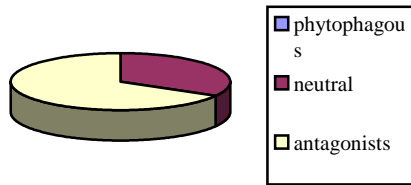


Fig.3. Insect structures in open-soil, 2007

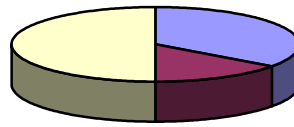


Fig.4. Insect structures in green-cover, 2007

### Conclusions

Investigation of influence of the green cover in vineyards on insect fauna and insect structure depending on diet behaviour showed positive effects. Fauna investigation in the open soil vineyard showed a smaller number of species (6 to 13) than in the vineyard with grass – legume mixtures that had more insect species (18 to 20) and better structure.

As regards to the phytophages structure in vineyards with green cover, it is necessary to carry out research on species of plants to be used in the mulch that might have the same efficiency in terms of diet and soil structure.

### Acknowledgements

We would like to thank the students I. Havranek and B. Hlevnjak, who assisted with field work.

### References

- Boller, E. F. - Häni, F. - Poehling, H.P.: 2004. Ecological Infrastructures Ideabook on Functional Biodiversity at the Farm Level, IOBC Edition, Switzerland. 46 – 62.
- Diercks, R.: 1983. Alternativen im Landbau, Verlag Eugen, Stuttgart, 4 – 362.
- Csaba, G. - Péter, M. - Földesi, P. - Ujj, A. - Kabnár, T.: 2006. Investigation of green manuring plants as secondary crop improving unfavorable field conditions to efficient food production. Cereal Research Communications, Vol 34 (1). 191 – 195.
- Husti, I.: 2006. The main elements of sustainable food chain management. Cereal Research Communications, Vol 34 (1), 793 – 797.
- Karoglan, Kontić, J. - Maletić, E. - Kozina, B. - Mirošević, N.: 1999. The Influence of Inter-Row Cover Cropping on Mean Characteristics of Grapevine. Agriculturae Conspectus Scientificus, Vol 64, 3. 187 – 198.
- Várallyay, Gy.: 2006. Soil degradation processes and extreme soil moisture regime as environmental problems in the Carpathian Basin. Agrokémia és Talajtan. 55. (1 – 2). 9 – 18.