Qualitative and Quantitative Components of The Evaluating System of the Arthropods Biodiversity Populations Impact in the Blackcurrant Crops from the South Part of Romania (I)

Irina IONESCU-MĂLĂNCUȘ¹, T. MANOLE², P. NICULIȚĂ¹, Oana LIVADARIU¹, Eugenia PETRESCU², Gabriela MĂRGĂRIT¹

¹) Faculty of Biotechnology- U.S.A.M.V.B., 59 Bd Mărgăuți, 011464 Bucharest, Romania, irina_crusgali@yahoo.co.uk
²) Research-Development Institute for Plant Protection, 8 Ion Ionescu de la Brad Bvd, District 1, Bucharest, Romania

Abstract. The present paper is refer to the original research carried out for the first time in Romania in the period spring-autumn 2009 and had the proposed objective the development of an ecological based pest management experimental model on the blackcurrant crops.

In the first stage of the research the collecting of biological material using specific methods from different structural components (stratifications) of biotopes of the ecosystem upon which follows the identification and the species classifications in pest and useful for the management system proposed. The monitoring performed is referring so to the surveillance of arthropods populations dynamics correlated with the command factors and with share of those factors in the research area. The research activities of the stage are including:
The biological material collecting;
The present arthropod species identification;
The arthropods fauna structure and biodiversity highlighting (number of individuals, number of species, density and relative abundance, dominant populations);
The biodiversity of blackcurrant crops investigated by qualitative and quantitative methods was divided on a preliminary analysis (which will be thorough by the route of testing/experimentation of the ecological management system by specific statistical methods) in the frame of the structure highlight by the vegetation period of the crop.
The arthropods identified are including:
Characteristic species of the fauna of the soil level, on the soil or on the low plants (phytophagous, predators, coprophagous, necrophagous and detritophagous);
Specific pest species;
Polyphagous species (phytophagous, predators);
Species without any trophyc correlations with blackcurrant crop, characteristic of surrounding crop with the accidentally presence.

In the study two experimental surfaces of blackcurrant in which EBPM is applied (plot I and II) in comparison with one check plot with intensive crop management will be investigated. The arthropod populations identified belongs to 5 classes, 15 taxonomic orders, 35 families, 61 genuses and 67 species (plot I) and 5 classes, 17 taxonomic orders, 40 families, 60 genuses and 65 species (plot II).

Key words: arthropods populations, blackcurrant crops, pest management.

INTRODUCTION

The ecological control system of management of pests elaborated for ecological crops some preliminary conditions is assuming. First of all, a deep knowledge of the bioecological
specific interrelations of the studied crop is requiring. Second, an essential condition consist in the possibility of highlighting of the accurate interdependencies between different trophyc guild or tropho-dynamic modules, in which the natural factors plays a very important role. Knowing the impact of drivers upon biodiversity components of natural ecosystems presume to know processes which define every ecological system (complexity, material and energy flows, space-temporal evolution, and growing non-linear dynamics) through an adequate ecological research. An adequate kind of research for those ecosystems types extremely complex is the systemic analyze, more exactly the recent conceptual model named ecosystem and adaptative management of development (EAM) (Botnariuc and Vadineanu, 1982; Vadineanu, 1998, 2004; Holling et al., 2001). Old basic models in estimation of ecological impact, the additive models of isomorphous type became un-functional and determine the necessity to conceive functional models, simplified of homomorphous type of a real (Vadineanu, 1998). EAM is an informational management program for environmental sustainable measures assistance and taking decision especially for biodiversity components conservation combined with the set of instruments able for natural resources and ecosystem services evaluation.

A last condition, a corollary of both firsts ones represent the necessity of relatively stable knowledge of the structure of the beneficial species or with control potential in the blackcurrant biocenosis case.

The research initiated invoke new conceptual conditions of scientific data analysis appointed by the predictive model of ecological based of ecosystem and adaptive management (Vadineanu, 2004). The ecosystem study from this point of view represents a study of complexity. The conception approached in the present paper is a starting point in the systemic analysis introduced by Botnariuc and Vadineanu, 1982 in the ecosystem study.

This theory recognize in the first place in the beginning of ecosystems ecological analysis the hierarchically structure of the biological systems. The first model is based by this vision and is proposing a complete image of multidimensional space of the real given ecosystem. The huge quantity of data provided by the basis model and the result of critical analysis of the conventional model performances allowed the elaboration of a new type of management which includes the production units and generating the natural resources and a wide range of services (Vadineanu, 2004).

In response to an increasing awareness of a rapid decline of biodiversity in European agricultural landscapes in general and mostly connected with the necessity to reintroduce biodiversity into intensively used arable landscapes a variety of measures are now being introduced to stop or even reverse this process. A response, our response is first of all in relation of the deep knowledge of the structure of insect communities, what are the roles played by colonization and environmental constraints in the establishment of insect populations, are this populations distinct and, if so, which environmental factors are responsible and last but not least are restricted to generalist species or do specialist species also manage to establish, and how quickly?

In order to understand general processes shaping the insect community, we analyze the response of species traits to differentiating environmental factors, assuming that environmental constraints lead to an underdispersion, i.e. more frequent that random occurrence, of species traits. As blackcurrant crops represent early successional stages, we also assume that competitive interactions are relatively less important than environmental constraints. Such interactions might lead to an overdispersion, i.e. lower than random occurrence of species traits due to niche avoidance, which would have complicated the interpretation of trait frequencies (Weiher, et all., 1995). Where competitive adversity is low,
neutral species traits in theory should be distributed randomly (Weiher, et all., 1995). A similar approach has been used by Brown (1985;1986) to study life cycle strategies of various insect groups in a study on a long-term secondary succession from initial stages to forest in neighbouring sites. In these studies, various species traits i.e. food specificity, number of generations per year, overwintering stage and mobility, were related to r-k continuum of various habitat templets (Southwood, 1977; 1988). These studies thus provide valuable background information to compare and evaluate our results with those of long-term succession in a more diverse landscape. An important difference, however, is that the blackcurrant we study have been sown, though spontaneous successional processes are also important in their development.

MATERIALS AND METHODS

The study area was near Bucharest in an intensively used arable former area in the south part of the city. It forms a relatively wide plane which is locally overlaid by loam and loess and the climate is relatively dry and warm in summer (27.85 average in July; 17.4 annual temperature average; data from local weather station).

The observations and biological samples collections are carried out in two different crops parcels from research area. Two types of samples were collected: quantitative and qualitative samples. The quantitative samples are taken by two methods:

Barber traps method for mobile insect at the level of the ground;
The netting method for the fauna mobile at the plant level (belt system, Banaszak and Manole, 1987). The quantitative samples are collected taking in consideration the relationship between insect and the phenology of host plant.

The Barber traps are installed on the soil surface with the purpose to collect insect fauna in the given time period. Such trap system is composed by a recipient with capacity of 300 cm$^3$ which are introduced in soil cu the open side at the soil level. Inside of the recipe an aldehyde solution in 4% concentration is introduced in proportion of 50-70% of the recipient volume. The recipient is covering with a plastic surface at the distance of 4-5 cm from the soil level. The collecting time is in this case 48 hours from the soil applied.

In the category of qualitative methods the pheromone traps, light traps and direct collection are included.

The collected material was conserved dry or in alcohol 70$^0$, selected and systematic determined in laboratory. The insects collected were determined using of entomological handbooks and other relevant publications Freude et al. (1981), Hoffman (1950) and Reitter (1916).

RESULTS AND DISCUSSION

The present paper is reffer to the list of insect species mentioned for the first time in Romania on the mentioned ecological crops i.e. blackcurrant biocenosis case. In the frames of the study the complete preliminary list of species identified is reported for the first time for the given crop. In the paper the impact ecological term is related according with Clark definition (the environment risks) in our study the backcurrant biocenosis could not be registered according with EU reglements and the Directive 85/337/ EEC because of the waste domaine (Clark, 1989).

Despite of the limits or wrong consideration and criticism about (Botnariuc and Vadineanu, 1982; Vadineanu, 1999; 2004) the impact risk of agricultural practices upon the
biodiversity of the antropic ecosystems is still the moment the single option of reveal with preventive purpose the direct effects on the arthropods populations of those given agricultural practices (Williams and Leppla, 1990).

In this sense the data obtained from the given research will be useful in the light of qualitative and quantitative arthropods populations parameters comparison reflecting on the some level the modification in the structure of the fauna in the biocenosis from we extract the samples.

The relevant informations for the research program connected with the ecological based pest management will be given by the lists of species present in the blackcurrant crops from research area.

The samples collected from the experimental field are included the following taxonomic groups:

- 5 class: Anellida, Crustacea, Arachnida, Myriapoda, and Insecta;
- 95 families
- 140 genuses
- 152 species

The arthropods identified in the blackcurrant crops are include:

- characteristic species from the level of soil fauna (phytophagous, predatory species, coprophagous, necrophagous, detritophagous);
- specific blackurant;
- polyphagous species (phytophagous, predatory species);
- species without any trophyc correlation with blackurant crops, characteristic only the adiacent crop category which are accidentally occured in the ecosystem;

The fauna structure from experimental parcels are presented in the following diagram (Figure 1)

plot I:
- 5 class: Anellida, Crustacea, Arachnida, Myriapoda, and Insecta;
- 61 genuses: Lumbricus, Porcellio, Theridion, Pardosa, Ceycdophyes, Bryobia, Phalangium, Polydesmus, Lithobius, Blaniulus, Armadillidium, Bourletiella, Sminthurus, Tomocerus, Folsomia, Hypogastrura, Leptophyes, Labidura, Aphis, Myzodes, Eupteryx, Javesella, Myrmica, Formica, Trimorus, Telenomus, Bombus, Apis, Carabus, Brachynus, Harpalus, Pterostichus, Chlaenius, Idiochroma, Bembidion, Lebia, Tachyporus, Astilbus, Ocalea, Atheta, Phloeopora, Oxytelus, Gyrophaena, Mycetoporus, Opatrum, Cantharis,
Dermestes, Airaphilus, Atomaria, Sericoderus, Formicomus, Anthicus, Aphthona, Haltica, Otiorrhynchus, Spermophagus, Bibio, Contarinia, Mayetiola, Anthomya, Sarcophaga.

67 species

Plot II (Figure 2):
5 class: Anellida, Crustacea, Arachnida, Myriapoda, and Insecta;

65 species

Check Plot (Figure 3):
4 class: Crustacea, Arachnida, Myriapoda, and Insecta;
9 orders: Isopoda, Acari, Aranea, Opilionida, Opistospermophora, Collembola, Hymenoptera, Coleoptera, Diptera.

20 species

Biodiversity of blackcurrant biocenosis investigated by qualitative and quantitative methods, was divided on the frame of this preliminary analysis (which will be deep compared by statistical methods by establishing of the numerical proportion of useful fauna category. Thus was established that of the total number of the species identified (152) a number of 113 (meaning 74.34%) was represented by useful arthropods species. In the experimental fields (parcel I) from the total of 67 species a number of 48 (71.64%) was belonging to useful fauna similarly with parcel II 73.84% respectively.
Fig. 1 – The fauna structure of pest and useful invertebrates found in the blackcurrant crops in the research area – Plot I

Fig. 2 – The fauna structure of pest and useful invertebrates found in the blackcurrant crops in the research area – Plot II
CONCLUSIONS

1. Qualitative and quantitative arthropods population parameters comparison was made in the blackcurrant experimental plots;
2. Qualitative and quantitative arthropods population parameters comparison reflecting on the some level the modification in the structure of the fauna in the biocenosis from was extracting the samples;
3. The relevant information for the research program connected with the ecological based pest management was given by the lists of species present in the blackcurrant crops from research area;
4. The samples collected from the experimental field has included the following taxonomic groups: 5 class, 20 orders, 95 families, 140 genuses, 152 species;
5. The fauna structure from experimental (parcel I) has included the following taxonomic groups: 5 class, 15 orders, 39 families, 61 genuses, 67 species;
6. The fauna structure from experimental (parcel II) has included the following taxonomic groups: 5 class, 17 orders, 40 families, 60 genuses, 65 species;
7. In comparison with experimental plots (I + II) check plot has included the following taxonomic groups: 4 class, 9 orders, 15 families, 19 genuses, 20 species;

REFERENCES