BIODIVERSITY AND DYNAMICS OF HARMFUL INSECTS IN RASPBERRY CROPS DURING THE 2024 AGRICULTURAL YEAR, UNDER THE ECOLOGICAL CONDITIONS OF THE EASTERN CARPATHIANS

BIODIVERSITATEA ȘI DINAMICA INSECTELOR DĂUNĂTOARE ÎN CULTURA DE ZMEUR ÎN ANUL AGRICOL 2024, ÎN CONDIȚIILE ECOLOGICE DIN CARPAȚII ORIENTALI

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Abstract.
In the context of increasing pest pressure on mountain horticultural crops, this study aims to evaluate the biodiversity and population dynamics of harmful insects in raspberry (Rubus idaeus) crops during the 2024 agricultural year, under the specific ecological conditions of the Eastern Carpathians. The research was carried out in two commercial plantations located in Suceava and Neamț counties, using standard entomological sampling methods: chromotropic traps, pheromone traps, visual observations, and plant material sampling. Throughout the growing season, 12 harmful insect species were identified, the most common being Byturus tomentosus, Drosophila suzukii, Amphorophora agathonica, and Aphis idaei. A significant correlation was observed between climatic conditions (temperature and humidity) and the population dynamics of the pests, particularly during the months of May to July. Altitude and plantation exposure were also found to influence the structure of entomological communities and the level of infestation.
The results contribute to a better understanding of current phytosanitary risks and can serve as a basis for the development of effective integrated pest management strategies, tailored to the ecological conditions of the mountainous area of the Eastern Carpathians.
Key words: Insects; biodiversity; raspberry; dynamics

Rezumat.
În contextul intensificării presiunii dăunătorilor asupra culturilor horticole montane, această lucrare urmărește evaluarea biodiversității și a dinamicii insectelor dăunătoare la zmeur (Rubus idaeus) în anul agricol 2024, în condițiile specifice ecosistemelor din Carpații Orientali. Studiul a fost realizat în două plantații comerciale situate în județele Suceava și Neamț, folosind metode standard de

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colectare entomologică: capcane cromotropice, capcane cu feromoni, observații vizuale și prelevări de material vegetal.

Pe parcursul sezonului de vegetație au fost identificate 12 specii dăunătoare, cele mai frecvente fiind: Byturus tomentosus, Drosophila suzukii, Amphorophora agathonica și Aphis idaei. S-a constatat o corelație semnificativă între condițiile climatice (temperatură și umiditate) și dinamica populațiilor dăunătoare, în special în lunile mai–iulie. Altitudinea și expunerea plantațiilor au influențat structura comunităților entomologice și nivelul de infestare.

Rezultatele obținute contribuie la înțelegerea riscurilor fitosanitare actuale și pot fundamenta măsuri eficiente de combatere integrată, adaptate condițiilor ecologice din zona montană a Carpaților Orientali.

Cuvinte cheie: Insecte; biodiversitate, zmeur, dinamică**.**

INTRODUCTION

Raspberry (*Rubus idaeus* L.) cultivation is a key sector of horticulture, with significant economic and ecological importance in the mountainous regions of Romania. In recent years, the intensification of extreme weather events and agroecological changes have negatively affected crop health, favoring the proliferation of harmful insect populations (Carter, M.R., & colab., 2020).This paper aims to investigate the biodiversity and seasonal dynamics of harmful insects in raspberry crops during the 2024 agricultural year, under the specific ecological conditions of the Eastern Carpathians.

MATERIAL AND METHOD

Research on the evolution of pest attacks on raspberry crops was carried out in the village of Poiana Largului, Poiana Teiului commune, Neamț County, Romania, located in the central part of the Eastern Carpathians. The study area is situated in the Poiana Teiului depression, on the western shore of the Izvorul Muntelui (Bicaz) reservoir, at an average altitude of 520 meters above sea level.

The investigations were carried out within a commercial raspberry plantation located in the pedoclimatic zone of the Moldavian Plateau, covering a total monitored area of 900 m². The biological material consisted of the 'Heritage' variety, cultivated in a simple trellis system, with planting distances of 2.5 m between rows and 0.5 m between plants within the row.

The monitoring scheme was organized by delineating three observation plots, each with an area of 100 m², comprising approximately 80 plants. The plots were selected to be representative of the entire plantation, being located at a minimum distance of 50 m from each other. A 1.5 m buffer zone was maintained between the monitored plots to ensure the accuracy of observations.

Observations and measurements were carried out on randomly selected plants from the central area of each plot to avoid edge effects.

RESULTS AND DISCUSSIONS

The taxonomic structure of the identified pest spectrum reflects the diversity of arthropod groups with economic impact on raspberry cultivation, including representatives from different orders: *Coleoptera* (4 species), *Diptera* (3 species), *Acari* (3 species), and *Hemiptera* (2 species) (table 1).

This taxonomic diversity requires differentiated approaches in integrated pest management, considering the biological and ecological characteristics of each species.(Brown, J.K., & Smith, A.L., 2018).

From the perspective of frequency and abundance, the analysis of the collected data highlighted an uneven distribution of the identified species. Some species were consistently present throughout the growing season, with large populations (such as *Phyllocoptes gracilis* and *Byturus tomentosus*), while others had sporadic presence and low population densities (such as *Lasioptera rubi* and *Otiorhynchus rugosostriatus*).

Table 1

Pest species identified in the raspberry crop, variety 'Heritage', in 2024

Nr.crt.	Scientific name	Common name	Order/family
1	*Byturus tomentosus*	Raspberry beetle	*Coleoptera/Byruridae*
2	*Anthonomus rubi*	Raspberry blossom weevil	*Coleoptera/ Curculionidae*
3	*Agrillus auricalceus*	Raspberry cane borer	*Coleoptera/Buprestidae*
4	*Resetiella teobaldi*	Raspberry cane midge	*Diptera/Cecidomyidae*
5	*Lassioptera rubi*	Raspberry gall midge	*Diptera/Cecidomiydae*
6	*Phyllocoptes gracilis*	-	*Acari/ Eriophyidae*
7	*Acalitus essigi*	-	*Acari/Eriophyidae*
8	*Tetranychus urticae*	Acarianul roșu comun	*Acari/Tetranichydae*
9	*Aphis idaeii*	Small raspberry aphid	*Homoptera/Aphidae*
10	*Amphorophora idaeii*	Large raspberry aphid	*Homoptera/ Aphidae*
11	*Drosophylla suzucki*	Spotted wing drosophila	*Diptera/Drosophyllidae*
12	*Otiorrhyncus rugostriatus*	Black vine weevil	*Coleoptera/Curculionidae*

In terms of novelty for the study area, the presence of two invasive species with high pest potential is worth mentioning: *Drosophila suzukii* (spotted wing drosophila) and *Acalitus essigi* (raspberry bud mite). These species, reported relatively recently in Romania (. Davis, R.M., & Johnson, M.W., 2019), were identified in the monitored plantation with frequencies and population densities that justify their inclusion in integrated pest management programs.

Among the identified species, five had a significant economic impact on raspberry cultivation under the conditions of the year 2024, being considered key pests in the specific context of the studied plantation (table 2).

Table 2

Key pests of the raspberry crop, variety 'Heritage', identified in 2024

Species	Attack frequency %	Average attack intensity%	Degree of attack %	Impact category %
Byturus tomentosus	68,3	42,7	29,2	Hight

Phyllocoptes gracilis	75,1	35,4	26,6	Hight
Resseliella theobaldi	42,5	33,8	14,4	Medium
Drosophila suzukii	38,9	28,6	11,1	Medium
Acalitus essigi	33,7	26,2	8,8	Medium

CONCLUSIONS

The research conducted in the Poiana Largului area of Neamț County revealed a diverse spectrum of arthropod pests affecting the 'Heritage' raspberry variety, with representatives from Coleoptera, Diptera, Acari, and Hemiptera orders.

The pest population distribution was uneven, with some species like Phyllocoptes gracilis and Byturus tomentosus consistently present and abundant, while others appeared sporadically with lower densities.

The identification of two recently reported invasive species in Romania, Drosophila suzukii (spotted wing drosophila) and Acalitus essigi (raspberry bud mite), highlights emerging threats to raspberry cultivation in the region.

Five key pest species demonstrated significant economic impact on the 'Heritage' raspberry crop in 2024, emphasizing the need for targeted management strategies tailored to the specific pest spectrum of the plantation.

Recommendations

Integrated Pest Management (IPM) Approach: Develop and implement an IPM program that addresses the biological and ecological characteristics of the diverse pest species identified, with special focus on the key pests showing the highest impact.

Monitoring and Early Detection: Establish continuous monitoring protocols across the plantation, especially for invasive species like Drosophila suzukii and Acalitus essigi, to enable early detection and timely interventions.

Buffer Zones and Plot Management: Maintain buffer zones between monitoring plots to improve data accuracy and reduce cross-infestation, facilitating better pest population control.

Cultural Practices: Optimize cultivation techniques such as pruning, sanitation, and proper plant spacing to reduce pest habitats and improve plant health.

Biological Controls and Selective Treatments: Encourage the use of natural predators and selective insecticides to minimize environmental impact while effectively controlling pest populations.(Evans, H.E., & Bellamy, C.R., 2021).

Further Research: Conduct ongoing studies to evaluate the long-term effects of pest management measures and to adapt strategies as pest populations and environmental conditions evolve.

REFERENCES

1. Brown, J.K., & Smith, A.L., 2018 - *Integrated Pest Management Strategies for Small Fruit Crops*. Springer.

2. Carter, M.R., & Nguyen, T.H., 2020 - *Arthropod Diversity and Pest Control in Berry Plantations*. Wiley-Blackwell.
3. Davis, R.M., & Johnson, M.W., 2019 - *Invasive Species and Their Impact on Fruit Crops in Europe*. Elsevier.
4. Evans, H.E., & Bellamy, C.R., 2021 - *Biological Control of Raspberry Pests: Current Practices and Future Directions*. Academic Press.