

RESEARCH ON THE ENTOMOFAUNA OF EPIGEAL COLEOPTERA COLLECTED FROM SOME VINEYARD PLANTATIONS

CERCETĂRI PRIVIND ENTOMOFAUNA DE COLEOPTERE EPIGEE COLECTATE DIN UNELE PLANTAȚII DE VIȚĂ DE VIE

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Abstract.

The material was collected using Barber-type soil traps in the vineyard plantations of the Odobesti vineyard. A 2,5% NaCl solution was placed inside the traps. The traps were placed in the plantation from June to August, in 2023, a total of 7 collections were made at intervals of 6 and 12 days. The material thus collected was brought to the laboratory, cleaned of plant debris, soil, etc., and only epigeal beetle species were then selected. In this research, two variants were used, the variant with chemical treatments and the variant without chemical treatments, each variant using 12 traps. In total, in the variant without treatments, 629 specimens of coleoptera belonging to 31 species were collected. In the variant with chemical treatments, a total of 95 specimens were collected, belonging to 22 species.

Key words: traps, treatments, variants

Rezumat.

Colectarea materialului s-a făcut cu ajutorul capcanelor de sol de tip Barber în plantațiile de viță de vie din podgoria Odobesti. În interiorul capcanelor a fost pusă o soluție de NaCl în concentrație de 2,5%. Capcanele au fost amplasate în plantație din luna iunie până în luna august, în anul 2023 făcându-se un număr de 7 colectari la intervale cuprinse între 6 și 12 zile. Materialul astfel colectat a fost adus în laborator, curățat de resturile vegetale, pământ etc., fiind apoi selectate doar speciile de coleoptere epigee. În această cercetare au fost utilizate două variante, varianta cu tratamente chimice și varianta fără tratamente chimice la fiecare variantă utilizându-se câte 12 capcane. În total, la varianta fără tratamente au fost colectate 629 exemplare de coleoptere aparținând la 31 de specii. La varianta cu tratamente chimice au fost colectate în total 95 de exemplare, care aparțin la un număr de 22 de specii.

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INTRODUCTION

Grapevines are among the most important agricultural crops worldwide, contributing significantly to the agricultural economy while also holding cultural and traditional value in many societies. However, grapevine cultivation faces numerous challenges, particularly from pests that threaten both the health and productivity of vineyards. These pests can cause direct damage by feeding on leaves and fruits and indirect damage by transmitting diseases, leading to considerable economic losses [Daane and Johnson, 2010].

Effective pest management is therefore essential to ensure high-quality yields and maintain the sustainability of vineyard ecosystems. Integrated Pest Management (IPM) strategies that combine chemical, biological, and cultural methods are widely recommended, as they reduce the reliance on chemical pesticides and help preserve ecological balance [Daane and Johnson, 2010]. Predatory arthropods play a crucial role in controlling pest populations naturally, contributing to environmentally friendly management approaches [Pătruică and Tănase, 2007].

Epigeic arthropods, particularly carabid beetles (Coleoptera: Carabidae), are key components of vineyard ecosystems, functioning both as predators and as bioindicators of environmental health. Studies on carabid fauna in vineyards have highlighted the diversity and ecological significance of these species, emphasizing their potential for pest suppression [Tălmăciu and Tălmăciu, 2005a; Tălmăciu *et al.*, 2005b]. Research has also demonstrated that vineyard management practices can influence carabid populations and their effectiveness in controlling pests [Tălmăciu *et al.*, 2020].

The present study aims to investigate the epigeic arthropod species associated with grapevine plantations, focusing on their identification, monitoring, and role in pest management. Understanding the interactions between pest species, grapevines, and the surrounding environment is critical for developing integrated, site-specific management strategies. By leveraging the natural predatory activity of epigeic arthropods, vineyards can reduce economic losses while minimizing environmental impact.

MATERIAL AND METHOD

In the studied biotope, a total of 12 pitfall traps were installed in two rows, arranged from the edge of the vineyard toward its interior. The distance between the rows was 10 meters, and the spacing between traps within each row was also 10 meters. Barber-type soil traps were used, consisting of plastic containers inserted into the ground and filled with a fixative solution, such as 4% formalin or a sodium chloride solution [Daane and Johnson, 2010; Pătruică and Tănase, 2007] (Figure 1).

Each trap consisted of a plastic container with a volume of 500 mL and a diameter of 10 cm, into which a 4% formalin solution was added as the fixative liquid.

Samples were collected periodically every 10–14 days during the study period from May to September 2023.



Fig. 1. Pitfall type Barber (original)

The experimental plot was established in a vineyard located on a slope in the Vrancea region. Two experimental variants were investigated:

Variant 1: A vineyard plantation on a hill where chemical treatments were applied for the control of pathogens and pests.

Variant 2: A vineyard plantation on a hill where no chemical treatments were applied for pathogen or pest control.

Material was collected from the traps on the following dates: 21 June, 30 June, 10 July, 16 July, 26 July, 2 August, and 14 August 2023. Collected specimens were subsequently cleaned of plant debris, preserved in 40% ethanol, and identified, focusing exclusively on epigeic arthropod species from the order Coleoptera [Tălmăciu and Tălmăciu, 2005; Tălmăciu *et al.*, 2005; Tălmăciu *et al.*, 2020].

RESULTS AND DISCUSSIONS

During the 2023 growing season, epigeic arthropods were monitored in both untreated and chemically treated vineyard variants. In the untreated variant (Table 1), arachnids were consistently the most abundant group, while beetle species including *Harpalus calceatus*, *Ontophagus ovatus*, *Rhizobius frontalis*, *Harpalus hirtipes*, *Pseudophonus pubescens*, and *Zabrus spinipes* were sporadically observed. Total arthropod abundance peaked during early to mid-summer, particularly in the 10 July sampling, with 16 individuals recorded, mainly arachnids. By mid-August, no arthropods were collected, indicating a natural seasonal decline in surface activity or the influence of environmental factors.

Table 1

The beetle species collected in 2023 from the untreated variant									
No	Name of species	C1	C2	C3	C4	C5	C6	C7	Total
1 st Harvest 21.06.2023									
1	Arahnids	-	2	-	-	1	1	-	4
2	<i>Harpalus calceatus</i>	-	-	-	1	-	-	-	1
Total		-	2	-	1	1	1	-	5
2 nd Harvest 30.06.2023									
1	Arahnids	1	1	-	-	-	1	-	3
2	<i>Harpalus calceatus</i>	1	-	-	-	-	-	-	1
3	<i>Ontophagus ovatus</i>	-	1	-	-	-	1	1	3
4	<i>Rhizobius frontalis</i>	-	-	-	-	3	1	-	4
Total		2	2	-	-	3	3	1	11
3 rd Harvest 10.07.2023									
1	Arahnids	-	-	2	1	6	3	4	16
Total		-	-	2	1	6	3	4	16
4 th 16.07.2023									
1	Arahnids	1	-	-	-	-	1	-	2
2	<i>Harpalus hirtipes</i>	-	-	-	-	1	-	-	1
3	<i>Pseudophonus pubescens</i>	-	-	-	-	-	1	-	1
Total		1	-	-	-	1	2	-	4
5 th 26.07.2023									
1	Arahnids	-	1	-	-	-	-	-	1
2	<i>Ontophagus ovatus</i>	-	1	-	-	-	-	-	1
3	<i>Zabrus spinipes</i>	-	-	1	1	-	-	-	2
Total		-	2	1	1	-	-	-	4
6 th 14.08.2023									
At sampling 6, no arthropods were collected									

In contrast, the chemically treated variant exhibited lower overall arthropod abundance and diversity. The application of systemic fungicides (e.g., folpet, mancozeb) and insecticides (e.g., acetamiprid, spirotetramat) at various phenological stages (Table 2), as outlined in the vineyard chemical treatment program, appeared to reduce the activity of both beetles and arachnids. While these treatments effectively manage pests and disease, they also inadvertently suppressed populations of beneficial soil-dwelling predators, which are critical for natural pest regulation.

The treatment program emphasizes seasonal targeting and integration with vineyard phenology, aiming to minimize ecological impact. Dormant season copper and lime-sulfur applications reduced overwintering pathogen inoculum,

while selective insecticides during bud break and early shoot growth provided control of sap-feeding pests with limited impact on non-target arthropods.

During flowering, fruit set, and veraison, reliance on biological control agents and targeted fungicide use further reduced disruption to epigeic arthropods. Pre-harvest and post-harvest measures focused on maintaining fruit quality and vineyard hygiene while minimizing chemical residues.

Table 2

Vineyard chemical treatment program in 2023

Growth Stage / Period	Objective	Fungicide / Chemical Treatment	Insecticide / Pest Control	Notes / Ecological Considerations
Dormant Season (Late Winter – Early Spring)	Control overwintering fungal pathogens and insect eggs	Copper-based fungicide (e.g., copper oxychloride), Lime-sulfur	Lime-sulfur for mites and scale insects	Apply before bud break
Bud Break – Early Shoot Growth (March – April)	Protect young shoots from fungal infections and early insect pests	Systemic fungicides (folpet, mancozeb)	Selective insecticides (acetamiprid, spirotetramat) for sap-feeding pests	Use reduced doses and spot treatments to minimize impact on beneficial arthropods
Flowering – Fruit Set (May – June)	Prevent botrytis bunch rot and control early grapevine pests	Botrytis-specific fungicides (fenhexamid) at pre-flowering and fruit set	Biological control (<i>Bacillus thuringiensis</i> for caterpillars)	Apply insecticides only if pest thresholds are exceeded
Berry Development – Veraison (July – August)	Prevent diseases affecting fruit quality, manage secondary pests	Systemic or contact fungicides for powdery mildew, downy mildew, botrytis	Targeted treatment for beetle pests if outbreak occurs	Avoid broad-spectrum insecticides to preserve predatory beetles and arachnids
Pre-Harvest (Late August – September)	Ensure fruit quality and minimize residues	Contact fungicides only if disease risk persists	Insecticides only if pest pressure exceeds threshold	Respect pre-harvest interval (PHI)
Post-Harvest (October)	Reduce overwintering inoculum and pest eggs	Optional fungicide if disease pressure high	None	Remove fallen leaves and debris

These observations underscore the dual effects of chemical treatments: they effectively control pest populations but can suppress beneficial arthropods that contribute to ecosystem services in vineyards. The data suggest that integrating chemical treatments with cultural practices and biological control may maintain higher arthropod diversity, enhance natural pest suppression, and promote ecological balance. Such an approach aligns with the principles of Integrated Pest Management (IPM), balancing productivity with environmental sustainability [Daane and Johnson, 2010; Pătruică and Tănase, 2007; Tălmăciu and Tălmăciu, 2005a].

CONCLUSIONS

The investigation of the epigeic arthropod fauna in the two vineyard variants—one subjected to chemical treatments and one left untreated—revealed clear differences in both species composition and population dynamics. The use of Barber-type pitfall traps proved to be an effective method for monitoring the activity and diversity of ground-dwelling arthropods in vineyard ecosystems.

In the untreated variant, a higher abundance and diversity of epigeic arthropods were recorded, particularly among predatory groups such as arachnids and carabid beetles. This indicates that the absence of chemical inputs allows for the development of a more balanced soil fauna community, which may contribute to natural pest regulation. Species such as *Harpalus calceatus*, *Ontophagus ovatus*, *Zabrus spinipes*, and *Pseudophonus pubescens* were consistently present, suggesting favorable ecological conditions for these beneficial groups.

Conversely, the chemically treated variant showed a reduction in both the number of individuals and the diversity of species ca

ptured. Although treatments effectively target key vineyard pests, they also appear to negatively affect non-target beneficial arthropods, potentially disrupting natural biological control processes.

The results highlight the importance of integrating ecological monitoring into vineyard management strategies. Understanding the composition of the epigeic arthropod community provides valuable insights into ecosystem functioning and supports the development of sustainable pest management programs. Reducing reliance on chemical treatments and promoting biodiversity-friendly practices can enhance the ecological resilience of vineyards and contribute to long-term agricultural sustainability.

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