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STUDIUL COMPARATIV PRIVIND INFLUENȚA TEHNOLOGIILOR POMICOLE CONVENȚIONALE ȘI ECOLOGICE INOVATIVE ASUPRA ENTOMOFAUNEI UTILE ÎNTR-O PLANTAȚIE DE AFIN

COMPARATIVE STUDY ON THE INFLUENCE OF CONVENTIONAL AND INNOVATIVE ECOLOGICAL TECHNOLOGIES ON BENEFICAL ENTOMOFAUNA IN A BLUEBERRY PLANTATION

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Abstract

This paper presents data on the diversity of entomophagous fauna in an ecologically managed blueberry plantation, as well as comparative aspects regarding the structure of the entomophagous complex under two phytoprotection technologies: 'Ecological' and 'Conventional'. The study was conducted at the Research Institute for Fruit Growing Pitesti, during the period 2024-2025, in a blueberry plot with an area of 1.0 ha belonging to Experimental Base No. 1. Observations were carried out visually, in the experimental field and in the laboratory, under a binocular stereomicroscope, noting the entomophagous insects present, as species, number, and biological stage of development. Following this study, seven species of arthropods were identified: *Coccinella septempunctata*, *Adalia bipunctata*, *Psyllobora vigintiduopunctata*, *Chrysopa carnea*, *Phytoseiulus persimilis*, *Aphidoletes aphidimyza* and *Anthocoris* spp., belonging to the orders *Coleoptera*, *Neuroptera*, *Mesostigmata*, *Diptera*, and *Hemiptera*.

Cuvinte cheie: afin, insecte benefice, tehnologii fitoprotecție.
Key words: blueberry, beneficial insects, phytoprotection technologies.

1. Introduction

In recent years, an increasing number of consumers demand residue-free food produced in accordance with environmentally friendly standards. Beneficial entomofauna, an essential component of agroecosystem biodiversity, plays a crucial role in maintaining ecological balance, pollination, and biological control of pests.

In the context of modern agriculture, conventional practices involving intensive pesticides use significantly affect the composition and abundance of beneficial entomofauna, often leading to ecological imbalances and reduced resilience of agricultural systems.

In contrast, organic farming systems promote a more balanced interaction between plants, soil, and living organisms, creating favorable conditions for the diversity and activity of beneficial entomofauna. Numerous studies highlight significant differences between the beneficial entomofauna associated with ecological plantations and those in conventional systems.

For instance, Hole et al. (2005) reported higher diversity of beneficial insects, especially pollinators and natural predators of pests, in organic farms compared to conventional ones. Similarly, Bengtsson et al. (2005) demonstrated that the density and diversity of beneficial entomofauna is up to 30% higher in organic plantations, correlating with improved ecological stability and a superior capacity for self-regulation.

Furthermore, Letourneau et al. (2011) showed that the functional diversity of entomofauna in ecological agroecosystems reduces pest pressure through competition and predation mechanisms. Gagic et al. (2017) also highlighted the importance of complex trophic networks in ecological systems, where beneficial insects naturally regulate phytophagous populations, providing sustainable biological control. The positive impact of beneficial insects also extends to essential ecosystem services such as crop pollination. Garibaldi et al. (2013) demonstrated a direct correlation between pollinator diversity and crop productivity.

Another important aspect is the energy footprint of different farming systems. Conventional agriculture involves a high consumption of fossil fuels necessary for the production and application of plant protection products, fertilizers, and intensive mechanization. Unfortunately, the consequences of their use on climate change are increasingly visible. Global warming generates multiple ecosystem changes, under which pest aggressiveness is expected to increase and cause significant crop losses. Consequently, society has acknowledged the need for transition towards more sustainable energy sources and technological innovations that support a sustainable energy future.

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According to Pimentel et al. (2006), the energy inputs of conventional systems are up to three times higher than those of organic systems. This difference has major implications for sustainability and the climatic impact of agricultural production. Organic farming, by using local resources, compost, and traditional soil management methods, significantly reduces energy consumption and greenhouse gas emissions, thus contributing to climate change mitigation.

The aim of this paper is to investigate the role of beneficial insects in an ecological blueberry plantation compared to a conventional one, by analyzing the composition, diversity, and ecological functions of the insects encountered. By integrating literature data with our field observations, we aim to highlight how different agricultural management practices influence the dynamics of insects and, implicitly, the sustainability of agricultural production systems.

2. Material and methods

The study was conducted during 2024–2025 at the Research Institute for Fruit Growing Pitesti, , in a 1.0 ha blueberry plot belonging to the Experimental Base 1. The experimental model, designed in the first phase of the project, was established in 2021 with the cultivars: 'Duke', 'Legacy', 'Elliott, 'Bluecrop' and 'Bluegold'. Planting was carried out at distances of 3.0 m between the rows and1.0 m on the ridges, these containing soil mixed with acidic peat, covered with agrotextile. Plants were trained as bushes, while irrigation and fertilization were provided through a Venturi-type fertigation system with drip lines placed under the agrotextile, two per row. The inter-row spaces were maintained with spontaneous flora, periodically mowed and kept as green mulch.

For pest prevention and control, two phytoprotection variants were established: “Ecological” and “Conventional,” each with four replications, the products used being listed in Tables 1 and 2. To identify entomophagous fauna, dynamic surveys were carried out during the two years of study, analyzing 15 blueberry shoots per replication (60 shoots per variant). Observations were made visually in the field and in laboratory under a stereomicroscope, recording the entomophagous species present in each variant and replication.

3. Results and discussions

Seven species of arthropods were identified in the blueberry experimental plot: *Coccinella septempunctata*, *Adalia bipunctata*, *Psyllobora vigintiduopunctata*, *Chrysopa carnea*, *Phytoseiulus persimilis*, *Aphidoletes aphidimyza* and *Anthocoris* spp. belonging to the orders *Coleoptera*, *Neuroptera*, *Mesostigmata*, *Diptera* and *Hemiptera*.

The entomophagous fauna was noted as number, species, systematic classification and biological stage of development, for each year of study (Tables 3 and 4). The analysis of the influence of the crop system, entomophagous species, and blueberry cultivar on the number of entomophagous insects indicated very significant effects of the crop system and of the interaction crop system x entomophagous species (Figure 1), as well as very significant effects of the entomophagous species and the interaction blueberry cultivar x entomophagous species (Figure 2), in all cases discussed $p \leq 0.05$.

Considering the entire study period (years 2024 and 2025, Fig. 1), it was highlighted that the ecological system was significantly more favorable for entomophagous insects. On average across blueberry cultivars, the best represented entomophagous species in both studied crop systems was *Phytoseiulus persimilis* totaling 202 specimens, of which 149 were identified in the ecological system. It was followed by *Coccinella septempunctata*, for which, out of a total of 114 specimens, 87 were present in the ecological system, and *Chrysopa carnea*, 97 specimens, of which 75 in the ecological system. Although in significantly lower numbers compared to the first three species, *Adalia bipunctata*, *Anthocoris* sp. and *Psyllobora vigintiduopunctata* are represented by 21, 10 and 7 individuals respectively in the ecological system, while the first and last species are absent, and the second species is very poorly represented (only one specimen) in the conventional system.

Regarding the blueberry cultivar x entomophagous species interaction, as shown in Figure 2, in three of the five blueberry cultivars ('Bluecrop', 'Elliott' and 'Legacy') *Phytoseiulus persimilis* was the predominant entomophagous species, with a significantly higher number of specimens compared to the other six species, totalling between 34 and 74 individuals. In the 'Bluegold' and 'Duke' cultivars, most specimens belonged to the *Coccinella septempunctata* species (24 and 37 individuals, respectively), but in these cases no statistically significant differences were recorded compared to the *Phytoseiulus persimilis* and *Chrysopa carnea* species (a group that, in the 'Duke' cv., was joined by the *Aphidoletes aphidimyza* species).

Figures 3 and 4 present the comparative analysis of the 5 blueberry cvs. studied, in order to highlight the significant influence of the type of phytoprotection on the structure of the entomophagous complex.

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Thus, in the 'Duke' cv., in the "Ecological" variant, a high diversity of entomophagous fauna was observed, with 6 species being present in proportions ranging between 5.00 and 23.00% in 2024, respectively between 2.00 and 26.00% in 2025. In the case of the "Conventional" phytoprotection variant, only two species predominated: *Phytoseiulus persimilis* (67.00% in 2024 and 43.00% in 2025), followed by *Chrysopa carnea* with 33.00% in 2024, respectively 36.00% in 2025, while other species had reduced weights or were completely absent.

For the 'Legacy' cultivar, the structure was more balanced, with the constant participation of predatory mites, lacewings and coccinellids. Thus, in the "Ecological" variant, high percentages were recorded by the species: *Phytoseiulus persimilis* (35.00% in 2024; 37.00% in 2025), *Coccinella septempunctata* (30.00% in 2024; 24.00% in 2025) and *Chrysopa carnea* (25.00% in 2024; 21.00% in 2025). In the "Conventional" variant, the diversity of entomophagous insects was reduced, the predominant species being *Phytoseiulus persimilis* (45.00% in 2024 and 50.00% in 2025).

In the case of the 'Elliott' cultivar, in the "Ecological" variant, high proportions were recorded by the species: *Phytoseiulus persimilis* (64.00% in 2024; 67.00% in 2025), *Coccinella septempunctata* (17.00% in 2024; 9.00% in 2025) and *Chrysopa carnea* (14.00% in 2024; 20.00% in 2025), while in the "Conventional" variant, the predatory mites *Phytoseiulus persimilis* dominated massively (100.00% in 2024; 93.00% in 2025).

At the 'Bluecrop' cultivar, in the organic variant, diversity was constant, with the participation of 5-7 entomophagous groups, in relatively close proportions, namely 25.00-39.00% in 2024, and 19.00-46.00% in 2025, respectively, for the dominant species. In the conventionally treated variant, entomophagous populations were less diversified, dominated by the species *Phytoseiulus persimilis* (62.00%).

Regarding the 'Bluegold' cultivar, in the organic version the community was clearly superior, with 5-7 entomophagous species being present simultaneously in balanced proportions.

In 2024, the species *Coccinella septempunctata* (31.00%), *Chrysopa carnea* (24.00%) and *Phytoseiulus persimilis* (21.00%) were noted, and in 2025 the distribution remained diverse, with weights between 15.00-29.00% for the main species. In the conventional system, only two species were identified, namely *Chrysopa carnea* and *Coccinella septempunctata*, each with 50.00%, in 2025 the structure remained unchanged.

Analyzing the above-mentioned aspects, it was highlighted that in the “Ecological” variant, the share of entomophagous fauna is visibly higher, with a balanced distribution of predators, compared to the “Conventional” variant, where predator communities were lower, being dominated by 1-2 species.

Of the 5 blueberry cultivars analyzed, 'Duke' and 'Elliott' presented a higher level of infestation with pests (aphids - *Aphis* spp., respectively mites - *Tetranychus* spp.), which determined a higher share of predators specific to these groups. The results suggest that the intensity of pest attack directly influences the structure of entomophagous populations, but the type of phytoprotection applied determined the degree of diversity and their balance.

The distribution of entomophagous species in the blueberry studied cvs. in the two phytoprotection variants is graphically presented in Figures 5 and 6. Thus, in the "Ecological" variant, in both years of observations, 7 arthropod species were identified, with higher numerical density, highlighting: *Phytoseiulus persimilis*, *Coccinella septempunctata*, *Chrysopa carnea* and *Aphidoletes aphidimyza*. The species *Adalia bipunctata*, *Psyllobora vigintiduopunctata* and *Anthocoris* sp. were present, but with lower numerical density.

In the case of the "Conventional" variant, only 3 entomophagous groups were determined, respectively *Phytoseiulus persimilis*, *Coccinella septempunctata* and *Chrysopa carnea*. The species *Anthocoris* sp. was observed sporadically, in 2025 at the ‘Bluecrop’ cv., while the species *Adalia bipunctata*, *Psyllobora vigintiduopunctata* and *Aphidoletes aphidimyza* were completely absent.

The evolution of entomophagous populations during the period 2024-2025 is highlighted in Figures 7 and 8.

Under the conditions of 2024, in the organic variant, higher values were noted for all species, especially *Phytoseiulus persimilis* (19.00%), *Coccinella septempunctata* (12.70%) and *Chrysopa carnea* (11.00%). The conventional variant had lower values or even absent values for some species.

In 2025, the abundance of entomophagous insects increased in the organic variant compared to the previous year, especially for *Phytoseiulus persimilis* (30.70%), which indicates a higher pressure of phytophagous mites. Increases were also recorded in the populations of the species *Coccinella septempunctata* (16.30%), *Chrysopa carnea* (14.00%), and *Aphidoletes aphidimyza* (8.00%). In the conventional variant, the presence of predators remained low, but with a slight upward trend compared to 2024.

The differences between years can also be correlated with climatic conditions or the phenology of the cultivars, but the general trend shows that the ecological system maintains a more balanced community of entomophagous insects.

4. Conclusions

Following the study conducted in the period 2024-2025, 7 arthropod species were identified: *Coccinella septempunctata*, *Adalia bipunctata*, *Psyllobora vigintiduopunctata*, *Chrysopa carnea*, *Phytoseiulus persimilis*, *Aphidoletes aphidimyza* and *Anthocoris* sp, belonging to the Orders *Coleoptera*, *Neuroptera*, *Mesostigmata*, *Diptera* and *Hemiptera*.

The results showed significant differences between the two phytoprotection variants, with entomophagous populations being significantly superior in the ecological system, both in 2024 and 2025.

The "Ecologic" variant favored a high diversity and a relatively balanced distribution of entomophagous communities, with the concomitant participation of coccinellids, lacewings, mites and predatory dipterans, compared to the "Conventional" variant, where entomophagous populations were lower, being dominated by the species *Phytoseiulus persimilis*.

The results suggest that the intensity of pest attack directly influences the structure of entomophagous populations, but the type of phytoprotection applied determined the degree of diversity and their balance.

The results support the idea that ecological management favors biodiversity and stability of the agrosystem, which contributes to a more efficient natural control of pests.

The use of biological or less polluting products constitutes a viable alternative in limiting the attack caused by specific harmful organisms, having the advantage of selectivity towards useful entomofauna, an essential aspect for a sustainable and efficient integrated management.

Aknowledgements

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Tables and Figures

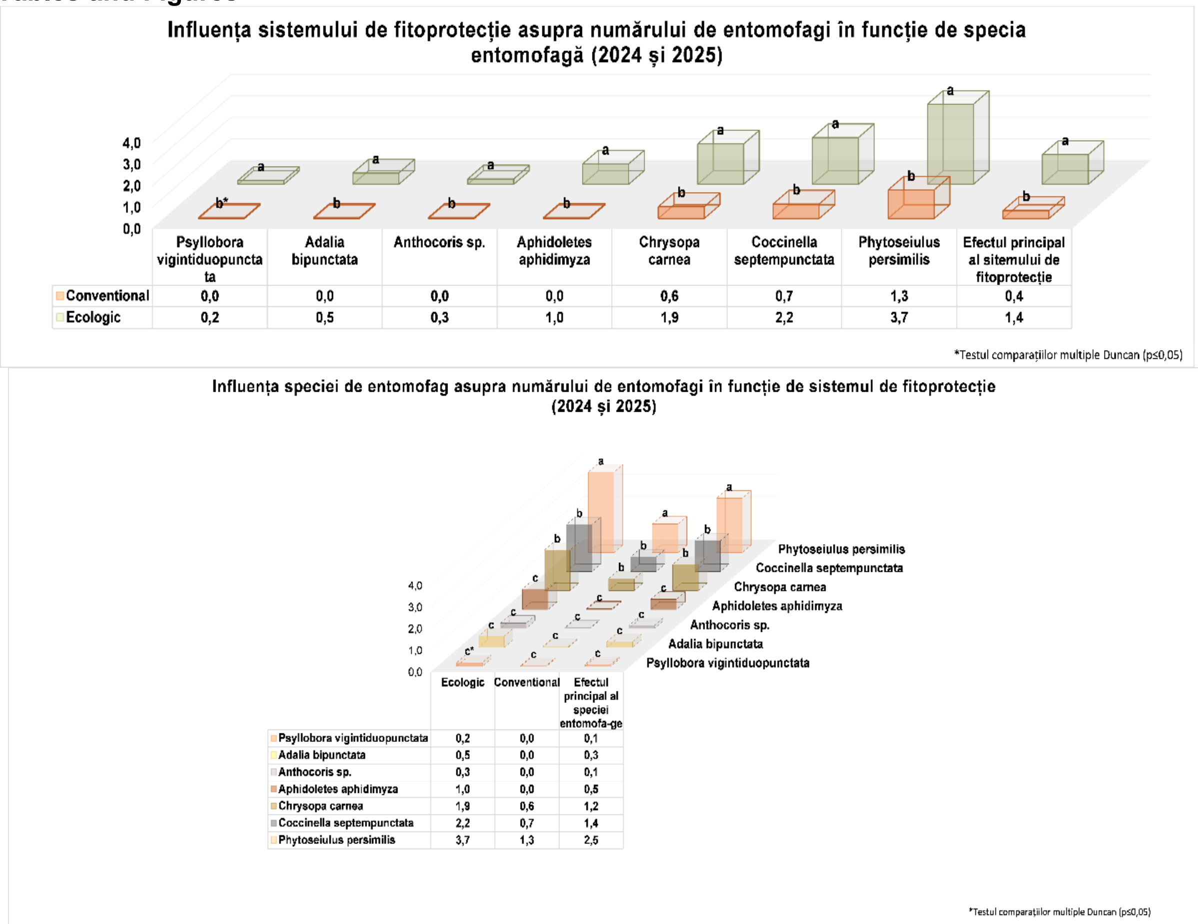

Fig.1. Influence of the phytoprotection system, entomophagous species and interaction of phytoprotection system x entomophagous species on the number of entomophages (2024-2025, 5 blueberry cultivars)

Table 1. Products used to control of harmful organisms in the ”Ecologic” blueberry plot, RIFG Pitesti, 2024-2025

No	Phenophase	Products used	Conc. (%) /Rate (l; kg/ha)	Active ingredient	Targeted harmful organisms
1.	End of the dormant period	Bouillie Bordelaise Ovipron Top	0,5% 0,5%	cupru 200 g/kg (Bordeaux mixture) parafinic oil 800 g/l	Mycotic and bacterian pathogens. Insects (hibernating stages).
2.	Budbrake - leafing	Cuproxat flowable	0,35%	tribazic copper sulphate190 g/l	Mycotic and bacterian pathogens.
3.	Blooming start	Taegro	0,37 kg/ha	*Bacillus amyloliquefaciens* tulp. FZB24 (1×1013 UFC/kg	Grey mold - *B. cinerea,* other mycotic pathogens.
4.	Petal fall	Laser 240 SC	0,6 l/ha	spinosad 240 g/l	Defoliator insects.
5.	Growing fruits	Prev-Am	0,5%	oranges oil 60 g/l	Aphids - *Aphis* spp., mites - *Tetranychus* spp., scales - *Parthenolecanium corni.*
6.	Norman sized fruits	Taegro	0,37 kg/ha	*Bacillus amyloliquefaciens* tulp. FZB24 (1×1013 UFC/kg	Grey mold - *Botrytis cinerea,* other mycotic pathogens.
To stimulate plant metabolism and activate the endogenous defense system against harmful agents, starting with the phenophase of fruit formation, foliar fertilizations were carried out with: Shigeki (2.0 l/ha), Kaishi (2.0 l/ha), Kerafol Evo (3.0 l/ha), Wuxal (1.0 l/ha) and Kinactiv fruit (2.0 l/ha) - 2-3 applications at 15-day interval.					

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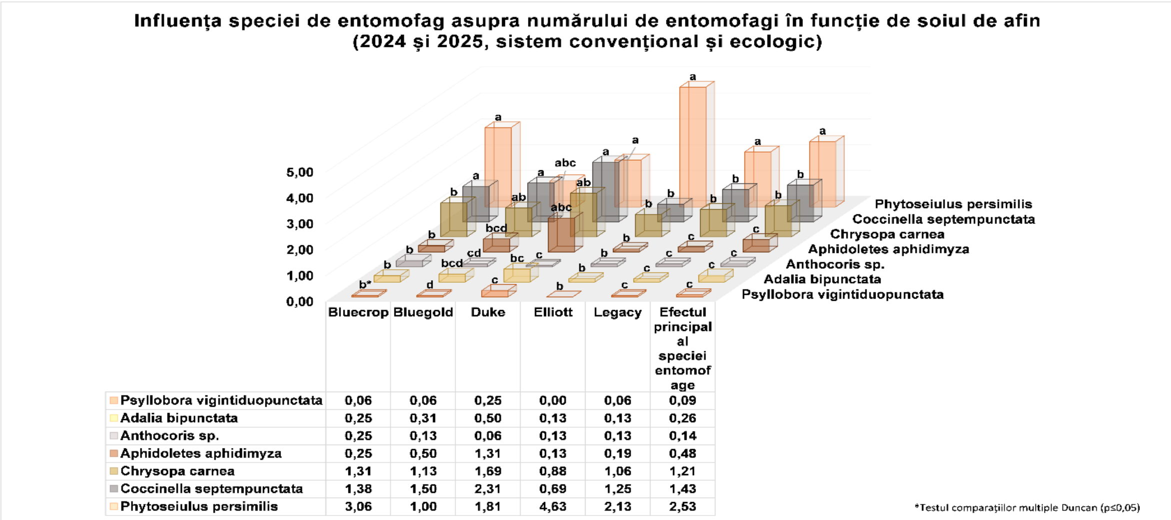

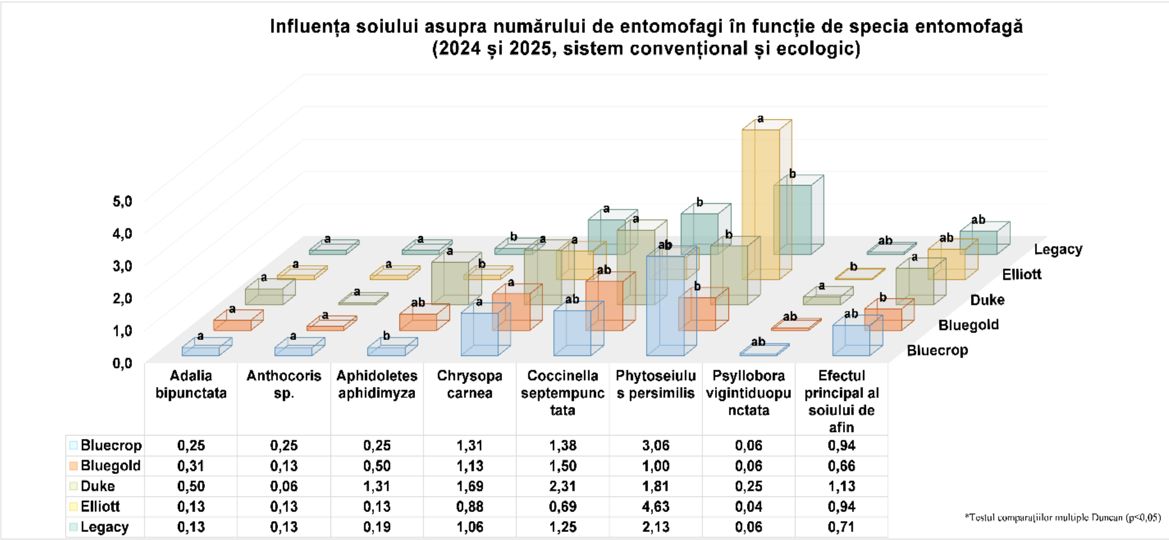

Fig. 2. Interaction of culture system x entomophagous species on the number of entomophages (2024-2025, 2 phytoprotection systems).

Table 2. Products used for the control of harmful organisms in the ”Conventional” blueberry plot, RIFG Pitesti, 2024-2025

N.	Phenophase	Products used	conc. (%)/ rate (l; kg/ha)	Active ingredient	Targeted harmful organisms
1.	End of the dormant period	Bouillie Bordelaise Krima 20 SG	0,5% 0,03%	cupru 200 g/kg (Bordeaux mixture) acetamiprid 200 g/kg	Mycotic and bacterian pathogens. Insects (hibernating stages).
2.	Budbrake - leafing	Scala Affirm Top	2,0 l/ha 1,5 kg/ha	pirimetanil 400 g/l emamectin benzoat 9,5 kg/ha	Mycotic pathogens. Defoliator insects.
3.	Blooming start	Switch	1,0 kg/ha	ciprodinil 375 kg/ha + fludioxonil 250 g/kg	Grey mold - *Botrytis cinerea,* other mycotic pathogens.
4.	Petal fall	Scala Karate Zeon	2,0 l/ha 0,015%	pirimetanil 400 g/l lambda - cihalotrin 50 g/l	Grey mold - *Botrytis cinerea,* other mycotic pathogens. Defoliator insects.
5.	Growing fruits	Switch Krima 20 SG	1,0 kg/ha 0,03%	ciprodinil 375 kg/ha + fludioxonil 250 g/kg acetamiprid 200 g/kg	Grey mold - *Botrytis cinerea,* other mycotic pathogens Aphids - *Aphis* spp., mites - *Tetranychus* spp., scales - *P. corni*.
6.	Norman sized fruits	Scala	2,0 l/ha	pirimetanil 400 g/l	Grey mold - *Botrytis cinerea,* other mycotic pathogens.

Table 3. Identification of entomophagous species in experimental blueberry variants, under the conditions of 2024, RIFG Pitesti-Maracineni

Variant	Variety	Repl.	Analyzed shoots	IDENTIFIED ENTOMOPHAGOUS			
				Species	Systematic framing (taxonomy)	Biologic stage	Total [No.]
” Ecological”	Duke	*R1*	15	*Coccinella septempunctata*	Ord. *Coleoptera*; Fam.*Coccinellidae*	larva; adult	3
				Chrysopa carnea	Ord. *Neuroptera*; Fam. *Chrysopidae*	egg	4
				Aphidoletes aphidimyza	Ord. *Diptera;* Fam. *Cecidomyiidae*	larva	5
				Phytoseiulus persimilis	Ord. *Mesostigmata*; Fam. *Phytoseiidae*	larva; adult	7
		R2	15	*Coccinella septempunctata*	Ord. *Coleoptera*; Fam. *Coccinellidae*	adult	1
				Adalia bipunctata	Ord. *Coleoptera*; Fam. *Coccinellidae*	adult	1
				Aphidoletes aphidimyza	Ord. *Diptera;* Fam. *Cecidomyiidae*	larva	4
		R3	15	*Coccinella septempunctata*	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	3
				Chrysopa carnea	Ord. *Neuroptera*; Fam. *Chrysopidae*	egg	3
				Psyllobora vigintiduopunctata	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	1
				Phytoseiulus persimilis	Ord. *Mesostigmata*; Fam. *Phytoseiidae*	adult	3
		R4	15	*Coccinella septempunctata*	Ord. *Coleoptera*; Fam.*Coccinellidae*	egg; adult	3
				Chrysopa carnea	Ord. *Neuroptera*; Fam. *Chrysopidae*	egg	2
				Adalia bipunctata	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	2
				Psyllobora vigintiduopunctata	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	1
	Legacy	*R1*	15	*Coccinella septempunctata*	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	2
				Anthocoris sp.	Ord. *Hemiptera*; Fam. *Anthocoridae*	adult	1
				Phytoseiulus persimilis	Ord. *Mesostigmata*; Fam. *Phytoseiidae*	adult	3
		R2	15	*Coccinella septempunctata*	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	2
				Chrysopa carnea	Ord. *Neuroptera*; Fam. *Chrysopidae*	egg	3
				Adalia bipunctata	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	1
				Phytoseiulus persimilis	Ord. *Mesostigmata*; Fam. *Phytoseiidae*	adult	2
		R3	15	*Coccinella septempunctata*	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	1
				Chrysopa carnea	Ord. *Neuroptera*; Fam. *Chrysopidae*	egg	1
				Phytoseiulus persimilis	Ord. *Mesostigmata*; Fam. *Phytoseiidae*	adult	2
		R4	15	*Coccinella septempunctata*	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	1
				Chrysopa carnea	Ord. *Neuroptera*; Fam. *Chrysopidae*	egg	1
	Elliott	*R1*	15	*Coccinella septempunctata*	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	1
				Phytoseiulus persimilis	Ord. *Mesostigmata*; Fam. *Phytoseiidae*	adult	4
		R2	15	*Coccinella septempunctata*	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	4
				Chrysopa carnea	Ord. *Neuroptera*; Fam. *Chrysopidae*	egg	2
				Adalia bipunctata	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	1
				Phytoseiulus persimilis	Ord. *Mesostigmata*; Fam. *Phytoseiidae*	adult	8
		R3	15	*Coccinella septempunctata*	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	1
				Phytoseiulus persimilis	Ord. *Mesostigmata*; Fam. *Phytoseiidae*	adult	6
		R4	15	*Chrysopa carnea*	Ord. *Neuroptera*; Fam. *Chrysopidae*	egg	3
				Adalia bipunctata	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	1
				Aphidoletes aphidimyza	Ord. *Diptera;* Fam. *Cecidomyiidae*	larva	2
				Phytoseiulus persimilis	Ord. *Mesostigmata*; Fam. *Phytoseiidae*	adult	5
	Bluecrop	*R1*	15	*Coccinella septempunctata*	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	2
				Chrysopa carnea	Ord. *Neuroptera*; Fam. *Chrysopidae*	egg	1
				Adalia bipunctata	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	1
				Phytoseiulus persimilis	Ord. *Mesostigmata*; Fam. *Phytoseiidae*	adult	3
		R2	15	*Coccinella septempunctata*	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	2
				Chrysopa carnea	Ord. *Neuroptera*; Fam. *Chrysopidae*	egg	3
				Adalia bipunctata	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	1
		R3	15	*Coccinella septempunctata*	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	1
				Chrysopa carnea	Ord. *Neuroptera*; Fam. *Chrysopidae*	egg	1
		R4	15	*Coccinella septempunctata*	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	2
				Chrysopa carnea	Ord. *Neuroptera*; Fam. *Chrysopidae*	egg	2
				Anthocoris sp.	Ord. *Hemiptera*; Fam. *Anthocoridae*	adult	1
				Phytoseiulus persimilis	Ord. *Mesostigmata*; Fam. *Phytoseiidae*	adult	8
	Bluegold	*R1*	15	*Coccinella septempunctata*	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	3
				Chrysopa carnea	Ord. *Neuroptera*; Fam. *Chrysopidae*	egg	3
				Adalia bipunctata	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	1
				Psyllobora vigintiduopunctata	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	1
		R2	15	*Coccinella septempunctata*	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	2
				Chrysopa carnea	Ord. *Neuroptera*; Fam. *Chrysopidae*	egg	2
				Anthocoris sp.	Ord. *Hemiptera*; Fam. *Anthocoridae*	adult	1
				Phytoseiulus persimilis	Ord. *Mesostigmata*; Fam. *Phytoseiidae*	adult	3
				Aphidoletes aphidimyza	Ord. *Diptera;* Fam. *Cecidomyiidae*	larva	3
		R3	15	*Coccinella septempunctata*	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	2
				Chrysopa carnea	Ord. *Neuroptera*; Fam. *Chrysopidae*	egg	1
				Adalia bipunctata	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	1
				Anthocoris sp.	Ord. *Hemiptera*; Fam. *Anthocoridae*	adult	1
				Phytoseiulus persimilis	Ord. *Mesostigmata*; Fam. *Phytoseiidae*	adult	3
		R4	15	*Coccinella septempunctata*	Ord. *Coleoptera*; Fam.*Coccinellidae*	egg	2
				Chrysopa carnea	Ord. *Neuroptera*; Fam. *Chrysopidae*		1

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" Conventional"	**Duke**	*R1*	15	-	-	-	-
		R2	15	*Coccinella septempunctata* *Chrysopa carnea*	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Neuroptera*; Fam. *Chrysopidae*	adult egg	2 1
		R3	15	*Coccinella septempunctata* *Chrysopa carnea*	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Neuroptera*; Fam. *Chrysopidae*	adult egg	1 1
		R4	15	*Coccinella septempunctata*	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	1
	Legacy	*R1*	15	*Coccinella septempunctata* *Chrysopa carnea*	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Neuroptera*; Fam. *Chrysopidae*	adult egg	1 1
		R2	15	*Phytoseiulus persimilis*	Ord. *Mesostigmata*; Fam. *Phytoseiidae*	adult	5
		R3	15	*Chrysopa carnea*	Ord. *Neuroptera*; Fam. *Chrysopidae*	egg	1
		R4	15	*Coccinella septempunctata* *Chrysopa carnea* *Phytoseiulus persimilis*	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Neuroptera*; Fam. *Chrysopidae* Ord. *Mesostigmata*; Fam. *Phytoseiidae*	adult egg adult	2 1 5
	Elliott	*R1*	15	-	-	-	-
		R2	15	-	-	-	-
		R3	15	*Phytoseiulus persimilis*	Ord. *Mesostigmata*; Fam. *Phytoseiidae*	adult	3
		R4	15	*Phytoseiulus persimilis*	Ord. *Mesostigmata*; Fam. *Phytoseiidae*	adult	4
	Bluecrop	*R1*	15	*Coccinella septempunctata* *Chrysopa carnea*	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Neuroptera*; Fam. *Chrysopidae*	adult egg	1 1
		R2	15	*Coccinella septempunctata* *Chrysopa carnea* *Phytoseiulus persimilis*	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Neuroptera*; Fam. *Chrysopidae* Ord. *Mesostigmata*; Fam. *Phytoseiidae*	adult egg adult	1 1 6
		R3	15	-	-	-	-
		R4	15	*Coccinella septempunctata* *Chrysopa carnea*	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Neuroptera*; Fam. *Chrysopidae*	adult egg	1 1
	Bluegold	*R1*	15	*Chrysopa carnea*	Ord. *Neuroptera*; Fam. *Chrysopidae*	egg	1
		R2	15	*Chrysopa carnea*	Ord. *Neuroptera*; Fam. *Chrysopidae*	egg	1
		R3	15	-	-		-
		R4	15	*Coccinella septempunctata*	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	2

Table 4. Identification of entomophagous species in experimental blueberry variants, under the conditions of 2025, RIFG Pitesti

Variant	**Variety**	**Repl.**	**Analyzed shoots**	**IDENTIFIED ENTOMOPHAGOUS**			
				Species	**Systematic framing (taxonomy)**	**Biologic stage**	**Total [No.]**
" Ecological"	**Duke**	*R1*	15	*Coccinella septempunctata* *Chrysopa carnea* *Phytoseiulus persimilis* *Psyllobora vigintiduopunctata*	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Neuroptera*; Fam. *Chrysopidae* Ord. *Mesostigmata*; Fam. *Phytoseiidae* Ord. *Coleoptera*; Fam. *Coccinellidae*	larva; adult egg adult adult	6 3 9 1
		R2	15	*Coccinella septempunctata* *Chrysopa carnea* *Aphidoletes aphidimyza* *Adalia bipunctata* *Phytoseiulus persimilis*	Ord. *Coleoptera*; Fam. *Coccinellidae* Ord. *Neuroptera*; Fam. *Chrysopidae* Ord. *Diptera;* Fam. *Cecidomyiidae* Ord. *Coleoptera*; Fam. *Coccinellidae* Ord. *Mesostigmata*; Fam. *Phytoseiidae*	egg; larva; egg larva adult adult	4 3 6 2 7
		R3	15	*Coccinella septempunctata* *Chrysopa carnea* *Anthocoris* sp. *Adalia bipunctata*	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Neuroptera*; Fam. *Chrysopidae* Ord. *Hemiptera*; Fam. *Anthocoridae* Ord. *Coleoptera*; Fam.*Coccinellidae*	larva; adult egg adult adult	4 2 1 1
		R4	15	*Coccinella septempunctata* *Chrysopa carnea* *Adalia bipunctata* *Psyllobora vigintiduopunctata* *Aphidoletes aphidimyza*	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Neuroptera*; Fam. *Chrysopidae* Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Diptera;* Fam. *Cecidomyiidae*	larva; adult egg adult adult larva	3 3 2 1 6
	Legacy	*R1*	15	*Coccinella septempunctata* *Chrysopa carnea* *Anthocoris* sp.	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Neuroptera*; Fam. *Chrysopidae* Ord. *Hemiptera*; Fam. *Anthocoridae*	adult egg adult	3 3 1
		R2	15	*Coccinella septempunctata* *Chrysopa carnea* *Adalia bipunctata* *Phytoseiulus persimilis*	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Neuroptera*; Fam. *Chrysopidae* Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Mesostigmata*; Fam. *Phytoseiidae*	adult egg adult adult	2 1 1 5
		R3	15	*Coccinella septempunctata* *Chrysopa carnea* *Psyllobora vigintiduopunctata*	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Neuroptera*; Fam. *Chrysopidae* Ord. *Coleoptera*; Fam.*Coccinellidae*	adult egg adult	3 2 1
		R4	15	*Chrysopa carnea* *Aphidoletes aphidimyza* *Phytoseiulus persimilis*	Ord. *Neuroptera*; Fam. *Chrysopidae* Ord. *Diptera;* Fam. *Cecidomyiidae* Ord. *Mesostigmata*; Fam. *Phytoseiidae*	egg larva adult	1 3 7
	Elliott	*R1*	15	*Coccinella septempunctata* *Phytoseiulus persimilis*	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Mesostigmata*; Fam. *Phytoseiidae*	adult adult	1 7
		R2	15	*Chrysopa carnea* *Anthocoris* sp. *Phytoseiulus persimilis*	Ord. *Neuroptera*; Fam. *Chrysopidae* Ord. *Hemiptera*; Fam. *Anthocoridae* Ord. *Mesostigmata*; Fam. *Phytoseiidae*	egg adult adult	5 2 10

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		R3	15	*Coccinella septempunctata* *Chrysopa carnea* *Phytoseiulus persimilis*	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Neuroptera*; Fam. *Chrysopidae* Ord. *Mesostigmata*; Fam. *Phytoseiidae*	adult egg adult	2 2 6
		R4	15	*Coccinella septempunctata* *Chrysopa carnea* *Phytoseiulus persimilis*	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Neuroptera*; Fam. *Chrysopidae* Ord. *Mesostigmata*; Fam. *Phytoseiidae*	adult egg adult	1 2 7
	Bluecrop	*R1*	15	*Coccinella septempunctata* *Adalia bipunctata* *Chrysopa carnea* *Aphidoletes aphidimyza*	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Neuroptera*; Fam. *Chrysopidae* Ord. *Diptera;* Fam. *Cecidomyiidae*	adult adult egg larva	3 1 4 4
		R2	15	*Chrysopa carnea* *Phytoseiulus persimilis*	Ord. *Neuroptera*; Fam. *Chrysopidae* Ord. *Mesostigmata*; Fam. *Phytoseiidae*	egg adult	2 9
		R3	15	*Coccinella septempunctata* *Phytoseiulus persimilis* *Psyllobora vigintiduopunctata*	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Mesostigmata*; Fam. *Phytoseiidae* Ord. *Coleoptera*; Fam.*Coccinellidae*	adult adult adult	5 15 1
		R4	15	*Coccinella septempunctata* *Anthocoris* sp. *Adalia bipunctata* *Chrysopa carnea*	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Hemiptera*; Fam. *Anthocoridae* Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Neuroptera*; Fam. *Chrysopidae*	adult adult adult egg	2 2 1 3
	Bluegold	*R1*	15	*Coccinella septempunctata* *Adalia bipunctata* *Phytoseiulus persimilis*	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Mesostigmata*; Fam. *Phytoseiidae*	adult adult adult	5 2 4
		R2	15	*Coccinella septempunctata* *Chrysopa carnea* *Aphidoletes aphidimyza*	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Neuroptera*; Fam. *Chrysopidae* Ord. *Diptera;* Fam. *Cecidomyiidae*	adult egg adult	3 1 5
		R3	15	*Chrysopa carnea* *Phytoseiulus persimilis*	Ord. *Neuroptera*; Fam. *Chrysopidae* Ord. *Mesostigmata*; Fam. *Phytoseiidae*	egg adult	3 6
		R4	15	*Coccinella septempunctata* *Chrysopa carnea* *Adalia bipunctata*	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Neuroptera*; Fam. *Chrysopidae* Ord. *Coleoptera*; Fam.*Coccinellidae*	larva egg adult	2 2 1
„ Conventional”	**Duke**	*R1*	15	*Coccinella septempunctata* *Chrysopa carnea*	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Neuroptera*; Fam. *Chrysopidae*	adult, larva egg	3 1
		R2	15	*Coccinella septempunctata* *Chrysopa carnea*	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Neuroptera*; Fam. *Chrysopidae*	larva egg	2 1
		R3	15	*Chrysopa carnea* *Phytoseiulus persimilis*	Ord. *Neuroptera*; Fam. *Chrysopidae* Ord. *Mesostigmata*; Fam. *Phytoseiidae*	egg adult	2 1
		R4	15	*Coccinella septempunctata* *Chrysopa carnea* *Phytoseiulus persimilis*	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Neuroptera*; Fam. *Chrysopidae* Ord. *Mesostigmata*; Fam. *Phytoseiidae*	adult egg adult	1 1 2
	Legacy	*R1*	15	*Chrysopa carnea*	Ord. *Neuroptera*; Fam. *Chrysopidae*	egg	1
		R2	15	*Coccinella septempunctata* *Chrysopa carnea* *Phytoseiulus persimilis*	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Neuroptera*; Fam. *Chrysopidae* Ord. *Mesostigmata*; Fam. *Phytoseiidae*	adult egg adult	2 1 4
		R3	15	*Coccinella septempunctata*	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	1
		R4	15	*Phytoseiulus persimilis*	Ord. *Mesostigmata*; Fam. *Phytoseiidae*	adult	1
	Elliott	*R1*	15	*Coccinella septempunctata* *Phytoseiulus persimilis*	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Mesostigmata*; Fam. *Phytoseiidae*	adult adult	1 6
		R2	15	*Phytoseiulus persimilis*	Ord. *Mesostigmata*; Fam. *Phytoseiidae*	adult	5
		R3	15	*Phytoseiulus persimilis*	Ord. *Mesostigmata*; Fam. *Phytoseiidae*	adult	3
		R4	15	-		-	-
	Bluecrop	*R1*	15	-		-	-
		R2	15	*Chrysopa carnea* *Phytoseiulus persimilis*	Ord. *Neuroptera*; Fam. *Chrysopidae* Ord. *Mesostigmata*; Fam. *Phytoseiidae*	egg adult	2 2
		R3	15	*Coccinella septempunctata* *Phytoseiulus persimilis*	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Mesostigmata*; Fam. *Phytoseiidae*	adult adult	1 6
		R4	15	*Coccinella septempunctata* *Anthocoris* sp.	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Hemiptera*; Fam. *Anthocoridae*	adult adult	1 1
	Bluegold	*R1*	15	*Coccinella septempunctata*	Ord. *Coleoptera*; Fam.*Coccinellidae*	adult	2
		R2	15	*Coccinella septempunctata* *Chrysopa carnea*	Ord. *Coleoptera*; Fam.*Coccinellidae* Ord. *Neuroptera*; Fam. *Chrysopidae*	adult egg	1 2
		R3	15	-		-	-
		R4	15	*Chrysopa carnea*	Ord. *Neuroptera*; Fam. *Chrysopidae*	egg	1

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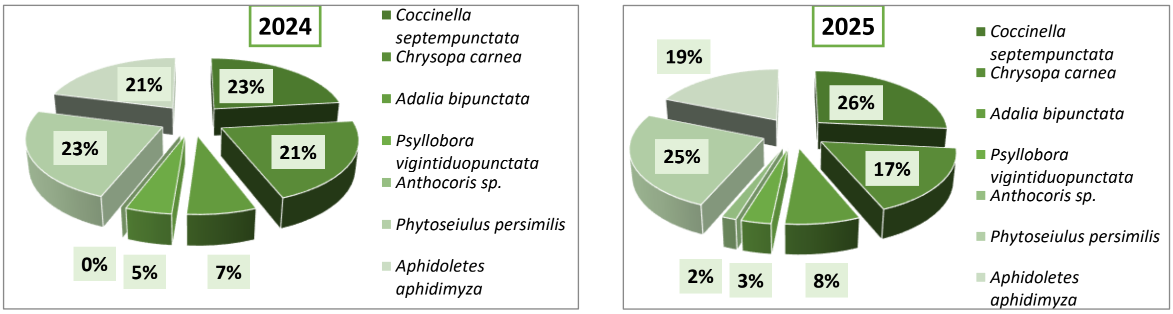
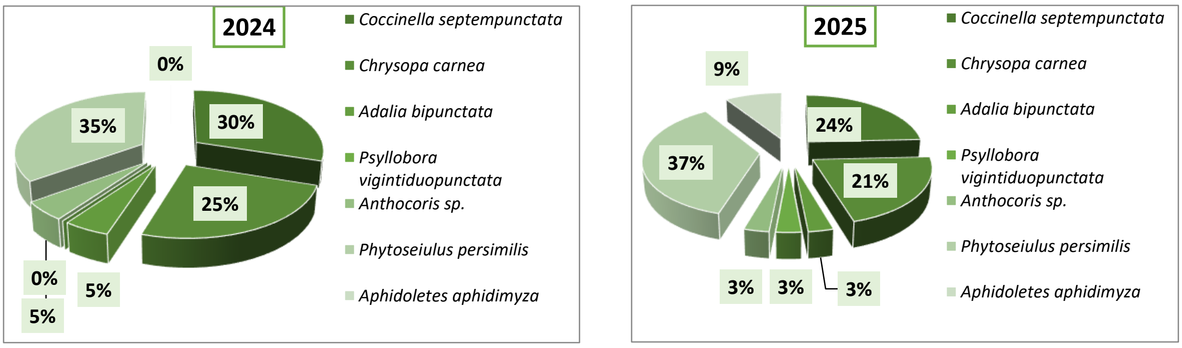
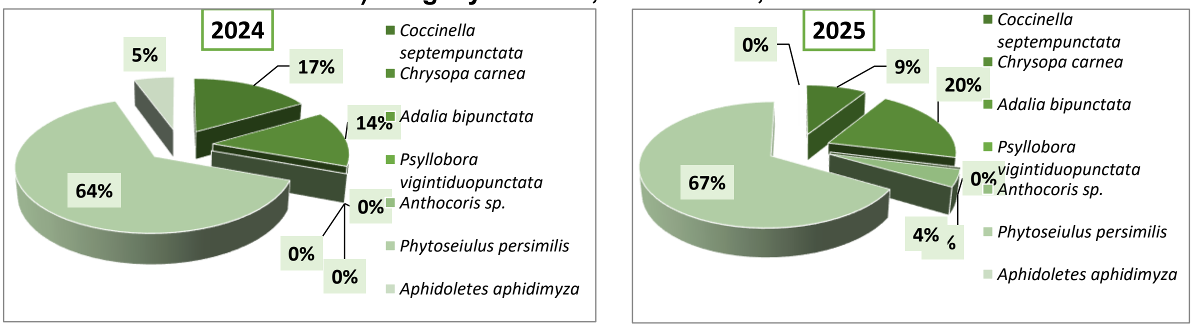


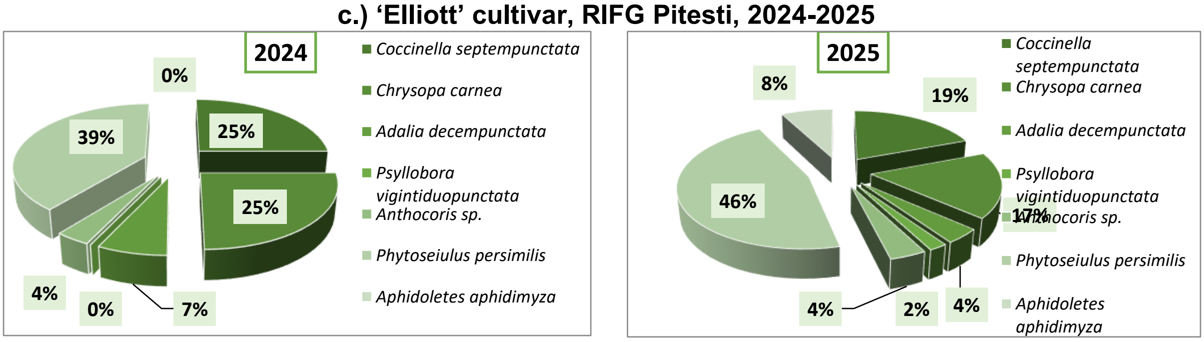
a.) 'Duke' cultivar, RIFG Pitesti, 2024-2025



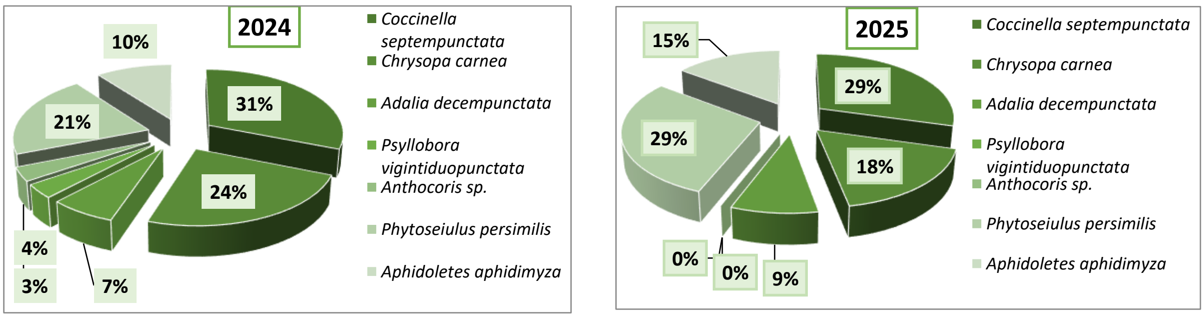
b.) 'Legacy' cultivar, RIFG Pitesti, 2024-2025



c.) 'Elliott' cultivar, RIFG Pitesti, 2024-2025



d.) 'Bluecrop' cultivar, RIFG Pitesti, 2024-2025



e.) 'Bluegold' cultivar, RIFG Pitesti, 2024-2025

Fig. 3. Share of entomophagous species identified in the "Ecologic" phytoprotection variant on the blueberry cultivars studied

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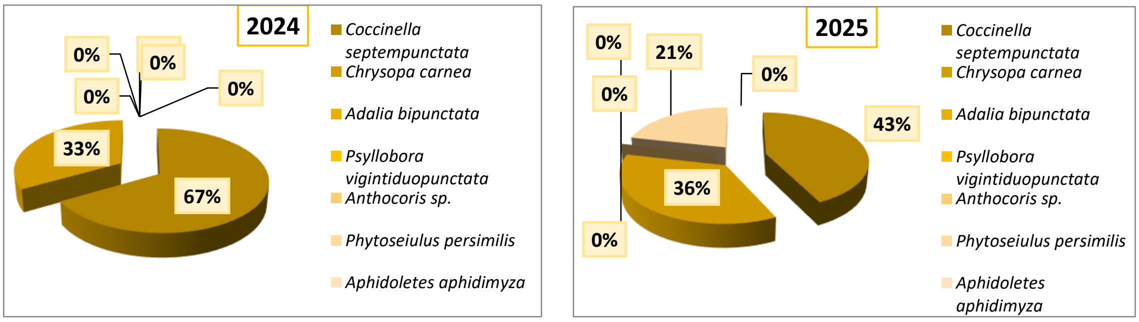
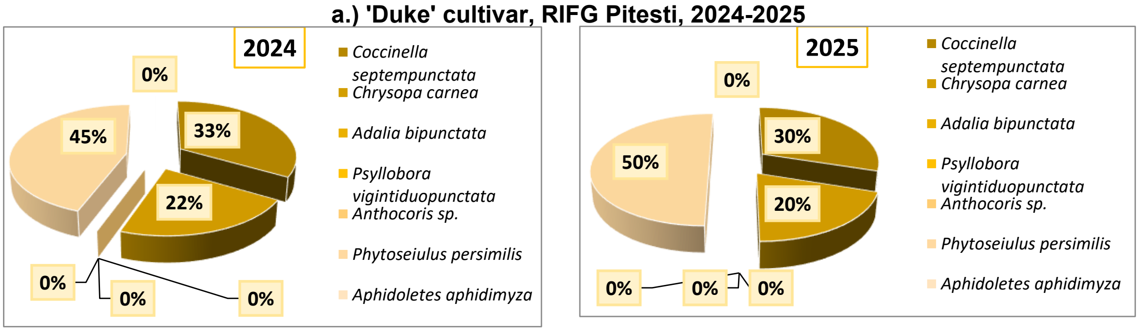
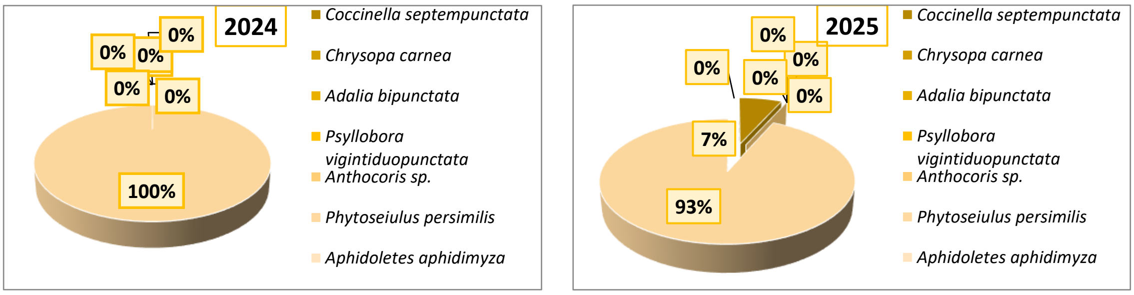


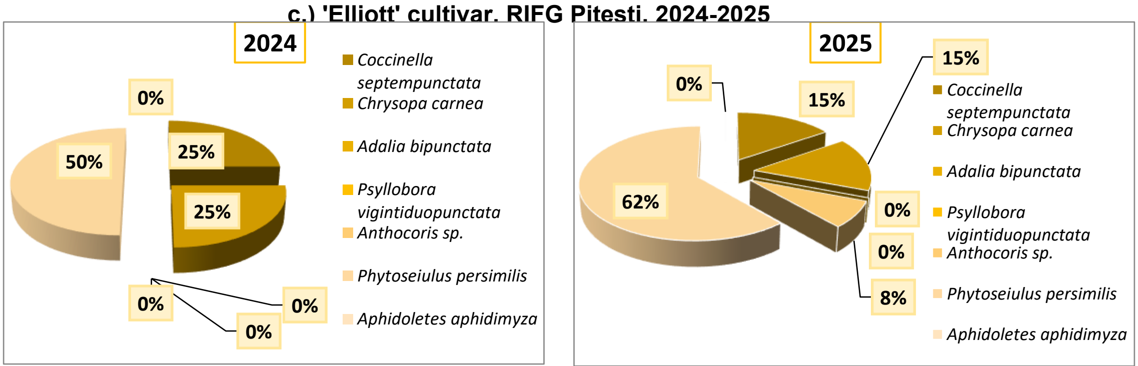
a.) 'Duke' cultivar, RIFG Pitesti, 2024-2025



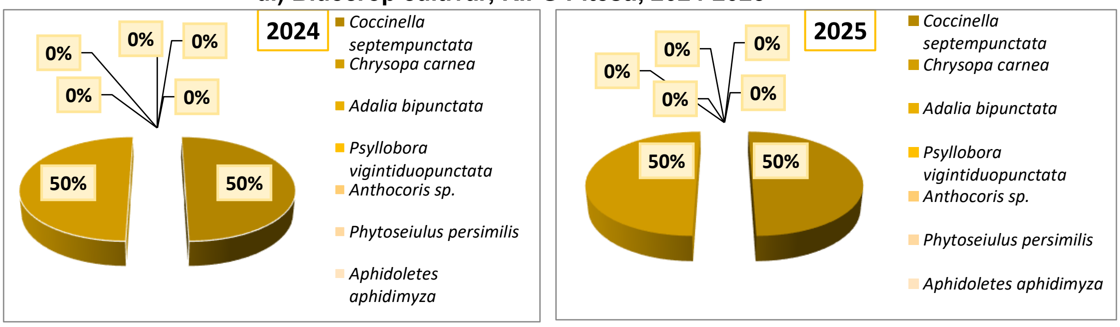
b.) 'Legacy' cultivar, RIFG Pitesti, 2024-2025



c.) 'Elliott' cultivar, RIFG Pitesti, 2024-2025



d.) Bluecrop cultivar, RIFG Pitesti, 2024-2025



e.) Bluegold cultivar, RIFG Pitesti, 2024-2025

Fig. 4. Share of entomophagous species identified in the ”Conventional” phytoprotection variant in blueberry cultivars studied: a) 'Duke'; b) 'Legacy'; c) 'Elliott'; d) 'Bluecrop'; e) 'Bluegold'

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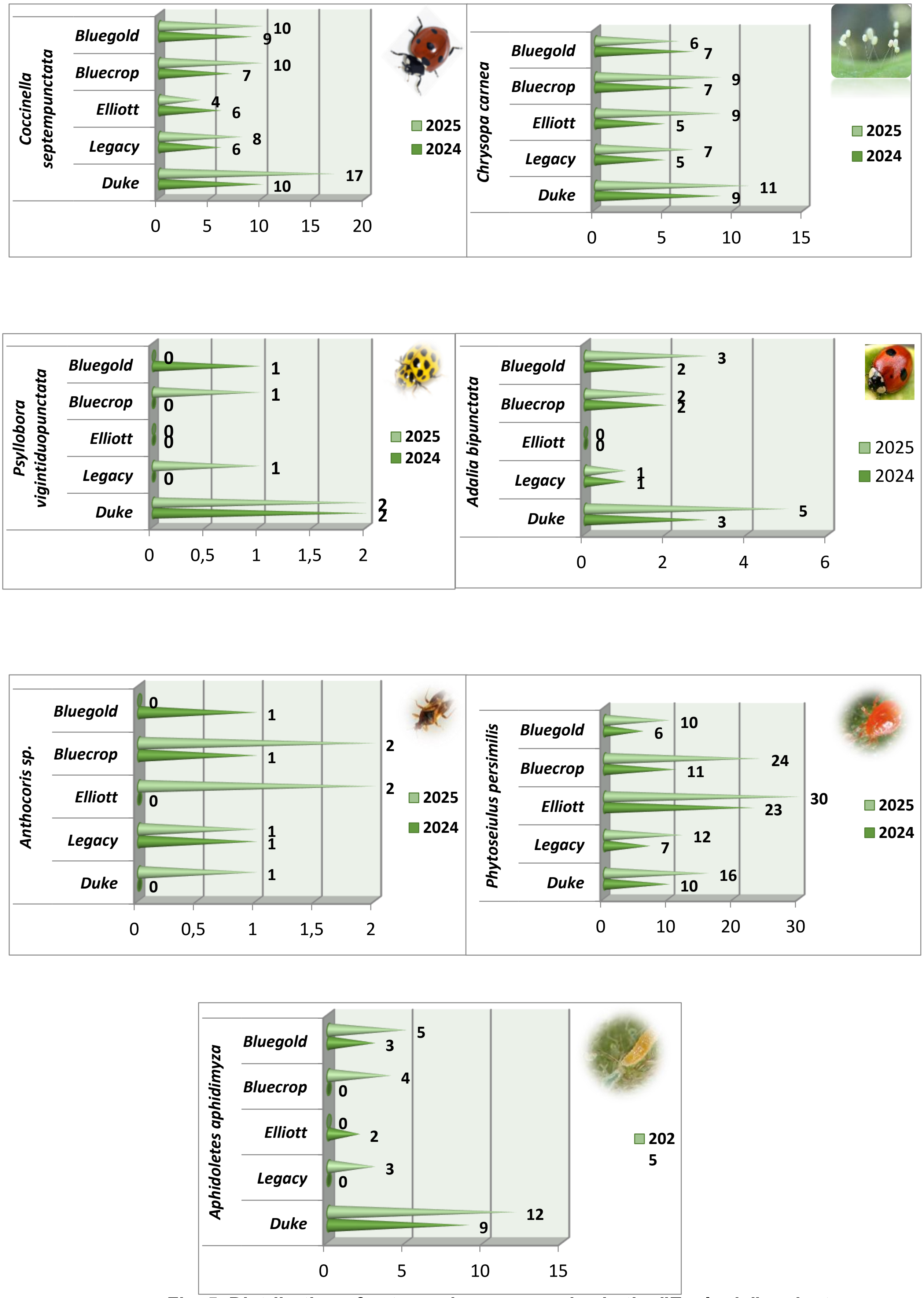

Fig. 5. Distribution of entomophagous species in the ”Ecologic” variant on the blueberry cultivars studied at RIFG Pitesti, 2024-2025

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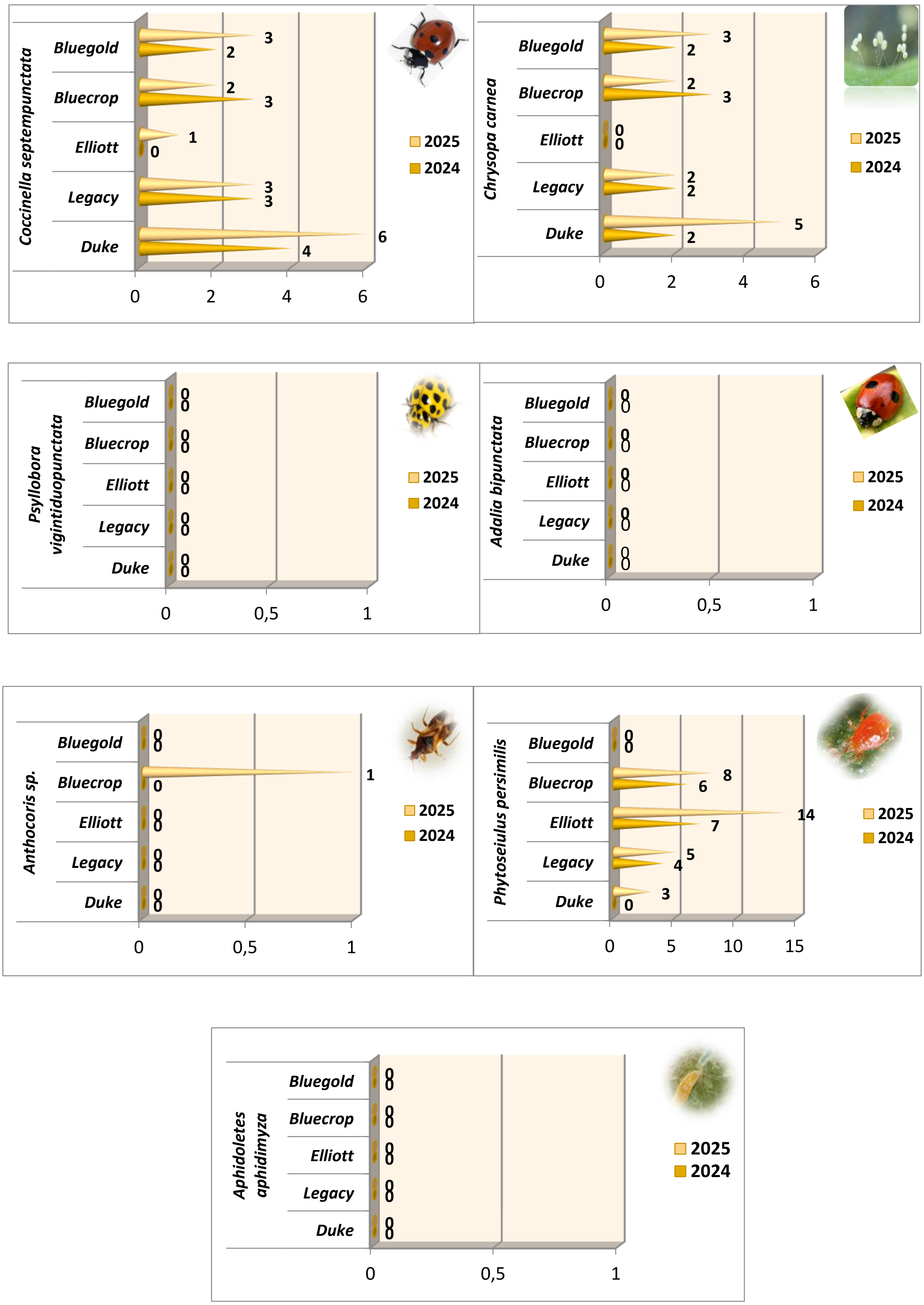

Fig. 6. Distribution of entomophagous species in the"Conventional" variant on the blueberry cultivars studied at RIFG Pitesti, 2024-2025.

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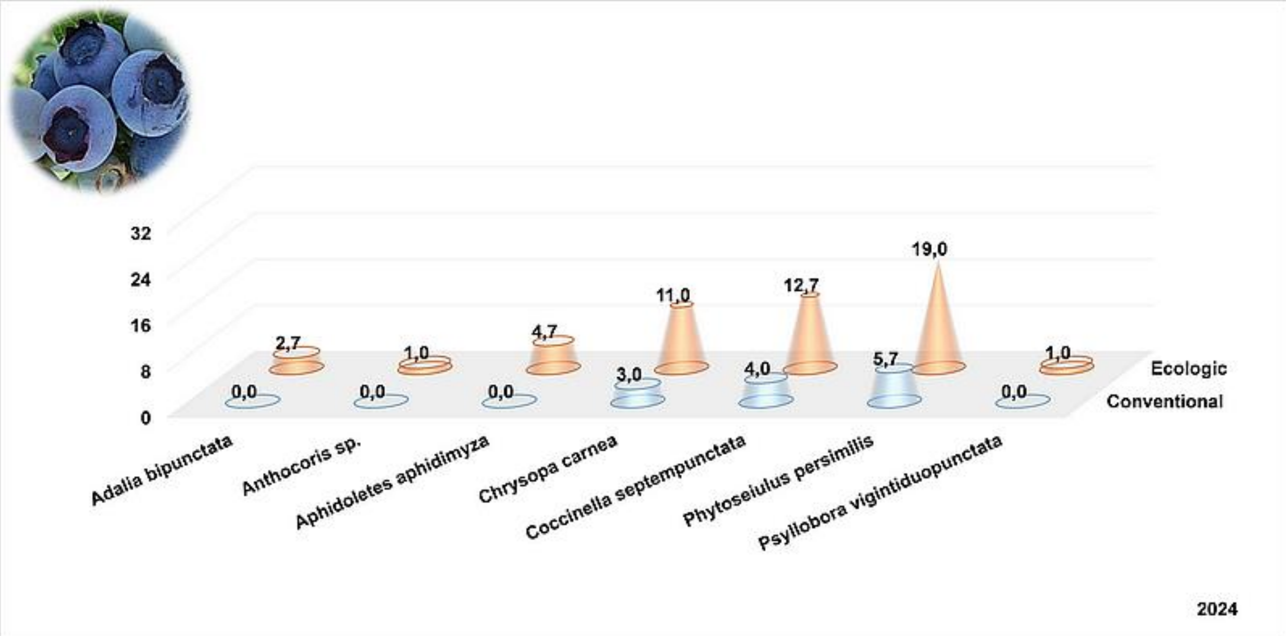

Fig. 7. Dynamics of entomophagous populations in ”Ecologic” and ”Conventional” phytoprotection variants, RIFG Pitesti, 2024.

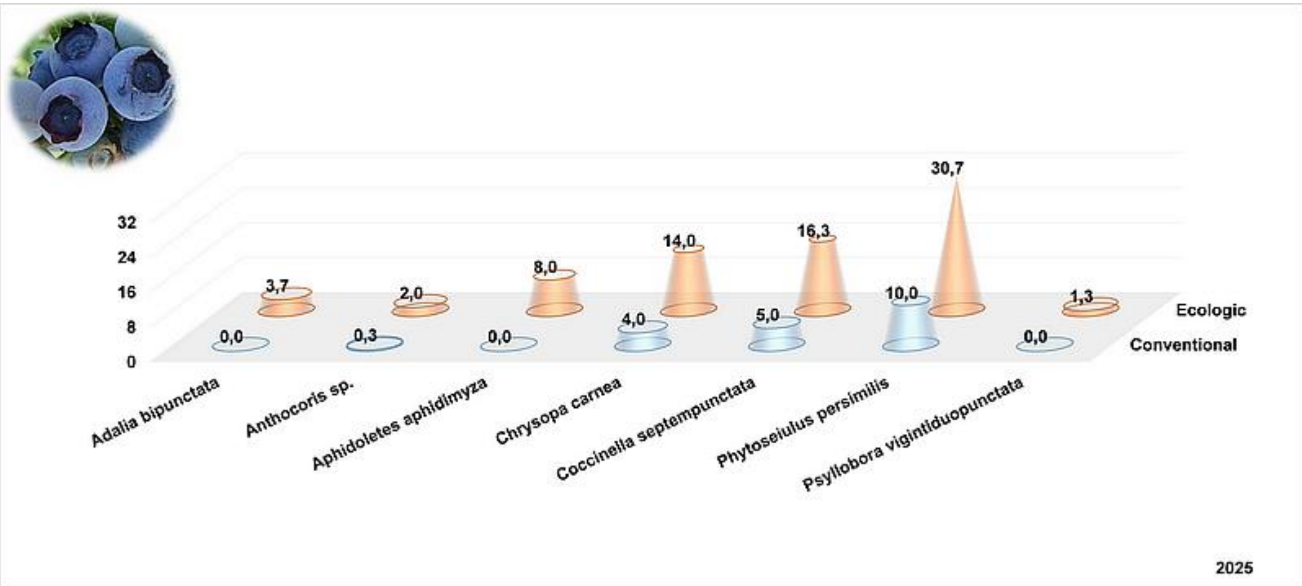

Fig. 8. Dynamics of entomophagous populations in ”Ecologic” and ”Conventional” phytoprotection variants, RIFG Pitesti, 2025.

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a.) b.)

c.) d.)

e.) f.)

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g.) **h.)**

i.) **j.)**

k.) **l.)**

Fig. 9. Aspects from the experimental blueberry plot - variant „Ecologic”: location of experience (a); *Coccinella septempunctata* - adults and larval stages, *Adalia bipunctata*, *Psyllobora vigintiduopunctata* and *Anthochoris* spp.- adults (b-i); *Chrysopa carnea* - eggs (j-l)