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Entomofauna Of Plants Of The Genus Cerasus (Prunus) And Their Role In The Agroecosystem

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Annotation. This article examines the composition, proportion, and ecological interactions of harmful insects and their natural enemies – entomophages – occurring in the cherry (Cerasus spp.) agrobiocenosis of the Fergana Valley during 2020–2025. The study identified 21 species of harmful entomofauna and 48 species of beneficial entomophages. The analysis showed that among pests, the orders Coleoptera (38.1%) and Lepidoptera (19.0%) are dominant, while among entomophages, the greatest proportion belongs to representatives of Diptera and Arachnida (27.1% each). These groups play a crucial role in maintaining the biological balance of the agroecosystem.
Keywords: *Cerasus spp., cherry, entomofauna, harmful insects, entomophages, agrobiocenosis, Fergana Valley, biological balance, Coleoptera, Diptera, IPM.*

In Uzbekistan and across the entire Central Asian region, species belonging to the subgenus Cerasus (Prunus) — such as cherry and sour cherry — have long held great importance among fruit-bearing trees. These trees are significant not only for their nutritional value but also for their contribution to maintaining ecological balance within the agroecosystem.

During the vegetation period, plants interact with a wide range of insects. The entomofauna includes phytophagous insects (pests), entomophagous insects, pollinators—beneficial insects—and neutral species. They directly influence flowering, pollination, fruit formation, and the phytosanitary stability of the plants.

In recent years, due to global climate change, excessive use of pesticides, and the decline of natural enemies, serious shifts have occurred within the entomofauna associated with Cerasus crops. In particular, species such as the cherry fruit fly (Rhagoletis cerasi), the black cherry aphid (Myzus cerasi), the slimy cherry sawfly (Caliroa cerasi), and the cherry weevil (Rhynchites spp.) have been documented as major economically damaging pests. At the same time, studying the populations of beneficial insects—such as green lacewings (Chrysopidae), hoverflies (Syrphidae), lady beetles (Coccinellidae), as well as pollinating bees—is essential for preserving ecological balance.

Therefore, investigating the entomofauna associated with plants of the subgenus Cerasus, understanding their ecological roles, seasonal dynamics, integrated protection measures, and the rational use of beneficial insects is of great scientific and practical significance.

According to research conducted in Turkey by Tezcan et al. (2020), more than 120 insect species were recorded in sweet cherry and sour cherry plantations. Approximately 60% of these species were identified as phytophagous insects, 25% as entomophagous species, and 15% as pollinators. The study showed that insect diversity in cherry agroecosystems is closely linked to agricultural practices and pesticide use.

In Romania, observations carried out between 2010 and 2014 revealed that the composition of entomofauna varies depending on regional climate, tree cultivars, and orchard management (Popa et al., 2015). Notably, in organic orchards, the abundance of beneficial entomofauna was found to be 1.5–2 times higher.

In Cerasus agroecosystems, the principal harmful insect is the European cherry fruit fly (Rhagoletis cerasi L.), which reduces fruit quality and export potential (Daniel & Grunder, 2012). The female lays eggs mainly during the fruit-ripening period, and the larvae feed inside the fruit, causing internal damage and deterioration.

The black cherry aphid (Myzus cerasi), a sap-feeding species, disrupts photosynthesis, slows plant growth, and serves as a vector for viral diseases (Bencharki et al., 2023).

In addition, species such as the plum moth (Grapholita funebrana) and the cherry weevil (Rhynchites auratus) are also recognized as economically significant pests in Cerasus orchards.

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The beneficial component of entomofauna in Cerasus ecosystems includes members of the families Coccinellidae, Chrysopidae, and Syrphidae, which play an essential role in reducing populations of aphids, thrips, and other pest eggs naturally (Kutinkova et al., 2018).

In integrated pest management, increasing the population of beneficial entomofauna through the use of biological agents such as Beauveria bassiana and Metarhizium anisopliae, as well as establishing flower strips around orchards to support pollinators within the agrobiocenosis, has been shown to produce effective results (Mateos-Fierro, 2020).

The analyzed sources indicate that the composition of entomofauna in crops belonging to the subgenus Cerasus changes depending on regional, climatic, and agrotechnical factors. The increase in phytophagous insect species is often associated with excessive use of chemical pesticides, a decline in populations of natural enemies, and monoculture orchard systems. Therefore, a comprehensive study of entomofauna in Cerasus agroecosystems serves as an important scientific basis for developing ecologically stable protection systems.

The aim of the study is to examine the entomofauna associated with cherry and sour cherry trees belonging to the subgenus Cerasus, and to determine their ecological role and significance within the agroecosystem. This includes assessing the biological balance between pest, beneficial, and neutral insect species, and identifying opportunities to use natural enemies effectively within integrated pest management strategies.

The research was conducted during 2023–2025 in experimental orchards located in the Izboskan, Paxtaobod, Xo‘jaobod, and Jalakuduk districts of Andijan region; the Turaqo‘rg‘on district of Namangan region; and the Kuva and Uzbekistan districts of Fergana region. The experimental objects consisted of Prunus avium L. (sweet cherry) and Prunus cerasus L. (sour cherry), belonging to the subgenus Cerasus. The climate of the study area is temperate, with hot and dry summers and cold winters. The average annual temperature ranges from +13 to +14°C, and precipitation during the vegetation period is around 200–250 mm.

The area of the experimental plots ranged from 1.0 to 2.0 hectares, with trees planted at a 5 × 4 m spacing scheme. Agrotechnical practices in the orchards—including irrigation, weed control, and partial nitrogen fertilization—were carried out under uniform conditions. No chemical pesticides were applied, which made it possible to observe the entomofauna in its natural state.

Several field methods were used to study the entomofauna. Using the sweep-net method, insects were collected from the air layer by sweeping ten times between every ten trees. In the trap-setting method, one pheromone or yellow sticky trap was installed for every ten trees and inspected every 7–10 days. During visual observation, the presence of insects, oviposition, and larval stages on leaves, shoots, buds, and fruit surfaces were recorded. Soil samples were also taken and analyzed to identify overwintering and soil-dwelling insects. Collected insects were preserved in 70% ethanol solution and identified in the laboratory using a binocular stereomicroscope based on their morphological characteristics. Identification was carried out using determination keys (Zahradnik, 1995; Gorodkov, 1984; Belokobylskij, 2012). Each species was classified according to its order, family, genus, and species. The ecological group of each species (phytophagous, entomophagous, or pollinator) was determined based on its feeding source and its relationship with the host plant.

Based on observations conducted in the Fergana Valley during 2020–2025, the overall composition of harmful entomofauna identified in the cherry agrobiocenosis was analyzed. As shown in the diagram, the largest share among pests belongs to the order Coleoptera (38.1%). This group includes economically damaging species such as Melolontha hypocastani, Epicometis turanica, and Oxythyrea cinctella. Their high abundance indicates the importance of monitoring and preventive treatments against beetles in cherry orchards.

The second-largest group of pests is Lepidoptera (19.0%). Representatives of this order—such as Grapholita molesta and Cemiostoma scitella—damage leaves and fruits, and controlling their seasonal population dynamics requires the effective use of pheromone traps.

Representatives of Homoptera (14.3%), including Empoasca meridiana, the San Jose scale (Diaspidiotus perniciosus), and the Comstock mealybug (Pseudococcus comstocki), feed on plant sap, leading to reduced growth and weakening of cherry trees. Additionally, they pose a threat as major vectors of viral diseases.

The orders Arachnoidea and Hemiptera, each accounting for 9.5%, include widely distributed species such as Tetranychus urticae (two-spotted spider mite) and Carpocoris coreanus. Among Diptera (4.8%), the most important species is Rhagoletis cerasi (the cherry fruit fly), which, despite its relatively small percentage, causes the most direct damage to fruit quality. From the order Hymenoptera, only Caliroa cerasi was recorded,

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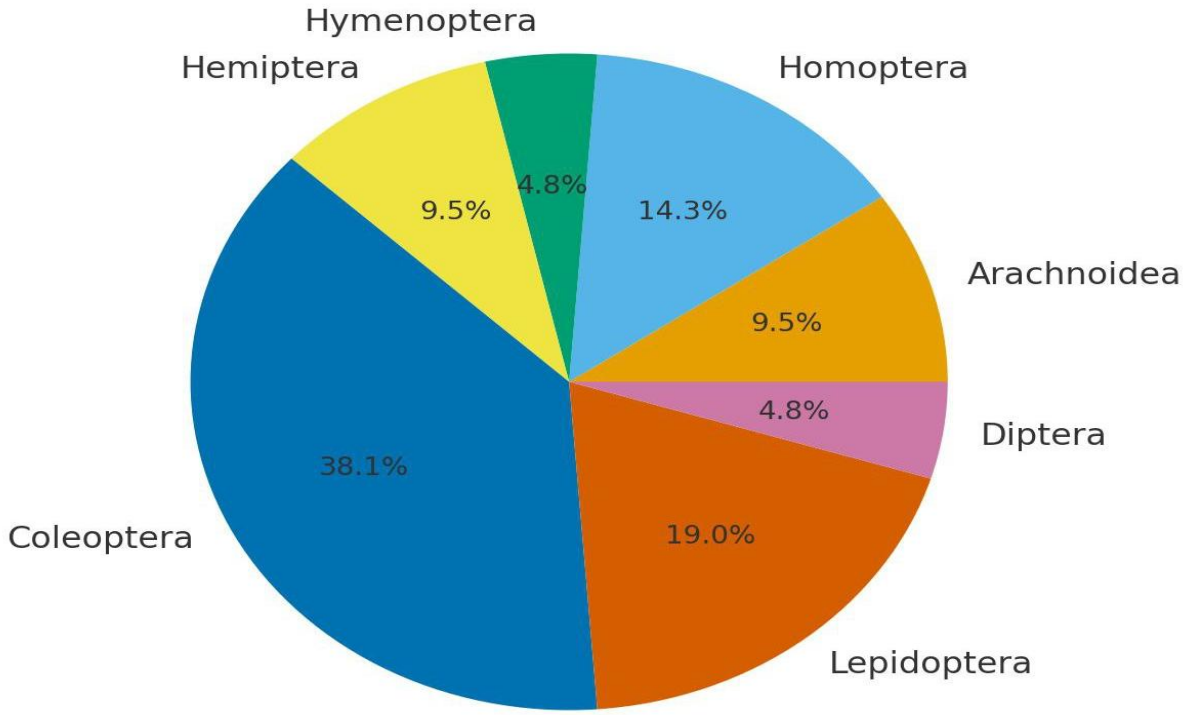
making up 4.8% of the harmful entomofauna.

The proportion of pest orders occurring in the agrobiocenosis of the subgenus Cerasus under the conditions of the Fergana Valley (2020–2025)



Overall, the analyses indicate that under the conditions of the Fergana Valley, the pest groups Coleoptera and Lepidoptera dominate in terms of both frequency of occurrence and level of damage within the cherry agrobiocenosis. This suggests that integrated pest management strategies should place particular emphasis on these two groups.

The analysis of the 48 beneficial entomophagous species recorded in the cherry agrobiocenosis shows that the largest proportions belong to the orders Diptera (27.1%) and Arachnida (27.1%). Representatives of Diptera—families Tachinidae, Sarcophagidae, and Syrphidae—are the primary natural enemies of moth, beetle, and aphid pests in cherry orchards. In particular, the larvae of Syrphidae (hoverflies) are distinguished by their effectiveness in regulating aphid populations.

Members of Arachnida—spiders and predatory mites such as Phytoseiulus corniger, Xysticus cristatus, and Tetragnatha spp.—are continuously active within the agrobiocenosis and naturally limit populations of mites such as Tetranychus urticae.

The proportion of entomophagous insect orders occurring in the agrobiocenosis of the subgenus Cerasus under the conditions of the Fergana Valley (2020–2025)

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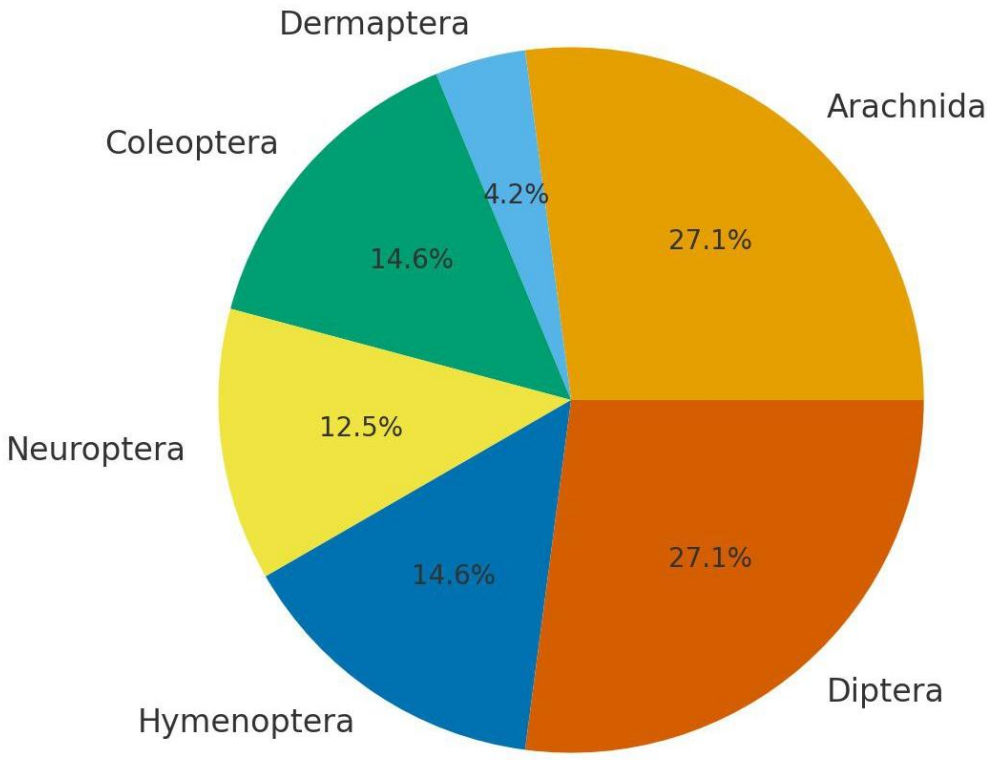

The next significant group is Coleoptera (14.6%), especially lady beetles such as Coccinella septempunctata, Exochomus quadripustulatus, and Chilocorus bipustulatus, which are among the most effective entomophagous predators of aphids, thrips, and other small phytophagous insects. Representatives of Hymenoptera (14.6%)—including Trichogramma species and parasitoid wasps such as Lathrolestes and Mesoleius—serve as natural egg parasitoids of moths and play an important role in controlling fruit moths and leaf-feeding pests.

Neuroptera (12.5%), represented by green lacewings (Chrysopa carnea, Chrysopa formosa), stand out as strong predators that rapidly reduce aphid populations in cherry orchards. The smallest proportion belongs to Dermaptera (4.2%), whose earwigs also play an important ecological role by feeding on aphids, thrips, and other small insects.

The results indicate that the high diversity of entomophagous insects in the cherry agrobiocenosis—particularly Diptera, Arachnida, Coleoptera, and Hymenoptera—naturally stabilizes pest populations. This, in turn, can reduce the use of chemical agents and enhance the effectiveness of integrated pest management (IPM) in cherry orchards.

Analyses of pests and their entomophagous enemies in the Fergana Valley during 2020–2025 show that the ecological system is complex and highly interconnected. Among pests, Coleoptera (38.1%) and Lepidoptera (19.0%) represent the largest proportions, indicating that beetles, weevils, bronze beetles, cherry borers, and caterpillars are the main risk factors in cherry orchards. High activity of Homoptera, particularly aphids, scale insects, and mealybugs, directly harms the vegetative development of plants.

Among entomophagous insects, the dominance of Diptera and Arachnida (each 27.1%) highlights the strong natural control mechanisms in cherry agrobiocenoses. In particular, populations of Syrphidae (hoverflies), Tachinidae (larval parasitoids), and predatory spiders help suppress pests without chemical interventions. The significant proportions of Coleoptera (lady beetles) and Hymenoptera (Trichogramma, Ichneumonidae) also play an important role in stabilizing pest populations in cherry orchards.

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