



"VARIETY, ECOLOGICAL FEATURES AND SIGNIFICANCE OF COCCINELLIDS (COLEOPTERA, COCCINELLIDAE) OF NATURAL AND ANTHROPOGENIC TERRITORIES OF KARAKALPAKSTAN"

Aytmuratova Malika Rasbergen kizi

Ecology

<https://doi.org/10.5281/zenodo.18951296>

ARTICLE INFO

Received: 07th March 2026

Accepted: 09th March 2026

Online: 11th March 2026

KEYWORDS

Coccinellidae, Karakalpakstan, biodiversity, ecological features, biological control, agroecosystems, desert ecosystems, entomofauna

ABSTRACT

Coccinellids (Coleoptera: Coccinellidae) are one of the most ecologically significant groups of predatory insects, playing a crucial role in regulating populations of phytophagous pests in natural and agricultural ecosystems. The fauna of coccinellids in Karakalpakstan, a region characterized by arid climate conditions and diverse landscapes influenced by both natural and anthropogenic factors, remains insufficiently studied. This paper examines the species diversity, ecological characteristics, and economic importance of lady beetles inhabiting natural ecosystems (deserts, tugai forests, steppe zones) and anthropogenic territories (agricultural fields, orchards, urban landscapes) of Karakalpakstan. Special attention is given to dominant and widespread species, their trophic specialization, seasonal dynamics, habitat preferences, and role in biological control. The analysis demonstrates that coccinellids contribute significantly to the stabilization of agroecosystems by suppressing aphids, scale insects, and other pests. The results highlight the necessity of conserving native species and integrating them into environmentally sustainable pest management systems..

Lady beetles (Coleoptera: Coccinellidae) represent a diverse and ecologically important family of beetles distributed worldwide. More than 6,000 species have been described globally, inhabiting a wide range of ecosystems from tropical forests to arid deserts. Most species are predatory and feed on aphids, scale insects, whiteflies, and mites, making them valuable natural enemies in biological pest control programs. Karakalpakstan, located in the northwestern part of Uzbekistan, is characterized by extreme continental climate conditions, desert and semi-desert landscapes, and significant anthropogenic transformation associated with irrigated agriculture. The ecological situation in the region has been strongly influenced by the Aral Sea crisis, which led to changes in vegetation cover, soil salinity, and microclimatic conditions. These factors directly affect insect diversity and distribution, including coccinellids.

Natural territories of Karakalpakstan include desert ecosystems (Kyzylkum desert fragments), tugai forests along the Amu Darya River, and steppe habitats. Anthropogenic landscapes consist of cotton and wheat fields, orchards, vegetable plantations, and urban green zones. Each of these habitats supports specific assemblages of coccinellid species adapted to particular ecological conditions. The study of coccinellid diversity in this region is essential for several reasons. First, lady beetles serve as bioindicators of ecosystem stability and biodiversity. Second, they play a key role in controlling agricultural pests, reducing the need for chemical insecticides. Third, understanding their ecological preferences contributes to the development of integrated pest management (IPM) strategies.[1] Despite their importance, the fauna of Coccinellidae in Karakalpakstan remains insufficiently documented. Previous entomological studies in Central Asia have primarily focused on economically significant species, while comprehensive ecological analyses are limited. Therefore, this work aims to summarize available data and analyze the variety, ecological features, and practical significance of coccinellids inhabiting natural and anthropogenic territories of Karakalpakstan.

The fauna of Coccinellidae in Karakalpakstan includes both widely distributed Palearctic species and regionally adapted desert forms. Among the most common and economically significant species are:

- *Coccinella septempunctata* – seven-spotted lady beetle
- *Adonia variegata* – variegated lady beetle
- *Hippodamia variegata*
- *Chilocorus bipustulatus*
- *Scymnus frontalis*

These species differ in body size, coloration, trophic specialization, and habitat preferences. For example, *Coccinella septempunctata* is a polyphagous predator feeding mainly on aphids in agricultural crops, while *Chilocorus bipustulatus* specializes in scale insects on trees and shrubs. Field observations indicate that more than 20 species may occur in different landscapes of Karakalpakstan, with species richness generally higher in irrigated agricultural areas compared to arid desert habitats.[2]

In natural desert and semi-desert habitats, coccinellids face extreme temperature fluctuations and low humidity. Species adapted to such conditions often exhibit behavioral and physiological adaptations, including seasonal diapause and sheltering under vegetation or soil cracks. For example, *Adonia variegata* is frequently found on desert shrubs infested with aphids. During peak summer temperatures, adults may reduce activity and seek microhabitats with higher humidity. In tugai forests along the Amu Darya River, species such as *Scymnus frontalis* inhabit tree canopies and feed on aphids colonizing poplar and willow species. Seasonal dynamics show that population peaks usually occur in spring and early summer when aphid populations increase. A second generation may develop in late summer if food resources remain sufficient.

Agricultural ecosystems of Karakalpakstan, particularly cotton and wheat fields, provide abundant food resources for predatory lady beetles. *Coccinella septempunctata* and *Hippodamia variegata* are dominant species in these habitats.[3]

Example: In cotton agroecosystems, aphids (*Aphis gossypii*) serve as primary prey. Observations show that one adult *Coccinella septempunctata* can consume up to 100 aphids

per day under favorable conditions. Such predatory activity significantly reduces pest density and supports biological control. In orchards, *Chilocorus bipustulatus* plays an important role in controlling scale insects on fruit trees. Urban green areas also support diverse coccinellid assemblages, contributing to pest suppression in ornamental plants. However, intensive pesticide application negatively affects coccinellid populations, leading to decreased biodiversity and disruption of natural regulation mechanisms.

Coccinellids are key components of integrated pest management systems. Their advantages include:

- High reproductive potential
- Strong predatory capacity
- Ability to disperse and locate prey
- Adaptation to local climatic conditions

Conservation of native species through reduced pesticide use, maintenance of shelter belts, and diversification of crops enhances their effectiveness. Artificial introduction of local species into greenhouse systems can further strengthen pest control.[4]

Environmental degradation, salinization, and habitat loss threaten insect diversity in Karakalpakstan. Protecting natural tugai forests and reducing chemical load in agriculture are essential for maintaining stable coccinellid populations. Long-term monitoring of species composition and abundance is recommended to assess ecological changes and develop conservation strategies. The diversity and ecological significance of coccinellids in Karakalpakstan reflect the adaptability of this insect family to both natural desert environments and anthropogenic agricultural landscapes. The region hosts a combination of widely distributed Palearctic species and locally adapted forms capable of surviving under extreme climatic conditions. In natural ecosystems such as deserts and tugai forests, lady beetles contribute to maintaining trophic balance by regulating phytophagous insect populations. Their seasonal cycles are closely linked to prey availability and climatic factors.[5]

Adaptations such as diapause and habitat selection enable them to survive harsh summer conditions. In agricultural and urban territories, coccinellids play a crucial role in biological pest control. Dominant species like *Coccinella septempunctata* and *Hippodamia variegata* significantly reduce aphid populations in cotton and wheat fields. Specialized predators such as *Chilocorus bipustulatus* help manage scale insects in orchards. Thus, these beetles contribute to crop protection and reduce dependence on chemical pesticides. Sustainable management practices, including reduced pesticide application, habitat conservation, and support of natural vegetation strips, are essential to preserve coccinellid biodiversity. Integration of native predatory species into IPM systems enhances ecological stability and agricultural productivity. In conclusion, the study of species composition, ecological features, and economic importance of Coccinellidae in Karakalpakstan provides a scientific basis for biodiversity conservation and sustainable agriculture development in arid regions.

References:

1. Savoyskaya G.I. Mares (Coccinellidae) of the Fauna of the USSR. - L.: Science, 1983.
2. Kuznetsov V.N. Entomophages of agricultural crops of Central Asia. - Tashkent: Fan, 1992.

3. Mamayev B.M., Medvedev L.N., Pravdin F.N. Determinant of insects of the European part of the USSR. - M.: Prosveshchenie, 1976.
4. Yakhontov V.V. Pests of agricultural crops and forest plantations. - M.: Kolos, 1969.
5. Zakhvatkin Yu.A. Ecology of insects. - M.: Kolos, 2001.

