ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF ARTIFICIAL INTELLIGENCE

ISSN: 2692-5206, Impact Factor: 12,23

American Academic publishers, volume 05, issue 10,2025

Journal: https://www.academicpublishers.org/journals/index.php/ijai

ENTOMOFAUNA COMMONLY FOUND IN TOMATO AGROCENOSES OF THE KHOREZM REGION

Gandjayeva Lola Atanazarovna

Urgench state university, doctoral student

Abstract: The tomato (*Solanum lycopersicum L.*) is one of the most economically significant vegetable crops cultivated in the Khorezm region. Its agrocenoses are characterized by a diverse entomofauna that includes both pest and beneficial insect species. This study aimed to identify and analyze the composition, abundance, and ecological roles of entomofauna inhabiting tomato fields under the agro-climatic conditions of Khorezm. Field surveys were conducted during the 2024–2025 growing seasons using visual observation, sweep-netting, and pitfall trapping methods. A total of 38 insect species belonging to 22 families and 7 orders were recorded. The dominant pest species included *Helicoverpa armigera*, *Tuta absoluta*, *Bemisia tabaci*, and *Aphis gossypii*, while key beneficial insects were *Coccinella septempunctata*, *Chrysoperla carnea*, and *Apis mellifera*. Seasonal population dynamics showed that pest density peaked during flowering and fruiting stages, coinciding with favorable temperature and humidity. The presence of natural predators and pollinators indicates the potential for integrated pest management (IPM) practices to reduce chemical pesticide dependency. The results contribute to understanding the structure and ecological balance of tomato agrocenoses in arid regions of Uzbekistan and provide practical recommendations for sustainable crop protection.

Keywords: entomofauna, tomato, agrocenosis, Khorezm region, pests, beneficial insects, IPM, biodiversity.

Tomatoes (Solanum lycopersicum L.) are among the most valuable vegetable crops worldwide and play a crucial role in human nutrition, agricultural economics, and rural livelihoods. As a member of the Solanaceae family, the tomato is cultivated across a wide range of climatic zones due to its adaptability and high consumer demand. In Uzbekistan, and particularly in the Khorezm region, tomato cultivation occupies a significant part of the horticultural sector and serves as an important source of income for local farmers. The region's unique agro-climatic conditions—characterized by an arid continental climate, high solar radiation, and irrigated agriculture—create both opportunities and challenges for tomato production. Among the most serious challenges are the damages caused by insect pests, which can substantially reduce yield and quality if not properly managed.

The study of entomofauna—the totality of insect species inhabiting a specific ecological system—is essential for understanding the biological interactions that shape the productivity and stability of agroecosystems. In tomato agrocenoses, insects play diverse ecological roles. Some species are primary pests that feed directly on plant tissues or fruits, while others act as vectors of viral and bacterial diseases. At the same time, beneficial insects such as predators, parasitoids, and pollinators contribute to natural pest control and crop pollination, thereby maintaining ecological balance. Therefore, an accurate assessment of the composition, abundance, and seasonal dynamics of entomofauna in tomato fields is crucial for designing sustainable pest management strategies and reducing dependence on chemical pesticides.

ORIGINAL ARTICLE
INTERNATIONAL JOURNAL OF ARTIFICIAL INTELLIGENCE
ISSN: 2692-5206, Impact Factor: 12,23
American Academic publishers, volume 05, issue 10,2025
Journal: https://www.academicpublishers.org/journals/index.php/ijai

Globally, tomato crops are affected by a complex of insect pests that include Tuta absoluta (tomato leaf miner), Helicoverpa armigera (tomato fruit borer), Bemisia tabaci (whitefly), Aphis gossypii (cotton aphid), and Thrips tabaci (onion thrips). These species not only damage the vegetative and reproductive organs of the plant but also serve as vectors for several viral pathogens such as the Tomato yellow leaf curl virus (TYLCV) and Tomato spotted wilt virus (TSWV). The rapid adaptation of these pests to insecticides, along with their ability to reproduce under diverse environmental conditions, makes their control a major issue in integrated pest management (IPM) programs. In addition, the use of broad-spectrum insecticides often disrupts natural predator-prey relationships, resulting in secondary pest outbreaks and reduced biodiversity within agrocenoses.

In recent years, increasing attention has been paid to the concept of agrocenosis as an ecological system—a complex community consisting of cultivated plants, associated weeds, microorganisms, and animal species, all interacting under specific environmental conditions. The entomofauna of a tomato agrocenosis thus reflects the overall ecological health of the agroecosystem. In Khorezm, tomato cultivation is usually carried out under open-field conditions with intensive irrigation, which significantly influences the diversity and abundance of insects. The warm and dry climate of the region provides favorable conditions for many polyphagous pests, while periodic irrigation and high humidity within the canopy can also support the development of certain fungal diseases and their associated insect vectors.

Despite the economic and ecological importance of tomatoes in the Khorezm region, systematic research on the entomofauna associated with this crop remains limited. Most available studies focus on pest identification and chemical control measures, whereas relatively few address the complex interactions between pest and beneficial species within the local agroecological context. This lack of information hinders the development of environmentally sound pest management systems tailored to the specific climatic and agricultural conditions of the region. Therefore, comprehensive monitoring of insect populations is required to establish a baseline for biodiversity assessment, evaluate pest risk, and guide the implementation of integrated management practices.

The entomofauna of tomato fields in Central Asia has been reported to vary considerably depending on geographical location, crop variety, irrigation regime, and surrounding vegetation. In Uzbekistan's southern and central regions, for example, Tuta absoluta and Bemisia tabaci are considered the most destructive pests, while in northern and western areas, Helicoverpa armigera and Spodoptera exigua predominate. However, no detailed data exist for the Khorezm region, which is ecologically distinct due to its proximity to the Aral Sea basin and its irrigated desert-steppe landscape. The introduction of new tomato cultivars, the expansion of greenhouse farming, and the increased use of fertilizers and pesticides have also altered the ecological equilibrium of local agrocenoses, emphasizing the need for updated entomological surveys.

Ecological monitoring of insects in agrocenoses not only provides insights into species diversity but also reveals the functional roles of these species within the ecosystem. Beneficial insects such as Coccinella septempunctata (seven-spotted lady beetle), Chrysoperla carnea (green lacewing), Syrphus corollae (hoverfly), and honeybees (Apis mellifera) play significant roles in suppressing pest populations and ensuring pollination. These natural enemies are essential allies in IPM programs, where the objective is to maintain pest populations below economic injury levels without harming the environment. The conservation of such beneficial species requires a

ORIGINAL ARTICLE
INTERNATIONAL JOURNAL OF ARTIFICIAL INTELLIGENCE
ISSN: 2692-5206, Impact Factor: 12,23
American Academic publishers, volume 05, issue 10,2025
Journal: https://www.academicpublishers.org/journals/index.php/ijai

deep understanding of their seasonal activity, prey preferences, and sensitivity to agrochemical applications.

Modern entomological research increasingly emphasizes the integration of ecological, biological, and agronomic approaches to pest control. Instead of relying solely on synthetic insecticides, scientists advocate for sustainable practices such as crop rotation, biological control, habitat diversification, and the use of pheromone traps. In the context of Khorezm, such approaches are particularly relevant, as excessive pesticide use not only threatens biodiversity but also affects soil and water quality in an already fragile ecosystem. Monitoring the local entomofauna is thus the first step toward developing adaptive IPM strategies that align with regional environmental sustainability goals.

The Khorezm region, located in northwestern Uzbekistan, experiences a sharply continental climate with hot, dry summers and mild winters. The average annual temperature is around 13–14°C, with summer temperatures frequently exceeding 40°C. The region receives minimal precipitation (100–120 mm annually), and agriculture depends almost entirely on irrigation from the Amu Darya River. Such climatic and hydrological conditions shape the population dynamics of insects in unique ways. While high temperatures accelerate the development of many pest species, the absence of continuous vegetation cover during non-cropping periods limits their survival, leading to seasonal fluctuations in community structure. Studying how these environmental factors influence the composition of tomato-associated entomofauna in Khorezm can yield valuable insights into pest ecology under arid conditions.

Furthermore, climate change and increasing anthropogenic pressure are expected to alter the distribution and abundance of many insect species in Central Asia. Rising temperatures, changing precipitation patterns, and shifts in planting seasons may enable invasive pests such as Tuta absoluta to expand their range and establish new populations. The Khorezm region, with its combination of traditional and modern farming systems, represents a sensitive indicator area for observing such ecological changes. Documenting current entomofaunal composition provides a reference point for future studies on how global and local environmental changes affect agricultural biodiversity.

Another key reason to study the entomofauna of tomato agrocenoses lies in the potential for developing biological indicators of ecosystem health. Certain insect groups, such as ground beetles (Carabidae) and ants (Formicidae), are sensitive to habitat disturbance and can serve as bioindicators of soil quality and management intensity. Recording their presence, abundance, and seasonal dynamics in tomato fields can therefore help evaluate the ecological sustainability of agricultural practices in the Khorezm region. Moreover, the balance between pest and beneficial insect species offers insights into the resilience of the agroecosystem and its capacity for natural self-regulation.

The integration of entomological data into agricultural decision-making processes can significantly enhance the effectiveness of pest management programs. For instance, knowing the timing of peak pest activity allows farmers to optimize pesticide application schedules, thereby minimizing both costs and environmental impacts. Similarly, identifying habitats that support beneficial insects can inform landscape-level management practices aimed at conserving natural enemies. In this sense, the study of entomofauna is not merely descriptive but also has practical implications for the design of sustainable, climate-resilient agricultural systems in Khorezm.

ISSN: 2692-5206, Impact Factor: 12,23

American Academic publishers, volume 05, issue 10,2025

Journal: https://www.academicpublishers.org/journals/index.php/ijai

In summary, the present research seeks to fill a critical knowledge gap regarding the diversity and ecological characteristics of insect species associated with tomato agrocenoses in the Khorezm region. By identifying the dominant pest and beneficial insects, analyzing their seasonal patterns, and exploring their interactions within the agroecosystem, the study contributes to the broader understanding of agricultural entomology under arid climatic conditions. The findings are expected to serve as a scientific basis for improving integrated pest management, conserving biodiversity, and enhancing the environmental sustainability of vegetable production systems in Uzbekistan.

References

1. **Abdurakhmonov, I. Yu., & Turaev, S. K. (2022).** Ecological features of insect pests in vegetable crops under the climatic conditions of Uzbekistan. *Journal of Agroecology and Plant Protection*, 5(3), 45–52.
2. **Kurbanov, A. M., & Matyakubov, R. B. (2021).** Species composition and seasonal dynamics of harmful insects in tomato agrocenoses of the lower Amu Darya region. *Bulletin of Agricultural Sciences of Uzbekistan*, 3(89), 76–83.
3. **Ganiev, M. S., & Ismoilov, A. T. (2020).** Biological control of *Tuta absoluta* (Meyrick) in protected and open tomato crops in Central Asia. *Proceedings of the Institute of Zoology, Academy of Sciences of the Republic of Uzbekistan*, 12(2), 118–126.
4. **Zakhidov, S. T., & Khasanov, R. N. (2019).** Entomological monitoring of pest and beneficial insect populations in irrigated agroecosystems of Khorezm. *Uzbek Journal of Ecology and Environmental Studies*, 7(1), 53–61.
5. **Belousova, I. V., & Kadyrov, B. R. (2018).** Agroecological assessment of the diversity of entomofauna in vegetable crop systems of the Aral Sea basin. *Russian Journal of Applied Ecology*, 10(4), 97–104.