



THE IMPORTANCE OF SYNANTHROPIC INSECTS AS INDICATORS OF SANITARY CONDITIONS IN THE KHOREZM OASIS

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Abstract. Synanthropic insects are insect species that live in close association with humans and human-modified environments. They are commonly found in residential buildings, food storage facilities, livestock shelters, markets, gardens, waste accumulation areas, and other anthropogenic habitats. This thesis examines the importance of synanthropic insects as indicators of sanitary conditions in the Khorezm Oasis. Although not all synanthropic insects are parasitic or direct vectors of diseases, their presence, abundance, habitat preference, and seasonal activity may reflect the level of hygiene, food storage quality, waste management, humidity, organic pollution, and general ecological stability of human settlements. The study focuses mainly on non-parasitic synanthropic insects that are associated with human environments but do not directly parasitize humans or animals.

The results of the analysis suggest that different ecological groups of synanthropic insects indicate different sanitary problems. Stored-product insects may indicate poor storage conditions, excessive humidity, and long-term accumulation of grain or food products. Saprophagous insects are usually associated with organic waste, decomposing plant residues, and unsanitary surroundings. Household insects may indicate food remains, cracks in buildings, poor ventilation, and insufficient cleaning. Therefore, regular monitoring of synanthropic insects can be used as an effective method for evaluating sanitary conditions in urban and rural areas of the Khorezm Oasis. The study has both theoretical and practical significance. From a theoretical perspective, it contributes to the understanding of insect ecology in anthropogenic landscapes. From a practical perspective, it may help improve sanitary control, prevent food contamination, protect stored agricultural products, and develop environmentally safe pest management strategies.

Keywords: synanthropic insects, sanitary condition, Khorezm Oasis, bioecology, urban environment, indicator species.

Introduction. The Khorezm Oasis is one of the most specific ecological regions of Uzbekistan. It is located in the lower part of the Amu Darya basin and is characterized by a dry continental climate, hot summers, cold winters, irrigated agriculture, rural settlements, urbanized areas, and traditional household food storage systems. These ecological and social conditions create favorable habitats for different groups of insects that are closely connected with human activity. Among these insects, synanthropic species occupy a special place. Synanthropic insects are species that live near humans

and use human-created environments for feeding, reproduction, shelter, and survival. They can be found in houses, markets, food warehouses, barns, gardens, livestock shelters, waste sites, and other areas influenced by human activity. The study of synanthropic insects is important because their presence often reflects the sanitary condition of the environment. Insects are sensitive to changes in food availability, humidity, waste accumulation, building structure, and hygiene level. Therefore, they may serve as biological indicators of environmental and sanitary problems. In many cases, the appearance of synanthropic insects in large numbers is not accidental. It may show that food products are stored improperly, organic waste is not removed regularly, humidity is too high, buildings have cracks or hidden shelters, or sanitary measures are insufficient. For this reason, studying synanthropic insects in the Khorezm Oasis is important for ecology, public hygiene, agriculture, and food safety.

Purpose of the Study. The main purpose of this thesis is to analyze the role of synanthropic insects as biological indicators of sanitary conditions in the Khorezm Oasis.

Objectives of the Study. The main objectives are:

1. To describe the ecological groups of synanthropic insects found in anthropogenic habitats.
2. To explain the relationship between synanthropic insects and sanitary conditions.
3. To identify which insect groups may indicate specific sanitary problems.
4. To analyze the importance of insect monitoring in residential, agricultural, and storage environments.
5. To propose practical recommendations for improving sanitary control in the Khorezm Oasis.

Scientific Novelty. The scientific novelty of this thesis is connected with the interpretation of synanthropic insects not only as common inhabitants of human settlements, but also as biological indicators of sanitary and ecological conditions. In the Khorezm Oasis, these insects can provide useful information about the state of food storage, waste management, household hygiene, humidity, and ecological imbalance in anthropogenic habitats.

Materials and Methods. The study is based on ecological analysis of synanthropic insects associated with human-modified habitats in the Khorezm Oasis. The main attention is given to non-parasitic insects that do not directly parasitize humans or domestic animals but live close to human activity. The following habitat types were considered:

- residential houses;
- food storage facilities;
- markets and food-selling areas;
- livestock shelters;



- gardens and orchards;
- irrigated agricultural fields;
- waste accumulation areas;
- household and farm buildings.

The insects were analyzed according to their ecological groups, feeding behavior, habitat preference, seasonal activity, and sanitary significance. The study used a descriptive and analytical approach. The presence and abundance of insect groups were interpreted as possible indicators of different sanitary conditions.

Table 1. Main Anthropogenic Habitats of Synanthropic Insects in the Khorezm Oasis

№	Habitat type	Main ecological conditions	Possible insect groups	Sanitary importance
1	Residential houses	Food remains, warmth, cracks, hidden shelters	Household insects, omnivorous insects	May indicate poor cleaning, food remains, or building defects
2	Food storage facilities	Grain, flour, dried fruits, seeds, humidity	Stored-product insects	May indicate poor storage and risk of food contamination
3	Markets	Food waste, organic residues, human activity	Saprophagous and omnivorous insects	May indicate weak waste management
4	Livestock shelters	Manure, plant residues, high organic matter	Saprophagous insects	May indicate organic pollution and poor sanitation
5	Gardens and orchards	Plants, irrigation, plant residues	Phytophagous and omnivorous insects	May indicate plant damage or ecological imbalance
6	Waste areas	Decomposing organic matter, moisture	Saprophagous insects	May indicate unsanitary conditions
7	Agricultural fields	Crop plants, irrigation, soil humidity	Phytophagous insects	May indicate pest activity and crop vulnerability

Results and Discussion 1. Synanthropic Insects as Biological Indicators

Synanthropic insects can be considered biological indicators because their presence reflects certain ecological and sanitary conditions. Unlike chemical or physical indicators, insects are living organisms that respond to long-term environmental conditions. Their abundance may show that a habitat provides enough food, shelter, humidity, and breeding opportunities. For example, if stored-product insects are found in large numbers in a grain warehouse, this may indicate that grain has been stored for a long time, ventilation is weak, or humidity is not controlled. If saprophagous insects are common near houses or livestock buildings, this may indicate accumulation of organic waste or insufficient cleaning. If household insects are repeatedly found inside buildings, this may show that food remains are available or that buildings have cracks and hidden shelters. Thus, synanthropic insects can be used as natural warning signs of sanitary problems.

2. Ecological Groups of Synanthropic Insects and Their Sanitary Meaning

Synanthropic insects are not a single uniform group. They include species with different feeding habits and ecological roles. In the Khorezm Oasis, the most important groups include stored-product insects, saprophagous insects, phytophagous insects, omnivorous insects, and household-associated insects. Stored-product insects are mainly connected with grain, flour, seeds, dried fruits, and other stored food materials. Their presence is especially important because they may damage food products and reduce their quality. These insects may also indicate unsuitable storage conditions. Saprophagous insects feed on decomposing organic matter. They may be found in places where food waste, manure, plant residues, or other organic materials accumulate. In small numbers, they participate in decomposition processes. However, their mass development may indicate poor sanitation. Phytophagous insects are associated with plants in gardens, orchards, and agricultural fields. Their presence may indicate plant damage, seasonal vegetation growth, or ecological changes in irrigated landscapes. Omnivorous insects have high ecological plasticity. They can feed on different food sources and survive in unstable human environments. Their presence may indicate the availability of mixed organic materials and poor environmental control.

Household-associated insects live mainly inside or around human dwellings. They often use food remains, warm places, and hidden shelters. Their occurrence may reflect the sanitary level of residential buildings.

Table 2. Ecological Groups of Synanthropic Insects and Their Indicator Value

№	Ecological group	Main food source	Typical habitat	What they may indicate
1	Stored-product insects	Grain, flour, seeds, dried fruits	Warehouses, kitchens, storage rooms	Poor storage, high humidity, food contamination risk

2	Saprophagous insects	Decomposing organic matter	Waste areas, livestock shelters, markets	Organic pollution, weak waste removal, poor sanitation
3	Phytophagous insects	Living plants and plant parts	Gardens, orchards, crop fields	Plant damage, vegetation imbalance, irrigation influence
4	Omnivorous insects	Mixed food sources	Houses, markets, farms	Food remains, ecological plasticity, sanitation problems
5	Household insects	Food residues, household organic matter	Kitchens, basements, cracks, storage rooms	Poor cleaning, hidden shelters, building defects

3. Influence of Climate on Synanthropic Insects in the Khorezm Oasis

The climate of the Khorezm Oasis has a direct influence on the development and seasonal activity of synanthropic insects. The region has hot and dry summers, cold winters, and limited natural humidity. However, irrigation systems, household water use, gardens, and storage buildings create artificial microhabitats where insects can survive. During spring, insect activity increases because temperature rises and food sources become more available. In summer, high temperatures accelerate insect development and reproduction. This period is usually the most favorable for many synanthropic insects. In autumn, activity decreases gradually, but some insects move into buildings and storage places. In winter, many species survive in protected shelters, cracks, warehouses, or household environments. Therefore, the presence of synanthropic insects in the Khorezm Oasis is influenced not only by natural climate but also by human-created microclimatic conditions.

Table 3. Seasonal Activity of Synanthropic Insects in the Khorezm Oasis

№	Season	Environmental condition	Insect activity level	Sanitary interpretation
1	Spring	Rising temperature, vegetation growth	Activity begins to increase	Start of reproduction and population growth
2	Summer	High temperature, irrigation, food availability	Highest activity	Increased risk of stored-product damage and waste-related insects
3	Autumn	Cooling temperature, harvest storage	Moderate activity	Movement into storage rooms and buildings

4	Winter	Low temperature, protected shelters	Low visible activity	Survival in houses, warehouses, cracks, and hidden places

4. Synanthropic Insects and Sanitary Conditions. The sanitary condition of a settlement can be evaluated by observing the type and abundance of synanthropic insects. If a habitat contains many insects connected with food waste, this may indicate that organic residues are not removed regularly. If stored-product insects are common, this may indicate problems in food preservation. If insects are frequently found inside houses, this may suggest that cleaning, ventilation, or building maintenance is insufficient. In this sense, synanthropic insects can help identify hidden sanitary problems before they become more serious. For example, a warehouse may look clean from the outside, but the presence of grain insects may show that food products are already damaged. Similarly, a livestock shelter may appear normal, but high numbers of saprophagous insects may indicate excessive organic accumulation. This indicator function is especially important for the Khorezm Oasis, where many households store agricultural products for long periods. Grain, flour, dried fruits, vegetables, and seeds are often kept in houses or storage rooms. If storage conditions are not controlled, insects may develop quickly and cause economic loss.

Table 4. Sanitary Problems Indicated by Synanthropic Insects

№	Observed insect situation	Possible sanitary problem	Recommended preventive measure
1	Many insects in grain or flour storage	Poor storage, high humidity, long-term storage	Improve ventilation, dry products, inspect storage regularly
2	Insects near organic waste	Waste accumulation, poor cleaning	Remove waste regularly, close containers, clean area
3	Insects in kitchens or food rooms	Food remains, open products, poor hygiene	Store food in closed containers, clean surfaces
4	Insects in livestock shelters	Manure accumulation, organic pollution	Regular cleaning, manure removal, dry bedding
5	Insects in cracks and hidden places	Building defects, shelters for insects	Seal cracks, repair walls and floors
6	Insects appearing every summer	Seasonal reproduction and favorable microclimate	Start monitoring in spring before population growth

5. Practical Importance of Monitoring. Regular monitoring of synanthropic insects is necessary for maintaining sanitary conditions. Monitoring does not mean only counting insects. It also includes identifying where they appear, when they become



active, which food sources they use, and what environmental conditions support their development.

In the Khorezm Oasis, monitoring should be conducted especially in:

- food storage facilities;
- grain warehouses;
- markets;
- livestock shelters;
- residential houses;
- school and public kitchens;
- waste collection points;
- gardens and irrigated areas.

Monitoring can help prevent insect population growth before it becomes a serious problem. It can also reduce the need for excessive chemical insecticide use. Preventive sanitation, proper storage, humidity control, and regular cleaning are usually more effective and safer than uncontrolled chemical treatment.

Table 5. Suggested Monitoring Criteria for Synanthropic Insects

No	Criterion	What should be observed	Importance
1	Habitat location	Where insects are found	Helps identify the source of the problem
2	Population abundance	Few, moderate, or many insects	Shows the level of sanitary risk
3	Seasonal timing	Month or season of appearance	Helps plan preventive measures
4	Food source	Grain, waste, plants, household food	Shows ecological group and risk type
5	Humidity level	Dry, moderate, humid conditions	Important for storage and household control
6	Sanitation condition	Clean, moderately polluted, polluted	Helps connect insects with hygiene problems
7	Repeated occurrence	One-time or regular appearance	Shows whether the problem is temporary or permanent

Recommendations. Based on the analysis, the following recommendations can be proposed:

1. Food products should be stored in dry, clean, and well-ventilated places.
2. Grain, flour, seeds, and dried fruits should be inspected regularly.
3. Organic waste should be removed from residential and market areas in time.
4. Livestock shelters should be cleaned regularly to reduce organic pollution.



5. Cracks in walls, floors, and storage rooms should be repaired.
6. Insect monitoring should begin in early spring before summer population growth.
7. Chemical control should be used only when necessary and according to safety rules.
8. Preventive sanitation should be considered the main method of control.

Conclusion. Synanthropic insects play an important role in indicating sanitary and ecological conditions in the Khorezm Oasis. Their presence, abundance, habitat preference, and seasonal dynamics can provide valuable information about hygiene level, food storage quality, waste management, humidity, and organic pollution. Different ecological groups of synanthropic insects indicate different environmental problems. Stored-product insects are mainly associated with poor storage and food contamination risk. Saprophagous insects may indicate organic waste accumulation and poor sanitation. Household insects may show the presence of food remains, hidden shelters, and insufficient cleaning. Phytophagous insects reflect the condition of gardens, orchards, and irrigated agricultural landscapes. The Khorezm Oasis has specific climatic and anthropogenic conditions that support the development of synanthropic insects. Hot summers, irrigation, rural settlements, household storage systems, and organic waste create favorable habitats for many species. Therefore, regular monitoring of these insects is important for improving sanitary conditions, protecting food products, and maintaining ecological balance. The use of synanthropic insects as biological indicators can become an effective tool for ecological assessment and sanitary control. Such an approach is practical, environmentally safer, and suitable for both urban and rural areas of the Khorezm Oasis.

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