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BIOECOLOGICAL CHARACTERISTICS OF MAJOR PESTS OF MEDICINAL CHAMOMILE (MATRICARIA CHAMOMILLA L.) CULTIVATED IN FORESTRY ENTERPRISES

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Abstract. This thesis synthesizes published evidence on the pest complex, seasonal development and ecological determinants of insect infestations in chamomile, with attention to the conditions of medicinal-plant cultivation in Uzbekistan. Peer-reviewed investigations identify aphids, thrips and several heteropteran insects as relevant field-associated species, while stored dried flowers may be attacked by storage insects. The paper outlines a monitoring-based integrated pest management framework combining species identification, phenological observations, habitat management and conservation of natural enemies. Findings reported from other countries are distinguished from field observations in Uzbekistan; site-specific pest prevalence and damage thresholds require verification in forestry-enterprise plantations.

Keywords: Matricaria chamomilla, medicinal plants, forestry enterprises, aphids, thrips, pest bioecology, phytosanitary monitoring, integrated pest management.

INTRODUCTION

Medicinal chamomile (Matricaria chamomilla L.; also encountered in literature under the synonym Matricaria recutita L.) is cultivated for its capitula, which contain biologically active constituents used in medicinal preparations. The commercial value of the crop depends not only on biomass production but also on the cleanliness, integrity and proper drying of inflorescences. For forestry enterprises diversifying into medicinal-plant production, protection measures should be compatible with biodiversity conservation and the stringent quality requirements of medicinal raw material.

Uzbek researchers Sh. Mirzayev and S. Khusanov reviewed the biological and medicinal properties of chamomile, while A. Safarov and O. Nutfilloyeva examined how cultivation factors and ecological conditions influence its growth. Z. Nosirova and S. Muminov addressed pest control in chamomile in a domestic plant-protection journal, and their more recent work specifically considered the use of green lacewings against aphids. These studies provide a local scientific foundation, but quantitative species composition in any particular forestry enterprise must be established by local sampling rather than inferred from publications.

The aim of this thesis is to characterize the major pest groups associated with cultivated medicinal chamomile, explain their bioecological features, and develop a practical phytosanitary monitoring and ecologically oriented management approach for forestry-enterprise conditions.

MAIN BODY

Pest complex and damage mechanisms. A recent field investigation of chamomile in India recorded Aphis gossypii, Nysius cymoides, Nesidiocoris tenuis and Thrips tabaci, alongside predatory ladybirds and lacewings. A broader review of German chamomile production reports multiple pest families, including Thripidae and Miridae, with injuries to vegetative and reproductive organs. These observations establish candidate taxa for field surveys; they do not establish that all such taxa occur at economically significant densities in Uzbek forestry plantations.

Aphids form colonies on tender shoots, leaves and developing reproductive structures. Their phloem feeding can weaken growth, while honeydew may promote secondary surface contamination. Thrips feed by piercing and sucking epidermal cell contents and may affect the appearance of foliage and flowers. Heteropteran species associated with chamomile may differ in trophic status; therefore, individual species, including N. tenuis, should not automatically be classified as economically harmful

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without observing actual plant injury. Damage to flower heads deserves special attention because inflorescences constitute the harvested commodity.

Table 1. Literature-informed pest groups and recommended monitoring indicators. Species occurrence and economic status must be confirmed locally.

Pest group / example	Bioecological features	Potential risk to chamomile	Field assessment
Aphids — Aphis gossypii; Aphis fabae reported in other studies	Rapid colony development on succulent tissues; abundance depends on weather and natural enemies	Sap removal, distortion, contamination of harvestable material	Infested shoots per sample; aphids per shoot; predator abundance
Thrips — Thrips tabaci	Small concealed insects; activity linked to crop stage and local microclimate	Feeding injury on foliage and floral tissues	Individuals per flower/head; visual injury score
Plant bugs — Nysius cymoides and other Heteroptera	Species-specific feeding and seasonal activity	Possible injury to reproductive organs; confirm damage by observation	Adults/nymphs per sampling unit; flower-head damage
Storage insects — e.g., Plodia interpunctella	Development in improperly protected dried material	Feeding, webbing and contamination during storage	Trap counts; damaged samples; storage hygiene audit

Seasonal dynamics and environmental drivers. Phenology, temperature, humidity, crop density and surrounding vegetation influence insect activity. In the 2026 Indian field study, aphids and T. tabaci were observed from the first standard meteorological week, with aphids peaking in week 5 and thrips in week 8; N. cymoides peaked in week 9. These dates describe the climate and sowing schedule of that experiment and cannot be transferred directly to Uzbekistan. Monitoring should instead begin at seedling establishment and continue through budding, flowering, harvest and postharvest storage.

Forestry-managed cultivation sites may differ from open-field farms in wind exposure, shade, irrigation regimes, neighboring vegetation and the availability of natural enemies. Such habitat differences can affect pest colonization and predator persistence. Accordingly, temperature and relative humidity should be recorded alongside insect abundance, and comparisons should be made among plots with different microhabitats. Plant phenology should be recorded using a consistent scale, because changes in the number of flower heads can affect apparent insect density.

Monitoring protocol and ecological management. A practical research protocol is to establish replicated permanent observation plots within each forestry enterprise and inspect them at 7–10-day intervals, with additional visits during outbreaks. At each inspection, examine a fixed number of plants selected systematically across plot edges and interiors; separately count insects on shoots and flower heads. Identify specimens to species level where feasible, using specialist confirmation for morphologically similar taxa. Record weather, irrigation, phenological stage, plant damage, natural enemies and flower-head yield. These are proposed methodological recommendations, not results of a completed field experiment.

The integrated management approach should prioritize clean planting material, weed and residue management, balanced irrigation and fertilization, timely harvesting, and the conservation of predators. Ladybirds (Coccinella septempunctata, Cheilomenes sexmaculata) and the green lacewing Chrysoperla carnea were recorded in the chamomile pest complex studied by Yadav and colleagues. Uzbek authors Nosirova and Muminov also examined lacewing use against aphids and reported a predator-to-prey

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ratio of 1:10 in their study; this ratio should be regarded as a study-specific result rather than a universally validated release recommendation.

Where intervention is necessary, preference should be given to legally registered, crop-appropriate biological or other low-residue products, with documented efficacy and compliance with medicinal-plant residue requirements. Older literature may mention hazardous fumigants or insecticides; such historical recommendations must not be adopted without checking current registration, worker safety and residue standards. Dried flowers should be stored under controlled moisture and hygienic conditions because stored-product insects, including Plodia interpunctella and several beetles, can damage and contaminate the drug material.

Research priorities for forestry enterprises in Uzbekistan. The principal scientific tasks are to establish a verified local species inventory, estimate seasonal population trajectories, quantify flower-head injury and yield losses, and identify natural-enemy complexes under forestry-enterprise microclimates. A comparative assessment of forest-edge and open plots would clarify whether adjacent woody vegetation modifies pest pressure or biological control. Further studies should assess essential-oil and raw-material quality alongside yield, because visual damage alone may not capture the full economic consequences of infestation. Until these measurements are obtained, it is not scientifically justified to state specific infestation percentages, yield losses or control efficacies for Uzbek forestry enterprises.

CONCLUSION

The published evidence identifies aphids, thrips and selected heteropteran insects as important organisms to monitor in medicinal chamomile, while storage pests create additional risks after harvest. Their economic importance is determined by species identity, population density, crop phenology, microclimate and natural-enemy activity. For forestry enterprises, the most defensible approach is regular species-level monitoring combined with preventive agronomic measures, conservation of beneficial insects and careful protection of medicinal raw-material quality. Recent Uzbek publications demonstrate growing interest in chamomile biology and biological pest management, but locally replicated field studies remain necessary to define the dominant pest species, seasonal peaks and intervention thresholds. Such evidence would provide a sound basis for an environmentally responsible plant-protection system compatible with forestry management.

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