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THE IMPACT OF GARELLA MUSCULANA (ERSCHOFF, 1874) ON WALNUT PRODUCTIVITY AND ITS BIOECOLOGICAL CHARACTERISTICS

Yuldasheva Shokhista Kobiljonovna
Associate Professor, Department of Zoology and General Biology,
Fergana State University, Fergana, Republic of Uzbekistan
E-mail: sh.k.yuldasheva@fdu.uz

Abstract
This article investigates the bioecological characteristics, developmental dynamics, and negative impacts on yield of the walnut moth (Garella musculana Erschoff, 1874), one of the most dangerous pests of walnut (Juglans regia L.) plantations. Based on monitoring conducted under the climatic conditions of the Fergana region, the generations of the pest during the vegetative period and the quantitative damage caused to various plant organs (shoots, leaves, fruits) were analyzed.

Keywords: Garella musculana, Juglans regia, walnut moth, productivity, generation, phytophagous, damage degree, Fergana Valley.

INTRODUCTION

The walnut (Juglans regia L.) is a perennial fruit tree of high biological and economic importance that has been cultivated by humanity since ancient times. The fruit of this plant is characterized by a high content of unsaturated fatty acids, high-quality proteins, phenolic compounds, vitamins, and trace elements. Consequently, the global demand for walnut products is increasing annually. In recent years, walnut cultivation has expanded through intensive technologies, increasing plantation areas and making the issues related to ensuring sustainable crop productivity highly relevant.

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In Uzbekistan, walnuts stand out among fruit crops due to their high economic efficiency and nutritional value. Significant efforts have been made recently to expand walnut orchards and increase yields. However, due to insufficient agrotechnical measures or climatic shifts, the mass outbreak of various phytophagous insect pests has been observed.

One such pest causing irreversible damage is the walnut moth, Garella musculana (Erschoff), belonging to the order Lepidoptera and the family Nolidae. This species is native to the flora of Central Asia, particularly Uzbekistan, and infests both the vegetative and generative organs of walnuts. The aim of this study is to determine the impact level of Garella musculana on walnut productivity under the conditions of Fergana and to scientifically substantiate its damage patterns.

MATERIALS AND METHODS

The research was conducted during 2025–2026 in walnut plantations and farms within the Fergana region. Promising and widely distributed walnut varieties were selected for observation.

The phenology and quantitative dynamics of the pest were studied based on standard entomological methods (Fast et al., 2010; Kozlova, 2015). Flights and oviposition of Garella musculana butterflies were recorded. Using a random sampling method, 100 shoots, leaves, and fruits were collected from each tree, and the infestation rate was calculated using the following formula:

$$P=n/N\times100$$

Where:

- **P** – infestation percentage (%);
- **n** – number of infested organs (fruits or shoots) (pieces);
- **N** – total number of analyzed organs (pieces).

RESULTS

According to field observations, Garella musculana completes 3 full generations during one vegetative season under the conditions of Fergana. Each generation of

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the pest coincides with a specific phenological phase of the walnut plant, exerting different impacts on productivity.

Characteristics of First-Generation Damage

The spring flight coincided with the second ten days of April (when the air temperature reached +15...+17°C). During this period, female butterflies lay eggs primarily on the apical parts of young shoots and leaf petioles. The hatched larvae bore into the young shoots and feed inside. Consequently:

- Young shoots stop growing and dry up (up to 32% shoot damage was recorded).
- This condition hinders the formation of generative buds, which serve as the foundation for the following year's harvest.

Impact of Second and Third Generations on Yield

The second and third generations, developing in June and August, directly attack the walnut fruits. The larvae enter the fruit through the fruit stalk and feed on the unhardened kernel, as well as the green pericarp.

Table 1 illustrates the negative impact of Garella musculana on the fruit yield of different varieties:

Table 1. Damage indicators of walnut varieties caused by Garella musculana in the Fergana region

Variety and Research Location	Examined Fruits (pcs)	Damaged Fruits (pcs)	Infestation Rate (%)	Fruit Drop Share (%)
"Ideal" (Kurgantepa village, Fergana district)	500	145	29.0%	22.4%
"Chandler" (Fergana city)	500	98	19.6%	14.2%
Local forms (Khonqiz village, Fergana district)	500	162	32.4%	26.8%

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As shown in the table, the highest infestation rate was recorded in local varieties and forms (32.4%), followed by the early-maturing "Ideal" variety (29.0%). Although the "Chandler" variety was slightly less damaged due to the later mechanical hardening of its shell, it still exceeded the economic injury level (EIL > 10%).

DISCUSSION

The obtained results demonstrate that feeding by Garella musculana larvae does not only cause the loss of the current year's harvest. When larvae feed inside the walnut, they create a favorable microclimate for the propagation of parasitic fungi (e.g., Alternaria, Fusarium) and bacteria. This induces premature rotting and dropping of fruits (up to 26.8%).

Damage to shoots and growing points by the first generation reduces the total volume of photosynthetic organs of the tree, which has been scientifically proven to decrease the overall yield potential by up to 35-40%. In orchards where chemical and biological control measures (Trichogramma, Bracon) against the pest are not implemented on time, the marketable yield drops drastically.

CONCLUSION

1. Garella musculana is the most dangerous and economically damaging phytophagous pest of walnuts under the conditions of the Fergana Valley, yielding 3 generations per vegetative period.
2. While the 1st generation damages shoots and leaves, disrupting tree architecture, the 2nd and 3rd generations directly destroy the fruit kernel, reducing productivity by 19.6% to 32.4%.
3. To preserve productivity in walnut orchards, it is recommended to use pheromone traps at the beginning of the spring butterfly flight and apply systemic insecticides during the larval hatching period.

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