

NEW RECORDS OF *Garella musculana* (Lepidoptera: Nolidae) IN BULGARIA

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Abstract

The Asian walnut moth, *Garella musculana* (Erschov, 1874), a major pest of walnut in Asia, was recently detected in Bulgaria. The common walnut (*Juglans regia* L.) is widely distributed in the country, being cultivated in gardens, along streets and roads, and in orchards. Surveys conducted between May and September of 2024 and 2025 examined walnut trees in streets, parks, and suburban areas across different climatic zones. The species was recorded in the Sofia region, northeastern Bulgaria, and along the Black Sea coast, but was not found in southern and northwestern Bulgaria. In the Sofia region, three generations were observed. Larvae were found mainly in the fruit pericarp, although some also penetrated the nut. Our results suggest that the species is still expanding its range in Bulgaria. Considering its rapid spread in the Sofia region and the growing importance of walnut cultivation, further investigations into the distribution and impact of this pest are needed.

Key words: alien species, pest distribution, Asian walnut moth, *Juglans regia*.

INTRODUCTION

The common walnut (*Juglans regia* L.) is the most widely distributed nut tree species globally (Martínez et al., 2010) and is recognized for the high nutritional and economic value of its kernels (Iordănescu et al., 2018), which positions it among the FAO priority plant species (Bujdosó et al., 2019). In Bulgaria, walnut is extensively cultivated in home gardens, along streets and roads, and in commercial orchards. According to the Agrostatistical Yearbook (2025), walnut ranked first among nut crops in Bulgaria in 2024 in terms of cultivated area. Despite its importance, *J. regia* is vulnerable to a wide range of insect pests and diseases that may reduce tree vitality, compromise nut quality, and result in significant yield losses.

The EPPO Global Database lists more than 70 pest species associated with walnut worldwide (EPPO, 2025). Research on walnut pests has been particularly developed in Asia (Sharma et al., 2012; Khan et al., 2016), whereas in Europe most studies have focused on species of major economic significance or on newly emerging invasive threats.

In recent years, several highly damaging walnut pests have expanded their ranges across

Europe. Among them is the Asian walnut moth, *Garella musculana* (Erschov, 1874) (Lepidoptera: Nolidae), a species developing on *Juglans* spp., including the common walnut (*J. regia*) and the black walnut (*J. nigra*). Its larvae feed on shoots, buds, and fruits, causing direct losses and predisposing trees to secondary infections. The EFSA Plant Health Panel recently concluded that *G. musculana* meets all criteria to be regarded as a potential quarantine pest for the European Union (EFSA PLH, 2024).

Originating in Central Asia, the species was first reported in Europe in 2008 in Sevastopol, Ukraine (Sviridov, 2008). Subsequent records include Türkiye in 2015 (Bartın Province, Black Sea region) (Yıldız et al., 2018), Bulgaria in 2016 along the Black Sea coast (Beaumont, 2018), and Romania between 2018 and 2020, specifically in the localities of Albești and Arsa (Bostancı et al., 2021). In Romania, the species has so far remained confined to the Dobrogea region, where infestations were observed on both young and mature walnut trees (EFSA PLH, 2024). No additional official detections have been reported from other parts of Romania, suggesting either an early stage of establishment or insufficient survey coverage.

Given the shared climatic conditions and extensive *Juglans regia* distribution across the lower Danube region, continued cross-border monitoring is warranted.

Further detections across eastern and southeastern Europe rapidly followed. In May 2018, a single female was trapped in the Rostov region of southern Russia (Romanchuk & Kolesnikov, 2021). In 2021, the species was detected in northeastern Italy (Veneto region) (Scaccini et al., 2023) and subsequently in Emilia-Romagna (Zanolli et al., 2023). Today, *G. musculana* is included in the EPPO A2 List and is classified as “present, restricted distribution” in Europe (EPPO, online-a).

In Bulgaria, *G. musculana* was first detected in September 2016 at Byala, south of Varna. In 2018, ten light-attracted specimens were recorded from Botevo, Varna Province (Beaumont, 2018; EPPO, online-b). In July 2019, the Bulgarian National Plant Protection Organization (NPPO) formally reported the pest from Burgas Province (municipality of Kableskovo), where approximately 20% of trees in a 2.3-ha plantation exhibited symptoms, particularly on young shoots. Later that year, the NPPO declared the species as “present, only in some parts of Bulgaria” mainly in Varna Province (EPPO, online-c). Additional occurrences include a male captured near Lake Shabla in August 2022 (Beshkov et al., 2024).

In September 2023, *G. musculana* was recorded for the first time in inland Bulgaria, with detections at four urban and suburban sites within Sofia City Province (unpublished data), suggesting that the species had begun expanding westward from its coastal range.

A recent study from newly invaded walnut orchards in Türkiye showed that *G. musculana* develops two to three generations per year, causes substantial shoot and fruit damage up to 60%, proving the threatening risk of this pest expansion (Yoğurcu & Kaçar, 2022).

Given these recent findings and the increasing prevalence of *J. regia* in urban and rural landscapes, an updated assessment of the distribution of *G. musculana* in Bulgaria was needed. The present study therefore aimed to document the current occurrence of the species using extensive field surveys conducted in

2024-2025 across multiple climatic zones of the country.

MATERIALS AND METHODS

Field surveys were conducted between May and September in 2024 and 2025 across 80 locations in Bulgaria, of which 21 were situated within Sofia City Province. Common walnut trees (*J. regia*) growing along streets, in private gardens, parks, hedgerows, markets, and other urban and suburban green areas were examined for young shoots, fruits, and cocoons showing characteristic symptoms attributable to *G. musculana*. At each site, symptomatic shoots and fruits, as well as conspicuous white cocoons, were collected and dissected. The presence of the species was confirmed by detecting larvae within shoots or fruits, or pupae within cocoons. A subset of larvae was preserved for morphological examination, while others were reared to adulthood on naturally infested host material under laboratory conditions.

Specimens were identified using larval, pupal, and adult morphological characters, following EPPO diagnostic criteria (EPPO online-d), OEPP/EPPO (2005), Scaccini et al. (2023), and Lepiforum (2025). Each locality was georeferenced and its elevation (m a.s.l.) recorded. Localities were classified as “present” when confirmed specimens were detected and “absent” when no developmental stages were found. Positive and negative sites were treated equally in the dataset to produce a complete presence/absence distribution map. The distribution of *G. musculana* was mapped using the UTM grid system according to Abadjiev (2001).

In Sofia City Province, where repeated visits were possible, each sampling event was recorded separately to allow temporal assessment of infestation recurrence. For the determination of the number of generations in the Sofia region, shoots and fruits with signs of infestation were collected monthly from May to August in both years. All raw field records, including locality name, date, elevation, GPS coordinates, developmental stage, and number of specimens, were compiled into a standardized dataset.

These data form the basis of Table 1 (confirmed records), which summarize the outcome of the 2024-2025 survey.

To determine the timing of adult emergence and the number of generations, a subset of larvae collected during each monthly sampling event in Sofia was reared under laboratory conditions on naturally infested walnut material. Larvae were maintained individually in ventilated containers at ambient laboratory temperature and natural photoperiod and were checked regularly for pupation and adult emergence. The emergence dates recorded in the laboratory were used in combination with field observations of fresh feeding symptoms and late-season larvae to interpret the generation pattern in the Sofia region.

All collected material has been deposited in the authors' collection at the University of Forestry, Sofia.

RESULTS

Distribution and occurrence

A total of 32 surveyed localities confirmed records of *G. musculana* on *Juglans regia*

during the 2024-2025 survey (Table 1, Figure 1, Figure 2). Positive detections were concentrated along the Black Sea coast, in northeastern Bulgaria, and throughout the urban and suburban areas of Sofia City Province, which accounted for 21 of the confirmed sites. The altitudinal range of infested localities extended from 11 m a.s.l. (Sozopol) to 839 m a.s.l. (Simeonovo). The remaining 48 surveyed sites, primarily in southern and northwestern Bulgaria, showed no evidence of infestation. These sites are: Asenovgrad; Banichan; Bansko; Belovo; Blagoevgrad; Byala Reka; Chelopek; Chernichevo; Churuligovo; Dalbok Izvor; Dolna Beshovitsa; Gorni Dubnik; Gorski Izvor; Gotse Delchev; Kapitan Andreevo; Klokotnitsa; Kostenets; Kresna; Kulata; Lyubimets; Mezdra; Momin Prohod; Novo Delchevo; Purvomay; Patriarch Evtimovo; Pazardzik; Petrevene; Petrich; Plevan; Plovdiv; Pavolche; Troyan; Razliv; Rila; Rodopi; Sandanski; Septemvri; Simeonovgrad; Stara Zagora; Svilengrad; Svoge; Varbitsa; Vidin; Vratsa; Yasen; Zlatna Panega; Zlokuchene; Zvanichevo .

Table 1. Confirmed records of *Garella musculana* on *Juglans regia* in Bulgaria during the 2024-2025 survey

Locality	Elevation (m a.s.l.)	Date(s)	Stage	No. specimens
Achtopol	13	18.07.2025	Larvae	1
Burgas	25	02.08.2024	Larvae	1
Chernomorets	30	02.08.2024; 02.08.2025	Larvae	4; 8
Ihtiman	647	28.08.2024	Larvae	2
Pismenovo	139	18.07.2025	Larva	1
Ravadinovo	30	18.07.2025; 03.08.2025	Larvae	6; 3
Sevlievo	202	14.08.2025	Larva	1
Shumen	207	14.08.2025	Larvae	4
Sozopol	11	30.07.2024; 15.09.2024	Larvae	1; 5
Veliko Turnovo	227	14.08.2025	Larva	1
Kostinbrod	537	20.08.2025	Larva	1
Sofia - Mladost Market	505	06.08.2024	Larvae	19
Sofia - Dimitar Petkov Market	553	09.08.2024	Larva	1
Sofia - Krasna Polyana Market	558	09.08.2024	Larvae	8
Sofia - Krasno Selo Market	593	09.08.2024	Larvae, cocoons	9, 2
Sofia - Slatina Market	539	09.08.2024	Larvae, cocoons	9, 4
Sofia - Druzhiba	-	09.08.2024; 13.07.2025; 04.08.2025	Larvae	7; 2; 4
Sofia - Prince's Garden	542	25.07.2024	Larvae	4
Sofia - South Park	583	25.07.2024	Larvae	6

Locality	Elevation (m a.s.l.)	Date(s)	Stage	No. specimens
Sofia - North Park	530	25.07.2024	Larvae	8
Sofia - West Park	576	25.07.2024	Larvae	12
Sofia - Borisova Garden	591	25.07.2024	Larvae	5
Sofia - Darvenitsa	590	09.05.; 17.05.; 01.06.; 22.07.2024; 07.06.; 05.07.; 21.08.2025	Larvae	6; 8; 7; 8; 5; 6; 9
Dragalevtsi	833	06.08.2024; 14.07.2025	Larvae	9; 6
Simeonovo	839	06.08.2024	Larva	1
Pancharevo	607	15.08.2024	Larvae	6
Katina	-	22.08.2024	Larvae, cocoons	4, 4
German	-	07.08.2024; 15.09.2024	Larvae, cocoons	1, 5
Negovan	520	07.08.2024; 10.08.2025	Larvae	1; 1
Svetovrachene	515	07.08.2024; 10.08.2025	Larvae, cocoons	30, 10; 1
Bankya	640	20.08.2025	Larvae	3
Novi Iskar	515	22.08.2024; 20.08.2025	Larvae	3; 1

The results of the present survey, together with previous records (Beaumont, 2018; EPPO, online-b; EPPO, online-c; Beshkov et al., 2024), including the 32 localities across

Bulgaria, with urban and suburban areas of the Sofia City Province, northeastern Bulgaria, and the Black Sea coast are shown in Figure 1.

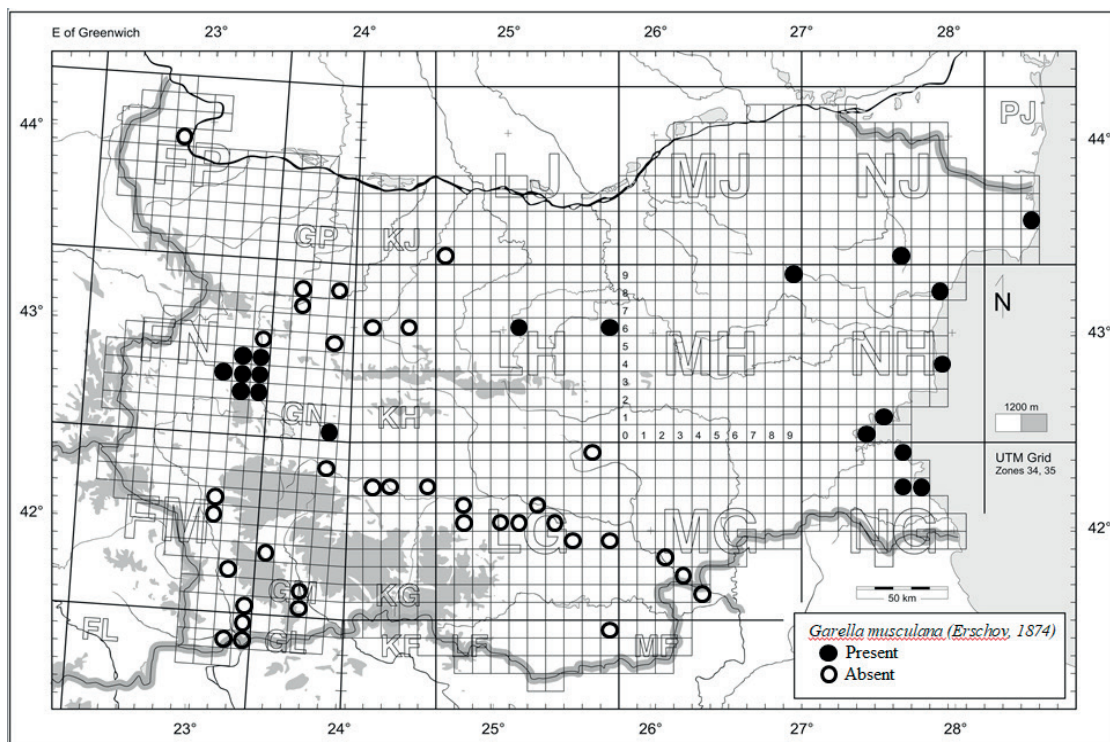


Figure 1. Distribution of *G. musculana* in Bulgaria (2025), UTM Grid

Field Findings

Considering that earlier Bulgarian records were restricted to the Black Sea region, surveys emphasized southern and western Bulgaria. Most sites were visited once, primarily in late July and August. Many fruits exhibited typical

symptoms, empty pericarp galleries, hollow kernels, and abundant frass, although only samples containing larvae or pupae were attributed to *G. musculana*, as similar damage may result from *Cydia pomonella* L. (Figure 2).

In 2025, adverse climatic conditions led to poor fruit set, which likely accounts for the small numbers of larvae found at several sites. In contrast, 2024 surveys in Sofia Municipality were extensive, covering markets, parks, trading areas, and suburban districts. The species was detected at every surveyed location within the city. Larvae were recovered mostly from the pericarp (Figures 2, 3), though occasional penetration into the kernel was also observed.

Generations in the Sofia region

Three generations of *G. musculana* were observed in the Sofia region. As described before, shoots and fruits showing signs of infestation were collected monthly from May to August, and larvae obtained from these samples were reared under controlled laboratory conditions to record adult emergence. Based on field-collected larvae and subsequent laboratory rearing, first-generation larvae were present from early May to early June, with adults emerging under laboratory conditions until late June. Second-generation larvae developed in July, followed by adult emergence in early August. A third generation occurred during August–September: late-season larvae

produced overwintering cocoons in the laboratory, and adults emerging from these individuals were recorded in September. Importantly, the occurrence of the third generation was also confirmed directly in the field, where late-season larvae and fresh feeding symptoms were observed in multiple sites across Sofia.

Although these observations strongly support a three-generation pattern in the Sofia region, further multi-year field monitoring would help determine whether voltinism varies among years or across habitat types.

Invasion pattern and dispersal

Although population density could not be quantified across habitats, the widespread and repeated detections in Sofia in 2024 indicate that the species was introduced to the region prior to 2023. The earliest known inland site, recorded in autumn 2023, was located in a peripheral village with no connection to markets or trade, suggesting that natural dispersal contributed to its establishment. The occurrence of mixed infestations involving *C. pomonella* highlights the need for continued monitoring to assess the relative importance of each pest and their potential interactions.



Figure 2. Representative symptoms of *Garella musculana* infestation on *Juglans regia* (original): (a-b) damaged shoots showing frass accumulation and internal necrotic galleries; (c) destroyed young fruits with larval entry holes and frass; (d-f) fruit damage at different stages, including pericarp browning, deformation, and empty larval galleries



Figure 3. Developmental stages of *Garella musculana* recorded during field surveys in Bulgaria (original). (a) young larva on walnut shoot; (b) larva feeding in the pericarp; (c) late-instar larva; (d) cocoon; (e) pupa within the fruit; (f) adult moth on walnut leaf

DISCUSSIONS

The present study provides the most extensive and up-to-date assessment of the distribution of *G. musculana* in Bulgaria and reveals that the species has undergone a marked westward expansion from its previously known distribution along the Black Sea coast. Earlier Bulgarian records were confined to Varna and Burgas provinces (Beaumont, 2018; EPPO, online-b; EPPO, online-c), but our findings demonstrate that *G. musculana* is now firmly established throughout Sofia City Province and has also appeared in several inland regions of central and northeastern Bulgaria. This pattern reflects a broader regional trend reported in other countries, where initial localized detections were followed by rapid spread over short periods (Bostancı et al., 2021; Scaccini et al., 2023; Zanolli et al., 2023).

Drivers of expansion and pathways of introduction

The presence of *G. musculana* at all surveyed locations within Sofia, including multiple parks and market areas, suggests a well-established population capable of completing multiple generations under urban climatic conditions. The earliest known Sofia record from 2023,

obtained in a peripheral village unrelated to trade activities, supports the hypothesis that natural dispersal played a significant role in the species' inland expansion. Lepidopteran dispersal over considerable distances has been documented for related Nolidae and Noctuoidea species, facilitated by urban heat-island effects and continuous host availability (Battisti et al., 2005)

Nevertheless, long-distance human-mediated transport remains a likely introduction pathway. EFSA PLH (2024) concluded that several developmental stages of *G. musculana*, particularly larvae and pupae hidden beneath the bark or in the pericarp, can be easily transported via infested nursery stock, pruned shoots, wooden packaging, or firewood. The species' initial emergence along the Black Sea coast in Bulgaria and Romania, and its rapid appearance in Italy, is consistent with the movement of plant materials and traded wood products across the Black Sea and Mediterranean regions (EPPO, 2025a).

Host availability and environmental suitability

The widespread distribution of *J. regia* in Bulgarian urban and rural landscapes provides continuous host availability, facilitating the species' establishment in a variety of habitats.

Our records span an altitudinal gradient from sea level to 839 m a.s.l., consistent with previous findings from Türkiye (Yıldız et al., 2018) and Italy (Scaccini et al., 2023), where the species was also found across broad ecological zones. The ability of *G. musculana* to thrive in both coastal and inland climates indicates a high degree of ecological plasticity, typical of invasive Lepidoptera adapting to new regions (Roques et al., 2020).

Phenology and multivoltinism in Bulgaria

The identification of three generations per year in Sofia is consistent with EFSA's predictions that the species is multivoltine in most parts of southeastern Europe (EFSA PLH, 2024). In Türkiye, two to four generations have been reported depending on climatic conditions (Yoğurcu & Kaçar, 2022), and similar voltinism has been observed in newly invaded areas of Italy (Zanolli et al., 2023). The slightly extended flight period observed in Sofia may be linked to urban microclimatic warming, which is known to accelerate lepidopteran developmental rates and increase the number of generations per year (Meineke et al., 2017). Adverse climatic conditions in 2025, particularly reduced fruit set, resulted in low larval densities at several sites. This is comparable to reports from Italy, where interannual variations in fruit production influenced larval detectability (Scaccini et al., 2023). Such fluctuations complicate population monitoring and underscore the need for long-term surveillance across multiple seasons.

Interactions with other walnut pests

Mixed infestations with *C. pomonella* were common across surveyed fruits. Co-infestation raises questions regarding competitive interactions, susceptibility of fruits at different phenological stages, and potential modification of damage symptoms. Similar mixed infestations have been reported in Türkiye and Italy (Yıldız et al., 2018; Zanolli et al., 2023). Because both species target the pericarp and kernel, economic losses may be underestimated when attacks are attributed solely to *C. pomonella*. Developing species-specific monitoring tools, including pheromone traps for *G. musculana*, which are currently lacking, is therefore a priority.

Comparison with neighbouring countries

The Bulgarian expansion mirrors developments in Romania and Italy. In Romania, the species has remained restricted to the Dobrogea region since its first detection between 2018 and 2020 (Bostancı et al., 2021), but the limited number of official surveys may mask a broader distribution. In Italy, the species spread rapidly from Veneto into Emilia-Romagna within one year (Scaccini et al., 2023; Zanolli et al., 2023), demonstrating a high invasion potential once established. Bulgaria now represents one of the most inland confirmed European populations, highlighting the importance of the country in understanding the western expansion front of the species.

Implications for plant protection and future monitoring

The continuous spread of *G. musculana* across Bulgaria, including urban centers far from initial coastal introductions, confirms its invasive potential and capacity for adaptation. As *J. regia* production expands across southeastern Europe due to increasing economic interest in walnut cultivation, the risk of economic losses associated with *G. musculana* is expected to rise. The detection of multiple generations per year in Sofia, coupled with the species' ability to persist in urban habitats, suggests that eradication is unlikely and long-term management will be necessary. Future efforts should prioritize the development of early-warning monitoring systems, including pheromone lures, molecular diagnostic protocols, and coordinated cross-border surveys. Regional cooperation among Bulgaria, Romania, Türkiye, and Italy will be essential for tracking dispersal routes and implementing phytosanitary measures to prevent further spread.

CONCLUSIONS

During the 2024-2025 surveys, *G. musculana* was confirmed in Sofia City Province, in several inland localities of northeastern Bulgaria, and along the Black Sea coast, while remaining undetected in southern and northwestern regions of the country. This distribution pattern indicates that the species is undergoing an active range expansion beyond

its previously known coastal range. The rapid establishment and widespread occurrence of *G. musculana* in the Sofia region, combined with its capacity to complete multiple generations per year, suggest that the species is now well adapted to urban and peri-urban environments in inland Bulgaria.

The observation of three generations in Sofia, supported by both field evidence and laboratory rearing, show the need for additional multi-year field surveys to confirm voltinism across habitats and climatic conditions. Understanding the true number of generations under natural outdoor conditions is essential for predicting population build-up, timing management interventions, and assessing long-term invasion potential.

Given the economic importance of walnut cultivation and the growing evidence of westward and inland spread, it is equally important to obtain accurate information on the species' status in neighbouring countries. Coordinated cross-border monitoring, including systematic field inspections, phenological studies, and determination of life-cycle parameters, will be necessary to establish the real regional situation and to enable harmonized phytosanitary responses. Such efforts, combined with improved diagnostic tools and long-term surveillance, will support the development of effective strategies to mitigate the impact of this emerging walnut pest.

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REFERENCES

- Abadjiev, S. (2001). An atlas of the distribution of the butterflies in Bulgaria (Lepidoptera: Hesperioidea & Papilionoidea). *Zoogeographica Balcanica*, 1, Sofia–Moscow: Pensoft.
- Battisti, A., Stastny, M., Netherer, S., Robinet, C., Schopf, A., Roques, A., & Larsson, S. (2005). Expansion of the pine processionary moth caused by increased winter temperatures. *Ecological Applications*, 15(6):2084–2096, DOI: 10.1890/04-1903
- Beaumont, H. E. (2018). The occurrence of *Garella musculana* (Erschov, 1874) (Lepidoptera: Nolidae) in eastern Bulgaria. *Entomologist's Record and Journal of Variation*, 130, 315–316.
- Beshkov, S., Nahirnić-Beshkova, A., & Jakšić, P. (2024). Contribution to knowledge of the Balkan Lepidoptera III. *Ecologica Montenegrina*, 73, 226–287.
- Bostancı, C., Yıldırım, İ., Aydoğan, O., Yıldız, Y., Kiss, I. K., & Albas, E. (2021). First report of walnut (*Juglans regia*) pest *Garella musculana* in Romania. *OEPP/EPPO Bulletin*, 51, 293–295. <https://doi.org/10.1111/epb.12753>
- Bujdosó, G., Varjas, V., Szügyi-Bartha K., & Tóth-Nagy, A. (2019). Evaluation of the novel bred persian walnut genotypes. *AgroLife Scientific Journal*, 8(1). <https://agrolifejournal.usamv.ro/index.php/agrolife/article/view/416>
- Iordănescu, O., Băla, M., Sala, F., Scedei, D., & Toth, M., (2018). Characterization of some walnut (*Juglans regia* L.) biotypes based on the biometrical and biochemical parameters of nuts. *AgroLife Scientific Journal*, 7(2). <https://agrolifejournal.usamv.ro/index.php/agrolife/article/view/697>
- Khan, A. A., Dar, S. H., Shah, M. A., Mohi-ud-Din, S., & Majid, S. (2016). Insect pests of walnut and their management. In *Insect pests management of fruit crops*, 307–355.
- Martínez, M. L., Labuckas, D. O., Lamarque, A. L., & Maestri, D. M. (2010). Walnut (*Juglans regia* L.): Genetic resources, chemistry, and by-products. *Journal of the Science of Food and Agriculture*, 90(12), 1959–1967.
- Meineke, E. K., Dunn, R. R., Sexton, J. O., Frank, S. D. (2013). Urban warming drives insect pest abundance on street trees. *PLoS ONE* 8(3): e59687. <https://doi.org/10.1371/journal.pone.0059687>
- Romanchuk, R. V., & Kolesnikov, S. I. (2021). Report on the detection of *Garella musculana* (Erschov, 1874) (Lepidoptera: Nolidae) – a new pest species for the Rostov region from the Chulekskaya Balka specially protected natural area. *Uchenye Zapiski Krymskogo Federalnogo Universiteta Imeni V. I. Vernadskogo. Biology. Chemistry*, 7(2), 145–157. http://sn-biolchem.cfuv.ru/wp-content/uploads/2021/07/14_Romanchuk.pdf
- Scaccini, D., Bramuzzo, D., Bostancı, C., Faccoli, M., Martinez-Sañudo, I., Matov, A., & Pozzebon, A. (2023). First report of *Garella musculana* (Erschov, 1874) (Lepidoptera: Nolidae) in Italy with insights into its identity. *Journal of Applied Entomology*, 147(3), 239–243.
- Sharma, R., Pandey, M., & Shankar, U. (2012). Pest management in walnut: An overview. In *Ecologically based integrated pest management*, 765–790.
- Sviridov, A. (2008). The walnut nycteoline moth *Erschoviella musculana* Erschov - a noctuid species new for Europe and Ukraine (Lepidoptera: Noctuidae). *Biological Series*, 113(1), 60–62.
- Yoğurcu, A., & Kaçar, G. (2022). Management and population dynamics of *Garella musculana* (Erschov) (Lepidoptera: Nolidae) in newly areas, Turkey, *International Journal of Pest Management*. DOI: 10.1080/09670874.2022.2076955

- Yıldız, Y., Yıldırım, İ., Bostancı, C., & Aydoğan, O. (2018). *Erschoviella musculana* Erschoff, 1874 – a new record and walnut pest in Turkey [in Turkish]. *Journal of Bartın Faculty of Forestry*, 20(2), 296–302. <http://dergipark.gov.tr/download/article-file/475282>
- Zanoli, P., Scaccini, D., & Pozzebon, A. (2023). New insights into the distribution and spread of the Asian walnut moth *Garella musculana* (Erschoff, 1874) (Lepidoptera: Nolidae) in Europe, with a focus on the Italian range. *Biodiversity Data Journal*, 11, e107609. <https://doi.org/10.3897/BDJ.11.e107609>
- ***Agrostatistical Yearbook 2025: Ministry of Agriculture and Food. (2025, March). Fruit production in Bulgaria – 2024 harvest (No. 453). <http://www.mzh.government.bg/en>.
- ***EFSA Panel on Plant Health (PLH); Bragard C, Baptista P, Chatzivassiliou E, Di Serio F, Gonthier P, Jaques Miret JA, Justesen AF, Magnusson CS, Milonas P, Navas-Cortes JA, Parnell S, Potting R, Reignault PL, Stefani E, Thulke HH, Van der Werf W, Vicent Civera A, Yuen J, Zappalà L, Grégoire JC, Malumphy C, Gobbi A, Kertesz V, Maiorano A, Sfyra O, MacLeod A. (2024). Pest categorisation of *Garella musculana*. *EFSA J*. Mar 7;22(3): e8646. DOI: 10.2903/j.efsa.2024.8646.
- ***EPPO, (2025). European and Mediterranean Plant Protection Organization (EPPO). (2025). EPPO Global Database. <https://gd.eppo.int/taxon/IUGRE/pests> [Accessed on: 22 October 2025]
- ***EPPO, (online-a). European and Mediterranean Plant Protection Organization (EPPO). EPPO Global Database: Distribution of *Garella musculana*. <https://gd.eppo.int/taxon/ERSHMU/distribution> [Accessed on: 22 October 2025]
- ***EPPO, (online-b). European and Mediterranean Plant Protection Organization (EPPO). First report of *Garella (=Erschoviella) musculana* in Bulgaria. EPPO Reporting Service, 01–2019. <https://gd.eppo.int/reporting/article-6439> [Accessed on: 22 October 2025]
- ***EPPO, (online-c). European and Mediterranean Plant Protection Organization (EPPO). New data on quarantine pests and pests of the EPPO Alert List. EPPO Reporting Service, 08–2019. <https://gd.eppo.int/reporting/article-6584> [Accessed on: 22 October 2025]
- ***EPPO, (online-d). European and Mediterranean Plant Protection Organization (EPPO). EPPO Global Database: Photos of *Garella musculana*. <https://gd.eppo.int/taxon/ERSHMU/photos>
- ***Lepiforum (2025). *Garella musculana*. https://lepiforum.org/wiki/page/Garella_musculana
- ***OEPP/EPPO (2005). OEPP/EPPO Bulletin, 35, 425–428.