Turkish Journal of Agriculture - Food Science and Technology, 7(12): 2133-2136, 2019
DOI: https://doi.org/10.24925/turjaf.v7i12.2133-2136.2869

Turkish Journal of Agriculture - Food Science and Technology

Available online, ISSN: 2148-127X | www.agrifoodscience.com | Turkish Science and Technology

New Host Walnut Species *Juglans nigra* For *Garella musculana*

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ARTICLE INFO

Research Article

Received : 04/08/2019
Accepted : 17/09/2019

Keywords:
Asian walnut moth
Black walnut
Erschoviella musculana
Garella musculana
Juglans nigra

ABSTRACT

As a result of the studies conducted in Bartın in 2019, it was determined that *Garella musculana* (*Erschoviella musculana* Erschoff 1874) caused damage to young shoots of *Juglans nigra* in the world for the first time. According to Eppo data,it is known that *Garella musculana* damages only in *Juglans regia* (major), but in this study, it has been revealed as the first record in the world that *Garella musculana* also causes damage in *Juglans nigra* (Black walnut) (young shoots).

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Introduction

Juglans regia walnut species is one of 22 different walnut species growing in Asia, Europe and America (Black Walnut and White Walnut) (Zhang, 2019). *Juglans regia* is a type of walnut that grows naturally in our country and is economically cultivated. The *Juglans regia* walnut is an economically valuable walnut species, both for edible consumption and for the quality of its timber. Turkey ranks the 4th in World walnut production after China, the United States and Iran with 210,000 tons production (FAO, 2017; Figure 1). Asian Walnut Moth *Garella musculana* is one of the most important pests for Juglans regia walnut species due to the damage caused in the fruit and young shoots (Figure 2). *Garella musculana* (*Erschoviella musculana* Erschoff 1874) is known to cause damage only to *Juglans regia* (Major) among walnut species (EPPO, 2019). *Garella musculana* attacks wild and cultivated varieties of *Juglans regia* (Pavlovskii and Shtakelberg, 1955; Degtyareva, 1964). *Garella musculana* damage is mixed with *Zeuzera pyrina* in young shoots of *Juglans regia* and with *Cydia pomonella* damage in the green husk of *Juglans regia* fruit. (Yıldız et al., 2018).

Juglans nigra is known as North American black walnut. Growing naturally in Northeastern and North-central United States, Southern Canada and Europe, *Juglans nigra* is of great economic importance for timber. Currently, the estimated value of standing *Juglans nigra* in the US is $568 billion (Hadziabdic et al., 2014) and wood, veneer, lumber and logs are exported to over 45 countries (Utley et al., 2013). *Juglans nigra* seeds are a food source for wildlife but are also processed and sold as handmade crafts such as necklace. *Juglans nigra* is an economically valuable walnut species in edible walnut production in the United States. Among the oldest known *Juglans nigra* trees in our country, 2 trees were planted in Istanbul University, Faculty of Forestry Garden in 1950 and 8 trees were planted in Bolu West Black Sea Forestry Research Institute garden in 1965 (Tosun, 2018, Figure 3). In Turkey there are very small amounts of newly planted *Juglans nigra* saplings for landscaping purposes in parks and gardens. *Juglans nigra* that does not grow naturally in our country and does not have economic cultivation (Exotic tree for Turkey), has a much greater importance in terms of walnut

species in especially its natural habitat, United States, Southern Canada and other European countries. In France, Germany and Spain, especially because of valuable timber (*Juglans nigra* × *Juglans regia*), a number of hybrids (NG23-NG38) are specially produced economically for cross-breeding and new plantings are made in forest areas.

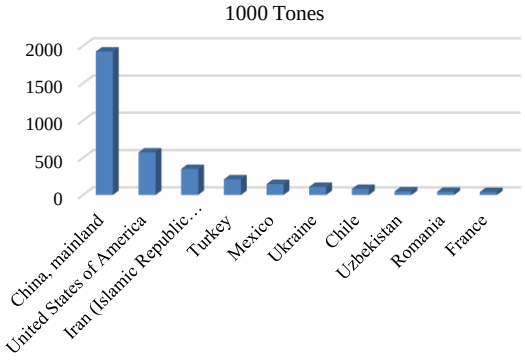

Figure 1 World Walnut Production (FAO, 2017)

Figure 2 Damage of *Garella musculana* on young shoots of *Juglans regia*

Figure 3 *Juglans nigra* Trees and Fruit (Bolu West Black Sea Forestry Research Institute Garden 2018)

Figure 4 Grafting of *Juglans nigra*

Material and Method

In order to investigate the damage of *Garella musculana* in *Juglans nigra* , 6 year old *Juglans regia* was grafted with *Juglans nigra* on May 1, 2019 using grafting method (Figure 4). On June 12, 2019, young shoots of *Juglans nigra* were placed chiffon gauze cage and 1 female and 1 male *Garella musculana* adult was released into these cages. The eggs that the pest leaves in young shoots, the larvae hatching from the eggs were observed with the help of the corrugated board attached to the brances to allow the larva to pass to the pupae and all stages until the adult period and the damage in the young shoots were photographed.

Findings and Discussion

Chiffon tulle was tied to the young shoots of *Juglans nigra* tree on 12 June 2019 and 1 female and 1 male *Garella musculana* were released into the tulle. (Figure 5).

Figure 5 Chiffon tulle lattice attached to young shoots of *Juglans nigra*

Figure 6 *Garella musculana* Egg in *Juglans nigra* Young Shoots

The eggs of *Garella musculana* were detected in young shoots of *Juglans nigra* and between the leaf stalk and young buds on June 14, 2019. (Figure 6). On June 19, 2019, larvae infiltrations into young shoots of *Juglans nigra* were observed. Larvae's feeding residue and larvae were observed on the following days. (Figure 7). *Garella musculana* larvae entry was detected in 2 young shoots of *Juglans nigra* tree and 7 larvae entries were found in 2 shoots. (Figure 8).

Figure 7 Larvae entry into *Juglans nigra* young shoots

On July 3, 2019, where the larvae of *Garella musculana* go down to corrugated cardboard cartons to become pupae, on July 12, 2019 adult exits from the pupae were detected in (Figure 9). As a result of feeding for 15 days, larvae were fed with shoots and emptied them and caused the shoots to dying. This year's growth in the tree has declined due to the damage affecting the growth of the shoot, the growth time of the tree and the fruit yield.

Garella musculana larva gallery length is 2 cm in leaf stem and 6 cm in Juglans nigra young shoots was measured. (Figure 10)

Figure 8 *Garella musculana* Damage in Young Shoots of *Juglans nigra*

Figure 9 The Emergence of The Larvae of *Garella musculana* For Pupae from *Juglans nigra* Shoots, Pupae in Corrugated Cardboard, and Adult Originating from Pupa

Figure 10 Gallery length of Larva in The Leaf Stem and Young Shoots of The *Juglans nigra*

Results and Recommendations

In Europe, *Garella musculana* was first identified in 2008 in Ukraine in Sevastopol, in 2015 in the city of Bartın in Turkey and then determination was made in 2016 (Beaumont, 2018) in Varna, Bulgaria. In our study,it has been put forward that the continuation of the spread of the pest has a great risk for *Juglans regia* walnut species as well as the *Juglans nigra* species. In our observations for *Garella musculana* (Asian Walnut Moth) in Bartın,it has been found that *Garella musculana* (Asian Walnut Moth) give 4 generations a year and spend the winter as pupa (*Juglans regia*) in the bark,cracks on bark and loose bark of the walnut tree. *E. musculana* can spread throughout all stages of its life cycle. It can spread by flying of adults in adult form, in the bark of walnut's (*Juglans regia*) log (Pupae), green husk fruit (Egg-Larva), and with potted walnut saplings during the vegetation period and grafting buds (Egg-Larva). Especially, the transport between countries, the risk of realization with bark logs in the form of pupae is much higher than the others. (Yıldız et al., 2018)

With the decision of Council of Ministers dated 24/4/1974 and numbered 7/8186 published in the Official Gazette dated 11/05/1974 and numbered 14883, it is forbidden to export walnut species as billet, timber, log, plank and draft from our country. In addition, those listed in the standard determined by the Under secretariat of Foreign Trade include the list of products made of Walnut tree with a saving letter dated 28.11.2005 and numbered 28357. Particularly, the risk of transporting the *Garella musculana* between countries is much higher than in the pupae form with bark logs. For this reason, it is necessary to be more careful in the inspection procedures in the import of barked walnut log (*Juglans regia*, *Juglans nigra*) from harmful and contaminated countries. Due to the biology of the *Garella musculana*, there is no risk of transport by saplings and scion wood between November and March. We didnt detect any form of pest (eggs, larvae, pupae or adult) in the control of saplings and scion wood (*Juglans regia*) between November and March, (stagnant period) and no harm was observed.

Acknowledgements

We would like to thank to Prof. Dr. Ünal Akkemik (Istanbul University Faculty of Forestry), Suat Tosun (Bolu-Forestry Engineer), Bolu West Black Sea Forestry Research Institute, Ramis Ozan Uzun.

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