

THE FIRST PARASITOID RECORD OF *GARELLA MUSCULANA* (NOLIDAE, LEPIDOPTERA) FROM TURKEY; *PIMPLA SPURIA* (ICHNEUMONIDAE, HYMENOPTERA)

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Abstract. This research was conducted within the border of Bartın province between the years of 2015-2018 for making detailed research on the biology of the important walnut pest *Garella musculana* identified for the first time in Turkey. The pupas collected from the study area were brought to the laboratory and monitored. It was observed that some pupas were parasitic, and the type of parasitic species that emerged from these pupae was also recorded and the species were diagnosed. As a result of the diagnosis, the parasitoid species were identified as *Pimpla spuria* (Gravenhorst, 1829). This was the first parasitoid recorded on *Garella musculana* in Turkey. This situation should be helpful of biological control on *Garella musculana* in walnut orchards.

Keywords: *Garella musculana*, walnut, *Pimpla spuria*, parasitoid, first record, Turkey

Introduction

Walnut (*Juglans regia*), an income-generating species, has a large distribution area and is a very old and important fruit of Turkey. Turkey's walnut production is the fourth in the world (FAO, 2016). *Garella musculana*, one of the important pests of the walnut plant, was determined for the first time in Turkey in the studies carried out in Bartın province in 2015.

Garella musculana is one of the most important pests of walnut fruit and young shoots in infected countries. Larvae damage fruit as a result of nutrition, and usually there are 1 larvae in the fruit, while sometimes 2 and rarely 3 larvae have been observed. In fruit, larvae are only nourished in the green shell (pericarp). As a result of the damage of larvae, fruits become deformed and there is no normal fruit development. As a result of the damage of the species 70-80% yield decrease can occur in the nuts. In addition to the loss of product in Walnut, this insect can cause seed distress for regeneration of natural *Juglans regia* forests. In the years of low fruit production, larval nutrition in shoots causes the death of shoots and this is usually a more serious danger for young trees (Orozumbekov and Moore, 2007).

One of the reasons for the rapid spread of invasive species in the area where they first infect is the absence of natural enemies. Therefore, in this study we tried to determine the natural enemies of *Garella musculana* in Bartın province.

Townes et al. (1965) reported that most of the species belonging to the Ichneumonidae family parasite Lepidoptera larvae and some species parasite Coleoptera

larvae. Especially *Pimpla* (F.) species belonging to the type of polyphagous pests many species under pressure has been recorded. Borrer et al. (1981) indicate that species belonging to the Ichneumonidae family have a large host distribution.

Ichneumonids, as hosts, use a range of insects and arachnids can play an important role in the normal functioning of terrestrial ecosystems. They were also successfully used as biocontrol agents (Gupta, 1991).

Ichneumonidae species are present as internal and external parasites in larvae and pupae of species belonging to Lepidoptera, Coleoptera and Hymenoptera (Oğurlu, 2000).

In this study conducted between the years of 2015-2018, parasitoid species of *Garella musculana* were investigated and *Pimpla spuria* was determined as the first parasitoid record for the related pest which can be used as a biological control agent.

Materials and methods

In Bartın province, in order to carry out detailed studies about pest, pupas under the bark (*Fig. 1*) from the study areas of different localities such as Karasu, Akıncılar were brought to the laboratory and monitored after the adult exits. Preparation of the parasitoid species derived from some parasitoid pupas was made and photographed under microscope and sent to the diagnosis and species was identified.



Figure 1. Pupa cocoons of Garella musculana

Results and discussion

In this study, parasitoid species *Pimpla spuria* (F.) (Hymenoptera: Ichneumonidae) was obtained from pupae cocoons of *Garella musculana*. This parasitoid is reported for the first time on *G. musculana* (*Fig. 2*).

Pimpla spuria is a common species that is widely distributed in the Holarctic/Palaearctic and Oriental regions (Kolarov et al., 2014). In Turkey, this parasitoid has been identified in Adana, Adıyaman, Ankara, Afyon, Artvin, Balıkesir, Bilecik, Burdur, Bursa, Çanakkale Denizli, Edirne, Erzincan, Erzurum, Gaziantep, Giresun, Hatay, Isparta, Mersin, Istanbul, Kars, Kırklareli, Kocaeli, Konya, Manisa, Muğla, Rize, Şanlıurfa, Tekirdağ, Tunceli, Trabzon, Uşak and Yalova so far (Konca, 2015; Çoruh et al., 2014; Kolarov et al., 2014; Coruh and Kolarov, 2010). This is the first time Bartın has been added to its distribution area.



Figure 2. *Pimpla spuria*. **a** General view of adult, **b** wings, **c** antenna, **d** head

As the hosts of *Pimpla spuria*; *Ostrinia nubillis* (Özdemir, 1981) and *Lobesia botrana* (Özdemir and Kılınçer, 1990) were recorded in Turkey. Aslan (2015) identified *Pimpla spuria* as the most densest species in a study of *Lobesia botrana* parasitoids that harmful in vineyards in Gaziantep province.

Yurtcan and Beyarslan (2005) identified 21 species of Pimpline and Polysphinctinini (Hymenoptera: Ichneumonidae: Pimplinae) in the Trakya region and *Pimpla implemporator* (Müller, 1776) and *P. spuria* (Gravenhorst, 1829) as the most common species.

Aydoğdu (2014) *P. spuria* has been detected as parasitoid of *Archips rosana* (L., 1758) (Lepidoptera: Tortricidae) in organic cherry orchards the first time. And also, in the cherry orchards of Sultandağı Basin, including *Pimpla spuria*, 30 species from the Ichneumonidae family were identified (Özdemir and Güler, 2009).

Pimpla spuria was identified as pupa parasitoid of *Sesamia nonagrioides* (Lepidoptera: Noctuidae) in Cukurova region. At the same time, Oztemiz et al. (2004) reported as pupa parasitoid of *Sesamia nonagrioides* (Lepidoptera: Noctuidae) and *Ostrinia nubilalis* (Lepidoptera: Pyralidae) of the same species.

In Bulgaria, *Pimpla spuria* (Gravenhorst, 1829) was identified as parasitoid of *Cydia pomonella* and *Grapholita funebrana* species. *Grapholita funebrana* was given to the new host of *P. spuria* (Velcheva and Atanassov, 2016).

The natural enemies of *G. musculana* can play an important role in regulating its populations. Sixteen species of parasitoids and predators belonging to Ichneumonidae, Braconidae, Pteromalidae, Torymidae, Trichommatidae, Carabidae, Raphididae and Formicidae are recorded as *G. musculana*. The most common of these, *Trichogramma*

sp. and *Pimpla instigator*. Sometimes, caterpillars are infected by bacteria *Bacillus thuringiensis* or fungi *Beauveria bassiana* (Degtyareva, 1964; Dzharparov, 1990).

Conclusion

Garella musculana which is harmful to walnut trees causes severe damage and brings about economic loss since first detected in Turkey. In order to control *G. musculana*, added to the A2 list in 2003 by the European and Mediterranean Plant Protection Organization (EPPO), some biological control methods are investigated against this pest. In our study conducted within the border of Bartın Province; it was observed that some pupas collected from the study areas were parasitic. As a result of the diagnosis, the parasitoid species were identified as *Pimpla spuria*. The importance of this identifying is; *P. spuria* was the first parasitoid recorded on *Garella musculana* in Turkey.

The abundance and effectiveness of *Pimpla spuria*'s host diversity is thought to play an active role in control of the important walnut pest *Garella musculana*.

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