

First Report of *Carcina quercana* on the Strawberry Tree (*Arbutus unedo*) in North Western Tunisia

Olfa Ezzine, Kaouther Ben Yahia, Laboratoire d'Ecologie Forestière, **Samir Dhahri**, Laboratoire de Gestion et de Valorisation des Ressources Forestières, **Youssef Ammari** Laboratoire d'Ecologie forestière, and **Mohamed Lahbib Ben Jamâa**, Laboratoire de Gestion et de Valorisation des Ressources Forestières. Institut National des Recherches en Génie Rural, Eaux et Forêts, Université de Carthage, Ariana, Tunisia

ABSTRACT

Ezzine, O., Ben Yahia, K., Dhahri, S., Ammari, Y., and Ben Jamâa, M.L. 2018. First report of *Carcina quercana* on the strawberry tree (*Arbutus unedo*) in north western Tunisia. Tunisian Journal of Plant Protection 13 (2): 269-274.

Carcina quercana is a polyphagous insect. In April 2018, larvae of *C. quercana* were observed for the first time in Majen Esfess (north western Tunisia) on the strawberry tree (*Arbutus unedo*). To estimate the percentage of tree infestation, the number of infested trees among 40 trees found in an area of one hectare was counted. Branches of about 30 cm in length were cut and examined in the laboratory to determine the percentage of the infested leaves. On infested leaves, shelters were counted and the number of larvae by shelter was determined. The percentage of infested tree was 20% and that of infested leaves was 7.16%. In each leaf, we found between 1 and 3 shelters, in which only one larva host it. Larvae of *C. quercana* build their shelters of about 1.91 cm in length and 0.73 cm in width by means of silk.

Keywords: *Arbutus unedo*, *Carcina quercana*, larvae, Tunisia

The Gelechioidea is a mega-diverse superfamily of Lepidoptera with 18000 described and more unnamed species and ranks among the most diverse Lepidopteran superfamilies (Kaila et al. 2011). The family of Peleopodidae includes 7 genera and 28 species (Van Nieukerken et al. 2011).

The species *Carcina quercana* is univoltine and a polyphagous insect (Luciano and Roversi 2001). Larvae attack several families: Fagaceae (*Quercus* (Luciano and Roversi 2001), *Fagus*

sylvatica, *Castanea sativa*), Rosaceae (*Crataegus monogyna*, *Prunus spinosa*, *Malus sylvestris*, *Sorbus*, *Rosa*), Caprifoliaceae (*Viburnum*), Hypericaceae (*Hypericum*), Aceraceae (*Acer pseudoplatanus*) (Emmet and Langmaid 2002) and Ericaceae (*Arbutus unedo*) (Luciano and Roversi 2001). *Carcina quercana* is widely distributed, particularly in central and southern Europe (Alford 2017), is common and widespread throughout the UK and Ireland (O'Reilly 2017) and an introduced pest in Canada (Alford 2017). It was reported in Algeria by Benia and Bounechada (2011) and in Morocco by Villemant and Fraval (1993).

The strawberry tree is one of 12 species, which belongs to the genus

Corresponding author: Olfa Ezzine
Email: olfa.ezzine@gmail.com

Accepted for publication 27 December 2018

Arbutus of Ericaceae family (Ertekin and Kirdar 2010). It is an evergreen shrub species and typical of Mediterranean fringe and climate, but today it is also cultivated in many other regions such as the Near East and Transcaucasia (Seidemann 1995). In Tunisia, *A. unedo* is observed in the north west, in the forests of *Q. suber* and *Q. canariensis* (Mezghani 1992) and in the north east, in Jebel Abderrahmane (Ezzine 2016).

This work is a first report of *C. quercana* on *A. unedo* in northwestern Tunisia.

MATERIALS AND METHODS

Study area.

The investigations were carried out in the northwestern Tunisia (Majen Essef, Ain Drahem, 36°46'07.48" N.; 8°47'41.80" E.; alt.800 m) in April and May 2018. The plot was circular shaped (1 ha). The forest study area consists mainly of *Q. suber*, *Q. canariensis*, *Erica arborea*, *Myrtus communis*, *Halimium halimifolium*, *Daphne gnidium*, *A. unedo* and *Phillyrea angustifolia*.

Host plant infestation.

To study shrub species infestation of this site, investigations have focused on all existing shrub species. Infestation was observed only on *A. unedo*. To estimate the infested host plant, the number of infested trees was counted. The largest and smallest diameters of the crown of each infested plant were measured and the mean diameter per plant was calculated (Ezzine et al. 2015).

Collection of branches and examination of shelters.

Branches of about 30 cm in length were cut and examined in the

laboratory to determine the number of the infested leaves per branch. There were two types of leaves: non infested leaves and leaves hosting only shelters of *C. quercana*. Infested leaves were placed in Petri dish (9 cm diameter) and kept in the laboratory at 25°C. The length and the width of the infested leafves were measured and the number of shelters per leaf was counted. The number of larvae by shelter was determined (Ezzine et al. 2018). Identification of species was done using Luciano and Roversi (2001) key.

RESULTS

Infestation.

In total, 40 trees were investigated and among them, about 20% (n = 8) of *A. unedo* were infested. The number of infested leaves was 1 to 3 per branch (average 1.29). Mean crown diameter of the trees ranged from 37.5 to 170 cm (average 104.81 cm). The height of the trees ranged from 60 to 390 cm (average 199.37 cm).

Shelters density.

In a single leaf, we find between 1 and 3 shelters (average 1.42), in which only one larva was observed. The shelter length ranged from 1.2 to 2.7 cm (average 1.91 cm), while the shelter width ranged from 0.4 to 1.4 cm (average 0.73 cm).

Biological observations.

In Majen Essef, larvae of *C. quercana* (Fig. 1a,b) were observed between April and May 2018. The extremities of the shelter are open allowing the movement of larvae. When fully grown, larva pupates beneath an opaque, sheet-like web (Fig. 1c). Adult (Fig. 1d) was observed in June 2018.



Fig. 1. Different stages of *C. quercana* development. **a:** Shelter of *C. quercana* (with 1: Larva in the shelter; 2: Defoliated part of the leaf); **b:** larva; **c:** pupa; **d:** adult.

DISCUSSION

The Gelechioid larvae display a wide array adaptation (Powell et al. 1998). Most species are external feeders at the larval stage, but larvae stay in a shelter/a silken web or tube, or between leaves that have been tied together (Kaila et al. 2011). Some Gelechioid larvae spend most of their time below ground, and regularly resurface to consume leaf rosettes or other resources from there. Certain species-rich lineages, entirely or partly, consist of species with larvae as leaf miners during at least some part of their development. Many other species are leaf miners at least at some life stage (Emmet et al. 1996).

Carcina quercana lives sheltered behind a flat transparent silken web attached to the underside of the leaves and

feeds on. It folds the leaf very slightly by drawing the outer margins together (Luciano and Roversi 2001). It feeds singly on the underside of leaves (this part is more often in the shade and so it is cooler, and to flee predators). Young larvae bite out patches in the underside of leaves often leaving the upper surface intact. Later, complete holes are made in the lamina near the web, either in the center or at the margin of the leaf (Alford 2017) but without causing any serious damage (Alford 2017; Luciano and Roversi 2001). It is common for shelter-building microlepidopterans to spend the whole larval stage protected (Gaston et al. 1991) as observed for *Anacampsis scintillella* on *Q. coccifera* (Ezzine et al. 2018). Larvae of *C. quercana* are active in

May and June; each sheltering beneath a transparent web of transverse threads (Alford 2017). In Majen Essef, larvae were observed between April and May. Adult was observed in July and August (Alford 2017), but in our study site, it was observed in June.

Carcina quercana is polyphagous and mainly related to oak species: *Q. canariensis* (Mannai 2017) and *Q. suber* (Luciano and Roversi 2001). In this work, larvae were observed on *A.*

unedo, even though the vegetation of this plot is composed also by *Q. suber* and *Q. canariensis*. So, it will be interesting to make an investigation on *Q. canariensis* in this site (Majen Essef) to check whether it is infested by *C. quercana* or not, to eventually compare the infestation of the two host plants (*A. unedo* and *Q. canariensis*) in the same site and to study the life cycle and larvae development on each host species.

RESUME

Ezzine O., Ben Yahia K., Dhahri S., Ammari Y. et Ben Jamâa M.L. 2018. Premier signalement de *Carcina quercana* sur l'arbousier (*Arbutus unedo*) dans le nord-ouest de la Tunisie. Tunisian Journal of Plant Protection 13 (2): 269-274.

Carcina quercana est un insecte polyphage. En avril 2018, des larves de *C. quercana* ont été observées pour la première fois à Majen Essef (nord-ouest de la Tunisie) sur l'arbousier (*A. Unedo*). Pour estimer le pourcentage d'infestation des arbres, nous avons compté le nombre d'arbres infestés parmi 40 arbres d'arbousier trouvés dans une zone d'un hectare. Des branches d'environ 30 cm de long ont été coupées et examinées au laboratoire pour déterminer le pourcentage de feuilles infestées. Sur ces feuilles infestées, les abris des chenilles ont été comptés et le nombre de larves par abri a été déterminé. Le pourcentage d'arbres infestés était de 20% et celui des feuilles infestées de 7,16%. Sur chaque feuille, nous avons trouvé entre 1 et 3 abris, et une seule larve par abri a été observée. Les larves de *C. quercana* construisent un abri en soie d'environ 1,91 cm de long et de 0,73 cm de large. Les extrémités de l'abri sont ouvertes pour assurer le déplacement de la larve.

Mots clés: *Arbutus unedo*, *Carcina quercana*, larve, Tunisie

ملخص

الزيتون، آفة وكوثر بن يحيى وسمير الظاهري ويوسف عماري ومحمد لحبيب بن جامع. 2018. أول تقرير حول تواجد العثة *Carcina quercana* على شجرة القطلب أونيدو/الشماري (*Arbutus unedo*) في شمال غرب تونس.

Tunisian Journal of Plant Protection 13 (2): 269-274.

إن العثة *Carcina quercana* هي حشرة متعددة العوائل النباتية. في أبريل 2018، شاهدنا يرقات *C. quercana* لأول مرة في ماجن الساف (شمال غرب تونس) على شجرة القطلب أونيدو/الشماري (*Arbutus unedo*). لتقدير نسبة الإصابة بالأشجار، قمنا بحساب عدد الأشجار المتضررة على 40 شجرة قطلب أونيدو موجودة في مساحة هكتار واحد. تم قطع بعض فروع الشجرة بطول 30 سم وفحصها في المخبر لتحديد نسبة الأوراق المصابة. ثم على هذه الأوراق المصابة، تم إحصاء ملاجئ اليرقة وحساب عدد اليرقات في كل ملجأ. بلغت نسبة الأشجار المصابة 20% وكانت نسبة الأوراق الموبوءة 7.16%. على كل ورقة، وجدنا ما بين 1 و 3 ملاجئ، وقد لوحظت يرقة واحدة فقط في كل ملجأ. تقوم اليرقات ببناء مأوى من الحرير يبلغ طوله 1.91 سم وعرضه 0.73 سم. يكون طرفي المأوى مفتوحين لضمان حركة اليرقة.

كلمات مفتاحية: تونس، يرقة، *Carcina quercana*, *Arbutus unedo*

LITERATURE CITED

- Alford, D.V. 2017. Pests of Fruit Crops: A Colour Handbook, 2nd Edition. CRC Press, USA, 462 pp.
- Benia, F., and Bounechada, M. 2011. Data concerning the entomological fauna in Tafat National Forest (North-East of Algeria). Bulletin UASVM Agriculture 68: 42-51.
- Emmet, A.M., and Langmaid, J.R. 2002. Oecophoridae to Scythrididae (Part1). Pages 1-326. In: The moths and butterflies of Great Britain and Ireland. A.M. Emmet, and J.R. Langmaid, Ed. Editions Harley Books, Colchester, Essex, UK.
- Emmet, A.M., Langmaid, J.R., Bland, K.P., Corley, M.F.V., and Razowski, J. 1996. Coleophoridae. Pages 126-338. In: The Moths of Great Britain and Ireland. A.M. Emmet, Ed. Editions Harley Books, Colchester, Essex, UK.
- Ertekin, M., and Kirdar, E. 2010. Breaking seed dormancy of the strawberry tree (*Arbutus unedo*). International Journal of Agriculture and Biology 12: 57-60.
- Ezzine, O. 2016. Interactions insectes/plantes-hôtes : cas *Orgyia trigotephras* Boisduval (1829) (Lepidoptera, Erebidae) en Tunisie. Doctorate Thesis in Biology, Faculté des Sciences Mathématiques, Physiques et Naturelles de Tunis, Université El Manar, Tunisia, 206 pp.
- Ezzine, O., Branco, M., Villemant, C., Schmidt, S., Nouira, S., and Ben Jamâa, M. L. 2015. Host use in *Orgyia trigotephras* (Erebidae, Lymantriinae) during outbreak: effects on larval performance and egg mortality. Annals of Forest Science 72: 561-568.
- Ezzine, O., Hammami, S., Boudhina, S., and Ben Jamâa, M.L. 2018. Performance of *Anacamptis scintillella* in Tunisia. Tunisian Journal of Plant Protection 13:183-189.
- Gaston, K.J., Reavey, D., and Valladares, G.R. 1991. Changes in feeding habit as caterpillars grow. Ecological Entomology 16: 339-344.
- Kaila, L., Mutanen, M., and Nyman, T. 2011. Phylogeny of the mega-diverse Gelechioidea (Lepidoptera): Adaptations and determinants of success. Molecular Phylogenetics and Evolution 61: 801-809.
- Luciano, P., and Roversi, P. 2001. Oak defoliators in Italy. Industria Grafica Poddighe Editions, Italy, 161 pp.
- Mannai, Y. 2017. Etude des Lépidoptères défoliateurs des chênes au nord-ouest de la Tunisie: Biodiversité et interactions insectes/plantes-hôtes. Doctorate Thesis in Biology, Faculté des Sciences Mathématiques, Physiques et Naturelles de Tunis, Université El Manar, Tunisia, 271 pp.
- Mezghani, S. 1992. Exploitation traditionnelle du Maquis au Nord de la Tunisie. Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH Editions, Eschborn, Germany, 177 pp.
- O'Reilly, P. 2017. Matching the Hatch. Stillwater, River and Stream. Quiller Editions, UK, 224 pp.
- Powell, J.A., Mitter, C., and Farrell, B. 1998. Evolution of larval food preferences in Lepidoptera. Pages 403-422. In: Lepidoptera: Moths and butterflies. Handbook of Zoology/Handbuch der Zoologie. N.P. Kristensen, Ed. Editions Walter de Gruyter GmbH. & Co, Berlin and New York, USA.
- Seidemann, J. 1995. Zur Kenntnis von wenig bekannten exotischen FruKchten. 5. Mitt.: Baumerdbeere

- (*Arbutus unedo* L.). Dtsch. Lebensmittel-Rdsch 91: 110-113.
- Van Nieukerken, E. J., Kaila, L., Kitching, I.J., Kristensen, N. P., Lees, D. C., Minet, J., and Zwick, A. 2011. Order Lepidoptera Linnaeus, 1758. Pages 212-221. In: Animal Biodiversity: an outline of higher-level classification and survey of taxonomic richness. Z.Q. Zhang, Ed. Editions Auckland, Magnolia Press, New Zealand.
- Villemant, C., and Fraval, A. 1993. The insect fauna of the cork-oak tree in the Mamora forest (Morocco). *Ecologia Mediterranea* 19: 89-98.
-