Brazilian Journal of Biology®

ISSN 1519-6984 (Print)
ISSN 1678-4375 (Online)

Original Article

Oncideres saga Dalman: first record damaging *Stryphnodendron adstringens* Mart. Coville (Fabaceae) in Brazil

Oncideres saga Dalman: primeiro registro em *Stryphnodendron adstringens* Mart. Coville (Fabaceae) no Brasil

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Abstract

Oncideres females girdle tree branches of the Fabaceae family, interrupting the sap flow and turning the wood conditions ideal for their larvae development. The bark of *Stryphnodendron adstringens* (Mart.) Coville, a species native to the Brazilian Cerrado, is widely used in the traditional medicine. The objectives were to report, for the first time, *Oncideres saga* (Dalman), using *S. adstringens* as a host and to describe the pattern of branch girdling and oviposition distribution by this insect on these branches. The diameter at the base and the length of the girdled branches were measured and the number of incisions made by the *O. saga* females to oviposit, per branch section (basal, median and apical), counted. The emerged specimens were counted and the diameter of the exit holes measured. The average diameter at the base of the girdled branches was 2.5 ± 0.16 cm and the length was 90.6 ± 4.6 cm. The average number of incisions per branch was 37.7 ± 2.7. Damage by *O. saga* can reduce the growth and cause losses on *S. adstringens*, a tree with great extractivism potential.,

Keywords: bark, beetle, Cerrado, IPM, twig girdler.

Resumo

As fêmeas de *Oncideres* anelam galhos de árvores da família Fabaceae, interrompendo o fluxo de seiva, tornando a madeira ideal para o desenvolvimento de suas larvas. A casca de *Stryphnodendron adstringens* (Mart.) Coville uma espécie nativa do cerrado brasileiro, é amplamente utilizada na medicina tradicional. Os objetivos foram relatar, pela primeira vez, *Oncideres saga* (Dalman), usando *S. adstringens* como hospedeiro e descrever o padrão dos galhos anelados e a distribuição das posturas desse inseto. O diâmetro na base e o comprimento dos galhos anelados foram medidos e o número de incisões feitas pelas fêmeas por seção do galho (basal, mediana e apical) quantificados. Os espécimes emergidos foram contados e o diâmetro dos orifícios de emergência medidos. O diâmetro médio, dos galhos anelados, na base foi de 2,58 ± 0,16 cm e o comprimento de 90,6 ± 4,6 cm. O número médio de posturas por galho foi 37,7 ± 2,7. Danos por *O. saga* podem reduzir o crescimento e causar perdas em *S. adstringens*, árvore com grande potencial extrativista.

Palavras-chave: besouro, casca, Cerrado, MIP, serrador.

1. Introduction

Beetles of the genus *Oncideres*, known as twig girdlers, girdle and detach branches and tree trunks for oviposition (Lemes el al., 2015). This action interrupts the sap flow from the tree, making the branch more nutritious, with a high nitrogen and phosphorus content, ideal for their larvae development (Calderón-Cortés et al., 2016, Correa et al., 2019). These longhorn beetles are exclusive to the Americas (Monné and Bezark 2009), with damage registered throughout Brazil, especially on trees of the Fabaceae family (Lemes et al., 2014a, Lemes et al., 2015, Corrêa et al., 2019).

The bark of *Stryphnodendron adstringens* (Mart.) Coville is used in the traditional medicine because of its antidiabetic, antifungal, anti-inflammatory and healing properties (dos Santos et al., 2018). However, the removal of the bark, in an inappropriate way, may lead to tree death and, therefore, the use of leaves, that also have these properties, may turn this extractivist activity more sustainable (Sabino et al., 2018).

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Received: 18 June 2020 – Accepted: 11 Nov. 2020

Seed and fruit borers, such as *Acanthoscelides gregorioi* (Pic), *Cydia tonosticha* (Meyrick), and larvae of *Holcocera cerradicola* (Clemens) (Adamski and Ribeiro-Costa, 2008, Silva and Zampieron, 2016) damage *S. adstringens,* but there are no records on damage to its non-reproductive parts. The knowledge on the hosts and distribution of Cerambycidae borers may reduce and prevent their damage (Corrêa et al., 2020).

The objectives of this study were to report, for the first time, a twig girdler beetle damaging *S. adstringens* and to describe the pattern of girdled branches and the oviposition distribution on these branches by this insect.

2. Material and Methods

Three branches of S. *adstringens*, fresh girdled and fallen to the ground, were collected in a Cerrado area on the margins of the Federal Highway BR-451 in the municipality of Olhos d'Água, Minas Gerais, Brazil (17° 13'25,1724 " S, 43° 40'19.3836 " W, 820 m), next to an *Eucalyptus* plantation in July 2018.

The diameter at the base and the length of the girdled branches were measured with a caliper (0.05 mm precision) and a millimeter tape (1.0 cm precision), respectively. The number of secondary branches and incisions, made by the females to lay eggs (Figure 1a), were counted by branch section (basal, median and apical).

The girdled branches were stored in 100 L closed plastic bags, with small holes for air entry, and kept at 24.1 ± 0.16 °C (temperature) and 57% ± 3.14% (relative humidity) between July 2018 and September 2019. These branches were weekly removed, wet with a watering can, left out to lose the moisture excess and placed back in the bags.

The emerged beetle specimens were quantified and conditioned in 70% alcohol for identification through literature and specialists consultation. Adult individuals of the morphospecies that emerged were pinned, tagged and sent to Dr. Miguel Monné (Museu Nacional, Universidade Federal do Rio de Janeiro - UFRJ, Rio de Janeiro, State of Rio de Janeiro, Brazil), for identification.

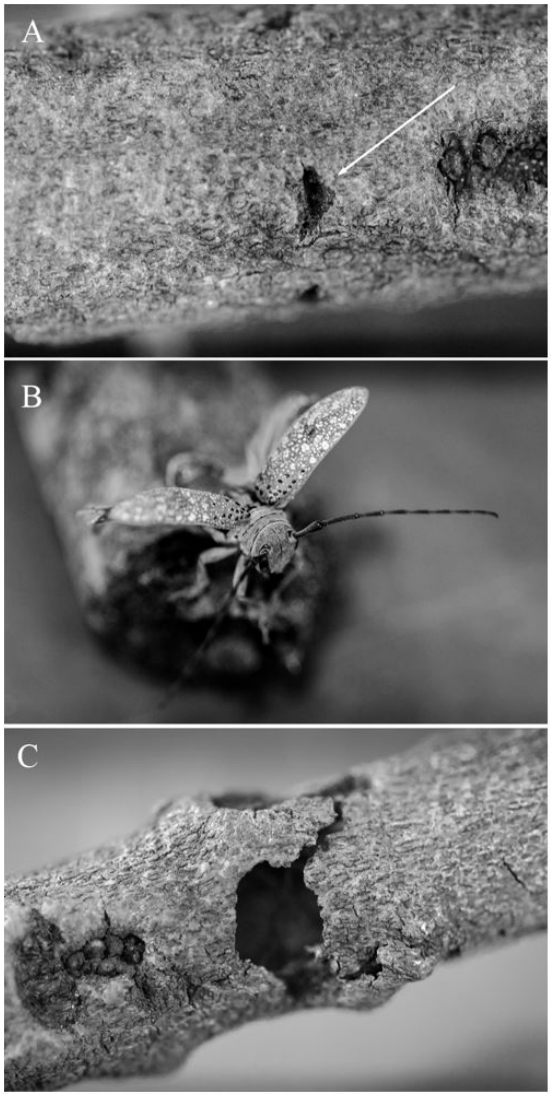

Figure 1. Incision made by the *Oncideres saga* female in a branch of *Stryphnodendron adstringens* to lay eggs (A, indicated by the arrow); adult emerged from the branch (B) and adult exit hole (C).

3. Results

A total of 38 beetles, from two species of the Cerambycidae family, were collected. The species, that girdled the branches, was *O. saga* (Figure 1b), the only twig girdler that emerged from the branches. *Oncideres saga* adults emerged from July to August 2019. *Oncideres saga* adults emerged through ellipse shaped holes (Figure 1c) with an average length and width of 0.71 ± 0.45 cm and 0.35 ± 0.20 cm, respectively. Thirty-two individuals of *Eriphus biguttatus* (Germar), an inquiline of the branches girdled by *O. saga*, emerged from December 2018 to September 2019 (Figure 2).

The diameter at the base and the length of the *S. adstringens* girdled branches were 2.34, 2.90 and 2.50 cm and 82, 92 and 98 cm, with three, five and three secondary branches, respectively. The number of incisions per branch was 37.7 ± 2.7. The number of egg incisions (Figure 3) was higher in the median section of the branches (16.3 ± 1.2), followed by the apical and basal, 11.7 ± 1.4 and 9.7 ± 1.8, respectively.

4. Discussion

Oncideres saga damages trees of several plant families of agricultural and forestry importance such as *Acacia mangium* Willd (Fabaceae) (Magistrali et al., 2013), *Anacardium occidentale* L. (Anacardiaceae) (Mesquita et al., 2017), *Cedrela fissilis* Vell. (Meliaceae) (Pereira et al., 2016), and *Ocotea puberula* (Rich.) Nees (Lauraceae) (Witeck Neto et al., 2015, Lemes et al., 2015). The opportunistic secondary colonizer *E. biguttatus*

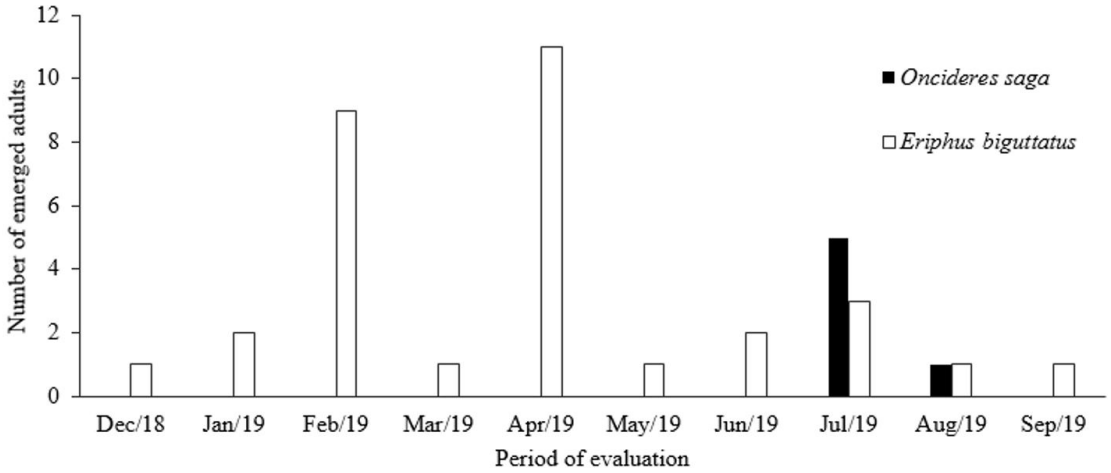

Figure 2. Number of *Oncideres saga* and *Erippus biguttatus* emerged from the *Stryphnodendron adstringens* (Fabaceae) girdled branches through time.

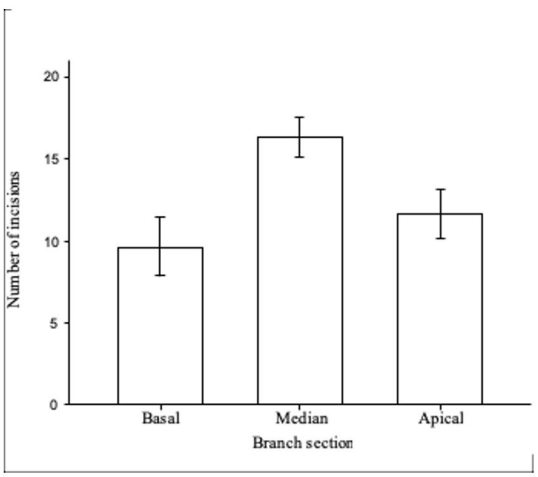

Figure 3. Egg laying incisions of *Oncideres saga* per branch section (average ± SE) of *Stryphnodendron adstringens* (Fabaceae).

inhabiting girdled branches of *S. adstringens*, indicates that they are a habitat with adequate food for the twig girdler larvae and inquiline species as found for *A. mangium* girdled branches (Lemes et al., 2015).

The diameter of the *S. adstringens* branches girdled by *O. saga* were smaller than those made by *Oncideres cervina* (Thomson) in *Ocotea puberula* (Rich.) Nees (Lauracea) in Santa Maria, Rio Grande do Sul, 4.06 ± 0.15 cm (Witeck Neto et al., 2015), *Oncideres dejeanii* (Thomson) in *Pyrus pyrifolia* (Burm. F.) Naka (Rosaceae), 3.47 ± 0.15 cm (Cordeiro et al., 2010) and *Oncideres ocularis* (Thomson) in *Mimosa bimucronata* (DC.) Kuntze (Fabaceae), 8.26 ± 0.84 mm (Lemes et al., 2014a) in Viçosa, Minas Gerais, Brazil.

The length of the *S. adstringens* branches girdled by *O. saga*, was shorter than those of *O. puberula* by *O. cervina*, 282 ± 0.87 cm (Witeck Neto et al., 2015), *P. pyrifolia* by *O. dejeanii*, 331 ± 0.17 cm (Cordeiro et al., 2010) and longer than those of *M. bimucronata* by *O. ocularis*, 126.72 ± 11.09 cm (Lemes et al., 2014a).

The preference of *O. saga* females to lay their eggs, preferably in the median section of the branches, may be associated with the quantity of wood volume available for the development of their larvae (Lemes et al., 2014b). The volume, the surface area and the length of the girdled branches correlate with the number of eggs laid and larva hatched by twig girdlers (Lemes et al., 2014c). These beetles lay eggs far from the edges, preventing their larvae from leaving the branches and ensuring adequate food reserves in any direction they move (Paulino Neto et al., 2006, Lemes et al., 2013).

The exit holes of *O. saga* in *S. adstrigens* were smaller than those of this beetle and *O. dejeani* in *Parapiptadenia rigida* (Benth.) Brenan (Fabaceae), 1.04 ± 0.18 cm and 0.85 ± 0.15 cm and 0.97 cm ± 0.18 and 0.79 cm ± 0.18 in length and width, respectively (Link et al., 1994) and those of *O. cervina* in branches of *O. puberula*, in Santa Maria, Rio Grande do Sul, 0.97 cm ± 0.23 long and 0.81 cm ± 0.15 wide (Witeck Neto et al., 2015). Differences between these exit holes dimensions may be associated to the variation in the adult size of each species. On the other hand, differences within individuals of the same species, but using different tree species as host, such as *O. saga* in *S. adstrigens* and *P. rigida*, may be associated with the quantity and quality of the wood used as food by their larvae, affecting the size of the adults emerged.

This is the first record of a twig girdler beetle damaging *S. adstrigens*. *Oncideres saga* damage may reduce the growth and cause losses on the *S. adstrigens* trees, which have great extractivist potential. The female twig girdler lays more eggs in the median section of *S. adstrigens* girdled branches, ensuring the development and survival of their offspring.

Acknowledgements

We are thankful to Dr. Miguel Monné (Museu Nacional – UFRJ) for the identification of insects and the Brazilian institutions "*Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq)*", "*Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES-Finance Code 0001)*", "*Fundação de Amparo à Pesquisa do Estado de Minas Gerais (FAPEMIG)*" and *Programa Cooperativo sobre Proteção Florestal (PROTEF) do Instituto de Pesquisas e Estudos Florestais (IPEF)* for supporting this research.

References

ADAMSKI, D. and RIBEIRO-COSTA, C.S., 2008. A new *Holcocera clemens*, 1863 (Lepidoptera: Coleophoridae) associated with leguminous plants from the Brazilian cerrado. *Proceedings of the Entomological Society of Washington*, vol. 110, no. 3, pp. 737-742. http://dx.doi.org/10.4289/07-068.737.1.

CALDERÓN-CORTÉS, N., URIBE-MÚ, C.A., MARTÍNEZ-MÉNDEZ, A.K., ESCALERA-VÁZQUEZ, L.H., CRISTOBAL-PÉREZ, E.J., GARCÍA-OLIVA, F. and QUESADA, M., 2016. Ecosystem engineering and manipulation of host plant tissues by the insect borer *Oncideres albomarginata chamela*. *Journal of Insect Physiology*, vol. 84, pp. 128-136. http://dx.doi.org/10.1016/j.jinsphys.2015.10.008. PMid:26654885.

CORDEIRO, G., ANJOS, N., LEMES, P.G. and MATRANGOLO, C.A.R., 2010. Ocorrência de *Oncideres dejeanii* Thomson (Cerambycidae) em *Pyruspyrifolia* (Rosaceae), em Minas Gerais. *Pesquisa Florestal Brasileira*, vol. 30, no. 62, pp. 153-156. http://dx.doi.org/10.4336/2010.pfb.30.62.153.

CORRÊA, C.A., et al, 2019. *Agrilozodes suarezi* (Coleoptera: Buprestidae) as secondary colonizer of a *Sclerolobium* sp. branch girdled by *Oncideres saga* (Coleoptera: Cerambycidae). *The Florida Entomologist*, vol. 102, no. 1, pp. 254-256. http://dx.doi.org/10.1653/024.102.0146.

CORRÊA, C.A., DOS ANJOS, N., CARVALHO, A.G., SOARES, M.A., DOS SANTOS JUNIOR, V.C. and ZANUNCIO, J.C., 2020. *Phoracantha recurva* (Coleoptera: Cerambycidae): first report in the Atlantic rainforest of Minas Gerais, Brazil. *The Florida Entomologist*, vol. 103, no. 1, pp. 142-144. http://dx.doi.org/10.1653/024.103.0426.

DOS SANTOS, E.L., BALDIVIA, D.S., LEITE, D.F., DE CASTRO, D.T.H., CAMPOS, J.F., DE OLIVEIRA, C.F.R., DE CARVALHO, J.T.G., SANTOS, U.P. and SOUZA, K.P., 2018. Antioxidant and anticancer activities from *Stryphnodendron adstringens*. *Free Radical Biology & Medicine*, vol. 128, pp. 66-66. http://dx.doi.org/10.1016/j.freeradbiomed.2018.10.136.

LEMES, P.G., DOS ANJOS, N. and JORGE, I.R., 2013. Bioecology of *Oncideres ocularis* Thomson (Coleoptera: Cerambycidae) on Acacia mangium Willd. (Fabaceae). *Journal of the Kansas Entomological Society*, vol. 86, no. 4, pp. 307-317. http://dx.doi.org/10.2317/JKES121121.1.

LEMES, P.G., CASTRO, A.A. and ZANUNCIO, J.C., 2014a. *Oncideres ocularis* (Coleoptera: Cerambycidae) girdling *Mimosa bimucronata* (Fabaceae) in Brazil. *The Florida Entomologist*, vol. 97, no. 3, pp. 1240-1243. http://dx.doi.org/10.1653/024.097.0333.

LEMES, P.G., ANJOS, N., JORGE, I.R. and LEITE, H.G., 2014b. Twig morphology effects on the number of egg incisions and reproductive success of *Oncideres ocularis* (Coleoptera: cerambycidae). *Studies on Neotropical Fauna and Environment*, vol. 49, no. 1, pp. 4-49. http://dx.doi.org/10.1080/01650521.2014.912541.

LEMES, P.G., et al, 2014c. Effect of intercropping on predation of *Oncideres ocularis* (Coleoptera: Cerambycidae) in Brazilian *Acacia mangium* plantations. *Revista Colombiana de Entomologia*, vol. 40, no. 1, pp. 34-39.

LEMES, P.G., CORDEIRO, G., JORGE, I.R., ANJOS, N.D. and ZANUNCIO, J.C., 2015. Cerambycidae and other Coleoptera associated with branches girdled by *Oncideres saga* Dalman (Coleoptera: Cerambycidae: Lamiinae: Onciderini). *Coleopterists Bulletin*, vol. 69, no. 1, pp. 159-166. http://dx.doi.org/10.1649/0010-065X-69.1.159.

LINK, D., COSTA, E.C. and THUM, A.B., 1994. Bionomia comparada dos serradores, *Oncideres saga* (Dalman, 1823) e *Oncideres dejeani* (Thomson, 1868) (Coleoptera: Cerambycidae) *em Parapiptadenia* rígida. *Ciência Florestal*, vol. 4, no. 1, pp. 137-144. http://dx.doi.org/10.5902/19805098303.

PAULINO NETO, H.F., VASCONCELLOS-NETO, J. and CARMELLO-GUERREIRO, S.M., 2006. The biology of *Oncideres humeralis* Thorms (Coleoptera: Cerambycidae: Lamiinae) and new Cerambycidae–Melastomataceae host-plant associations. *Studies on Neotropical Fauna and Environment*, vol. 41, no. 3, pp. 227-233. http://dx.doi.org/10.1080/01650520600839680.

MAGISTRALI, I.C., COSTA, E.C., GARLET, J., BOSCARDIN, J. and MACHADO, L.M., 2013. Danos de *Oncideres saga* em plantios de *Acacia mearnsii* no Rio Grande do Sul, Brasil. *Pesquisa Florestal Brasileira*, vol. 33, no. 76, pp. 459-462. http://dx.doi.org/10.4336/2013.pfb.33.76.378.

MESQUITA, A., OLICARPO, G.T.P., CARDOSO, J.E., MOTA, M.S.C.S., 2017. *Novas ocorrências de Cerambycidae (Insecta: Coleoptera) em cajueiro no Brasil e recomendações de manejo*. Fortaleza: Embrapa Agroindústria Tropical., (Comunicado Técnico).

MONNÉ, M.A. and BEZARK, L.G., 2009. *Checklist of the Cerambycidae, or longhorned beetles (Coleoptera) of the Western Hemisphere. 2007 Version 1*.

PEREIRA, L.D., FLEIG, F.D., MEYER, E.A., LANZARIN, K. and WOLF, K., 2016. Susceptibility of cedar to pest attack in seasonally deciduous forest. *Pesquisa Agropecuária Brasileira*, vol. 51, no. 5, pp. 607-614. http://dx.doi.org/10.1590/S0100-204X2016000500022.

SABINO, A.P.L., EUSTÁQUIO, L.M.S., MIRANDA, A.C.F., BIOJONE, C., MARIOSA, T.N. and GOUVÊA, C.M.C.P., 2018. *Stryphnodendron adstringens* ("Barbatimão") leaf fraction: chemical characterization, antioxidant activity, and cytotoxicity towards human breast cancer cell lines. *Applied Biochemistry and Biotechnology*, vol. 184, no. 4, pp. 1375-1389. http://dx.doi.org/10.1007/s12010-017-2632-z. PMid:29043662.

SILVA, T.M. and ZAMPIERON, S.L.M., 2016. Interações entre parasitoides e insetos endófagos em frutos de *Stryphnodendron adstringens* (Mart.) Coville (Fabaceae) no Cerrado Mineiro. *Revista Agrogeoambiental*, vol. 8, no. 2, pp. 53-63. http://dx.doi.org/10.18406/2316-1817v8n22016757.

WITECK NETO, L., LINK, D. and PASINI, M.P.B., 2015. Bioecologia de *Oncideres cervina* (Coleoptera: Cerambycidae) em canela-guaicá (Ocoteapuberula: Lauraceae) na região central do Rio Grande do Sul, *Brasil. Ciência Florestal*, vol. 25, no. 2, pp. 469-476. http://dx.doi.org/10.5902/1980509818466.