

Supplementary Material for TAVARES, WAGNER DE SOUZA, GERALDO SALGADO-NETO, JESUSA CRISOSTOMO LEGASPI, FRANCISCO DE SOUSA RAMALHO, JOSÉ EDUARDO SERRÃO AND JOSÉ COLA ZANUNCIO—**The Biological and Ecological Consequences of *Diolcogaster* sp. (Hymenoptera: Braconidae) Parasitizing *Agaraea minuta* (Lepidoptera: Arctiidae) and the Effects on Two *Costus* (Costaceae) Plant Species in Brazil.** Florida Entomologist 95(4) (December, 2012) at <http://purl.fcla.edu/fcla/entomologist/browse>

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#### ABSTRACT

*Costus spicatus* (Jacq.) Sw. and *Costus spiralis* (Jacq.) Roscoe var. *spiralis* (Costaceae) are economically important plants due to their pharmacological and medicinal properties and ornamental value. These plants are natives from Brazilian Atlantic Rainforest and are fed upon by *Agaraea minuta* Schaus, 1892 (Lepidoptera: Arctiidae). This study describes the damage done by *A. minuta* on *C. spicatus* and *C. spiralis* and the biological and ecological aspects of this species parasitism by *Diolcogaster* sp. (Hymenoptera: Braconidae). Twenty stems of *C. spicatus* and *C. spiralis*, with 100 last-instar caterpillars of *A. minuta*, were collected per plant in each of 2 years. The stem heights ( $F, P > 0.05$ ), leaf lengths ( $F, P > 0.05$ ), leaf widths ( $F, P > 0.05$ ) and the number of leaves per stem ( $F, P > 0.05$ ) of both plant species; number of pupae obtained from caterpillars of *A. minuta* ( $F, P > 0.05$ ), adult emergence of this defoliator ( $F, P > 0.05$ ) and of *Diolcogaster* sp. ( $F, P > 0.05$ ) were similar during the 2 study periods. *Agaraea minuta* fed on *C. spicatus* and *C. spiralis*, and *Diolcogaster* sp. was shown to be a parasitoid suppressor of populations of this defoliator.

Key Words: Arctiidae, biological control, Costaceae, defoliation, Microgastrinae, parasitoids

#### RESUMO

*Costus spicatus* (Jacq.) Sw. e *Costus spiralis* (Jacq.) Roscoe var. *spiralis* (Costaceae) são plantas economicamente importantes devido às suas propriedades farmacológicas e medicinais e valor ornamental. Essas plantas são nativas da Mata Atlântica brasileira e alimento para *Agaraea minuta* Schaus, 1892 (Lepidoptera: Arctiidae). Esse estudo descreve o dano por *A. minuta* sobre

*C. spicatus* e *C. spiralis* e aspectos biológicos e ecológicos de seu parasitismo por *Diolcogaster* sp. (Hymenoptera: Braconidae). Vinte hastes de *C. spicatus* e *C. spiralis*, com 100 lagartas de último estágio de *A. minuta*, foram coletadas por planta em cada um de dois anos. A altura das hastes ( $F, P > 0,05$ ), comprimento das folhas ( $F, P > 0,05$ ), largura das folhas ( $F, P > 0,05$ ) e o número de folhas por haste ( $F, P > 0,05$ ) de ambas as espécies de plantas; número de pupas obtidas de lagartas de *A. minuta* ( $F, P > 0,05$ ), emergência de adultos desse desfolhador ( $F, P > 0,05$ ) e de *Diolcogaster* sp. ( $F, P > 0,05$ ) foram semelhantes durante os dois períodos de estudo. *Agaraea minuta* pode se alimentar de plantas de *C. spicatus* e *C. spiralis* e *Diolcogaster* sp. mostrou ser um parasitóide supressor de populações desse desfolhador.

Palavras Chave: Arctiidae, controle biológico, Costaceae, desfolha, Microgastrinae, parasitóides



Suppl. Fig. 1A. Damage on leaves of *Costus spiralis* (Jacq.) Roscoe var. *spiralis* (Costaceae) by *Agaraea minuta* Schaus, 1892 (Lepidoptera: Arctiidae) caterpillars.



Suppl. Fig. 1B. Damage on leaves of *Costus spiralis* (Jacq.) Roscoe var. *spiralis* (Costaceae) by *Agaraea minuta* Schaus, 1892 (Lepidoptera: Arctiidae) caterpillars.



Suppl. Fig. 1C. Damage on apical bud of *Costus spiralis* (Jacq.) Roscoe var. *spiralis* (Costaceae) by *Agaraea minuta* Schaus, 1892 (Lepidoptera: Arctiidae) caterpillars.





Suppl. Fig. 1D. Damage on apical bud of *Costus spiralis* (Jacq.) Roscoe var. *spiralis* (Costaceae) by *Agaraea minuta* Schaus, 1892 (Lepidoptera: Arctiidae) caterpillars.



Suppl. Fig. 1E. Damage on petiole of *Costus spiralis* (Jacq.) Roscoe var. *spiralis* (Costaceae) by *Agaraea minuta* Schaus, 1892 (Lepidoptera: Arctiidae) caterpillars.



Suppl. Fig. 1F. Damage on petiole of *Costus spiralis* (Jacq.) Roscoe var. *spiralis* (Costaceae) by *Agaraea minuta* Schaus, 1892 (Lepidoptera: Arctiidae) caterpillars.





Suppl. Fig. 1G. Damage on *Costus spiralis* (Jacq.) Roscoe var. *spiralis* (Costaceae) clumps by *Agaraea minuta* Schaus, 1892 (Lepidoptera: Arctiidae) caterpillars.





Suppl. Fig. 1H. Damage on *Costus spicatus* (Jacq.) Sw. (Costaceae) clumps by *Agaraea minuta* Schaus, 1892 (Lepidoptera: Arctiidae) caterpillars.



Suppl. Fig. 2A. Adult of *Agaraea minuta* Schaus, 1892 (Lepidoptera: Arctiidae) with wings closed (dorsal view).



Suppl. Fig. 2B. Adult of *Agaraea minuta* Schaus, 1892 (Lepidoptera: Arctiidae) with wings closed (dorsal view).



Suppl. Fig. 2C. Adult of *Agaraea minuta* Schaus, 1892 (Lepidoptera: Arctiidae) with wings open (ventral view).





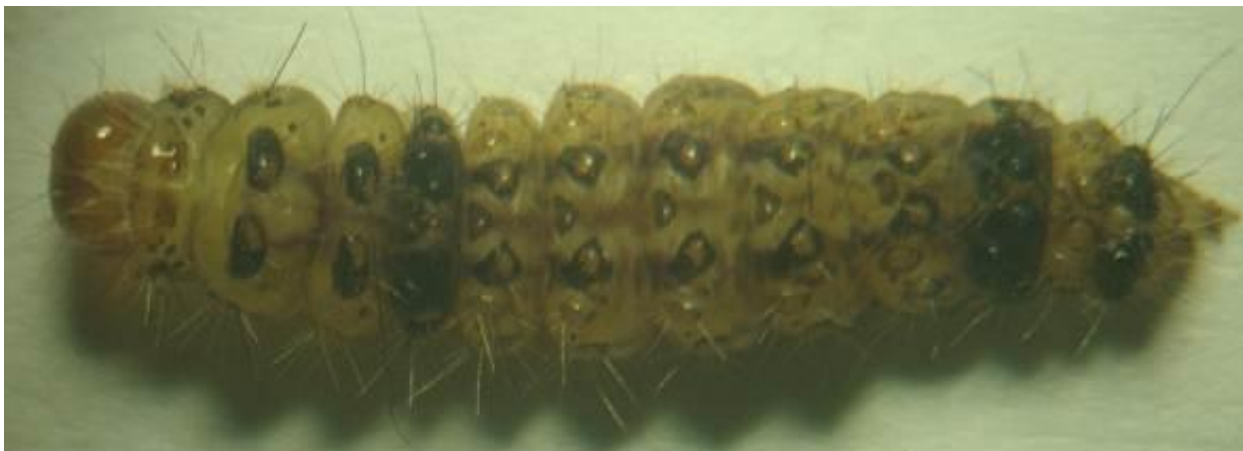
Suppl. Fig. 2D. Adult of *Agaraea minuta* Schaus, 1892 (Lepidoptera: Arctiidae) with wings open (dorsal view).



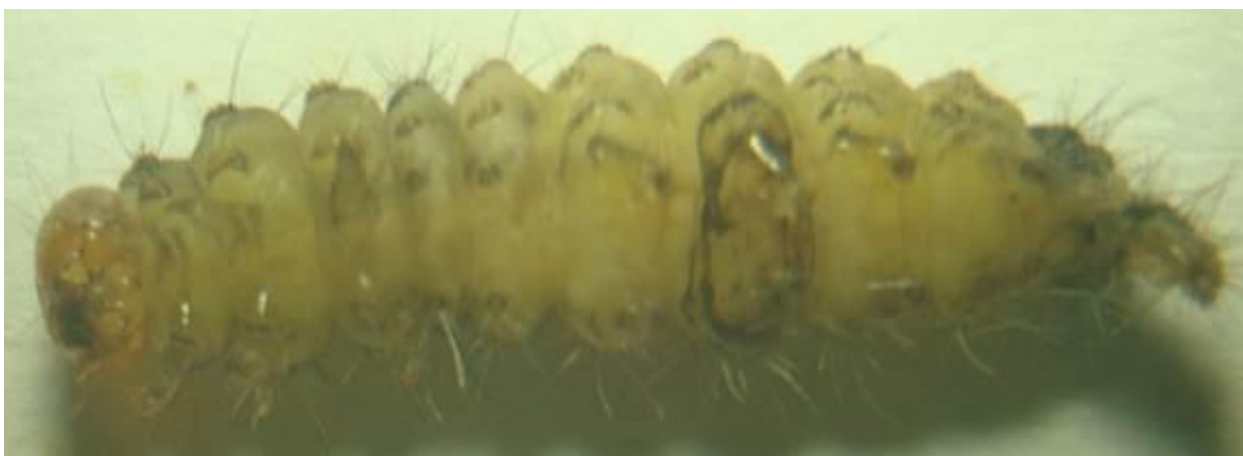
Suppl. Fig. 2E. Formation of the cocoon of *Agaraea minuta* Schaus, 1892 (Lepidoptera: Arctiidae).



Suppl. Fig. 2F. Formation of the pupa of *Agaraea minuta* Schaus, 1892 (Lepidoptera: Arctiidae).



Suppl. Fig. 2G. Caterpillar of *Agaraea minuta* Schaus, 1892 (Lepidoptera: Arctiidae) (dorsal view).



Suppl. Fig. 2H. Caterpillar of *Agaraea minuta* Schaus, 1892 (Lepidoptera: Arctiidae) (ventral view).



Suppl. Fig. 3A. Cocoon of *Diolcogaster* sp. (Hymenoptera: Braconidae).



Suppl. Fig. 3B. Female adult of *Diolcogaster* sp. (Hymenoptera: Braconidae).





Suppl. Fig. 3C. Female adult of *Diolcogaster* sp. (Hymenoptera: Braconidae).



Suppl. Fig. 3D. Female adult of *Diolcogaster* sp. (Hymenoptera: Braconidae).



Suppl. Fig. 3E. Female adult of *Diolcogaster* sp. (Hymenoptera: Braconidae).