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Behavioral aspects and predation of seeds of *Cardiospermum grandiflorum* Swartz (Sapindaceae) by *Cissoanthonomus tuberculipennis* Hustache (Coleoptera: Curculionidae)

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Abstract. For the first time in Brazil, the weevil *Cissoanthonomus tuberculipennis* Hustache, 1939 (Coleoptera: Curculionidae) are reported preying on seeds of *Cardiospermum grandiflorum* Swartz (Sapindaceae). Observations are presented on oviposition and larval behavior, pupation site, and adult emergence. Photos of host plant, egg, larva, pupa and adult are provided.

Key words. weevil, balloon vine, host plants, immature, Brazil

Introduction

The balloon vine, *Cardiospermum grandiflorum* Swartz (Sapindaceae), is native to and widely distributed in tropical areas of Central and South America from southern Mexico to Argentina and Brazil (Reitz 1980; Carroll et al. 2005; McKay et al. 2010; Simelane et al. 2011), and also occurs in Australia, Asia, and Africa (Reitz 1980; Ferrucci 1991; McKay et al. 2010). In Brazil, balloon vine is found in the states of Pará, Mato Grosso, Minas Gerais, Rio de Janeiro, São Paulo, Santa Catarina, and Rio Grande do Sul, where it is known by the following common names: cipó-timbó-miúdo, balãozinho, chumbinho, ensacadinha, and erva-de-vaqueiro (Reitz 1980; Pereira et al. 2010).

Cardiospermum grandiflorum was introduced as an ornamental garden creeper in Australia (Carroll et al. 2005) and South Africa (Henderson 2001; Olckers 2004), where it has become invasive, suppressing native species (Henderson 2001; Simelane et al. 2011) and causing ecological and economic problems (Martin 2003). The adaptability and invasive capacity of *C. grandiflorum* in regions where it has been introduced represent an increasingly severe threat to biodiversity (Simelane et al. 2011). Biological control is considered the most feasible option for containing the invasion of *C. grandiflorum* in regions where it has been introduced.

The aims of this study were to identify a species of insect that preys on seeds of *C. grandiflorum*, to quantify the percentage of damaged fruit, and to characterize the behavior of adults and larvae in the fruits and seeds.

Materials and methods

The experiment was conducted in Mata Atlântica Biome, Brazil, in deciduous forest on the shores of the Uruguay River, in the municipality of Erval Grande, northern Rio Grande do Sul state (27°16'35.74"S, 52°40'43.59"W, 266 masl). According to the Köppen classification system, climate in the region is humid subtropical (Cfa), with well-distributed rainfall during the year (Rio Grande do Sul 1994). Average annual rainfall is approximately 1954 mm and average minimum and maximum temperatures during the year are approximately 10.1°C and 19°C, respectively.

About 303 fruits were collected at random from five plants of *C. grandiflorum* in August 2009. These fruits were transported to the EMBRAPA entomology laboratory in Passo Fundo, Rio Grande do Sul state, and 253 fruits placed individually in plastic containers with sterilized sand in the bottom and closed with voile fabric. The remaining fruits, in different stages of development, were carefully examined



Figure 1. *Cissoanthonomus tuberculipennis*. (a) Developing fruits, with oviposition hole indicated by arrow. (b) Egg. Photos by Marcoandre Savaris.

to verify the presence of immature forms, the location of oviposition sites, the location and behavior of the larvae and pupae, and adult emergence.

The plastic containers with the fruits were maintained in the laboratory, in a well-ventilated area and at ambient temperature and relative humidity. Fruits were monitored daily to check for the emergence of adults, which was quantified, and the percentage of damaged seeds was calculated as well.

Results and Discussion

The weevil specimens found preying on *C. grandiflorum* seeds were identified by Rosado-Neto as *Cissoanthonomus tuberculipennis* Hustache, 1939 (Curculionidae: Curculioninae: Anthonomini), and this is the first record of the species for Brazil. The weevil has been recorded from Bolivia and Argentina



Figure 2. *Cissoanthonomus tuberculipennis*. (a) Larva. (b) Damaged and healthy seeds. Photos by Paulo Roberto Valle da Silva Pereira.

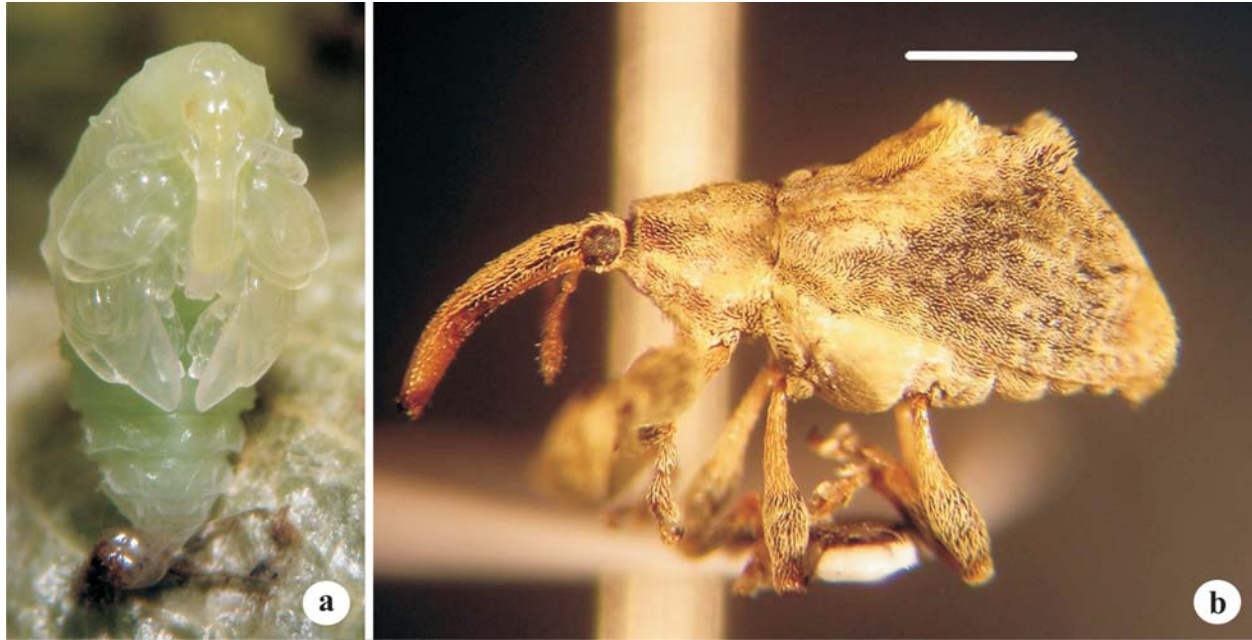


Figure 3. *Cissoanthonomus tuberculipennis*. (a) Pupa. (b) Adult. Scale line = 1 mm. Photos by Paulo Roberto Valle da Silva Pereira.

previously (Clark 2006; McKay et al. 2010; Simelane et al. 2011). Five voucher specimens were deposited in the Pe. Jesus S. Moure Entomology Collection of the Zoology Department at the Federal University of Paraná (DZUP), in Curitiba, Brazil.

An association between *C. tuberculipennis* and *C. grandiflorum* has previously been reported for Misiones province, Argentina (McKay et al. 2010; Simelane et al. 2011), along with 17 other phytophagous species of insects (McKay et al. 2010). The association of *C. tuberculipennis* with *C. grandiflorum* in Brazil corroborates results of Clark (2006), Clark et al. (2007), McKay et al. (2010), and Simelane et al. (2011), who reported *C. grandiflorum* as the only known host plant for *C. tuberculipennis*, which is considered monophagous and specific to this vine.

During oviposition, the female of *C. tuberculipennis* perforates the developing fruit with the *rostrum*, usually near the apex (Fig. 1a), where she places 1 to 3 small, hyaline eggs (Fig. 1b). This same behavior was observed in fruits (± 1 cm) in Argentina (McKay et al. 2010; Simelane et al. 2011).

The white-colored larvae (Fig. 2a) were observed feeding on seeds inside the capsules that splits the fruit. The percentage of damaged fruit was 64.3%, with an average of 1.5 insects/fruit. A single larva can move from one fruit to another and feed on more than one seed, and thus all seeds may be destroyed and not viable. We found 1-3 larvae inside each fruit, and feeding waste was observed around the damaged seeds (Fig. 2b). The movement of the larva inside the fruit in search of a new seed occurs with the larva's dorsal region turned to the inner walls of the capsule that splits it. In a study in Argentina, Simelane et al. (2011) reported 1-2 larvae of *C. tuberculipennis* per fruit, which were capable of destroying all seeds. Similar behavior was also recorded by McKay et al. (2010).

The pupae are white-cream to greenish, approximately 4 mm long, and found attached to the inner wall of the capsules of already developed fruits (Fig. 3a). Similar observations were reported by Simelane et al. (2011) in Misiones province, Argentina.

The adult (Fig. 3b) is approximately 5 mm long, with the body covered by light brown setae, darker in the apical half of the elytra. The head is deeply constricted behind the eyes, the anterior femora greatly enlarged, strong protuberances present on the dorsal middle of the elytra, and the elytral humeri acutely produced (Clark 1989, 2006). Adult emergence occurs inside the fruit while it is still on the plant or after it has fallen to the ground. After emergence, some individuals remain for some time inside the fruit before opening the outlet orifice, and may be dispersed together with the fruits. Adult emergence behavior corroborates the results obtained by Simelane et al. (2011) in Argentina.

In general, the results of this study are similar to those obtained by McKay et al. (2010) and Simelane et al. (2011) with specimens of *C. tuberculipennis* in Argentina. Based on our observations, we consider *C. tuberculipennis* a promising agent for biological control of *C. grandiflorum* in regions where the plant is native or exotic.

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Literature Cited

- Carroll, S. P., M. Mathieson, and J. E. Loye. 2005.** Invasion history and ecology of the environmental weed balloon vine, *Cardiospermum grandiflorum* Swartz, in Australia. *Plant Protection Quarterly* 20(4): 140-144.
- Clark, W. E. 1989.** Revision of the Neotropical weevil genus *Atractomerus* Duponchel and Chevrolat (Coleoptera: Curculionidae). *Transactions of the American Entomological Society* 114(4): 313-413.
- Clark, W. E. 2006.** Removal of *Cissoanthonomus* Hustache from synonymy with *Atractomerus* Duponchel and Chevrolat (Coleoptera: Curculionidae). *The Coleopterists Bulletin* 60(4): 345-346.
- Clark, W. E., H. R. Burke, and F. McKay. 2007.** The weevil genus *Achia* Champion (Coleoptera: Curculionidae): new species associated with *Urvillea* (Sapindaceae) and new *Serjania* host plant records for *A. ancile* Burke and *A. affinis* Hustache. *The Coleopterists Bulletin* 61(4): 542-550.
- Ferrucci, M. S. 1991.** Sapindaceae. In: R. S. Spichiger, and L. Ramella (eds). *Flora del Paraguay: Sapindaceae*. Editions des Conservatoire et Jardin Botaniques de la Ville de Genève; Chambésy. 144 p.
- Henderson, L. 2001.** Alien weeds and invasive plants. *Plant Protection Research Institute Handbook*, n. 12. Agricultural Research Council; Pretoria. 77 p.
- Martin, P. 2003.** Killing us softly – Australia's green stalkers. A call to action on invasive plants, and a way forward. CRC for Australian Weed Management. Bowden Printing; Adelaide. 6 p.
- McKay, F., M. Oleiro, A. Fourie, and D. Simelane. 2010.** Natural enemies of balloon vine *Cardiospermum grandiflorum* (Sapindaceae) in Argentina and their potential use as biological control agents in South Africa. *International Journal of Tropical Insect Science* 30(2): 67-76.
- Olckers, T. 2004.** Targeting emerging weeds for biological control in South Africa: the benefits of halting the spread of alien plants at an early stage of their invasion. *South African Journal of Science* 100: 64-68.
- Pereira, J., J. L. Bezerra, E. R. Drechsler-Santos, and L. C. Maia. 2010.** First report of *Phyllachora serjaniicola* causing tar-spot on *Cardiospermum grandiflorum*. *Tropical Plant Pathology* 35(4): 245-247.
- Reitz, R. 1980.** *Flora Ilustrada Catarinense. Sapindáceas*. Planejada e ilustrada por Raulino Reitz. Herbário Barbosa Rodrigues; Itajaí. 160 p.
- Rio Grande do Sul. 1994.** Macrozoneamento agroecológico e econômico do Estado do Rio Grande do Sul. Secretaria da Agricultura e Abastecimento; Porto Alegre. 307 p.
- Simelane, D. O., A. Fourie, and K. V. Mawela. 2011.** Prospective agents for the biological control of *Cardiospermum grandiflorum* Sw. (Sapindaceae) in South Africa. *African Entomology* 19(2): 269-277.

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