

Biology of *Gratiana boliviana*, the First Biocontrol Agent Released to Control Tropical Soda Apple in the USA¹

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Introduction

Tropical soda apple (TSA), *Solanum viarum* Dunal (Solanaceae) (Figure 1), is a perennial weed, native to Brazil, Argentina, Paraguay, and Uruguay, that has been spread throughout Florida very rapidly during the last two decades. TSA was first reported in Glades County in 1988. This weed is also present in Alabama, Arkansas, Georgia, Louisiana, Mississippi, North Carolina, Pennsylvania, South Carolina, Tennessee, and Texas (Figure 2). Currently, the area infested with TSA is estimated at more than one million acres.



Figure 1. Tropical soda apple in Florida.

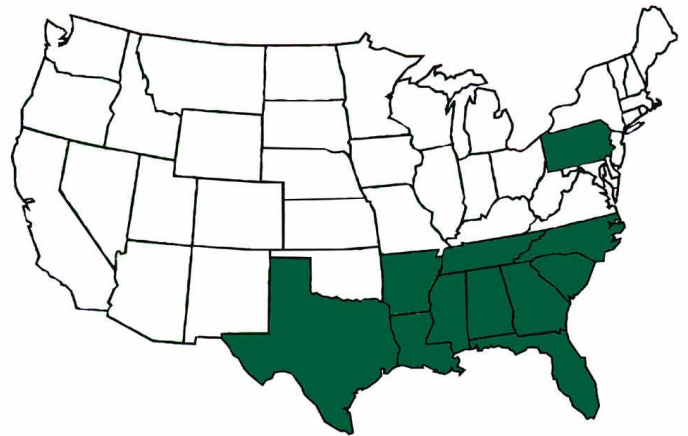


Figure 2. Distribution of tropical soda apple in the USA.

First Biocontrol Agent Released in Florida for Tropical Soda Apple

The TSA tortoise beetle, *Gratiana boliviana* Spaeth (Coleoptera: Chrysomelidae) was approved by the USDA-APHIS-PPQ for field release in Florida on May 7, 2003. The initial release of *G. boliviana* in Florida began in May 14 in Polk County. Since the summer of 2003, approximately 233,000 beetles have been released in Florida, Georgia, Alabama, and Texas. This beetle has been established and

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is dispersing at all the release sites in south/central Florida and Jasper County, Texas.

Gratiana boliviana lays individual eggs (Figure 3) on TSA leaves and petioles. Eggs are initially white in color but turn light green during the incubation period. Each egg is enclosed by two translucent brown membranes. The egg case is attached to the leaf surface by one extreme. A female can produce on average 300 eggs during her 3 to 4 month life cycle. Incubation of the egg takes 5-6 days at a temperature of 25°C (77°F).



Figure 3. *Gratiana boliviana* egg.

Larvae are cream with a small green spot in the anterior half. Each segment of the body has two lateral processes and a pair of long caudal processes or small forks that arise from the last abdominal segment. Like most tortoise beetles, larvae carry the cast skins on the anal forks with the posterior end of the larva bent forward (Figure 4). The five larval instars can be completed in 15-18 days. Larval feeding is concentrated mostly in the upper third of the plant canopy. Infested plants are easily detected by clusters of small to medium size holes made by the feeding larvae. As feeding progresses, the plants may exhibit large areas of defoliated leaves. Almost complete defoliation has been observed in enclosed cages when the beetle's natural enemies are excluded.

The pupal stage (Figure 5) is completed in about 6-7 days. The pupae are green and dorsal-ventrally (from top and bottom) flattened. Pupae are attached to the leaf by the last abdominal segment. The most common pupation place is the underside of leaves. In severely defoliated plants, some pupae can be found on the petioles and stems.

General coloration of the young adult is light green. Along the margin of the elytra (front wings) there is a continuous



Figure 4. *Gratiana boliviana* larva.

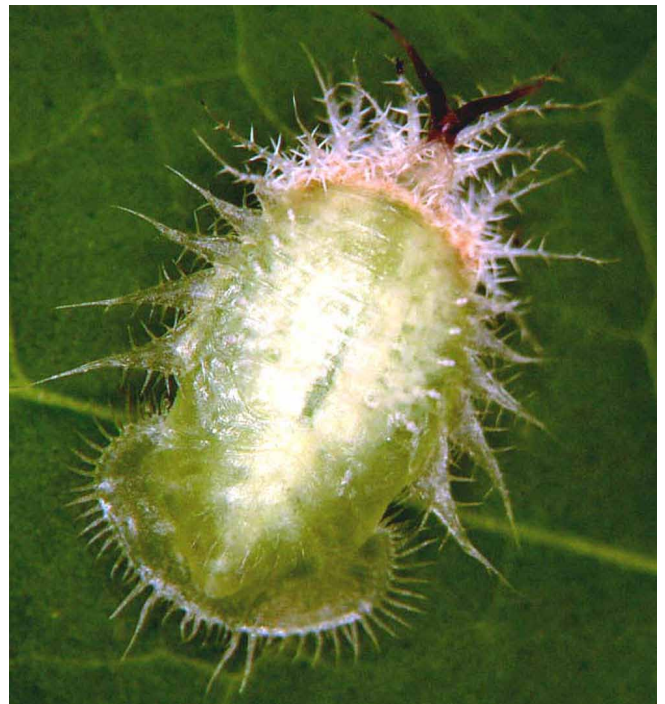


Figure 5. *Gratiana boliviana* pupa.

yellow band. The rest of the elytra is light green with irregular yellowish areas between rows or depressions (Figure 6). Mature adults turn a uniform yellow. Females and males can be distinguished by examining the underside of the body. In males, two somewhat rounded orange testes can be observed, one on each side of abdomen. In females there is a pair of white ovaries. Characters for separating the sexes can be observed 3-5 days after emergence. Pre-oviposition



Figure 6. *Gratiana boliviana* adult.

(pre-egg laying) period takes from 9 to 12 days. Longevity of females averages 3 months.

Reference

Westbrooks, R.G. 1998. Invasive Plants. Changing the Landscape of America: Fact Book. Federal Interagency Committee for the Management of Noxious and Exotic Weeds (FICMNEW), Washington, D.C.