



Tropical Soda Apple

Tropical soda apple (TSA) is a perennial weed from South America which was first seen in Florida in 1988. Since arriving, it has spread throughout Florida and into several other states including Georgia, North Carolina, Arkansas, Tennessee and Texas. TSA invades rangelands, improved pastures and natural areas. Although cattle do not consume TSA leaf tissue, they readily feed on the fruits, and in doing so, transport seeds to new areas in their digestive systems. Cattle ranchers lose an estimated \$6.5 to 16 million annually due to the cost of chemical and mechanical control of TSA.

Classical Biological Control

One method which has proven successful in controlling many invasive plants is called classical biological control. This strategy involves searching for natural enemies (insects, diseases) in a plant's native range and releasing them in the area which has been invaded. The key to successful biological control is finding natural enemies which are highly specific to the target plant, meaning that they will not feed or infect other plants. Only those insects or diseases which are shown to be highly specific are released.

Please contact your local county extension office for more information. To find your local extension office's phone number or address, please visit:

www.solutionsforyourlife.com

Tropical Soda Apple BIOLOGICAL CONTROL

with *Gratiana boliviana*



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Advantages of Biological Control

The major advantage of classical biological control over chemical and mechanical methods is its permanence. Once a biological control agent is established in an area, it will remain and provide long-term suppression of the invasive plant. However, classical biological control will not result in the complete elimination of a plant population

from an area. As the plants become scarce, the biological control agent will also decrease in density due to a lack of food (because they are host specific — they will not eat other plants). As the plant density increases in response to the lower density of the biological control agent, the agent will respond by an increase in numbers.

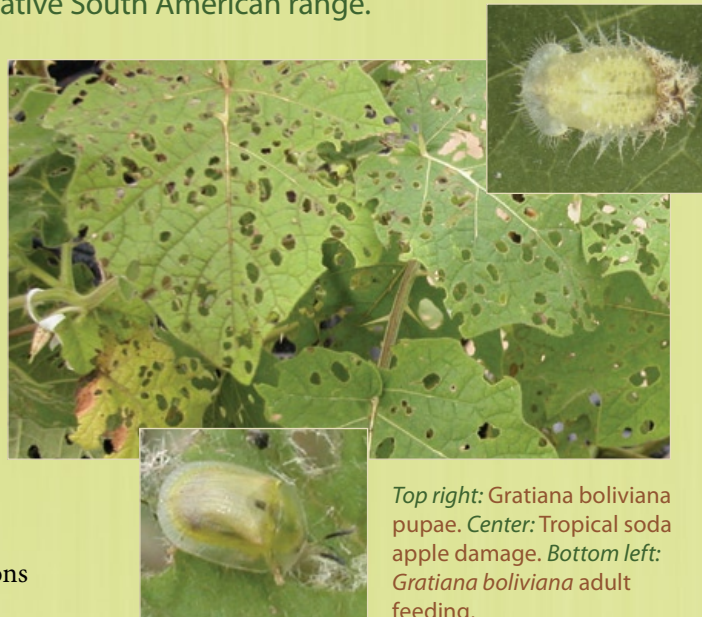
GRATIANA BOLIVIANA

The search for natural enemies of tropical soda apple began in the 1990s with exploration in the plant's native South American range.

ONE OF THE INSECTS discovered was *Gratiana boliviana*, a beetle which feeds on the leaves of tropical soda apple, in both the immature larval stages and as an adult. Studies on the host range of this insect demonstrated that it would only feed and reproduce on tropical soda apple. Based on these findings, the Florida Department of Agriculture and Consumer Services and the United States Department of Agriculture issued permits to allow field release of the beetle in 2003. The first releases were made that year, and since then, the beetle has been released at more than 200 locations in Florida.

Gratiana boliviana is a small green beetle which is about ¼ inches long. The light brown eggs are laid singly on TSA leaves and are difficult to find without close inspection. The beetles undergo 5 larval stages, with each stage being larger than the one before. The next stage is called a pupa, which is an immobile transitional stage. Adults emerge from the pupa, mate and lay eggs and the

life cycle is repeated. It takes approximately 30 days for the insect to develop from egg to adult, which allows several generations to be completed each year. However, during the winter months, the beetle enters a resting stage as an adult. During this period, which begins around November, the beetles cease feeding and egg laying until around March when they once again become active.



Top right: *Gratiana boliviana* pupae. Center: Tropical soda apple damage. Bottom left: *Gratiana boliviana* adult feeding.

Impact

When beetles are released in an area infested by tropical soda apple, they immediately begin feeding on the plants, and reproducing. Beetle feeding can be recognized by a characteristic shot hole appearance of leaves. If the area infested is large, it will take some time before the beetles can reach a density that is clearly noticeable to the land owner — it may take 2 to 3 years before an obvious decrease in density of tropical soda apple. The beetles will eventually disperse to new areas, but dispersal is slow and probably does not average much more than one mile per year. On its own, the beetle will not completely eliminate TSA, but it will bring the density down to a level which is tolerable to the land owner.

Management of Beetles

TSA grows both in open pasture areas and more closed hammocks. Land owners with severe TSA infestations in the open may choose to mow and/or use herbicides to control these plants (see <http://edis.ifas.ufl.edu/UW097>). Beetles should be released in hammock areas where control is more difficult. The beetles will establish in the hammocks and eventually spread to plants which are in open areas. Land managers should avoid disturbing plants in areas where beetles are released.