

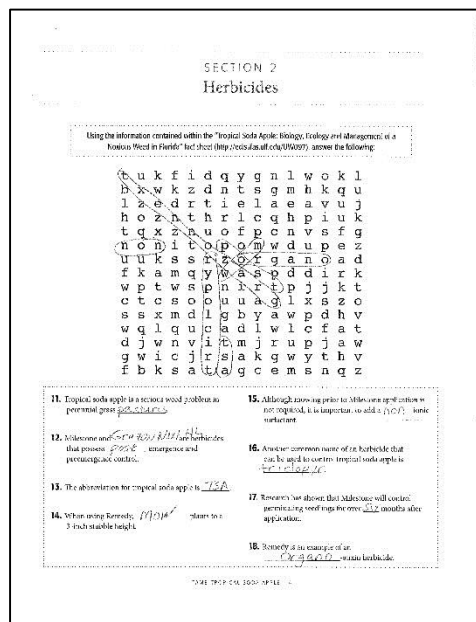
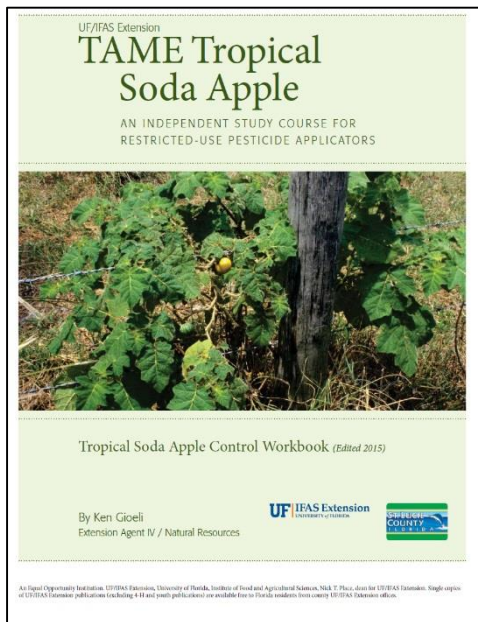
You Ain't From Around Here! Exotic Invasive of the Quarter: Tropical soda apple (*Solanum viarum*)

By: Jennifer Gagnon, Virginia Tech

Continuing my mission to expose invasive species that have not been found in Virginia, but are lurking outside our borders, I return (virtually) to my old stomping ground, Florida, to talk about tropical soda apple.

I begin all my research on the invasive species I write about at www.invasive.org. This website has many images and links to more information. You can only imagine my delight when I found that my *alma mater* has an independent study course on tropical soda apple. The course was designed to provide pesticide applicators (something that I am not) with continuing education credits. Since I love interactive learning, I went ahead and completed the course just so I could write this article. If you too are also a lover of interactive learning, you can find the course (and others) here:

<http://pesticide.ifas.ufl.edu/TropicalSodaApple/index.shtml>.



The TAME Tropical Soda Apple Independent Study Course Manual and the super-fun word search it includes. UF-IFAS Extension.

What did I learn?

Tropical soda apple is an annoying spiny shrub that goes by the acronym TSA and originally hails from Argentina and Brazil. Ranchers in South Florida first identified TSA in 1988. This species seems to be restricted to semi-disturbed sites, such as pastures, ditch banks, citrus groves, sugarcane fields, and wet areas on rangelands; it doesn't do well in areas with long periods of standing water. But even with those limitations, Florida's infestation increased from 25,000 to 500,000 acres between 1990 and 1996.

In addition to the typical problems most invasive species cause, such as shading out and out-competing native species, TSA takes over pastures quickly and replaces forage for

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grazing animals. TSA leaves are unpalatable to livestock, resulting in decreased stocking rates. It is on the federal noxious weed list.

A single plant can produce 40-50,000 seeds each year. These are dispersed by birds, cattle, deer, feral hogs and raccoons, all of which eat TSA fruits. Seeds are also dispersed by contaminated hay, sod and machinery. Seed germination rates depend on light, temperature, and age. The older seeds get, the lower the germination rate. But, under ideal conditions, germination rates are over 75%. Interestingly, greenhouse studies show seeds buried as deep as 3.25" will germinate; seeds under 6" of soils may even be able to germinate. Compare this to vegetable seeds that we plant typically no deeper than 1 - 1.5". In addition to seeds, TSA develops an extensive root system, which sends out shoots to create new plants.



TSA has not been reported in Virginia. According to the Early Detection & Distribution Mapping System, it has been reported in south-central North Carolina and throughout Tennessee, including counties just south of Washington County, Virginia. The USDA PLANTS Database maps also shows TSA being reported in Pennsylvania. There's no reason to believe TSA isn't planning a trip to the Old Dominion. We need to be on the lookout.

***A TSA infestation in south Florida. Photo by:
J. Jeffrey Mullahey, University of Florida.***

How to Identify TSA

Form: Bushy, prickly, herbaceous perennial; 3-6' tall.

Stems: Covered in broad-based straight or downward pointing prickles, white to yellowing color.

Leaves: Alternate, simple, oval-triangular, divided into broad pointy lobes; 4-7" long, 2-6" wide; surface dense with fine soft hairs resulting in a velvety sheen.

Flowers: White, in small terminal clusters (at the end of the stem); 5 petals; stamens with prominent cream-colored anthers; flowers all year, but concentrated September through May.

Fruit: Globose berry, 1-1.5" in diameter; green with dark veining, like a tiny watermelon when immature; dull medium yellow when ripe; 400 seeds per berry; 40,000 - 50,000 seeds per plant. Plants typically have both mature and immature fruits on them at the same time.

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Related species: *Solanum capsicoides*, commonly known as cockroach berry or red soda apple, is often mistaken for TSA. However, this species is not nearly as common as TSA and has red fruits. A relative of TSA, bitter nightshade (*Solanum dulcamara*) is an exotic species that does occur in Virginia. However, this species looks nothing like TSA.



Clockwise from top left: The leaves of TSA are deeply-lobed and almost as wide as they are long. The flowers are white with prominent cream colored-anthers. Immature fruits are green with prominent veination and look like small watermelons. The extensive root systems of TSA grow shoots that form new plants. Photos by: John D. Byrd, Mississippi State University, Rebekah D. Wallace, University of Georgia, J. Jeffrey Mullahey, University of Florida, and Charles T. Bryson, USDA Agricultural Research Service.

How to Control TSA

Mechanical: Frequent mowing to prevent the plants from blooming and going to seed can reduce TSA populations in areas that can be accessed with a mower. In addition, the spread of TSA can be minimized by cleaning all equipment (including shoes!) thoroughly when leaving an infested area.

Since cattle eat the fruits of TSA, and the seeds remain viable in their digestive tract for up to 6 days, avoid moving cattle from TSA infested areas to uninfested areas.

Chemical: Herbicides such as Milestone (active ingredient aminopyralid) and GrazonNext HL (active ingredients aminopyralid and 2,4-D) are effective for controlling TSA. Not only will these chemicals kill existing plants, they will also prevent germination of seeds in the soil for up to 6 months after application.

The application rate for Milestone is 5–7 oz/acre. The rate for GrazonNext HL is 2–2.6 pt/acre. Applying either of these chemicals at the lower rate will effectively kill existing plants; but if you think there may be a large seedbank in the soil, the higher rates will be more effective. Follow application instructions on the label.

Herbicides such as Remedy Ultra (active ingredient triclopyr) are also effective chemical treatments. When using triclopyr-based herbicides, mow plants to a 3-inch stubble height as soon as possible to keep them from producing fruit and seed. Repeat mowing when plants reach the flowering stage every 50–60 days through April. Fifty to 60 days after the April mowing, when plant regrowth is at the first flower stage (late May-June), apply the triclopyr-based herbicide at the rate recommended on the label. Triclopyr does not remain active in the soil, which could be a benefit if you are trying to reestablish native plants on the site; however, TSA seeds in the soil will continue to germinate and follow-up treatment will be necessary.

Regardless which herbicide is used, regular monitoring after treatment is necessary. TSA can produce fruit at almost any time during the growing season. In addition, if possible, quickly reclaim sites by planting desirable species.

Biological: The TSA beetle, *Gratiana boliviana*, is native to South America and is highly specific to TSA. While the TSA beetle doesn't kill the plants, it does reduce their vigor, growth rate, and fruit production, making them less competitive with native plants. This beetle is appropriate for small infestations or where TSA is present in remote areas.

For sparse infestations, release 100–300 beetles. For dense infestations, release 300–500 beetles. The TSA beetle has many natural enemies, so monitor the sites to ensure that the beetle population persists, reproduces, and spreads throughout the TSA-infested area.

To obtain TSA beetles, call the Florida Department of Agriculture and Consumer Services at (888) 397-1517.

Depending on the type of infestation, a combination of mechanical, chemical and biological controls may be most effective.

If you think you've found TSA in Virginia, please report it to the Southeast Early Detection Network. You can download the free mobile app to your smartphone or tablet from here:

<https://www.eddmaps.org/southeast/>.

Remember, early intervention is the easiest and least expensive way to manage invasive species outbreaks!

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Larvae of the TSA beetle feed on the TSA leaves. While this damage is not fatal, it does reduce the overall vigor of the plants, making them less competitive with native species. Photo by: Julio Medal, University of Florida.