

# Tropical Soda Apple (*Solanum viarum* Dunal)

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Fig. 1. Tropical soda apple plant in pasture.



Fig. 2. Tropical soda apple leaves with prickles.



Fig. 3. Tropical soda apple with mature (yellow) and immature (green) fruit.

## Introduction

### Problems Caused

Tropical soda apple, *Solanum viarum* Dunal (Solanaceae), is a perennial shrub (Figure 1) that belongs to section *Acanthophora* and subgenus *Leptostemonum*. It is native to Brazil and Argentina but has become a weed in other areas of South America and in Africa, India, Nepal, West Indies, Honduras, and Mexico and recently in the U.S. The primary means of dispersal of tropical soda apple in the U.S. is livestock and wildlife, such as raccoons, deer, feral hogs, and birds feeding on fruits. Mullahey et al. reported that tropical soda apple foliage is unpalatable to livestock although cattle will eat the mature fruit. Scarification of seeds by digestive systems of livestock and wildlife seems to promote seed germination. Intra- and inter- county and state movement of livestock that have recently fed on tropical soda apple fruit are the primary vectors for its spread. However, contaminated equipment, hay, seeds, composted manure, and sod may also serve as means of dispersal. Once established in an area, wildlife may continue the spread of tropical soda apple. Tropical soda apple is a threat to the vegetable crop industry as a competitive weed and because it is an alternate host for numerous pathogens that are diseases of eggplant, peppers, potatoes, tomatoes, etc. These vegetable crop pathogens include the cucumber mosaic virus, Gemini virus, potato leafroll virus, potato virus Y, tobacco etch virus, tomato mosaic virus, tomato mottle virus, and the fungal pathogen, *Alternaria solani*. Based on surveys during 1994 and 1995, tropical soda apple is not yet a widespread problem in Alabama, Georgia, and Mississippi; however, the total number of acres infested in these states are similar to the acreage infested in Florida five to six years ago. In Florida, tropical soda apple now infests nearly one million acres. It cost the cattle business over \$11 million in 1994. Damage to croplands, forestlands, and natural habitats and the cost of control of currently infested areas is difficult to determine, but tropical soda apple has the potential to become a major problem throughout the southern U.S. and could cost farmers and the public billions of dollars annually. In order to detect and prevent further spread of this pernicious weed in the U.S., the Cooperative Extension Service and the Departments of Agriculture in several states in the Southern U.S. and the U.S. Department of Agriculture- Agricultural Research Service and – Animal and Plant Health Inspection Service have initiated an education and notification campaign on the potential weed problem of tropical soda apple. Early detection is paramount to eliminate the threat of this weed which has the potential to infest millions of acres of pastures, crops, forests, and natural areas in the U.S.

### Regulations

Tropical soda apple is a Noxious weed in the United States. It is a state Noxious weed in Florida and Mississippi and a state Noxious plant in Texas. Tropical soda apple is a Class A Noxious weed in Alabama, North Carolina, and Vermont. In California and Oregon, it is a Quarantine pest. It is a Prohibited Noxious weed in Arizona and Minnesota, Prohibited in Massachusetts, and a Plant Pest in South Carolina and Tennessee.

## Description

### Vegetative Growth

Mature plants of tropical soda apple are 3 to 6 ft tall and are armed on the leaves, stems, pedicels, petioles, and calyxes with broad based white to yellowish thorn-like prickles up to ¾ inch long (Figure 2). The leaves and stems are pubescent.

### Flowering

Flowers are white with five recurved petals and white cream colored stamens that surround the single pistil. Immature

fruits are mottled whitish to light green and dark green, like a watermelon (Figure 3). The mature fruits are smooth, round, yellow and  $\frac{3}{4}$  to  $1\frac{1}{4}$  inches in diameter (Figure 3) with a leathery-skin surrounding a thin-layered, pale green, scented pulp and 180 to 420 flattened, reddish brown seeds. Each plant is capable of producing 200 or more fruit per year.

#### **Dispersal**

The primary means of dispersal of tropical soda apple in the U.S. is livestock and wildlife, such as raccoons, deer, feral hogs, and birds feeding on fruits.

#### **Spread By**

Tropical soda apple is spread by livestock and wildlife, such as raccoons, deer, feral hogs, and birds feeding on fruits.

## **Habitat**

Since its introduction into the U.S., tropical soda apple has spread rapidly, and currently infests an estimated one million acres of improved pastures, citrus groves, sugar cane fields, ditches, vegetable crops, sod farms, forestlands (oak hammocks and cypress heads), natural areas, etc. in Alabama, Florida, Georgia, and Mississippi. Although it can be a threat to a variety of habitat, it tends to be most problematic in pastures in the Mid-South.

## **Distribution**

### **US**

The first known collection of tropical soda apple in the U.S. was from Glades County, Florida in 1988, but it may have been present in the state as early as 1981 or 1982. Because of its rapid population explosion in Florida and the concerns of livestock producers, tropical soda apple was placed on the Florida Noxious Weed List in late February 1994 and was placed on the Federal Noxious list in 1995. It currently is escaped from North Carolina to Tennessee and Louisiana in the southeastern United States and Pennsylvania in the northeastern United States. Tropical Soda Apple occurs in most of the counties in Florida. It was found in Mississippi in October 1993, in Georgia in November 1994, in Alabama in January 1995, and in the U.S. territory of Puerto Rico in February 1995. Currently, it has been confirmed at 20 sites in 10 Mississippi counties, 7 sites in 7 Georgia counties, and 7 sites in 3 Alabama counties. In Alabama, Georgia, and Mississippi, tropical soda apple population sizes and numbers of acres infested per site are directly related to the number of cattle imported into Alabama, Georgia, and Mississippi from infested areas in Florida.

### **Mid-South**

Tropical soda apple has escaped in all Mid-South States, except Arkansas.

## **Control Methods**

### **Biological**

Several species of *Solanum* are native and no biological controls for *Solanum viarum* are in widespread use.

### **Chemical**

Chemical controls can be effective for tropical soda apple. Triclopyr is very effective for control of emerged tropical soda apple when applied at 1 quart per acre or 1 to 1.5 percent solution with  $\frac{1}{4}$  percent nonionic surfactant. However, if plants have been established long enough to release seed, the site should be frequently re-inspected and newly emerged seedlings treated. As an alternative, 1.5 to 2 quarts per acre or a 1 percent solution of 2,4-D plus picloram with  $\frac{1}{4}$  percent nonionic surfactant can be used for tropical soda apple control.

### **Mechanical**

Since plants are heavily armed, hand removal is discouraged unless extreme caution is used. Plants can regenerate from roots, so complete removal can be difficult. To prevent tropical soda apple spread within a farm or community, steps should be taken to minimize seed production. Mowing is an effective practice to prevent seed production, even after flowering has started, although plant regrowth will occur and the practice should be repeated when plants start flowering again. Plants discovered with mature fruit should be cut, piled, and burned to destroy seed viability, or buried more than 3 feet deep.

### **Physical**

No physical controls are currently recommended for tropical soda apple.

## **More Information**

Of the native *Solanaceae*, tropical soda apple most closely resembles horsenettle, *Solanum carolinense* L. which is generally smaller. Sticky nightshade (*Solanum sisymbriifolium* Lam.), another introduced species, is similar in habit to tropical soda apple, but has more deeply cut leaves.