

Tropical Soda Apple, *Solanum viarum* Dunal: The Plant from Hell ¹ (SOLANACEAE)

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INTRODUCTION: *Solanum viarum* Dunal, tropical soda apple, has recently made its presence known in Florida. The plant is prickly as are many other *Solanum* spp., so why would *Solanum viarum* be called "the plant from hell." The presence of this weed near Devils Garden, Hendry County, led to this new appellation. Another connection with hell is the common name "tropical soda apple" which is "Sodom apple" in British-speaking areas. Sodom is the biblical city noted for its wickedness. *Solanum viarum* has become the dominant vegetation in vast areas of the pastures in Glades, Hendry and Highlands counties.

The earliest record in Florida was collected from Glades Co. in 1988 (University of Florida Herbarium [FLAS]). David W. Hall, who identified the FLAS specimen, believes that *Solanum viarum* has been present in Florida since 1981 or 1982 (personal communication). Mullahey (1993) estimated that *Solanum viarum* has infested over 150,000 acres in Florida. The acreage may be higher (Patrick Hogue, Institute of Food and Agricultural Sciences [IFAS], Extension-Agent Highlands Co., personal communication).



Figures 1-3. *Solanum viarum* Dunal. Fig. 1) Tropical soda apple; 2) Flowers; 3) Immature to mature fruit (Photography credit: Jeffrey W. Lotz).

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How has this species, which is native to Brazil and Argentina, become a problem in Florida so rapidly? There are about 413 seeds per fruit and 125 berries per plant with germination exceeding 75% (Mullahey 1993). Although cattle avoid eating the prickly vegetation, their long tongues can reach into the foliage to pluck off the fruits. Cattle are apparently good vectors for spreading the seed through defecation. *Solanum viarum* is also present in hammocks where cattle retreat to rest. It occurs in ditch banks, citrus groves, sugar cane fields, watermelon fields and along roadsides. Wildlife, such as raccoons, deer and feral pigs, apparently also spread the seed. Birds have not yet been observed feeding on the fruits and may not be vectors for spread.

DISTRIBUTION: Originally native to Argentina and Brazil, *Solanum viarum* has spread into other parts of South America, Africa, India, Nepal, Caribbean, Mexico and Florida. It is thought that most Florida counties south of Lake County have been infested by this pest plant. Herbarium specimens at Division of Plant Industry Herbarium (PIHG) document *Solanum viarum* in Osceola (W. J. Shirley B93-172), Polk (J. E. Lindsay B93-180), Hendry (Coile 5936, 5937), Highlands (Coile 5938, 5939) and Alachua (Coile 5947) counties. The latter county is north of Lake Co.

DESCRIPTION: *Solanum viarum* is an herbaceous perennial which can persist if winters are mild. Plants grown in good conditions may reach 2 m (6 feet) in height; usually the plants are about 1 m (3 feet) tall. The stems are sturdy and have scattered small, hooked prickles. Leaves are alternate, simple, lobed; to 20 cm (8 inches) long; to 15 cm (6 inches) wide; and covered with fine soft hairs which give a velvety sheen to the leaves (Fig. 1). Rigid, yellowish prickles up to 20 mm (¾ inch) are scattered along the midvein and the secondary veins on both surfaces of the leaf blade and are more concentrated on the petiole (leaf stalk). The flowers are in small terminal clusters. The calyx is five-lobed and has tiny prickles on the surface; corollas are white, with five, recurved petals; anthers are cream-colored and surround the single pistil (Fig. 2). Immature fruits are pale-green with dark-green veining (appear like a tiny striped watermelon). Mature fruits are a dull medium-yellow, leathery-skinned, about 2 to 3 cm (up to 1½ inches) across (Fig. 3). The pulp band is narrow, pale-green, mucilaginous and scented. Seeds are numerous, flat, bitter and mucilaginous.

MAY BE CONFUSED WITH: World-wide there are over 1400 species of *Solanum* (Mabberly 1987). In Florida, the prickly species are: *S. capsicoides* Allioni, *S. carolinense* L., *S. dimidiatum* Raf., *S. tampicense* Dunal, *S. rostratum* Dunal, *S. sisymbriifolium* Lam., *S. torvum* Sw. and *S. viarum* Dunal.

Solanum capsicoides may be listed as *S. aculeatissimum* Jacq. or as *S. ciliatum* Lam. in older references (Kartesz and Kartesz 1980). Common names are soda apple, cockroach berry, Devil's apple, love-apple and berenjena (Perkins and Payne 1978; Standley 1923). The distribution is Texas, southern U.S., Bermuda, West Indies and tropical America (Correll and Johnston 1970). The stems are densely covered with broad-based, hooked, yellowish prickles, in contrast to *S. viarum* which has scattered prickles. The fruits are persimmon-red while *S. viarum* has yellow fruits which are slightly larger. *Solanum capsicoides* may grow in the same pastures as *S. viarum*, but in comparatively small numbers.

Solanum carolinense, or horse-nettle, was originally native to the southeastern United States north to Virginia and Kentucky. It is now distributed north to Ontario and westward (Gleason and Croquist 1991). This weed of disturbed areas has lavender to white flowers about 2 cm (¾ inch) wide. The prickles are not as long as those of *S. viarum*. Plants may reach 1 m (3 feet) in height, but are usually much shorter.

Solanum dimidiatum, originally of Kansas, Arkansas and Texas (Gleason and Cronquist 1991), has now spread to south Georgia and North Florida (Clewell 1985; Small 1933; Wunderlin 1982). Commonly called western horse-nettle, this species is distinguished by its purple corolla with a green eye. The fruit is pale yellow and the plant is clothed with stellate hairs (Correll and Johnston 1970).

Solanum tampicense (called *S. houstonii* in the earlier edition of this circular) is a newly discovered pest plant in Florida. Wunderlin *et al.* (1993) note that *S. houstonii* Dunal is a homonym of the 1807 *S. houstonii* Martyn and is thus illegitimate. The common names for this species are Tampico soda apple and wetlands soda apple. Standley (1923) uses the following common names: aijicon, huistomate, or huevo de gato. *Solanum tampicense* is distributed from Mexico, West Indies, British Honduras (Gentry and Standley 1974) and now Florida. The leaves of *S. tampicense* differ markedly from *S. viarum*: (1) being more elongate (to 16 cm long) and narrower (2.2 to 5.5 cm) wide; (2) lacking straight prickles but having curved on both leaves and stems. The plants are straggly and clamber onto other plants. Mark L. Runnals (personal

communication) observed that plants along the Peace River (near Arcadia) attained a height of 15 feet. The fruits are arranged in lateral clusters opposite the leaves, small (to 8.5 mm across), and red. The sites observed in Florida are along rivers and in cypress stands. The presence of this alien species may imperil natural areas of the state.

Solanum rostratum, with common names of buffalo bur, Kansas thistle and mala mujer (Correll and Johnston 1970) is native to the great plains (Gleason and Cronquist 1991) and is an occasional weed in Florida. It is not likely to be confused with *S. viarum* because the leaves resemble a watermelon leaf (are pinnatifid) and are covered with stellate hairs and many straight prickles. The extremely prickly calyx covers the fruits entirely.

Solanum sisymbriifolium, introduced from South America (Clewell 1985), occurs in the Panhandle and Central Florida. Unlike *S. viarum*, it has pinnatifid leaves. There are glandular hairs on the leaves which give it the common name, sticky nightshade. The spiny calyx mostly cover the red berry; spines are not as dense as those of *S. rostratum*.

Solanum torvum is a federally-listed noxious weed. Common names are bushy white solanum (Correll and Correll 1982) and susumber (Bird and Heinlein, no date; Gentry and Standley 1974). Leaf shape is highly variable: leaves may be lobed similar to those of *S. viarum*, unlobed, or oddly lobed. Both stems and leaves are covered with stellate hairs, and there may also be prickles which are straight or curved. The flowers are terminal and the petals are not recurved. Ripe fruits are yellow. Specimens, which were grown for especially for their edible fruit, have been located in Florida.

ECONOMIC IMPORTANCE: The difficulty of control is due to its: (1) prickly nature, (2) rapidly expanding range, and (3) tendency to form huge patches. This suggests that *S. viarum* will have a major economic impact in agricultural fields, orange groves and pastures. Natural areas are also at risk. Because of the displacement of native and preferred forage plants and the components of natural ecosystems, the Florida Department of Agriculture and Consumer Services in 1993 listed *S. viarum* as a noxious weed, followed in 1994 by addition to the Federal Noxious Weed List (USDA).

Solanum viarum is grown in India as a source of steroids (Mullahey 1993). The glycoalkaloid solasodine which is present in the fruit is a precursor for the steroid diosgenin, which is used in contraceptives (Budavari 1989). Although it is not advised, I bit into a fruit as far as the seed cavity and immediately took the fruit out of my mouth. It is bitter and the mucilage sticks to the teeth. The bitter alkaloids of the solanine type (eg., solasodine) are poisonous to humans (Kingsberry 1964; Smith, 1976).

CONTROL MEASURES: Research is underway at the IFAS Southwest Florida Research and Education Center toward controlling this pest plant. Moderate success in control has been observed by mowing the plants before they set fruit and following up with the application of an herbicide to the young seedlings. Reintroduction of seed from neighboring uncontrolled sites will require repeating control measures. Considerably more funds and research need to be directed towards understanding how to control this extremely pestiferous "plant from hell."

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