

Biology and Control of Indian Jujube (*Ziziphus mauritiana*): A Weed to Watch in Florida Pastures and Natural Areas¹

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Indian jujube (*Ziziphus mauritiana*), also known as chinee tree, is a large shrub or small tree (Figure 1). The plant is native to southern Asia and eastern Africa, but has spread to Queensland, Australia, where it is considered a Class 2 Invasive Plant. This designation means the plant is established and has or could have an adverse economic, environmental, or social impact, and management of the plant is subject to control programs conducted by agencies and landowners (Anonymous 2005).



Figure 1. Indian jujube in a pasture near Lakeport, FL. (The man on the left is approximately 6 feet tall.) Several smaller Indian jujube plants were also found in this pasture.

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According to the *Atlas of Florida Vascular Plants*, Indian jujube is also present in Miami-Dade County, FL (Wunderlin and Hansen 2008). The University of Florida Herbarium has also identified specimens of Indian jujube in Lee County, FL. Several plants identified as Indian jujube have also recently been located in a pasture in Glades County, FL, near Lakeport. These findings suggest this invasive plant may be more widespread than indicated by vouchered herbarium specimens.

Plant Identification

Indian jujube is a woody plant, densely branched with zigzag branches (Figure 2). Mature Indian jujube plants can be as tall as 26 feet with a canopy diameter of at least 30 feet. Branches typically have a leaf and a thorn at each angle. Leaves are ovoid, glossy green above and nearly white underneath (Figure 3). The major veins in the leaves are nearly parallel (Figure 3). Over time, the leaves typically become infested with a fungus, causing the leaves to have a yellow-mottled appearance above and to turn black below (Figure 4). Flowers of the Indian jujube are small and inconspicuous, greenish-white, and emit an unpleasant odor.

The fruits are edible and are similar in shape and size to the hog plum (Figure 5), which is native to Florida. The Indian jujube fruits are initially green, but have a yellow to

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Figure 2. Branches of Indian jujube typically zigzag, with a thorn and leaf at nearly every angle.
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Figure 3. Indian jujube leaves are glossy green above and nearly white below. Note that the major leaf veins are nearly parallel.
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Figure 4. A fungus typically infests the leaves of Indian jujube, giving them a mottled appearance above and a black color below.
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pale-orange color when ripe. Seeds are enclosed within a woody endocarp.



Figure 5. Indian jujube fruits are similar in size and shape to that of the hog plum, which is native to Florida. Immature Indian jujube fruits are green, changing to yellow followed by reddish-orange when ripe.
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Habitat and Ecology

In most cases, Indian jujube is restricted to the drier tropics. During the dry season, these plants typically lose their leaves, but rapid regrowth occurs at the onset of the rainy season. According to researchers in Australia, Indian jujube is capable of growing on a wide range of soil types among various vegetation groups. However, Indian jujube prefers open habitats and does not survive well under the canopy of other trees (Anonymous 2005).

Fruit and seed production is highly variable among Indian jujube plants. However, plants less than 5 feet tall typically do not produce fruits (Grice 1998). Large plants (>10 feet tall) are capable of producing 5,000 fruits (Grice 1998). Plants in the range of 5 feet to 6½ feet produced an average of 2 - 7 fruits per plant. Plants in the range of 6½ feet to 10 feet produced an average of 19 -54 fruits per plant (Grice 1998).

Seedling survival in Australia is extremely low, with 0.002% - 3.7% survival. Grice (1998) contends that the critical phase of Indian jujube's life cycle occurs in the first dry season following germination. During the dry season most seedlings die, and the number of surviving seedlings is governed by the length of the dry season.

Spread

Dispersal of Indian jujube is primarily through animals. In large infestations within cattle-grazing areas in Australia,

an average of 17.5 fruits (woody endocarps) were recovered from cattle dung piles (Grice 1998). Feral swine and birds also likely disperse Indian jujube seeds in Florida, as in Australia.

Control

Methods for controlling Indian jujube include cut-stump, basal bark, and foliar sprays. Basal bark and cut-stump applications of Vista (fluroxypyr) at a 1% solution (in oil) or triclopyr-ester (Garlon 4 Ultra, Remedy Ultra, Tahoe 4, etc.) at a 5% solution (in oil) have been effective in Australia. Foliar sprays of a 3% v/v triclopyr-ester or glyphosate at the same concentration have also been effective in Australia.

Although Indian jujube is not widespread in Florida, the plant should be recognized early as invasive. The spread of this plant in Australia is causing harm in various ecosystems in a climate very similar to Florida's climate. For example, dense thickets of Indian jujube in Australia not only displace native plant communities, but also impair the movement of livestock and wildlife. Preventing the spread of this potentially invasive plant in Florida is extremely important.

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