The Prospects of Commercial Etrog Production in South Florida, a Culturally Significant Citron

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The traditional etrog is a type of yellow citron, Citrus medica L., with many uses. It also plays a role in Jewish ceremonies during the holiday of Sukkot. During this joyous week-long celebration of the agricultural harvest, people of the Jewish faith also commemorate the forty-year period during which the children of Israel are said to have wandered the Sinai desert some three thousand years ago. The Jewish population has since spread across the globe with a great many settling in Florida. The United States is home to a Jewish population of 5.7 million and an estimated 750,000 reside in Florida. South Florida has become such a popular destination that it possesses the single largest concentration of Jewish people outside of Israel. The potential for disease, insect pests, freezes, and a variety of other factors, make growing any type of citrus in south Florida a serious challenge. Etrogs grown for ceremonial purposes are even more problematic because the fruit must undergo the scrutiny of a rabbi prior to use. Defects in shape and blemishes on the skin may render the fruit useless for Sukkot but still suitable for other commercial purposes. The popularity and limited supply of etrogs for use by the faithful often results in prices ranging between $30 to $100 per individual fruit and upward of $1000 for choice specimens. With a growing Jewish population and increasing demand for this highly valued citron, there exists the potential for a locally grown supply of etrogs, if commercial production challenges can be met.

Long before citrus production became one of Florida’s most important industries, the fruit were significant to many people and cultures throughout the world. From its native origins of tropical and subtropical Asia and the island nations that make up the Malay Archipelago north of Australia, citrus has enjoyed a rich history in antiquity. The citron was the first member of the citrus group to become known to Europeans and was first described by the “father of botany,” the Greek philosopher Theophrastus, in the third century BC (Webber et al., 1943). The citron, popularly known by its Hebrew name—the etrog—was the only citrus fruit known to western civilization for several hundred years.

**Botanical Description**

The citron (Citrus medica L.) is a small shrubby tree with spines and an open growth habit capable of reaching heights of 8 to 15 ft (2.4–4.5 m) (Fig. 1). It possesses oblong evergreen leaves which are slightly pointed and can be ovate-lanceolate or ovate-elliptic. The thick leathery leaves are somewhat crinkled with serrate margins and range from 2.5–7 inches (6.25–18 cm) long (Hodgson, 1967). Some cultivars possess new foliage growth and flowers that are flushed with purple while others are entirely white (Fig. 2). Flowers are fragrant and develop in short clusters. The flowers range in size from 1.5 inches (4 cm) wide and are mostly perfect with 4- to 5-petals and 30–60 stamens. The citron fruit is very fragrant and is highly variable in shape but mostly oblong, obovoid, or oval. The fruit somewhat resembles an oblong lemon but considerably larger even when immature (Fig. 3). The rind is yellow, glossy, thick, and can be bumpy or smooth. The pulp is yellow, usually acidic with little juice and numerous seeds.

**The Introduction of Citrus to Europe**

Greek botanists accompanying Alexander the Great on his conquests only reported the citron being grown in Persia and Media...
of modern-day Iran. The tree was then introduced throughout the Near East by Greek and later Jewish settlers. The latter came to see the citron as the “beautiful” fruit referred to in biblical text of Leviticus 23:40. The traditional etrog has many uses and still plays a role in Jewish ceremonies during the holiday of Sukkot. Following the debut of the citron to the West, came the introduction to the sour orange (C. aurantium), lemon (C. limon), and sweet orange (C. sinensis). Literature of the time indicates that the sweet orange was not known in Europe until approximately 1400 A.D., some 700 years after the citron’s initial appearance, though the fruit was known to the ancient Chinese well before then. Chinese manuscripts make specific reference to citrus as far back as 2000 B.C. and sweet orange was cultivated in China for centuries before making its way out of the country (Webber et al, 1943).

Citrus in Florida

Christopher Columbus is credited with bringing the first citrus the New World in 1493. By the mid-1500s the first orange trees were planted around St. Augustine by early Spanish explorers. Florida’s sandy soil and subtropical climate proved ideal for growing seeds planted by the early settlers. It would however be another 350 years before the first description of the grapefruit (C. paradisi) was made. It was growing wild on the West Indies islands of Barbados, Haiti, and Jamaica. By 1823, Count Odette Phillipe brought the seeds of the so-called “forbidden fruit” to Safety Harbor near Tampa and established the first grapefruit plantings in Florida (Florida Citrus Mutual, 2012). Citrus has been farmed commercially in Florida since the mid-1800s and despite periodic freezes and foreign pests, has flourished ever since. The industry was valued at $10.7 billion during the 2012–13 season and employed just over 62,000 Floridians (Rusnak, 2014). Today’s citrus acreage, yields, and overall value have continued to decline as the industry grapples with the devastating effects from the introduction of Huanglongbing (HLB), otherwise known as citrus greening disease.

Palm Beach County Citrus

Palm Beach County was once an ideal place to grow citrus and there were over 17,000 acres of groves as recently as the 1970s. Various types of citrus are well suited to Palm Beach County because the subtropical climate makes subfreezing temperatures occasional and relatively short-lived. The native sandy soils also allow for good drainage and the topography is flat with plenty of easy access to water. The citrus acreage in Palm Beach County peaked in 1970 with 17,566 acres but had fallen to 12,746 by 1996 (Salsibury, 2003). Faced with hurricanes, citrus canker disease, and rising property values from urban encroachment, most owners sold their land to developers for residential communities by the turn third of the millennium. In January of 2006, only 1,668 acres of commercial citrus remained in Palm Beach County (Salsbury, 2013). Just two years later, when the HLB vector was first detected in the county, the remaining citrus acreage was less than 1000 acres. Callery-Judge Groves in Loxahatchee, started in the 1960s by Francis Callery and son James, was the last citrus producer standing in Palm Beach County and has since sold the grove to land developers.

Huanglongbing (a/k/a Citrus Greening Disease)

Citrus greening disease, also known as Huanglongbing (HLB), affects all citrus cultivars and severely limited citrus production.
in many citrus-growing areas of the world before reaching Homestead, Florida in 2005. The disease is caused by the bacterium Candidatus Liberibacter spp. and is spread by the Asian citrus psyllid (Diaphorina citri Kuwayama). The Asian citrus psyllid is an exotic pest that began establishing itself in Florida after its initial detection in 1998 (Brlansky et al, 2014).

The pathogenic bacterium vectored by the psyllid is phloem-limited and moves systemically within the plant. As the bacterium spreads and reproduces, it interferes with the plant’s ability to manufacture and translocate photosynthetically produced carbohydrates throughout the plant. Once the plant is infected, it remains a source of inoculum for surrounding trees. The psyllids become infected with the bacterium as they feed with their piercing-sucking mouthparts on already infected foliage. The infected psyllids spread and transmit the pathogen as they disperse and feed on healthy trees. Once infected, the psyllids remain capable of transmitting the citrus greening pathogen for the remainder of their 30–50 day lifespan. Laboratory studies show a range of 300–750 eggs are laid by female Asian citrus psyllids during their lifetimes (Rogers et al, 2012).

These psyllids are attracted to the soft tender leaves of a new flush of foliage and their feeding may result in the emerging leaves to be distorted, twisted, and curled. Symptoms of HLB develop over time, after the bacterium has had an opportunity to develop and spread within the plant. Typical leaf symptoms include a blotchy mottled appearance whereby a variegated chlorosis manifests in a nonsymmetrical pattern about the center vein of the leaf (Batool, 2007). The nonsymmetrical pattern is a key characteristic for diagnosing HLB as this pattern is in contrast to the symmetrical pattern of chlorosis shown by leaves showing iron and other nutritional deficiencies. As more time passes, the bacterium continues to multiply and spread within the plant leading to more pronounced yellowing and eventual dieback of infected branches (Fig. 4). Several studies have shown that infected citrus trees decline in health and many eventually become non-productive within 5–8 years.

To date, researchers have not been able to culture the bacterium in the laboratory. This severely limits the progress of research into understanding and finding a cure for the disease. The best recommendations for greening management is to protect the young flush of foliage from psyllid feeding and supplement infected tree’s nutritional needs with foliar fertilization. Additional management strategies may be found in the University of Florida, Institute of Food and Agricultural Sciences (UF/IFAS) 2014 Florida Citrus Pest Management Guide: Huanglongbing (Citrus Greening).

Cultural Significance of the Etrog Citron to the Jewish Faith

The etrog plays an important role in the Jewish holiday of Sukkot. During this joyous week-long celebration of the agricultural harvest, people of the Jewish faith also commemorate the 40-year period during which the children of Israel are said to have wandered the Sinai desert some three-thousand years ago. Traditional observers of the holiday build and dwell within a temporarily constructed outdoor booth called a sukkah, which provides shade and respectfully honors the years of nomadic existence spent living in huts. During the Sukkot festival, meals are eaten within the sukkah, special blessings using the etrog are recited, and some of the faithful may sleep there. Work is not permitted during the first two days of the seven-day (and night) holiday. During the subsequent days of Sukkot, some work may be done with restrictions though these days are traditionally devoted to family time. The final day of Sukkot is known as Hoshana Rabbah and on this day, special prayers for prosperity.
considered unsuitable for Sukkot may be utilized in many other ways including: fruit preserves, flavoring in food and beverages, fermented into alcohol, cosmetics, perfumes, and the like (Fig. 6).

Prospects for a Locally Grown Etrog

The United States is home to a Jewish population estimated to be nearly 5.7 million, but nearly all of the world’s etrog citrus production remains centered around the Mediterranean Sea region with high preference going to the Yanaver or Diamante etrog from the Italian province of Calabria (American-Israeli Cooperative Enterprise, 2015). These orchards are known to be of untainted pedigree and have been providing etrogos to people of the Jewish faith for centuries. Israel, Yemen, and Morocco are also significant producers of the etrog citrus. In the latter for example, about 1500 acres were farmed in 2013, with 85% of the exported fruit shipped to the United States (Ministry of Agriculture and Rural Development, 2013).

The United States has seen a big push from consumers who want locally sourced foods and a connection to where their food comes from. Though many have tried, to date, California has the only long-term successful etrog operation in America. John Kirkpatrick, a third generation citrus farmer, operates an etrog grove of 800 trees on fifty acres and accounted for 6% of the world’s supply in 2014 (Siev, 2014). Though the warm dry climate of California may be similar to that of the Mediterranean, the state’s citrus industry faces the same citrus greening threat as Florida. California’s first detection of a HLB positive tree came in 2012 from a residential neighborhood in the Hacienda Heights area of Los Angeles County. The citrus greening vector was also collected and found to be HLB positive at that time. Since then, the Asian citrus psyllid has been sporadically detected in localized areas as far north as San Jose and Stockton (California Dept. of Ag, 2012). A second detection of HLB appeared in Los Angeles County as recently as July 2015, prompting an extensive survey of citrus trees and a quarantine zone that limits the movement of plant materials (California Dept. of Ag, 2015).

Despite the pest, weather, and urban encroachment challenges to citrus production in Florida, citrus farms north of Palm Beach County, FL, continue to plant new trees and researchers continue to study and evaluate potential cures for citrus greening disease by testing new varieties and trialing HLB mitigation strategies. South Florida possesses the largest concentration of Jewish people outside of Israel (750,000 people). Considering the momentum of the buy-local movement, an average price range of $30 to $80 per piece of fruit for Sukkot (Krul, 2011), and the large population of the Jewish faithful residing in Florida, the highly prized and multifruit etrog citrus warrants consideration for additional production within the state.

Rabbinical Certification

The Torah, Leviticus 23:40, commands the “beautiful” fruit (etrog) to be “taken and rejoice,” but not just any citron will do. The beauty of an etrog is gauged by its cleanliness as determined by a Rabbi. Their scrutiny guarantees the etrog is from a tree that was inspected and ascertained to be purebred. An etrog harvested from a tree planted with another species is not suitable for the Festival of Sukkot. Trees grown from cuttings of purebred specimens are however, considered suitable (kosher). An etrog for Sukkot must have been grown following halakha law and tradition. The fruit should resemble an oblong lemon, approximating the shape of a candle flame. For a Rabbi, the main beauty of an etrog is in its top third or the part that slopes outward. For example, a flaw or area of discoloration in this region can invalidate the fruit for Sukkot (Rich, 2012). If blisters or bubbles project from the fruit’s exterior in more than two places, it may also be rejected. Discoloration of the rind disqualifies an etrog only if it is noticeable when taking a cursory glance. The rind therefore should lack obvious defects and discolorations, be completely intact, and possess part of the stem. The rind should also be bumpy and ideally have a woody style (pitam) protruding from the bottom of the fruit. The etrog may be rejected if the pitam falls off or is removed although an etrog that grew without a pitam is still considered kosher. An etrog considered unsuitable for Sukkot may be utilized in many other ways including: fruit preserves, flavoring in food and beverages, fermented into alcohol, cosmetics, perfumes, and the like (Fig. 6).

Literature Cited and Other References


