



Limoneira 8A on Flying Dragon rootstock

Citrus production in Argentina

By Stephen H. Futch and Ariel Singerman

In May of 2017, we visited the northwestern citrus production region of Argentina in the provinces of Jujuy, Salta and Tucumán. The purpose of the trip was to learn more about Argentina's citrus industry and programs being developed to deal with both the Asian citrus psyllid (ACP) and Huanglongbing (HLB).

Argentina has a very dynamic citrus industry. Citrus is grown in 10 out of 23 provinces. The important citrus varieties in terms of planted area are lemons, oranges, mandarins and grapefruit. In 2015, Argentina had 326,216 acres devoted to citrus. The country produced 63.5 million boxes of citrus in 2015–16, making Argentina the world's ninth largest citrus-producing country. Argentina's lemon production represents nearly 85 percent of that in the Southern Hemisphere and 22 percent of the world's production. The planted area for oranges and grapefruit is decreasing because growers are increasing acreage devoted to lemon production. Such shifts are due to market and economic reasons mainly driven by the high value of byproducts (i.e., essential oils).

Within Argentina, citrus is produced for both the domestic and export markets. In the processing industry, the fruit

is used for juice and essential oils. Lemon essential oils are key ingredients in the global brands of cola soft drinks and in other beverages that are consumed worldwide. The beverage companies have strict specifications for the products they purchase, which dictate production practices.

High rainfall makes producing blemish-free fruit difficult due to various pests and diseases like melanose, canker, black spot, mites, scale and greasy spot. However, where rainfall is lower, supplemental irrigation is key to producing an adequate crop in drier years.

GROWER-SUPPORTED AGENCY

Growers and processing industries within the state of Tucumán developed Estacion Experimental Agroindustrial Obispo Colombes in 1909. Its purpose is to perform research to improve the production and profitability of existing crops and to evaluate the feasibility of other crops. This research center is funded by a tax of 0.5 percent paid by both the grower and processing industry — for a total of 1 percent — based on the value of the commodity produced. The government also provides some financial support at various times for the research center.

ACP AND HLB MANAGEMENT

The three citrus-growing regions of Argentina are currently under one of the following categories:

- 1) Both ACP and HLB are present (the northeastern area centered around Corrientes)
- 2) ACP is present, but no HLB has been detected (Salta and Jujuy)
- 3) Neither ACP nor HLB has been detected (mainly refers to Tucumán)

While only one of the regions has both ACP and HLB, the other two regions are aggressively surveying for ACP and HLB. The efforts to slow down and/or stop the spread of ACP and HLB include an education and vehicle control campaign that prevents the shipping of unprocessed fruit across province borders. Thus, there are mandatory vehicle border phytosanitary controls.

Argentina is also releasing a parasitic wasp (*Tamarixia radiata*) as a biological control agent in urban areas to reduce ACP.

From conversations with industry leaders, we learned they believe that the largest five or six growers within Argentina can directly impact 70 percent of the total production area, and, thereby, have the power to develop and sustain an effective and coordinated ACP and HLB management program. One major obstacle not to be underestimated in the management of ACP and HLB is the extensive number of citrus trees planted all along the sidewalks of the major cities. These trees represent the colonial Spanish heritage and will be hard to manage or remove if they should become infected with HLB.

NURSERY PRODUCTION

Like in Florida, citrus nurseries in Argentina are required to produce trees in enclosed structures to exclude the psyllid.

To produce a tree from seed until it is ready to be planted in the orchard takes 18 to 24 months. A main difference is that the trees are grown with a central stem that does not form branches in the nursery. Prior to delivery, the single stem is cut to a height of about 20 to 24 inches above the bud union so the tree will form lateral branches in the field after planting. Prices of commercial nursery trees varied widely from U.S. \$10 to \$15 per tree, plus sales tax of 21 percent.

PLANTING PARAMETERS

When planting new citrus trees, the hotter and drier months are avoided. Trees are planted on a raised earthen mound of soil to enhance drainage. Trees are watered manually for the first two years, then a drip irrigation system is installed by year three.

Major rootstocks used include: Swingle citrumelo, Carrizo citrange, Flying Dragon, C-35, Benton, Volkameriana, sour orange and rootstocks developed in Argentina such as 75AB (pomelo x trifoliolate), 79AC (Cleopatra x pomelo x trifoliolate), 61AA3 (Cleopatra x trifoliolate) and 81G (Volkameriana x Cleopatra).

Rootstock compatibility issues have been reported when planting Eureka lemons on any of the trifoliolate hybrids.

The Argentine lemon industry is starting to use less vigorous, dwarfing rootstocks and increasing planting densities. Traditional planting densities, approximately 120 to 157 trees per acre, are now increasing to 275 or more trees per acre.

Some of the newer plant spacing being reported are 20 by 9.8 feet or 17 by 9 feet.

WEED MANAGEMENT

Growers stated that they mainly use post-emergent herbicides like glyphosate, or in some cases paraquat, up to six to eight times per year. In a few of these applications, 2,4-D may be added to control more difficult weeds that glyphosate is ineffective on. In a few cases, a single application of diuron was made early in the season and applied in combination with the post-emergent herbicide to lengthen weed control.

ORCHARD REJUVENATION

Orchards usually reach maximum production around year 16, and yields approach 1,000 boxes per acre. As the block gets older and yield declines, the block is removed due to decreasing revenue and increasing cost. It is common for blocks to be replanted on a 25-year rotation. Prior to replanting, the field will be fallow for one year to reduce disease pressure, or planted with corn or sorghum for a few years to build organic matter and provide some revenue until citrus is replanted.

PEST MANAGEMENT

Insect and disease management is based on the buyers' specifications for the final product, particularly for lemon essential oil since the beverage companies are a major purchaser of essential oils and have a low threshold for residues

of many chemicals.

Spraying is done four to five times per year for pests, although growers may do an additional three sprays of phosphite to help manage phytophthora.

Phytophthora is a major production issue, especially with young trees. Phytophthora can cause damage to stem, roots and the fruit as brown rot.

TREE SIZE MANAGEMENT

Typical hedging and topping operations are conducted on an annual basis. Lemon on most rootstocks will remain vigorous without annual hedging and topping, but access to the block for pest management and harvesting would be very limited otherwise. Standard hedging is about 7 feet wide, and topping height is approximately 12 to 14 feet tall.

HARVESTING

The harvesting of fresh lemons is by size (with 2.4 inches diameter preferred) and yellow color. Once the fruit breaks color, it will be harvested regardless of size. For lemons, spot-picking may occur up to four times per season, which makes for a large harvesting cost. It can run as high as U.S. \$5 per box averaged over the entire season. Oranges and grapefruit are picked in a single harvesting operation per season.

When harvesting lemons, pickers will use a 22-pound

sack and then place the fruit into a bin that is comparable to Florida's 10-box bin.

Mechanical harvesting of lemons would be very difficult due to the multiple harvests per year and the inability of the mechanical harvester to harvest selectively based upon color or size.

To minimize peel injury, harvesting operations do not begin until the fruit is dry. Therefore, harvesting of fresh fruit may not begin until 11 a.m. to noon each day.

PACKING OPERATIONS

The fresh-fruit packinghouses we visited were very modern with the latest grading, sizing and sorting equipment. Several houses had mechanical placement of fruit into cartons to reduce labor costs.

Due to the substantial number of fruit with skin blemishes caused by pests, diseases and wind scarring, a sizable percentage of fruit are culled in the packing operations and diverted to a processing plant.

When the fruit enters the packinghouse, it is pre-graded and separated based on color by electronic systems. Once separated into bins, the fruit is degreened as needed in chambers where temperature, humidity and ethylene are controlled. Fruit will be degreened for up to four days depending on color. Fruit not suitable for degreening is sent to a processing plant.

The quicker the fresh fruit is sorted and unwanted fruit is eliminated, the more efficient the packing operation becomes. Prior to sorting, the fruit is washed in a chlorine solution followed by sodium bicarbonate and/or other fungicides, as necessary. Imazalil also is used in the packing operation wash water. Stem end rot can be a significant post-harvest issue.

A complete traceability system required by many buyers is in place to allow any packed fruit to be traced all the way back to the block where the fruit originated.

When fruit is exported, it can take four to six weeks to reach markets in the European Union or Middle Eastern countries. Thus, proper packing and fungicide applications are essential.

TREE NUTRITIONAL PROGRAMS

The nutritional program varies with location and variety, with similar application rates that are used in Florida. The actual rates in each block are adjusted based upon soil and plant tissue testing.

LABOR

It seems like in any country that one visits, labor costs and supply are issues, and Argentina is no different. Labor is a major part of production costs. One grower reports that labor can be as high as 60 percent of the total production costs when



Harvesters in Argentina fill 22-pound picking bags and then place the fruit into bins.

harvesting costs are included. In addition to the labor rate per hour, government and social programs add significantly to the total costs. Just like in the rest of the world, the Argentinian growers are looking at ways to manage their labor costs.

In summary, Argentina's citrus industry is a very modern and productive system that meets both national and international production standards. 🍊

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