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Citrus Center

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Water Savings in Citrus Production for 2011 On-Farm Water Conservation Demonstration Sites

Shad D. Nelson

On-farm irrigation water use for 2011 in citrus production for the Lower Rio Grande Valley (LRGV) was one of the highest recorded during the Agricultural Water Conservation Demonstration Initiative (ADI) project, mainly due to near zero precipitation throughout the 2011 growing season. Most growers had only four inches of rainfall for the entire 2011 year, and this rainfall came at the very end of the 2011 year which did very little for citrus growth and yield production. Therefore, 2011 serves as an exceptional year representing of the extreme level of irrigation water use by Citrus growers in LRGV when there are severe drought conditions in South Texas. Water use comparisons are presented in Table 1 from data collected from various citrus producers using four irrigation strategies: Traditional 'Large-Pan' Flood (Trd Fld), 'Narrow' Border Flood (Brd Fld); Microjet Sprinkler Spray (MJ Spray); and 'single-line' and 'dual-line' Drip (Drip). Total average irrigation water use by growers for 2011 was 62, 51, 48, and 41 inches/acre with Trd Fld> MJSpray>Drip >Brd Fld, respectively. Citrus in the LRGV typically require approximately 45 inches of water per year to raise a good crop. The growers using Brd Fld irrigation best met this water requirement with 41 inches water applied via irrigation, plus the four inches of precipitation. All other irrigation methods exceeded this crop requirement, with Trd Fld irrigation having applied 62 inches and far exceeding the yearly irrigation crop demand by approximately 17 inches of water in the 2011 growing season.

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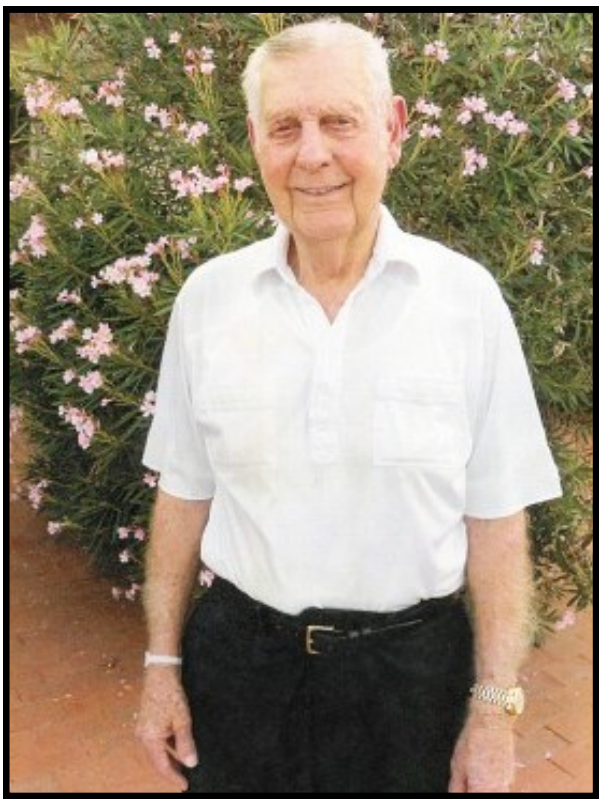
Table 1. Irrigation Water Use and Water Savings Projected from On-Farm Water Conservation Studies in the Agricultural Water Conservation Demonstration Initiative (ADI) Project for 2011 Growing Season.

Irrigation Method	Min. Inches Applied	Max. Inches Applied	Average Inches Applied	Inches/Acre Water Saved	Acre-Ft/Acre Water Saved	Potential Water Savings if Entire Citrus Industry Used Irrigation Method
Trd Fld	60	66	62	0	0.00	0
MJ Spray	48	56	51	11	0.94	26,200
Drip	48	50	48	14	1.18	33,000
Brd Fld	40	44	41	21	1.75	49,000

The total amount of water saved for the three alternative irrigation systems compared to that of Trd Fld was 0.94, 1.18, and 1.75 Acre-Feet/Acre for MJ Spray, Drip, and Brd Fld, respectively. The entire LRGV citrus industry consists of about 28,000 acres of Citrus. Using the numbers for water savings in 2011 as a guide of potential total water savings, if the entire industry switched to these alternative irrigation practices it could lead to 26,200; 33,000; and up to 49,000 Acre-Feet of water saved converting to MJ Spray, Drip, or Brd Fld, respectively. Switching from Trd Fld to Brd Fld irrigation would not only result in greater water savings, but would be the most cost effective and easiest alternative irrigation practices to implement for citrus growers currently using Trd Fld irrigation methods.

Citrus Center Loses a Friend – A Tribute to Blaine Holcomb

John da Graça



One of the Texas citrus industry's staunchest supporters for many years, Blaine Holcomb, passed away on June 18, 2012. He was born in Malvern, Arkansas in 1919, and moved to the Valley with his family in 1926. His father was selling citrus groves in Bayview, and the family settled in Port Isabel. As a young boy, he met John Shary, one of the citrus pioneers of Texas, when he helped take him out on a fishing boat; this connection later led to a long association with the Shary Estate. During World War II Blaine served in the navy, and in 1946 he worked as a CPA in San Antonio. He was then transferred to the Valley to work on the estate of John Shary who had died in 1945. He then took over the management of the estate properties, and looked after office matters for the Shary Estate for 63 years.

From 1968 until 2000, Blaine served as a member of the Citrus Center Advisory Committee, and his support was greatly appreciated. The Citrus Center expresses it condolences to the Holcomb family.

Lime Anthracnose in Texas

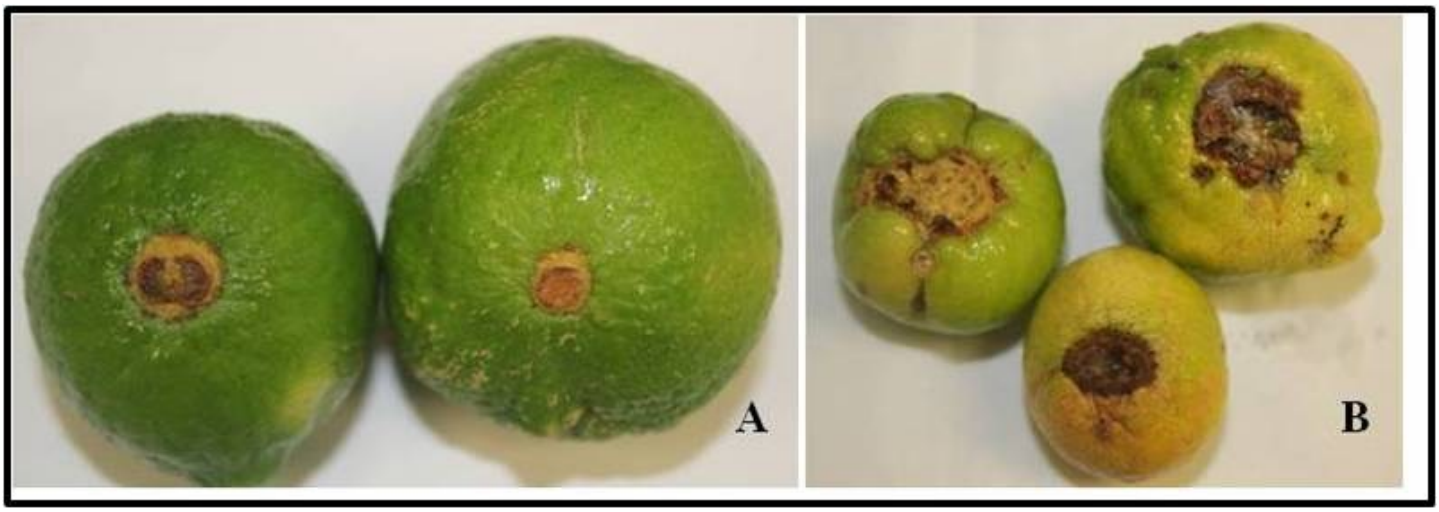
Madhurababu Kunta and John da Graça

During last week of September, 2012, several distorted small Mexican lime (also known as Key lime) fruit with a range of lesions from shallow sunken spot lesions to large, brown depressed cankers were collected by USDA–APHIS inspectors from trees in residential areas of Brownsville, Texas. These samples were brought to the Citrus Center's diagnostic laboratory to identify the problem. The inspectors also reported that they are seeing these symptoms quite often now. Based on the symptoms and after consulting Dr Pete Timmer, emeritus citrus pathologist at the University of Florida, we have provisionally identified the cause to be a fungal pathogen, *Colletotrichum accutatum*, which causes lime anthracnose disease. The disease is known to affect only Mexican limes and not other limes such as Tahiti (aka Persian or Bearss) lime.

The fungus is known to attack young leaves, immature fruit, and bloom. Infected flower buds turn brown and fall before opening, infected young immature fruit will develop the lesions which make them misshapen and drop prematurely, and late infected fruit show large and sunken canker lesions with fruit size reduction.

This disease is a serious problem for Mexican lime production in Mexico, Florida, and Caribbean area. In Texas, the disease was reported by Dr. Timmer in 1976 on Mexican lime trees, causing severe blight of new flush, premature drop of flowers and young fruit. In Florida, Brazil, and several other citrus production areas in Americas, *C. accutatum* is also known to cause post bloom fruit drop disease in sweet oranges, limes, and lemons, with some severe outbreaks in Florida and Brazil.

According to Dr. Timmer, the disease is serious only when new flushes coincide with extended periods of rainfall and frequent copper fungicide application during flushes can effectively control the disease. We are in the process of isolating the fungus onto media plates from the infected tissue, and plan to perform pathogenicity and molecular tests to confirm the identity of the pathogen.



Mexican lime [*Citrus aurantiifolia* (Christm.) Swingle] fruit showing lime anthracnose disease symptoms. A. Shallow necrotic spot lesions, B. Misshapen small fruit with large deep and depressed necrotic cankers.

Twig Dieback of Star Ruby Grapefruit and Midknight Valencia Orange Trees

Juan Carlos Melgar, Mamouodu Sétamou, Mani Skaria, Eliezer Louzada & John da Graça

In August, dying branches of some mature trees were observed in the Citrus Center groves. The situation was concerning because the cause of the problem was not clear. The initial symptoms (wilting leaves) resembled water stress. However, symptoms were restricted to a few branches of some trees whereas drought stress would normally cause wilting leaves in all branches. Also leaves did not fall and had to be pulled to remove them, whereas a drought stress would have made leaves to fall. In a more advanced stage, these branches started showing "firing-like" symptoms: twigs died quickly, in a few days, and gum exudation was observed at the branch axes, normally between dead and healthy tissues. One of the most confusing observations was that these symptoms were exclusively observed in Star Ruby grapefruit trees and in Midknight Valencia orange trees grafted on sour orange rootstock. Neighboring trees being different varieties or grafted on another rootstock in the same grove did not show any symptom even if the irrigation management was the same. No pathogenic organisms seemed to be implicated; the observations suggested it was related with a stress but it was not the typical water stress. *(continued on page 5)*

(Dieback cont. from pg.4…)

After doing a deep search by tracking down old articles, we found the answer. These symptoms were first reported in the Valley in 1980 by Dr. R.M. Davis and Dr. R.F. Leyden from the Citrus Center*. It was described as twig dieback and it was always found in Star Ruby Grapefruit on sour orange rootstocks. The description absolutely matched the symptoms described above: *"Twigs died quickly; leaves, wilted, turned brown, and usually remained on the tree. Gum exuded at the junction of dead and healthy tissue, which was often at a branch axis (...). Dieback was most prevalent during late summer."* Applications of fungicides done by Drs. Davis and Leyden showed no differences in the incidence of dieback in treated and untreated trees, which confirmed that the cause of the dieback was not pathogenic. Authors concluded that the causes included an imbalance between water demands of the foliage and the ability of roots to provide adequate moisture, and that a survey done on trees under flood or drip irrigation revealed that trees under flood irrigation were more commonly affected with dieback (3x times). After that study, no more studies were reported in the Valley.

Affected branches were removed and trees were not further damaged. The interaction Star Ruby/ sour and Midknight Valencia/sour is very clear; however, there are still many unsolved questions about twig dieback, especially related to 1) the environmental factors that cause its sudden appearance; and 2) twig dieback incidence and its relationship with tree species, size and management.

*Journal of the Rio Grande Valley Horticultural Society Vol. 34 (1980), pp. 115-120.

Congratulations and Best Wishes to Masters Graduate, Ms. Yadira Zapata

Mani Skaria and Randall Williams

Ms. Yadira Zapata of Mercedes, Texas successfully completed an MS degree program in the Agriculture, Agribusiness, and Environmental Sciences Department under the direction of Drs. Randall Williams and Mani Skaria, and graduated at the August 2012 commencement ceremony. Her research project was, "Determining the pathogenicity of *Elsinoe australis* on different citrus cultivars and efficacy of organic packinghouse treatments on the viability of *Elsinoe australis"*. This fungus is the causal agent of sweet orange scab (SOS) disease of citrus. For this project, she studied the pathogenicity of *E. australis,* by artificial inoculations on leaves and fruit of organically grown Satsuma, lemon, and grapefruit. She also studied the viability of *E. australis* under simulated laboratory and real-time packinghouse treatments with 14 different isolates of the fungus. She has reported that packinghouse-treated organic citrus fruit showed a significant decrease of the viability of *E. australis* after exposure to peroxyacetic acid solution, temperature and wax treatments.

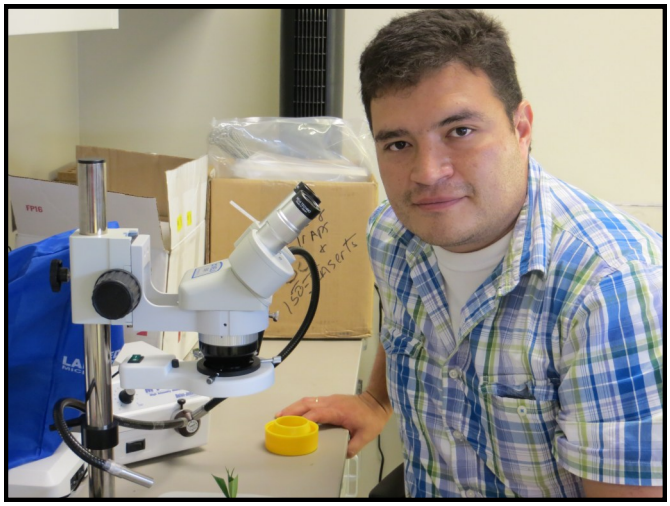
Yadira was employed from 1995-2012 with the USDA-ARS, Weslaco. She recently joined the Mercedes ISD as a high school Ag teacher. Congratulations and Best Wishes to Yadira in her new pursuit towards education local students.

Citrus Center Hosts International Visiting Scientists and Students

Juan Carlos Melgar & Mamoudou Setamou

The Citrus Center is currently hosting several international visiting scientists and students:

Augusto Ramirez (below), Agricultural Engineer, is a professor of entomology from the Universidad Nacional de Colombia. He is spending a year in Weslaco working with Drs. Mamoudou Sétamou and Juan C. Melgar on management and control of Asian Citrus Psyllid and the interaction between insect and tree phenology. Psyllids are present in the citrus producing areas in Colombia although greening has not been detected.



Dr. María Benlloch (above, left, with Research Associate Ayako Kusakabee) is a postdoctoral researcher from Spain who has just arrived at the Citrus Center after a 21-month visit to the CSIRO (Australia). She is developing a 3-month research program on aquaporins at the Plant Physiology Lab. Aquaporins are proteins in the cell membranes that regulate the passage of water across the cell membranes. They are scarcely studied in fruit trees, although they have important roles in water uptake, fruit development and ripening. The importance of aquaporins in semiarid areas consists in the higher expression of these proteins under conditions of lack of water.

Antonia Romero (below, right), Agricultural Engineer, is a graduate student from Spain who is carrying out several research experiments for her thesis. Antonia received a grant from the Universidad de Cordoba for a 6-month study abroad experience in the Plant Physiology Lab. She is working on water-saving irrigation strategies, focusing on partial rootzone drying, a novel technique that has shown promising results under greenhouse conditions.

Sheren Elsayed Farag (below, left) is a Ph.D student from Egypt who is interested in irrigation strategies that conserve water. Her research on deficit irrigation includes novel studies on monitoring sap flow movement in fruit trees under semiarid conditions. She is conducting a 3-month research project in the Plant Physiology Lab.

HLB in Texas: Lesson Learned from Florida

Mani Skaria

"Lessons Learned" comes loaded with opportunities to promote a learning culture for others for improvements. It will enhance and sustain effective practices and provide opportunities and resources to foster collaboration among professionals, the industry leaders and policy makers. The state of Texas reported its first HLB finding in January 2012 and California's was in March 2012. The first report of Florida HLB was in 2005. According to Dr Tim Gottwald and others at USDA-ARS, HLB incidence recorded in Florida increased from 0.2% to as much as 39% within 10 months. A citrus orchard is an economic asset; however, with HLB, it can become a liability for growers, the industry, and the state. In finance, the future income and expenses are estimated for a yearly net return on investment. If you discount the future net return to the present, you will get a net present value. With no HLB control strategies, even an initial disease incidence of 0.1%, citrus orchards with an average tree age of six years or less will have a **negative net present value**. This is indeed an alarming situation.

Since HLB was first reported in 2005 in Florida, both Texas and California had six years of preparation towards a proactive HLB control strategy. A baseline information on HLB, based on active large-volume samples of tissue and vector analysis by qPCR started in Texas and California. The January 2012 detection of HLB in Texas preceded by almost 30,000 tissues and 25,000 psyllid sample tests – all tested negative for HLB bacterium. In the current Texas situation, a quick review of **HLB Lessons Learned in Florida** may shed some light towards developing and fine-tuning certain control strategies in Texas and California. At the least, the Florida HLB experience that included a series of situations beyond control or with limited control, oversights, and a house divided, are worth revisiting, along with some Florida-Texas comparisons and expert opinions.

- HLB was first discovered in: **South Florida**, August 2005; ***Texas*** *January 2012*
- Vector first reported: June 1988, Palm Beach County **FL** on orange jasmine; ***TX*** *Spring 2001, in the LRGV, possibly via potted orange jasmine from Florida*
- Spread of the psyllid vector and humans: **FL** -By 2011 it spread to 31 counties; ***TX****- 2012; limited to a few trees in one county.*
- Citrus 2011 production (million boxes): **FL** 200 ; ***TX*** *8.5*
- Commercial varieties: **FL** – many types - oranges, grapefruit, tangerines, tangelos, etc.; ***TX*** *– two types -grapefruit and oranges*.
- Total acres: **FL** - 541,000 acres, (63% of 1966 acreage); ***TX*** *27,000 acres*
- Citrus canker: **FL –** disease widespread; situation exacerbated by legal issues and weather; citrus leafminer (CLM) infestations increase canker lesions and spread. Mis-identification of bacterial spot as canker in 1980s led to destruction of 20 million trees. ***TX*** *– neither canker not bacterial spot present, but CLM is common.*
- Researcher capabilities: **FL –** University of Florida**,** CREC, Lake Alfred has 28 faculty and is the largest facility in the world devoted to a single commodity. They have millions of dollars to spend on HLB research and control from Florida box tax. ***TX*** *-The TAMUK Citrus Center has 5 faculty. Texas citrus industry is a fraction the size of Florida's, and support for research and control consequently smaller.*

As a result of the decades-long canker experience, Florida Citrus growers were "tired". Citrus canker took a heavy toll on growers' financial resources and energy, and many could not deal with another problem, HLB. There are now 80,000 acres of abandoned groves in Indian River area alone, and some 130 citrus growers switching to other crops like olives.

Research on HLB was initially hampered because the tragic event of 9/11 led to Homeland Security regulations placing the HLB bacterial pathogen on the select agent list. HLB was detected in Florida on September 2, 2005, and only limited research by a few scientists working under restrictive conditions could be done until November 17, 2008, when the Federal regulation was lifted.

About the Citrus Canker: Citrus canker is a disease that was first found in Florida in 1910, declared eradicated in 1933. But it re-appeared in 1986, again in 1995. A statewide eradication program started by the late 1990s. The program with a state law destroyed all citrus trees with in 1,900 foot radius – an area of 250 acres. The canker bacteria can spread 1900 foot radius in a grove in one month. The 1,900 foot rule became the Achilles' heel. In 2001 angry residents in Broward County and some municipal governments sued the Florida State Canker Eradication Program. Officials compromised to destroy only infected trees in Southeast Florida during the litigation. The Eradication Program won the law suit, February 2004 when the Florida Supreme Court upheld use of 1,900 foot rule. Hurricane Charley hit on August 13, 2004 and there were 1000s of infected trees to be removed in southwest Florida and in other parts of Florida infected trees were untouched during the litigation period of three years. Hurricane Frances and Jeanne in September 2004 spread the bacterium all over Florida. The eradication program was SLOW, until 2004, the program removed only 16,000 commercial acres at a grower compensation of $105 million, means growers got $6,562/acre in compensation. Within a year after the storm, the program targeted to destroy 90,000 commercial acres of citrus, with compensation. By that time growers began to rebel and became a revolt. Another USDA study showed Florida growers likely to lose another 180,000 acres after the Hurricane Wilma, October 24, 2005. In January 2006, USDA announced it will not pay to remove uninfected trees. By this time, the eradication program removed only 65,270 acres. Today, Florida is **Learning to Live with Canker** with voluntary grove caretaking. A West Palm Beach county judge sided with home owners who won a $19 million jury verdict against the state for healthy citrus trees that they lost. However, Florida state lawyers had argued that the home owners should have to petition the legislature for money to pay. A Circuit judge, Robin Rosenburg ruled that the state must pay without involving lawmakers because it took private property for a public purpose.

Words of wisdom from Florida scientists, growers and industry leaders

● **Dr. Pete Timmer**, retired citrus pathologist, Univ. of Florida CREC, Lake Alfred, "I am pessimistic about the future of citrus in Florida but I am not pessimistic about Texas."

● **Doug Bournique**, Executive Director, Indian River Citrus League, FL., "We did not handle HLB right in the Indian River citrus district- we were wrong."

● **Dr. William Dawson**, Professor, CREC, Lake Alfred, FL., "Genetic engineering is not an immediate solution to the problem."

● **Dr. Harold Browning**, Entomologist and retired director, CREC, Lake Alfred, FL., "We spent millions of dollars for HLB control."

What we should do/not do in Texas? We should not dampen the enthusiasm of our growers with additional heavy regulations that we may all regret. However, we should do the best science to keep HLB under control with effective psyllid sprays, a good nursery program, removal of abandoned orchards, and let growers do non-regulated HLB tests and tree removal until it reaches unsustainable levels.

A house divided cannot stand (Abraham Lincoln speech, June 1858)

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Thank you!

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