

Texas A&M University-Kingsville

Citrus Center Highlights

FY 2019-2020



Message from the Interim Director



Dr. Mamoudou Sétamou
Interim Center Director

At the time this publication went to print, I had just marked my third month as Interim Center Director at the Citrus Center following the retirement of Dr. John da Graça. John devoted 21 years of his life to leading the Citrus Center and assisting the Texas citrus industry, while also working as an active scientist and mentor to many students.

Dr. da Graça has had significant impacts on the Center and the citrus industry as a whole. During his tenure, the Citrus Center moved to a new building after decades spent in renovated old military barracks.

John's vision and leadership led to the enactment of the Texas citrus budwood program, the sole source of clean budwood for nurseries in the state. Dr. da Graça excelled as a leader and collaborator in working on pest and disease management efforts for the citrus industry.

Throughout the last decade, John was at the forefront of industry efforts to curb the threat of Huanglongbing, or citrus greening disease. Although John has retired, the industry and the Center will continue to reap the benefits of his legacy for many years to come. All of us at the Center wish him a happy and healthy retirement.

In October 2020, the Citrus Center and the Texas citrus industry lost a great friend and mentor with the passing of Dr. J. Victor French, Professor Emeritus of Entomology. Dr. French worked as a citrus entomologist for 37 years until his retirement in 2010. He is undeniably the father of the Texas citrus pest management program which is being implemented to this date by growers. His legacy will live forever.

While Dr. French and I were originally brought together for academic purposes when I was hired in 2006 to replace him and ensure a smooth transition, I soon began to learn from his views and perspectives and his wealth of knowledge. Over time, our collaboration developed into a great friendship. I have never met someone as equally impressive, smart and goodhearted.

Dr. French, you carved your name on our hearts, not on tombstones. All of us at the Citrus Center and the Texas citrus industry will sincerely miss you. May your soul rest in peace, "Uncle Vic!"

The year 2020 has been marked by the COVID-19 pandemic that has affected all aspects

of our lives with long-lasting social and economic consequences. Many Texans have followed a "stay-at-home" order for all non-essential businesses and activities. With agriculture classified as an essential business, most workers in the sector continued their activities.

The Citrus Center has remained open to continue essential operations (budwood program, pest and disease detection, and recommendations to growers) though at times with reduced personnel and following the recommended social distancing guidelines.

This past September, the Citrus Center faculty met to develop a new strategic plan. In light of the ever-changing landscape of the Texas citrus industry, developing an adapted plan to improve efficiency and better serve our industry was a necessity. As an outcome of this plan, the Center will focus its efforts on the development of adapted solutions for our local growers' problems with emphasis on pest and disease management, horticultural practices, post-harvest issues and varietal development.

The Citrus Center faculty was successful in 2020 of securing \$2,110,467 in grant money to support various research programs.

The 2019-2020 crop season has been characterized by smaller than normal fruit sizes, which is one reason expected returns will be lower. The current 2020-21 harvest season is well underway with harvest of grapefruit and early oranges outpacing last year's levels at this time.

In collaboration with the industry, the area-wide psyllid management program continued to be implemented by growers. Although psyllid numbers started higher than expected earlier in the year, coordinated grove sprays brought down these numbers beginning in the spring.

We are grateful to the unwavering support of our industry leaders, citrus growers, packing houses and nurseries, and we look forward to continuing our efforts for the sustainability and profitability of the Texas citrus industry.

A handwritten signature in black ink that reads "Mamoudou Sétamou". The signature is fluid and cursive, with a long horizontal line extending from the end.



Dr. Shad Nelson
Dean

A Message from Dr. Shad Nelson, Dean of the Dick & Mary Lewis Kleberg College of Agriculture & Natural Resources (AGNR)

Dear Citrus Industry Friends and Stakeholders,

The wake of 2020 will live in our memories as a year of trial and opportunities. The worldwide battle to fight COVID-19, along with local stresses on many due to natural disasters have tried us all.

My heart goes out to all who have lost some of the fruits of their labors this season due to Hurricane Hanna, and more importantly to those who have experienced personal family loss. With good reason, many look forward to 2021 with the reality that things will be better.

I am always impressed with our Valley citrus producers and those who work in the industry. You are just as resilient as the orchards you all manage. I find great comfort in well-rooting trees that weather the storms that come and go. Still, they continue to grow and produce fruit for a new season.

You all do the same, and our faculty and staff at the Citrus Center get the joys of sharing that forward- thinking optimism with you as we work together to serve the most notable and fruitful industries South Texas has to offer.

We recently said farewell to two of the most dedicated servant-leaders the Citrus Center has provided to the citrus industry. These include the retirement of Dr. John da Graça after more than two decades of service as the Citrus Center director; and the recent passing of Dr. Victor (Vic) French, Professor Emeritus of Entomology. We are reminded of their great service. Both have left a lasting impact on the South Texas citrus industry, and we will miss them.

Dr. Mamoudou Setamou was appointed as the interim director of the TAMUK Citrus Center, and we are pleased that he has accepted this additional responsibility to carry forward the work and mission of the TAMUK Citrus Center.

As we consider 2021, we also look forward to adding a new faculty member soon to the Citrus Center science team.

As we have for decades, we look forward to serving you more in 2021.

Shad D. Nelson, Dean

A handwritten signature in dark ink, appearing to read 'Shad Nelson', written in a cursive, flowing style.

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Alex Blinder, Rod Santa Ana, RGV1.com

Message from the Editor



Dr. Madhurababu Kunta
Editor

I am delighted to serve as editor for this edition of the TAMU-K Citrus Center's Highlights Magazine. Similar to previous issues, this magazine brings exciting updates on our research, student, staff and faculty accomplishments, and information on the events that we conducted throughout the year.

We are in unprecedented times with the COVID-19 pandemic creating a profound impact on our daily lives. Since its onset, our families, friends and colleagues have all been facing unprecedented challenges and uncertainties.

But along with the difficulties come opportunities. There will likely exist a growing and lasting consumer interest in immunity-boosting and healthy food choices, creating a greater demand for citrus fruits.

Citrus Center employees and students have a deep appreciation for the support that we have received from the growers during the 2019-20 fiscal year. We are committed to grower-centered research efforts with an unwavering goal of sustainable production for the Texas citrus industry. These efforts are facilitated and enriched by our collaboration with growers.

A great big THANK YOU goes out to our growers and everyone involved in the citrus industry. We could not do it without you. My sincere appreciation to everyone for their resilience and teamwork to make our world a better place to live, in spite of the challenges posed by the pandemic. I hope our families and communities remain safe and healthy, and we look forward to a prosperous and successful future.

Dr. Madhurababu Kunta

Editor

A handwritten signature in black ink that reads "K. Madhura Babu". The signature is written in a cursive, flowing style.



TEXAS CITRUS MUTUAL

A Message From Dale Murden, Texas Citrus Mutual President



The year 2020 will be one for the ages. Thinking back to New Year's Day January 1st, 2020, could any of us have known what was soon to be on our horizon and in our lives?

We first referred to it as the Corona virus. I remember well what I was doing in March when things began to get very serious and our worlds began shutting down. I was in Washington, D.C. at the USDA building working on several projects, but the sale of grapefruit juice was at the forefront that day. I remember that suddenly the phones of everyone in the meeting began to blow up with messages; DC was shutting down. Just getting a flight out and returning home became a challenge.

Now fast forward to December. The past ten months, we as a country and a world have seen a lot. The virus is now almost exclusively known as COVID-19 and doesn't seem to be fading away as hoped. Sadly, many of us have lost family, friends and co-workers.

But those of us in agriculture were almost immediately named as "essential workers," and continue to work we did.

I am very proud of what we do for our nation and the world. We provide a healthy and nutritional food supply worldwide.

I mentioned in last year's message that no two years in agriculture are ever alike. That proved prophetic.

One change we are going through now is a changing of the guard at the Citrus Center. We wish Dr. DaGraça well in his retirement and thank him for his many contributions over the years to our industry.

To the current staff and great scientific team at the Center, on behalf of the industry, we thank each and every one of you for all you do to help growers provide the nation and the world with fruit rich in vitamins and flavor. For this, we should all be proud.

Thank you,

Appreciation Dinner



Citrus Center Legend plaques presented to Jim Hoffmann and Dr. Julian Sauls by Dr. John da Graça and Dale Murden in recognition of their outstanding support of the Citrus Center and service to the citrus industry of Texas.





Prukop and da Graça Lead Traditional Citrus Celebrations



Dr. da Graça served as Grand Marshal of the January 2020 Citrus Fiesta Parade of Oranges in Mission TX. Behind him is the Royal Float with Citrus King Ted Prukop aboard.



A new banner is on display at the entrance to the Citrus Center in Weslaco. The banner was created by the TAMUK Marketing and Communications Department.

Student and Faculty Awards

Student Award Winners



Victoria De Leon received Outstanding PLSS Graduate Student Award



Cynthia Puente received Outstanding PLSS Graduate Student Award

Award Winners

Faculty Award Winners



Dr. John da Graça received Extra Mile Award from Dick and Mary Lewis Kleberg College of Agriculture & Natural Resources



Dr. John da Graça received Special Recognition Award at the Subtropical Agriculture and Environments Society Annual Meeting for his outstanding dedicated service to the Society and the Citrus industry in the Lower Rio Grande Valley



Dr. Madhurababu Kunta received the Junior Research Award from Dick and Mary Lewis Kleberg College of Agriculture & Natural Resources. Dr. Madhurababu Kunta received the Junior Research Award for the second time. He has received the same award during 2016-2017



Dr. Mamoudou Sétamou
*Interim Director & Professor,
Citrus Entomology*



Dr. Eliezer S. Louzada
*Professor, Plant Breeding and
Biotechnology*



Dr. Veronica Ancona
*Associate Professor,
Plant Pathology*



Dr. Madhurababu Kunta
*Assistant Professor of Research,
Plant Horticulture &
Plant Pathology*



Dr. Andrew Chow
Project Director, Entomology



Dr. David Laughlin
*Postdoctoral Research
Associate, Pathology*



Dr. Chuanyu Yang
*Postdoctoral Research
Associate, Pathology*



Dr. Jong-Won Park
Research Scientist, Diagnostics.



James Hearn
Research Assistant



Cesar Medelez
Research Technician I



Hilda Sonia del Rio
Research Associate



Marissa Gonzalez
Research Assistant



Fatta B Gurung
Research Associate



Robert Saldaña
Research Associate

Retirement

of South Texas Citrus Legends: John da Graça

After 21 years at the helm of the Citrus Center, Dr. John da Graça officially retired from his post on August 31.

Dr. Mamoudou Sétamou is now serving as interim director.

A native of South Africa, da Graça's affiliation with the Center began in 1994 as a visiting scientist working with Dr. Mani Skaria on implementing the virus-free citrus tree budwood program.

At the time, da Graça was serving as an associate professor at the University of Natal in South Africa.

In 1999, he accepted the position of deputy center director of both the Citrus Center and the Texas A&M Agricultural Experiment Station, and moved with his family to the area.

He served as deputy director from 1999 to 2008 when the administration of the two centers was separated and he was named director of the Citrus Center.

Among his many accomplishments, da Graça was a major player in the development of construction plans to replace the aging facilities of the center.

In 2009, da Graça hosted groundbreaking ceremonies and by 2010, the modern, new two-story science research building was ready for move-in.

During his tenure, da Graça also oversaw the establishment of research protocols to combat a variety of emerging citrus insect pests and diseases, including HLB, the Asian citrus psyllid, citrus canker and tristeza.

He also supervised the development of a state-of-the-art certified budwood program.

As his retirement day drew near, faculty and other supervisors of the Citrus Center treated da Graça to a retirement party on August 31, 2020. The event was marked by mask-wearing and social distancing restrictions as the COVID-19 pandemic swept the nation.

Presented with a gift of a Citrus Center clock, da Graça remarked that his time at the center had been most rewarding, and that all accomplishments during his tenure were the result of teamwork by all faculty, staff, visiting scientists and students.

The College of Agriculture & Natural Resources sent him a gift of a Javelina-engraved fire pit.

After retirement, da Graça and his wife Sheila moved to McKinney TX to be closer to family.

Included among his last year of duties was bidding a loving farewell to Alfredo "Fred" Longoria, who retired in February after 39 years of loyal service to the Citrus Center.

Longoria joined the Center in 1981. He worked his way up from farm worker to being named farm manager in 2012.

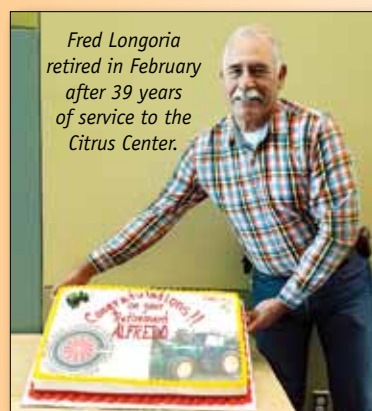
"The position of farm manager at any agricultural research facility is a key position and Fred excelled at running our farming operations flawlessly," da Graça said. "The Center owes Fred a deep sense of gratitude."



Dr. John da Graça, Executive Center Director, retired in August after 21 years' service at the Center. He received a retirement clock from faculty and supervisors at a COVID-19 socially distanced and masked ceremony, and a Javelina engraved fire pit from the College.



and Alfredo Longoria



Fred Longoria retired in February after 39 years of service to the Citrus Center.



Longoria was treated to a retirement luncheon and gifts from Center employees after retiring from his position of farm manager.

Current Graduate Students and Recent Graduates



Pramod Gudipally
— Dr. Kunta



Tirumala Danda
— Dr. Kunta



Olivia Segura
— Dr. Louzada



Yovanna Soto
— Dr. Setamou



Miriam Calderon
— Dr. Ancona



Sonia Munoz
— Dr. Setamou



Jennifer Belcher
— Dr. Kunta



Raelene Mendez
— Dr. Ancona



Marissa Gonzalez
— Dr. Kunta



Cecilia Segura
— Dr. Sétamou



Teresa Salazar
— Dr. Sétamou



Tofunmi I Ijila
— Dr. Sétamou



Mayra Reyes
— Dr. Sétamou



Franco C Guerra
— Dr. Louzada
— Dr. Kunta



Liliana Cantu
Ph.D. student
— Dr. Sétamou



Victoria Mora
— Dr. Ancona

Recent Graduates



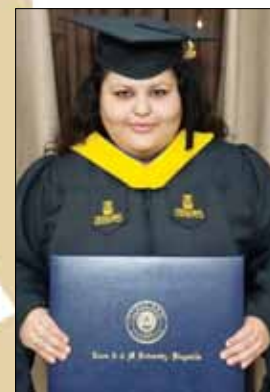
Venkata Boyapati - MS
"Over expression of RhNAC2
and RhEXPA4 genes in Carrizo
citrange to develop potential
drought tolerance"
Dr. Louzada (Chair)/
Dr. Kunta (co-chair)



Victora De Leon - MS
"Investigation of 'Candidatus
Liberibacter asiaticus'
Prophages in Texas and
Florida"
Dr. Louzada (Co-Chair)/Dr.
Kunta (Co-Chair)



Cecilia Villegas - MS
"Development of a technique
for reliable recovery of testable
Asian citrus psyllid from field
deployed sticky cards" Dr.
Setamou (Chair)



Cynthia Puente - MS
"The effect of thermotherapy
on Huanglongbing-affected
citrus trees in Texas".
Dr. Ancona (Chair)

A Tribute to Victor French (1936-2020)

Citrus Entomologist Extraordinaire

Contributions by Dr. John da Graça and Rod Santa Ana



Dr. Victor French, citrus research entomologist, is shown after receiving the prestigious Arthur T. Potts Award at annual meeting of the Lower Rio Grande Valley Horticultural Society in 2001.

(Photos by Rod Santa Ana)

On October 21, 2020, the Citrus Center and the Texas citrus industry lost a dear friend and beloved researcher with the passing of Vic French in McAllen.

Vic was born and raised in Colorado where he took an early interest in insects on his grandparents' potato and sugar beet farm. In an interview in 2001, he recalled exactly when that happened.

"I remember soldiers coming to my grandfather's farm during World War II to pick crops for the troops stationed near Colorado Springs," he said. "As we watched, an uncle suggested to me that being an entomologist would be an interesting living because it would involve working both indoors and outdoors and not stuck in an office somewhere."

He went on to earn his bachelor's degree in entomology and a master's degree in entomology and plant pathology at Colorado State University. Then, with his wife Lee Ann, he moved west to work as a research technician at the University of California at Riverside. This is where he developed a love for citrus research.

From there it was on to Michigan where he completed his PhD degree in entomology at Michigan State in 1973.

That same year, he and Lee Ann made a decision that would be of great benefit to the people of South Texas for decades to come; he accepted the position of assistant professor of entomology at the then-Texas A&I University's Citrus Center at Weslaco. Vic and Lee Ann settled in McAllen where they raised a daughter, Jeannine, and son Derek.

During his 35 years at the Citrus Center, Vic dedicated his time and talents to learning all he could about the pests attacking citrus trees in Texas. He eagerly passed on his invaluable knowledge and advice to countless growers, homeowners and colleagues.



Dr. Victor French, beloved citrus research entomologist at the Texas A&M-Kingsville Citrus Center at Weslaco for 35 years, passed away in McAllen on Oct. 21, 2020.

Vic was always available to receive questions from growers in person or by phone, and enjoyed spending

time in the field with them. Amongst his many contributions, he collected data from field trials which led to the registration of many pesticides, allowing growers to keep many highly damaging pests at bay.

He was also keen to take care of beneficial insects; he is probably best remembered for his role in the establishment of the citrus blackfly control program. He worked closely with other entomologists in Texas, Florida and California. He published numerous key papers, and guided several graduate students, including Barbara Storz, who has served Rio Grande Valley agriculture for many years.

Vic was a gentle soul with a delightful sense of humor. Interestingly, he had a habit of forgetting where he had put his coffee! He could easily be found in the building by simply following his trail of abandoned coffee cups.

He was also very humble. The industry and university both recognized Vic's contributions with several well-deserved awards, including the TCM Special Award, and the prestigious Arthur T. Potts Award from the Lower Rio Grande Valley Horticultural Society in 2001.

In 2008, he retired from the university, and in 2015 received emeritus professor status from the university. Even in retirement, he continued to serve the citrus growers by scouting orchards and conducting pesticide trials. The 2018, the Citrus Center recognized Vic with an award as a Citrus Legend.

Sadly, in 2017, Vic lost his wife Lee Ann, a microbiologist who taught at the Teachers Academy in Edinburg before retiring.

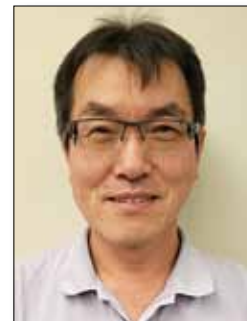
The news of his passing was felt deeply by all of us who knew him. He will be dearly missed, but his legacy, both professional and personal, will remain alive for many years to come.



Dr. Madhurababu Kunta

Development of High Throughput Methods for Sensitive, Specific and Pre-symptomatic Detection of Pathogens and Citrus Improvement Through Screening of Wild Relatives of Citrus and Natural Hybrids for HLB Resistance

Madhurababu Kunta, Jong-Won Park, Pramod Reddy Gudipelly, Tirumalareddy Danda, and Marissa Gonzalez
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312 N International Blvd, Weslaco, TX 78599

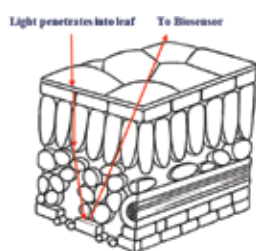


Dr. Jong-Won Park

The citrus industry in the U.S. has been devastated by huanglongbing (HLB) disease. The long-term goal of the citrus industry is to develop solutions for sustainable cultivation of citrus in the presence of HLB. My laboratory, in collaboration with the University of California, Riverside (UCR), is focusing on developing resistant citrus through a traditional breeding approach which leads to eco-friendly, financially sound solutions to an industry ravaged by the disease. UCR has identified sources of HLB resistance in Australian limes, introgressed resistance traits into commercial citrus cultivars, and have generated non-transgenic breeding lines. We are starting a project in Texas for field evaluations of promising novel hybrids for HLB resistance, horticultural performance, organoleptic assessments and consumer acceptance.

I. Field Deployable Pre-symptomatic Screening and Detection of HLB in Citrus

1. Biosensor



- Optical fingerprint will detect the internal structural changes in the leaf.
- Sensor, smart phone and battery source all contained in pelican-type case will enable maximum mobility and ergonomic use in the field.
- Validation of the sensor for a pre-symptomatic and early screening tool in commercial orchards is in progress.

2. Loop Mediated Isothermal Amplification (LAMP)

Typical HLB Symptoms



Portable device (Bio Ranger) connected to a tablet through Bluetooth

- No need for thermocycler
- Field deployable assay (portable device with a tablet)
- Quick and simple assay (<30min to get the assay result)

II. Next Generation Sequencing for Citrus Improvement against Biotic/Abiotic Stresses

1. Screening beneficial genetic traits in wild relatives of citrus (Collaboration with UC-Riverside)



- Wide hybridization between citrus and wild relatives
- Phenotype evaluation under stress conditions
- Genome sequencing, functional annotation and transcriptome analysis of parental lines and hybrids
- Identification of genetic loci providing resistance/tolerance against stresses
- Application of genetic improvement of commercial citrus cultivars



Dr. Mamoudou Sétamou

Chilli thrips (*Scirtothrips dorsalis* Hood) an emerging citrus pest in Texas

Mamoudou Sétamou¹, Olufemi J. Alabi², Holly Davis²

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²Texas A&M AgriLife Research & Extension Center, Weslaco, TX 78596

Appearance of distorted citrus leaves with superficial mines parallel to the midrib resembling citrus leafminer damage (Figure 1) was observed in a one year-old sweet orange (*Citrus sinensis* L. var. 'Pineapple') grove in Weslaco, TX during summer of 2018. A preliminary extended survey conducted in the sweet orange grove and three additional young grapefruit (*C. paradisi* cv. 'Rio Red') groves detected the presence of thrips associated with the leaf damage in all groves. During spring and summer 2020, areawide surveys were conducted in 30 commercial groves in the Lower Rio Grande Valley (LRGV). Chilli thrips was recorded in 63% of groves surveyed throughout the commercial citrus production area indicating its large spread and establishment in citrus groves in the LRGV. In addition to leaf damage, extensive feeding damage was recorded on some fruits during these surveys (Figure 2).

Specimens of thrips collected were further examined to confirm their identity. Both morphological identification and DNA barcoding confirmed the specimens to be chilli thrips, *Scirtothrips dorsalis* Hood (Figure 3). Chilli thrips is an invasive and highly polyphagous pest that was reported for the first time in Florida in 2005 and was detected on landscape roses in Houston, TX in 2007.

Chilli thrips are of Asian origin and considered as serious economic pests for many crops including citrus, tomato, watermelon, pepper and okra that are commonly grown in the LRGV. Chilli thrips possess piercing and sucking mouthparts and cause damage by extracting the contents of individual epidermal cells. Chilli thrips create damaging feeding scars, distortions of leaves, and discolorations of buds, flowers, and young fruits by feeding on the meristems of the host plant's terminals and on other tender parts above ground. In addition to causing direct damage, chilli thrips are also known vectors of seven recorded viruses.

They transmit chilli leaf curl (CLC) virus, peanut necrosis virus (PBNV), tobacco streak virus (TSV) in groundnut and three tospoviruses including the melon yellow spot virus (MYSV), watermelon silver mottle virus (Wsmov), and capsicum chlorosis virus (CaCV). On citrus, severe infestation of chilli thrips can stunt the growth of young plantings, while feeding damage on fruit will downgrade the fruit, thus significantly affecting the profitability of growers.

Chilli thrips complete their life cycles within 14 to 20 days. Temperature and moisture influence the number of generations that may occur per year. A single female is capable of laying 60 to 200 eggs in her lifetime. Females insert their eggs inside the plant tissue on/near leaf veins, terminal plant parts and floral structures. The eggs hatch between two to seven days, depending upon temperature. Larvae and adults tend to gather near the mid-vein or borders of the host leaf.

Their minute size and cryptic behavior make detection, monitoring, and identification difficult. However, detecting chilli thrips and implementing control actions before a high population builds up is critical. On young citrus plantings, early injury symptoms including leaf distortion and curling on expanding flush shoots need to be monitored every two weeks. Tapping of citrus foliage over a white sheet of paper can be used to dislodge chilli thrips for examination. Yellow and sticky cards deployed directly on citrus canopy can also be used to monitor thrips population. In mature groves, young and growing fruits should also be monitored for the presence of chilli thrips.

Various biological control agents, including minute pirate bugs (*Orius* spp.), entomopathogenic nematodes (*Thripinema* spp.), lacewings and predatory mites have been reported to effectively control chilli thrips in the field. However should a quick response be needed because of rapidly



Figure 1. Citrus leaves showing distortion following feeding damage by chilli thrips



Figure 2. Extensive feeding damage caused by chilli thrips on grapefruit



Figure 2. Chilli thrips, *Scirtothrips dorsalis* adult (left) and immatures (right)

increasing thrips population, organic growers can use neem oil or horticultural oils (e.g. SuffOil-X, JMS Stylet oil, Tres-Oil, TriTek), spinosad to control field populations of chilli thrips. In conventional citrus groves, growers may use abamectin (Agri-Mek SC), imidacloprid (Admire Pro), spinetoram (Delegate WG) for the control of chilli thrips to prevent significant damage.



Dr. Veronica Ancona

Rapid Orchard Decline Associated with Root Rot and Excessive Rainfall

David A. Laughlin¹, Jorge Solorzano², Juan Enciso², and Veronica Ancona¹

¹Texas A&M University –Kingsville Citrus Center,
312 N. International Blvd., Weslaco, TX 78599

²Texas A&M AgriLife Research, 2415 E. Hwy 83, Weslaco, TX 78596



Dr. David Laughlin

In the fall of 2019 following a significant rain event in June of the same year a block of mature Rio Red grapefruit trees near the town of Monte Alto, TX began exhibiting wilting symptoms. Interestingly the surrounding blocks exhibited none of the symptoms observed in the affected block. We hypothesized that the effect was likely the result of *Phytophthora* root rot infection exacerbated by poor drainage issues. The affected block (East) was compared to an apparently healthy adjacent block (West) to determine site characteristics that may have predisposed the East block to the severe wilt observed. We used an unmanned aerial vehicle (UAV) to monitor tree decline by assessing the triangular greenness index (TGI), a measure correlated to leaf chlorophyll content and to assess topography differences between blocks. Aerial images were captured six times between November 2019 and February 2020 (Figure 1). To further characterize the two different blocks, two sites on the northern and southern ends of each block were selected for *Phytophthora* sp. propagule counts and determination of the phreatic water surface. The level of the phreatic water surface was determined in November of 2019 and in June of 2020.

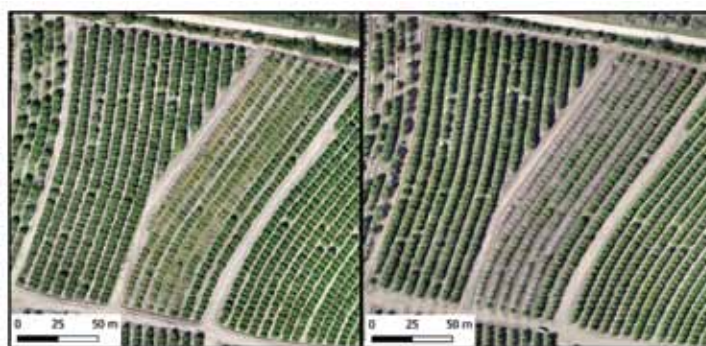


Figure 1. Aerial images of the monitoring site in November 2019, left, and February 2020, right.

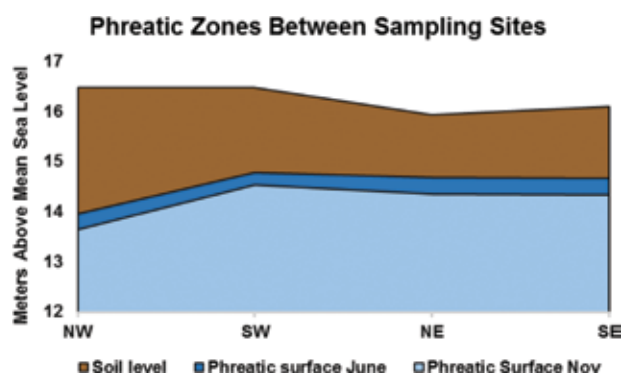


Figure 2. Change in TGI between the two sites is shown throughout the monitoring period.

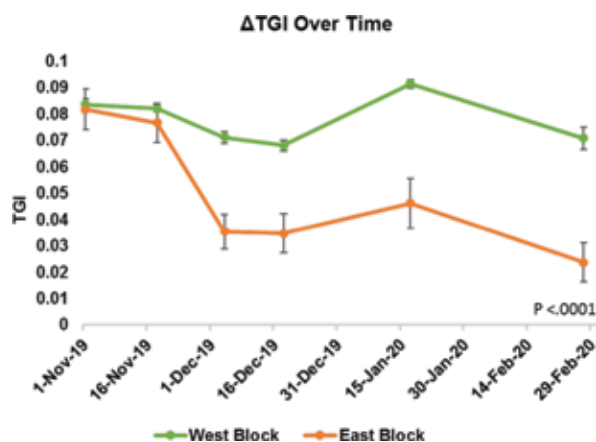


Figure 3. Site elevation and depth of the phreatic water surfaces measured in November 2019 and June 2020.

The decline over time in the East block can be clearly seen as a significant ($P < 0.0001$) reduction in TGI compared to the West block (Figure 2). This effect is easily confirmed by aerial images comparing images taken in November 2019 and February 2020 (Figure 1). *Phytophthora* sp. propagule counts in the West block were 9.6 and 14.6 in the East block, exceeding the 10 CFU/cm³ treatment

threshold for this pathogen. The site elevation and the distance between the soil level and the phreatic water surface was also different between the east and west blocks. The elevation of the declined East block averaged at 16.01 m above mean sea level (AMSL) and the healthy West block was at 16.48 m AMSL. The depth of the phreatic water surface was 1.58 m below the soil level in the East block

and 2.83 m below the soil level in the healthy West block, a difference of 1.25 m (Figure 3). Therefore, we conclude that excessive rainfall in an area with lower elevation, poor drainage and high water table induced massive *Phytophthora* root infection and lead to rapid orchard decline.



Dr. Eliezer S. Louzada

Laboratory of Breeding and Molecular Biology

Eliezer Louzada
Eliezer.Louzada@tamuk.edu
 956-447-3367

To offer more options for Texas growers, my lab is creating a series of new hybrids that may have great potential for the fresh market.



Seedless Meyer Lemon in patenting process.



We are using tissue culture and genetic transformation to create HLB-resistant citrus plants.



Creating Mandarin and grapefruit hybrids

Budwood Program Highlights 2019-20

Mark Van Ness & John da Graça

Texas A&M University –Kingsville Citrus Center, 312 N. International Blvd., Weslaco, TX 78599.



Aerial view of the complex of screenhouses



Work has recently begun to expand and upgrade the greenhouse at the Texas A&M AgriLife Center at Stephenville where back-up citrus germplasm is maintained.



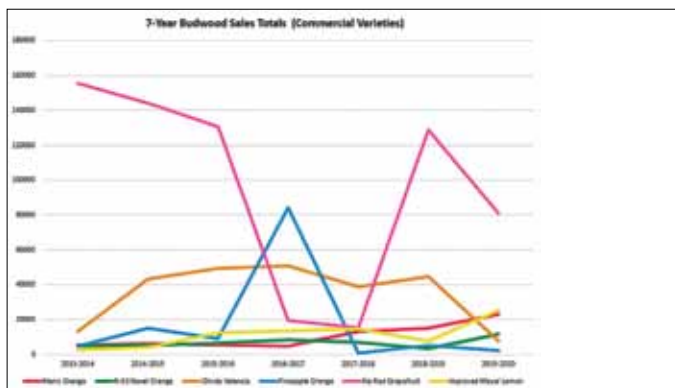
The budwood program team



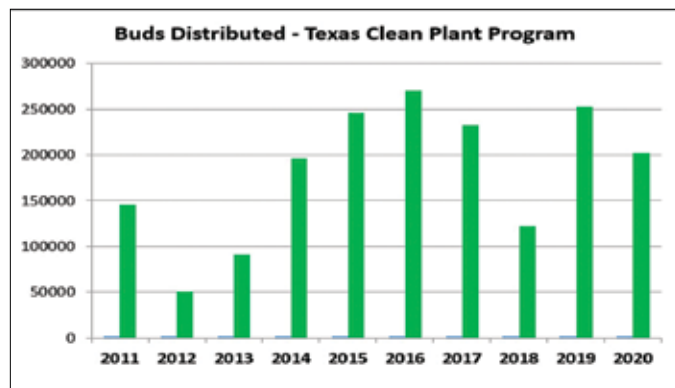
Canker decontamination at the entrance to screenhouses



Screenhouse for increase trees



Budwood order variety trends 2013-20



Budwood annual sale totals (2011-2020)

Events

74th Annual Meeting of the Subtropical Agricultural and Environments Society



John A. Goolsby, Ph.D. USDA research entomologist, is presented the prestigious Arthur T. Potts Award for his contributions to horticulture and agriculture in the Lower Rio Grande Valley. Also shown are Dr. Juan Anciso, AgriLife Extension horticulturist (left), and Dr. John da Graça, recently retired director of the Citrus Center. Both Enciso and da Graça are former Potts Award recipients. For more information, visit <http://www.subplantsci.org/john-goolsby/>



USDA-APHIS and a delegation from the Vietnamese Ministry of Agriculture visit the TAMUK Citrus Center



TAMUK GEAR UP invited high school students from Corpus Christi to visit the Citrus Center.



Second Binational Symposium of Young Scientists



New logo for the SAES designed by Niharika Kunta



Texas A&M University Kingsville Citrus Center

Advisory Board

Chair: **Dennis Holbrook**, *South Tex Organics*

Vice Chair: **Dale Murden**, *President, Texas Citrus Mutual*

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Earl Neuhaus, *Neuhaus Farms and Citrus Legend*

Jimmie Steidinger, *Former citrus grower and Citrus Legend*

Jud Flowers, *Lone Star Citrus Growers*

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