Texas A&M University-Kingsville

Citrus Center

Weslaco, Texas

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Administrative Changes

Dr Allen Rasmussen (Dean, Dick & Mary Lewis Kleberg College of Agriculture, Natural Resources & Human Sciences), and Dr Mark Hussey (Director, Texas AgriLife Research) issued the following Memorandum to all employees of the Citrus Center and Texas AgriLife Research & Extension Center on August 21.

"Effective September 1, 2008, Mike Gould will relinquish his duties as Director of the Citrus Center and will focus 100% of his time directing research programs and managing facilities as Director of the Texas AgriLife Research and Extension Center at Weslaco. Concurrently, John da Graca will relinquish his duties in support of the Texas AgriLife Research and Extension Center and will concentrate all his efforts in leading the Citrus Center full-time.

The successes of programs at both Centers have created the need for full-tile leadership for each Center. For example, the Citrus Center is playing a key role for Texas and the nation in monitoring, testing and developing strategies for dealing with the citrus greening disease that is currently devastating the Florida citrus industry and poses a threat to the Texas industry if introduced. Additionally, the Texas AgriLife Research program is experiencing significant growth, including vegetable pathology, biotechnology and biofuels as well an influx of new scientists. The Citrus Center is replacing its laboratory building with a new, state of the art facility, playing additional demands for administrative oversight of the design and construction process; while the Texas AgriLife Research and Extension Center is in the midst of a major laboratory and facilities upgrade.

We believe this new structure will allow both units to be more effective and to enhance their programmatic impacts. We fully expect the level of faculty-to-faculty cooperation to continue to be significant and to increase (e.g. scientists from both Centers are currently working together to address citrus greening disease and other vegetable diseases and pests).

We look forward to the continued successes that Mike and John helped establish as they shift their focus in these new leadership roles. Your continued support and assistance is essential and appreciated"

Asian Citrus Psyllids Spread Their Wings

John da Graça

Following the news in the June newsletter the Asian citrus psyllids had been found in Louisiana, and that one greening infected tree had been detected, the psyllid has continued to spread, and has been reported from Alabama, Mississippi, Georgia and South Carolina. In Texas, we have found psyllids in two new counties, Brazos and Jefferson, the latter being the first find in east Texas near the border with Louisiana. One psyllid has also been found in a trap in southern California; this follows the detection of psyllids recently in Tijuana, 1.5 miles from the US-Mexico border. Citrus greening has not been detected in any of these new psyllid-infested locations, but since the disease has a long incubation period, it is possible that infected symptomless trees are present.

Surveys in Texas are expanding. The Citrus Center is leading surveys in Valley orchards and in areas out of the Valley, while USDA-APHIS is just launching a major sentinel tree survey in residential properties throughout the Valley. The USDA has also just certified the Citrus Center as a greening diagnostic laboratory.

Dolly, the Destroyer: 15 to 20% of Valley Citrus Losses due to the Hurricane

M. Sétamou

Citrus production was off to a good start in many groves this year—very good fruit set and those fruit were sizing up nicely — until hurricane *Dolly* came. The pressure of key pests was generally low valley-wide until mid-July. Most growers were surely heading for a very good crop production year, when *Dolly* hit in late July. The toll paid to this hurricane was heavy for citrus growers. Many orchards were seriously battered by several hours of strong wind exceeding 70 mph and heavy rain exceeding 12 inches within a 24-h period. Almost all the citrus orchards within the path of the hurricane suffered severe fruit drop. Orchards located in the Lower Valley and northern Mi-Valley suffered the most losses, with fruit drop exceeding 40%. As we move inland, the losses due to the hurricane gradually declined with figures around 5-10% in the Upper Valley. Overall, 15-20% of the Valley citrus is lost due the destroyer *Dolly*. We hope that new forming hurricanes in the Atlantic do not find their way to the Valley this year in order to preserve what crop we have left.

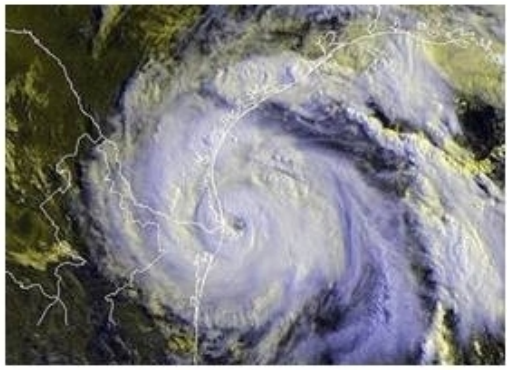


Figure 1. Aerial View of *Dolly* as it moves inland in South Texas, July 23, 2008

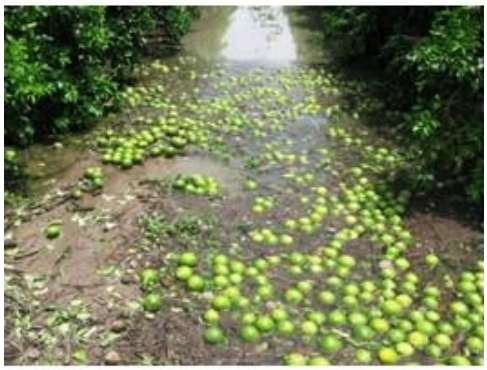


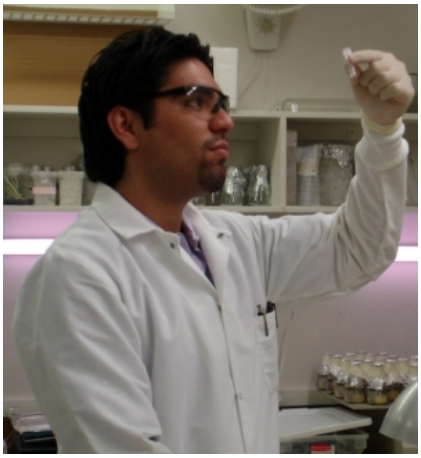
Figure 2. Severe fruit drop in citrus orchards following hurricane *Dolly*

High School Science Teachers Intern at the Center

John da Graça

The Academic Leadership Alliance invited the Citrus Center to participate in this year's Summer Educator Internship project. Science teachers from several Valley school districts spend a 2-week internship with an employer, during which they learn about the work done and develop ideas to take back to the classroom in the Fall for student projects. The Center agreed to host two teachers. During June, Mr German Rios from Valley View School in Hidalgo and Mr Jose Rodriguez from Mission High School actively participated in many activities at the Citrus Center.

The schools should benefit by learning from their teachers some real life employment opportunities in the Valley, and the Center benefits by receiving some exposure to the community. We have agreed with the teachers to arrange for Center scientists to visit their classrooms, and to host student tours of the Center. Hopefully, some students may consider TAMUK as an option for furthering their studies.



German Rios

Jose Rodriguez

Time to Think About Fruit Decay Control

Mani Skaria

Every year, the citrus fruit season comes with a lot of excitement to growers, fruit packers and consumers. It also brings a lot of anxiety to fruit packers because it is their role to deliver fruit free from decay. Consumers demand appealing fruit with good orange or red color and free from blemishes. In order to deliver orange-colored fruit, packers have to treat green fruit with ethylene. Ethylene is a gas; it is a hormone; and is used as an anesthetic agent and moreover, used to hasten fruit ripening. It does a good job in developing the right color and helps market fruits and vegetables such as banana, oranges, grapefruit, tomato, etc. It has the ability to breakdown chlorophyll and brings out the orange and yellow color in fruit and vegetables.

Researchers have documented the right amount of ethylene required to change citrus fruit color. The ethylene required is in very small quantities, measured in parts per million (ppm) quantities. One ppm is one milligram in one liter or in one kilogram. If you add more ethylene and increase temperature, naturally you will get a faster color change. For citrus growers, ethylene come with a curse and it is the onset of decay of ethylene-treated fruit. An optimum concentration for citrus color change is 3-5 ppm at a temperature 82-85F. More of either one can cause stem-end rot. This happens because the fungal spores get embedded in the fruit during the fruit maturing process. These spores normally stay dormant; however, ethylene can induce germination of spores, resulting in fruit decay. In addition to ethylene and temperature, the relative humidity, carbon dioxide, and fresh air exchange are also important factors that can affect fruit decay.

A balancing act of decay control in packinghouses is art and science combined. There are various factors that may influence the incidence of fruit decay. They are:

Pre-harvest practices that reduces citrus fruit decay
A knowledge of the principles of citrus fruit decay control
A knowledge of the post-harvest practices used
Culling and fruit re-packing practices
Sanitation in packinghouse
De-greening room practices
Pre-harvest chemical sprays
Air quality parameters in packing houses
Ethylene concentration
Bruise control
A knowledge of how fungicide applications work
Carbon dioxide as an indicator
Postharvest control chemicals
Physiological disorders
Oleocellosis or oil gland injury
Fruit turgor pressure

Our studies at the Citrus Center have demonstrated that fruit injuries and some infections that occur during fruit packing may not be visible at time of shipment, and become manifest during and after shipping. Many pre-harvest factors, including rootstock, rainfall, fertilization, fungicide applications, and fungal spores in the field influence the levels of post-harvest diseases.

Science Summer Camp for Weslaco High School Students - A True Success!!!

Dr. Eliezer Louzada and ***Sonia del Rio***

In 2007, we were funded by the Hispanic Serving Institution Education Grants Program, from the United States Department of Agriculture (USDA-HSI) to provide hands-on research experience for high school students from the Weslaco School District, and to train science teachers; we called this project the Discovery Science Summer Camp. Our first summer camp took place at the Citrus Center from July 14 to August 01, 2008. Sixteen high school students and four teachers participated in the program, assisted by a group of six student mentors. The students learned how to isolate DNA, RNA, how to clone a gene, and many other molecular techniques used by scientists who work in plants or in humans. During the whole period of the camp there was only one absence and this because of the hurricane conditions that happened in that time. This is the first time that such event has happened in the Rio Grande Valley. The feedback from the students was very positive, with many stating their interest in going to careers in science, They were also surprised to know that agricultural science could be so high tech. Even though it is too early to know if this is indeed a change in attitude related to science and agriculture, the goal of the program was reached, that was to show students that science careers are not out of reach to them. We are planning a new Discovery Science Summer Camp for the summer 2009.

The Aftermath of Hurricane Dolly: Pest Outbreaks in Valley Citrus Orchards

M. Sétamou

Because of the dry and hot weather that has prevailed in the early part of this season (from Spring to mid Summer 2008), infestation and population levels of key pests such as the citrus rust mite, the citrus leafminer, the Asian citrus psyllid and others, have been low to moderate in Valley Citrus. This situation has changed since early August, thanks to hurricane Dolly which brought heavy rainy and the much required moisture for pest population growth.

The citrus rust mite population has dramatically increased in many orchards requiring miticide sprays. Due to flooding, many growers were not able to get into their orchards as the rust mite populations were building up in early August. We recommend growers to be vigilant and be on the lookout and possibly take prompt action to avoid late season fruit damage by the citrus rust mite.

In many orchards and nursery plants, severe outbreaks of citrus leafminer are being recorded. Because citrus leafminer larvae feed cryptically within the epidermis of citrus leaves, they are generally not affected by contact insecticides. Thus, systemic insecticides (i.e., insecticide that penetrates the plant system) are the only viable control options. We recommend imidacloprid (e.g. Provado and Admire Pro), thiamethoxam (e.g. Actara and Platinum) and abamectin (Agrimek, Zoro or Abba). Although not systemic, abamectin has some translaminar effects—penetrate the plant tissue at the point of contact— where it affects the pest as it is feeding. Other materials with good efficacy on the citrus leafminer include the newly registered broad-spectrum systemic insecticide Movento (active ingredient spirotetramat) from Bayer. Some good control can be obtained with Spintor and Micromite, and the petroleum spray oil can provide some help too.

One of the pests whose population has rebounded after the hurricane is the Asian citrus psyllid (Figure 1). Although temporarily suppressed by the strong winds and heavy rains, population of citrus psyllid has exploded following the production of new flush growth on citrus trees promoted by the rains. Orange trees tend to be more infested by the psyllid than grapefruit. The Asian citrus psyllid is a new pest in Texas (found for the first time in 2001). It is a vector of the deadly citrus greening disease or Huanlongbing (HLB). Contrary to its name, citrus greening disease does not allow growers to see green! Florida citrus growers have been losing their orchards and their industry to this disease that was found there for the first time in 2005. As of now, the disease has not been detected in Texas, but we do have the vector. Our current situation is comparable to one's having the fuel and just waiting for the match to ignite the fire. Presently, there is no known cure to this deadly disease, and control of its psyllid vectors is one of the recommended solutions. We therefore recommend growers to be more aggressive in psyllid control as the threat is real for our industry. Many pesticides can be used for psyllid control, but a spray program just before each flush to kill adults is highly recommended.

Figure 1. Asian citrus psyllid on citrus flush shoots: Immatures on the left and Adults on the right

Combinations of Pesticides in Tank-Mixes: Avoid Incompatibility Problems

M. Sétamou

In order to manage the diversity of arthropod—mite and insect— pests and diseases in citrus orchards and to apply foliar fertilizers to citrus trees, growers usually mix together or t*ank-mix* several pesticides and fertilizers to broaden the spectrum of activity of the application. Simply put, tank-mixing is combining two or more crop production chemicals (pesticides, fertilizers, etc.) in one tank for application at the same time.

Generally, tank mixing allows the growers to work smarter, not harder! The primary benefit of tank mixing is a reduction in the number of spray applications, thereby saving time, decreasing labor, equipment and overall orchard care costs. In addition, tank mixing two pesticides may result in greater mortality of insect or mite pests than if either pesticide were used separately. This is often referred to as synergism, which

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may be due to one pesticide interfering with the insect's ability to get rid of the second pesticide. Another potential benefit of tank mixing is that it may delay the development of resistance in pest populations for a given pesticide, thus allowing growers to have for a long time that pesticide as a tool in their pest control arsenal.

Is tank mixing really a smart practice? Yes, if a grower is careful! The way chemicals may interact to induce greater pest mortality and improve control, problems may occur when two or more pesticides and/or foliar feeds are mixed together. These problems include increasing the probability of insect or mite resistance to multiple pesticides, potential plant or fruit injury (or phytotoxicity, e.g. Figure 1) and pesticide incompatibility. An even greater concern related to tank mixing pesticides is antagonism. Antagonism occurs when the mixing of two or more pesticides results in lower pest mortality than if the pesticides were applied separately. Before tank mixing pesticides it is important to understand how chemicals interact with one another.

There are basically four types of interactions that can affect the efficacy of pesticide combinations.

1. ***Additive effects*** occur when mixing pesticides provide the same response as the combine effects of each chemical when applied alone. Each chemical neither hurts nor enhances the other; chemicals are neutral toward each other. Such combinations are smart, they save time, labor and equipment use.

2. ***Synergistic effects*** occur when pesticide combinations provide greater pest control than the added effects of each pesticide when applied separately. In this case, chemicals are not neutral toward each other; they interact in some way that increases their effect and pest control efficacy. With true synergism, growers can even reduce pesticide application rates without sacrificing control. An example is the combination of pyrethrin, pyrethroid or carbamate insecticides (e.g. Sevin or Carbaryl) with piperonyl butoxide (PBO). PBO does not, by itself have pesticidal properties, but when added to insecticide mixtures it increases their potency considerably.

3. ***Enhancement*** is another type of interaction, but does involve two pesticides. When a pesticide is mixed with an additive or adjuvant such as oil to provide greater control, the interaction is called enhancement. One classic example is the addition of oil to Agrimek (abamectin) to provide better control of citrus rust mite and false spider mites.

4. Antagonism occurs when the combination of two chemicals provides less control than if each material is applied separately. In addition to providing less pest control, antagonistic chemicals can increase phytotoxicity. ***One classic example is the combination of chlorpyrifos (Lorsban) with any copper-based products. Some staining at the bottom of citrus fruit is often seen in Valley orchards when growers spray tank-mixes of Lorsban and copper or fertilizer containing copper (Fig. 1).***

In any case, before tank mixing chemicals, it is important to make sure that they are compatible, i.e. no adverse effects occur when they are mixed together. For example, some pesticides are compatible with liquid fertilizers and some are not. **Never mix fungicides with fertilizers. Similarly, one should not mix EC insecticides with fungicides.**

Two types of incompatibility exist: *chemical and physical*. By conducting a simple compatibility test before adding the pesticides to the tank, one can usually avoid making sludge in the tank, or having undesirable chemical reactions. A tree-step procedure for a compatibility test is summarized below:

Step 1: Measure 1 pint of water into a clear quart jar. Use the same water that you will use when making up the larger mixture of tank-mixes for sprays.

Step 2: Add ingredients in the following order. Stir each time a formulation has been added.

Compatibility agents (e.g. Blendex®, Unite®) and activators: Add 1 teaspoon for each pint per 100 gallons of final spray mixture.

Wettable Powders and Dry Flowables: Add 1 tablespoon for each pound per 100 gallons of final spray mixture.

Water Soluble Concentrates or Solutions: Add 1 teaspoon for each pint per 100 gallons of final spray mixture.

Emulsifiable Concentrates: Add 1 teaspoon for each pint per 100 gallons of final spray mixture.

Soluble Powders: Add 1 teaspoon for each pint per 100 gallons of final spray mixture.

Remaining Adjuvants and Surfactants. Add 1 teaspoon for each pint per 100 gallons of final spray mixture.

Step 3: After mixing, let the solution stand for 10 to 15 minutes. Stir well and observe the results. Feel the sides of the jar to determine if the mixture is getting hot. If so, the mixture may be undergoing a chemical reaction and the pesticides should not be combined. Let the mixture stand for another 15 minutes and feel again for unusual heat. If scum forms on the surface, or if any solids settle to the bottom (except for wettable powders), the mixture probably is not compatible.

Test the **pH** of the mixture; generally, the pH should be between 6 and 8. Many incompatibilities

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may result from excessively alkaline (pH > 8) or excessively acidic (pH < 6) mixture in the tank. In this case, the addition of buffering adjuvants can help solve the pH problem.

Finally, if no signs of incompatibility appear, test the mixture on a small area of the surface where it is to be applied

Make sure that you read all pesticide labels before considering any tank-mixes! Pesticide labels usually provide directions on the sequence for mixing materials. When provided by a label, please follow the directions.

Figure1. Fruit staining resulting from pesticide damage of tank-mixes of Lorsban and copper fertilizer.

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