# Research Report

## Area-Wide Spraying for Asian Citrus Psyllid in Texas and Florida[1]

AZ1651 February 2015

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## Introduction

Realizing that the Arizona citrus industry might someday have to deal with widespread ACP control, the Arizona Citrus Research Council approved a trip to Florida and Texas to investigate how ACP control was accomplished in those two states. The trips were to McAllen, Texas on 9-12 Nov 2011 and to Immokalee Florida on 17-18 Nov. 2011. In McAllen, I interviewed Dr. Mamoudou Setamou, extension entomologist for Texas A&M – Kingsville and his staff, and Mr. Ray Prewitt, president of Texas Citrus Mutual. In Florida, I interviewed Mr. Ron Hamel, manager of the Gulf Citrus Growers, and Dr. Mongi Zekri, southwest Florida Multi-County Citrus Agent, housed at the Hendry County Extension Office in LaBelle., FL. The author hopes that some of this information can be used in the development of an Area Wide Spray Plan in Arizona.

## Narrative

### Texas

Initiation of the Program

The Asian Citrus Psyllid (ACP) was first identified in the Rio Grande Valley (RGV) in 2001, however it was likely there one to two years beforehand; as early as the late 1990's or in 2000. At the time that the ACP was identified, it was not considered to be a threat to citrus as it simply feeds on the flush and does not kill it. Prior to the program, a record 2,400 ACP were found on a sticky trap placed in a lime tree. Even as late as 2006, the ACP was not universally considered to be a threat.

However, following the first reports of citrus greening (HLB) in Florida in 2005, Texas researchers considered the ACP to be important. Researchers quickly realized that there was a need to integrate the ACP control program with the traditional pest control program, which is focused (though not exclusively) on rust mite and scales, as the Texas industry grows oranges and grapefruit for the fresh market.

In 2007 and 2008, several experiments were conducted, and researchers discovered that ACP could only be controlled for two weeks in an orchard that is surrounded by untreated orchards; however it could be controlled for three months in an orchard if 10 contiguous orchards were also treated. Therefore, researchers realized that there was a need to develop an area-wide spray program.

Program Extent and Spray Timing

[1]. The author wishes to thank the Arizona Citrus Research Council for funding this project. This is a final report for project 2011-02 titled "Developing a plan for Area-Wide Spraying for Asian Citrus Psyllid in Arizona". Portions of this report were communicated to growers in various meetings as a PowerPoint presentation in 2011 and 2012.

Texas officials began by gathering information from Florida. Based on this, they developed a program that includes an area-wide dormant spray in November, possibly followed by an additional one in late January or early February. Area-wide sprays are applied via air blast sprayers or low volume (2-5 gpa) sprayers in the smaller blocks and using airplanes in the larger ones. As of 2011, the cost of an air blast sprayer was $35 per acre, and the cost of the materials ranged from $5 to $15 per acre. Cost of a low volume sprayer was $4 to $5 per acre plus cost of materials. Cost of an aircraft application was $9 to $12 per acre plus cost of materials.

Dormant sprays should be complete before the first flush which typically begins in mid-February through early March. Although two dormant sprays are recommended, one spray might be able to do the job. Typically, one dormant spray is sufficient to control the ACP through the first flush, and often through the second flush which occurs from late April to early May. These plans were presented to the growers in September, 2009 at a meeting with 150 persons in attendance.

The RGV contains a mixture of agricultural, residential, and commercial properties. Residential properties are often adjacent to orchards. The average orchard size is only 15 to 20 acres, and a large orchard is considered to be more than 60 acres. The distance from the westernmost citrus orchard to the easternmost orchard in the RGV is 75 miles. The Texas industry has divided the RGV into two zones bisected by US Highway 281, which extends from the border at Pharr, TX and continues northward towards San Antonio, exiting the Valley above Edinburg, TX. West of Highway 281, the weather is colder, while east of the Highway, the weather is warmer. Therefore, for the November dormant spray, applications begin earlier in the cooler west (e.g. November 7$^{th}$ through 28$^{th}$), and begin later in the east (November 14$^{th}$ through December 5$^{th}$). The spray program is determined by tree phenology, and program effectiveness and monitoring of the spray effectiveness is accomplished by a two-man psyllid monitoring team (See more information about this team below). Need for an additional January/February dormant spray is determined by the monitoring team. Spraying is done on weekends to avoid the harvest crews, and it can be extended by one week in the case of rain, wind, etc.

Since 2009, spraying has reduced ACP populations in orchards, abandoned orchards and residences. The drought experienced in the region also reduces insect population by reducing flush in abandoned orchards. Orchards that are under flood irrigation have lower ACP populations because there are fewer flushes and those flushes are synchronized. With drip irrigation there is always a flush.

Trapping and Sampling in Orchards and Residences

There is a two man psyllid monitoring team that surveys the orchards and some residences for ACP. The team's salaries are funded through the USDA Citrus Health Research Program Grant. These funds also are used for infrastructure. The funds are not used for spraying.

The two-man team has 65 sentinel orchards as well as 36 residences to survey. There are five yellow sticky traps per orchard and one trap at each of the residences, for a total of 361 traps total. They service up to 50 traps per day, and reach each orchard or residence every two weeks. Within the orchard, traps are set in the on the north, south, east and west sides, equidistant between the corners, one row in. The fifth trap in each orchard is located as close to the middle as possible.

At each orchard sampling site, each of the team visually inspects five flushes per quadrant. Flushes are selected at random. Visual inspections are done on the youngest visible leaves, and are used to monitor nymphs, eggs, and flush status. If more than six ACP are found in a quadrant, then they are collected to be sent for HLB analysis. Then, the team member does tap sampling, tapping three times on three flushes per quadrant. Psyllids are tapped onto a white sheet of paper that is covered with a light coat of a soapy solution, to keep them from flying away. Finally, old traps are removed and replace with new ones. Tap samples and traps are for locating adults.

Psyllids are first found on either the south and east or the north and west sides of the orchard, depending on the prevailing winds. From February to October, they are found on the south and east side of the orchards, and from November to January they can be found in trees on the north and west sides. In the winter, most of the ACP are found via tapping, as they are not moving, while in the spring and summer they move, and are found on the traps. They also move more in the early and late hours of the day, while in the middle of the day, when it is hot, they rest.

Tap sampling is imperative during the dormant season to properly sample the ACP, and it is best to combine both methods. However, most growers only inspect visually, and they do not tap sample, thus they miss some of the insects that are actually there, particularly in the colder months of December and January. Tap sampling gives

instantaneous data, while traps give long-term data, as they are on the tree for two weeks. If the ACP has moved, one would find many on the traps, but few from the tap samples. If they have just arrived in a location, one would find few on the traps, but many with the tap sampling.

The team selects locations of the 36 residential traps based on proximity to the established route, species diversity and proximity to a USDA fruit fly trap. There is an additional USDA team doing surveys in the residential areas. Unfortunately, there is no transparency between the TCM funded team and the USDA personnel.

Grower Participation and Program Communication

Information from the tap and trap samples are faxed from the team to Texas Citrus Mutual (TCM) the morning following collection. TCM will send text messages to growers if a population increase warrants a message, along with a recommended insecticide treatment. This information is also made available via an online newsletter. About 48 to 72 hours elapse between data collection and receipt of information by the growers. Information about the spray dates and the need for an additional spray is also communicated to the growers via phone calls.

Growers who spray send in a reporting form to a coordinating team at TCM. The form includes the grower's name, the acres sprayed, the variety (orange or grapefruit), the blocks sprayed, the material used, the rate and the date of application. Many growers choose to phone in their information rather than submit it on the form; this is the most common form of communication. Large growers often do orchard care for smaller growers, so the large growers inform the smaller ones that the dormant spray needs to be applied.

A mapping program and database were utilized to develop a map of the orchards in the RGV, and this work was done in cooperation with the USDA Mexican Fruit fly program. The owners of the orchards were identified using the county tax appraiser records.

Participation in the program is voluntary, and is based on acreage. At the start, 62% of the total RGV acreage was participating, and as of February 2011, 85% was participating. The goal for 2012 was 90%. There is a lower participation rate for the January dormant spray because either the November spray was effective or because growers only sample visually in the winter, and miss insects that could be found with tap sampling.

Non-participating growers may spray during the growing season, but not apply a dormant spray. Some non-participants refuse due to the cost of the material, while others are absentee and cannot be contacted. There are occasional outright refusals, where the grower will not spray because he/she does not see the ACP. To reduce the rate of refusals, the economic benefit of spraying is presented by researchers as based on risk reduction.

ACP Control Outside of the Program

Following the area-wide sprays, additional sprays may be needed to control the ACP during the third flush, which is in late May, during July and August, and/or September and October, before the fall flush. These non-dormant sprays are applied based on trapping/scouting in the individual orchards, and are not part of the area-wide spray program. Including the area-wide program, there are three or four sprays per year for ACP. Orchards are typically scouted for rust mite and scale, and ACP was added to the list. Thrips are controlled with a pre-bloom spray. Materials used to control ACP during the growing season are tank mixed with other insecticides.

ACP Control at Rio Queen Citrus

As of 2011, Rio Queen had 4500 acres of citrus, mostly grapefruit and oranges. Rio Queen's orchards generally lie west of Highway 281. They are a willing participant in the program, and note that the ACP population has dropped dramatically since the program has been in place.

The annual decision to apply a dormant spray in November or January depends on the pre-Christmas rush of business. For this year, one dormant spray of Danitol was applied on Saturday, January 22. There is a one day PHI, so harvest was not impacted. ACP applications are made with an airplane for the contiguous orchards and with an air blast sprayer for the non-contiguous ones. Non-dormant sprays are always made with an air blast sprayer, and are scheduled based on surveying. There are generally four non-dormant sprays annually.

The entomologists check 120 to 200 acres per day. In addition to ACP, they also survey for rust mite, scales, and appearance of HLB symptoms on the leaves. The survey consists of five stops in a ten acre orchard, and each location is checked once a month.

Flushes are examined only visually since tap sampling takes too much time, considering that there are 4500 acres to check. If more than two or three ACP are found, the orchard is sprayed, however they try to find other pests so that they can tank mix the material for the ACP with a miticide for the rust mite or Esteem or Provado for barnacle scale. They have noted flare-ups of barnacle scale and cottony cushion scale as a result of the ACP sprays. They apply insecticide in 70 gpa for ACP and 200 gpa for mites.

ACP Control in Residential Areas

There is no ongoing program for residential areas, however it is of concern. Marked ACP, when released, travel between the orchard and the residential areas. One ACP leaves the orchard for the residential areas for every five ACP that leave the residential areas for the orchards. For orchards that are near residential areas, a peripheral spray is recommended as a minimum.

For residential areas, Texas researchers are testing low pressure injection systems for systemic insecticide applications, the use of foliar sprays (Imidacloprid and Pyganic), soil drenches (Imidacloprid), and the Core-Tect tablet (http://www.backedbybayer.com/lawn-and-landscape-management/insecticides/coretect-tree-and-shrub-tablets/msds) as delivery systems. Another innovative system under test is the use of a yellow-green foam ball that is covered with mosquito netting. The netting is impregnated with Deltamethrin, Cyfluthrin (Baythroid) or Fenpropathrin (Danitol), all contact pyrethroids. When a psyllid lands on the "fruit" it dies. These traps must be replaced every three months and one cage study has been completed thus far. Microbial and biological work is also being done.

## Florida

Initiation of the Program

Southwest Florida is likely 100% infested with HLB. Use of nutritional sprays is common in the area. Area-wide spraying in Florida is accomplished through Citrus Health Management Areas (CHMA's). More information on Florida CHMA's can be found at the following website:

http://www.crec.ifas.ufl.edu/extension/chmas/chma_overview.shtml.

Most CHMA's in Florida started in 2007. They were started by the grower's as a way to organize themselves without the aid of the government (there was a backlash against the Florida Department of Agriculture and Consumer Services response to the citrus canker disease). In SW Florida, the Gulf Citrus Growers was the vehicle used to form the CHMAs. Strategic planning meetings began in 2007.

Program Extent and Spray Timing

Most growers make two dormant season sprays based on the work of Dr. Phil Stansly. In 2011, they recommended two dormant sprays, one in late November-or early December and the other in late December or early January. Preferable products to use for the first spray would be an organo-phosphate (Imidan, Lorsban, Dimethoate), and for the second a pyrethroid (Danitol, Mustang). However, these two could be flip flopped if necessary. Growers should also be prepared to make a dormant spray 3 weeks after a hard freeze to kill the ACP on the new flush.

Grower Participation and Program Communication

The program is voluntary and they have 76% participation, as of 2011. Each area has one or more team captain. Aerial applicators are often the team captains. Captains coordinate with aerial applicators and neighbors to coordinate sprays. There are only 6 or 7 captains in the region because several growers have 5000 to 8000 acres. The team captains (aerial applicators) are keeping records and growers will do so as well. They call all the parties on the phone, or send letters. This is how they get information (acreage, rate, product, gallonage, etc.). The captains identify growers who are non-participating through their neighbors. They will use data to enforce their position, and they will use arm twisting.

State and federal workers are doing the ACP surveying in Florida. The workers are paid from CHRP funds. Five to 10-tap samples are taken in each block, one at each of the four corners and the 5th in the middle. Each orchard is surveyed every three weeks. Three weeks is a "cycle". Results of the ACP count survey are placed on the website that can be accessed through the address above. The surveys aim to "tune" the program to find the hotspots.

ACP Control in Residential Areas

The CHMA's are not dealing with residential areas. No one wants to deal with residential areas. Also, abandoned orchards are a problem. They are trying to change the tax laws so that people will remove abandoned orchards by giving the owners an additional valuation for three years after orchard removal.