

CAPS Survey Report

Year:	2013
State:	Louisiana
Cooperative Agreement Name:	Citrus Commodity Survey
Cooperative Agreement Number:	13-8422-0990-CA
Project Funding Period:	April 15, 2013 to December 31, 2013
Project Report:	CAPS Survey Report
Project Document Date:	February 14, 2014
Cooperators Project Coordinator:	State Survey Coordinator (SSC)
Name:	J. Brett Laird
Agency:	Louisiana Department of Agriculture and Forestry
Address:	P.O. Box 3596
City/ Address/ Zip:	Baton Rouge, Louisiana 70821-3596
Telephone:	985-543-4024
E-mail:	brett_l@ldaf.state.la.us

Quarterly Report	<input type="checkbox"/>
Semi-Annual Accomplishment Report	<input type="checkbox"/>
Annual Accomplishment Report	<input checked="" type="checkbox"/>

- A. Write a brief narrative of work accomplished. Compare actual accomplishments to objectives established as indicated in the work plan. When the output can be quantified, a computation of cost per unit is required when useful.

The Louisiana Department of Agriculture and Forestry (LDAF) entered into a Cooperative Agreement with the United States Department of Agriculture (USDA), Animal Plant Health Inspection Service (APHIS), Plant Protection and Quarantine (PPQ) in 2013 to conduct a visual survey for 13 Citrus Commodity Pests. LDAF conducted this survey according to survey guidelines set forth by the USDA, APHIS, PPQ in 2013. LDAF's Agriculture and Environmental Science (AES) division is divided into 7 districts across the state and 4 of those districts located in citrus producing parishes were utilized to conduct this survey. LDAF AES inspectors conducted this survey in 24 parishes. The inspectors concentrated on surveying citrus trees in the Spring and citrus Fruit in the Fall. There were 37 inspections performed in the Spring and 45 inspections performed in the Fall.

Citrus Canker, a bacterial disease of citrus causing premature leaf and fruit drop, twig dieback and tree decline in citrus trees, was confirmed in Louisiana on June 21, 2013 in City Park, New Orleans, Orleans Parish. Immediately following the initial CC find in Louisiana, United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Plant Protection and Quarantine (PPQ) personnel initiated survey of citrus in the City Park area near the first find, including the Botanical Gardens on the park grounds. A one-mile-square grid system was developed for much of Orleans parish and survey began in adjacent grid blocks, first to the south of City Park, then to the west, and subsequently to the east and north. Survey was conducted by two-person teams. Teams entered a one-mile-square grid and selected ~10 residential sites where citrus trees were present. These ~10 sites were inspected for CC symptoms. Samples were collected and submitted for analysis from any tree with CC symptoms. A system was established for survey sample analysis. Suspect samples are collected and sent to the USDA APHIS PPQ Domestic Plant Pathology Laboratory in Manhattan, Kansas to Dr. Craig Webb for initial visual examination and CC screening. Samples with definite CC symptoms are forwarded to a USDA laboratory in Beltsville, Maryland for definitive polymerase chain reaction (PCR) analysis and CC confirmation. Results are reported back to USDA and LDAF. The majority of CC survey work to date has taken place on a limited scale in and around the known CC+ areas. Survey has been conducted by federal personnel (USDA-APHIS-PPQ) in conjunction with ongoing citrus greening survey. In addition, LDAF has been supplementing this survey with existing state personnel who respond to public inquiries by homeowners. These inquiries are screened at LDAF headquarters in Baton Rouge based on homeowner information and photos submitted to reduce the number of homeowner visits needed. When submitted information indicates possible CC infection, or presence of other citrus pests of concern, homeowner call-ins are followed up and samples are collected for federal laboratory analysis. LDAF inspectors surveyed 47 additional locations initiated from this call-in response. It is anticipated that this call-in / response system will continue as a supplement to active ongoing survey work. LDAF AES and Forestry personnel removed 20 Citrus Canker infected trees and disposed of them at a certified Landfill according to PPQ protocol. Tree removal stopped due to lack of funding and resources. LDAF also is working with USDA in an effort to schedule a small set of federal survey teams for a limited time in the future (FFY 2014). All survey work

conducted by state and federal personnel will also aid in identifying the potential presence of other citrus pests such as citrus greening disease, brown citrus aphid, and other pests of concern to our state. LDAF is currently pursuing federal funding from Farm Bill to assist in this effort. The following table represents the efforts performed by USDA APHIS PPQ and LDAF as a result of the Citrus Canker find.

Parish	Daily Number Sites Surveyed	Cumulative Sites Surveyed	Daily Number of Trees Sampled	Cumulative Number of Trees Sampled	Cumulative Number of Tree Samples Pending (Beltsville)	Total Number of Confirmed Positive Trees	# Trees Removed
Orleans		325		214	0	121	10
Jefferson	12	557	11	320	0	279	10
Plaquemines	17	185		49	0	40	N/A
St. Bernard		40		0	0	0	N/A
St. John the Baptist	1	56		1	0	0	N/A
St. Charles	4	110		3	0	3	0
Lafourche		25		0	0	0	N/A
Terrebonne	5	32		0	0	0	N/A
2013 Totals Final		1330		587		443	20

Funding Amount	Total Number of Traps	Cost Per Unit
Proposed = \$36,500.00	Proposed = N/A	Proposed= N/A
Actual = \$36,500.00	Actual = N/A	Actual = N/A

1. Survey methodology (trapping protocol):

	Common Name	Scientific Name
Pest:	Citrus Black Spot	<i>Guignardia citricarpa</i>
	Sweet Orange Scab	<i>Elsinoe australis</i>
	Fruit Piercing Moth	<i>Eudocima fullonia</i>
	Passion Vine Mealy Bug	<i>Planococcus minor</i>
	Orange Spiny Whitefly	<i>Aleurocanthus spiniferus</i>
	Citrus Blackfly	<i>Aleurocanthus woglumi</i>
	Citrus Weevil	<i>Diaprepes abbreviatus</i>
	Chili Thrips	<i>Scirtothrips dorsalis</i>
	Asian Citrus Psyllid	<i>Diaphornia citri, kuwayama</i>
	Citrus Canker	<i>Xanthomonas axonopodis pv. Citri</i>
	Citrus Greening (African Strain)	<i>Liberibacter spp.</i>
	Citrus Greening (Asian Strain)	<i>Liberibacter spp.</i>
	Citrus Variegated Chlorosis Strain	<i>Xylella fastidiosa</i>

	Proposed	Actual
Sites (Locations):	~ 100	129
Traps:	N/A	N/A

Number of Counties:	24
Counties:	<i>Ascension, Beauregard, Calcasieu, East Baton Rouge, Iberia, Jefferson, Jefferson Davis, Lafayette, Lafourche, Livingston, Orleans, Plaquemines, Point Coupee, St. Bernard, St. Charles, St. John the Baptist, St. James, St. Martin, St. Mary, St. Tammany, Tangipahoa, Terrebonne, Vermilion, Washington.</i>

2. Survey dates:

	Proposed	Actual
Survey Dates:	January 1, 2013 to December 31, 2013	April 15, 2013 to December 31, 2013

3. Benefits and results of survey:

	Positive	Negative	Total Number
Traps	N/A	N/A	N/A

4. Database submissions:

NAPIS data entries will be made for the Louisiana Citrus Commodity Survey by Brett Laird (SSC, Louisiana). This same data will be entered into the IPHIS database by Karen Jenkins (PSS, Louisiana).

B. If appropriate, explain why objectives were not met.

All objectives in this survey were met or exceeded. Phone calls from concerned citrus tree owners were up due to the Citrus Canker find which resulted in a higher number of inspections.

C. Where appropriate, explain any cost overruns or unobligated funds in excess of \$1,000.

There were no unobligated funds for this survey. LDAF incurred expenses of \$3,780.00 in excess of the cooperative agreement award. This overrun was due to the above average amount of calls resulting from the Citrus Canker find.



LSU received \$25,000 from LADF through this Cooperative Agreement for equipment, supplies, labor and services provided throughout the survey year. LSU conducts sample processing for LADF and for its County Agents during the survey season. Below is Dr. Raghuwinder Singh's Final Report:

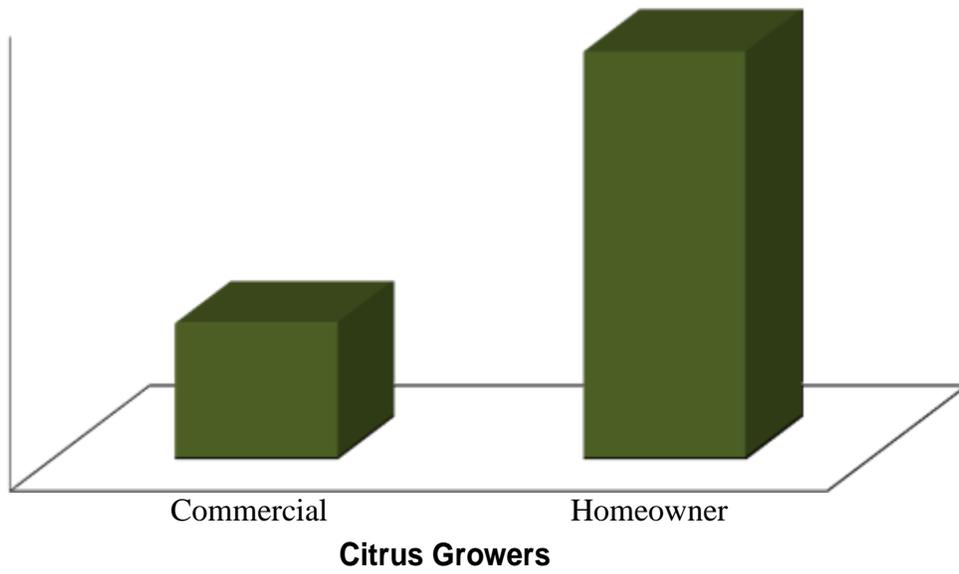
2013 Citrus Insect and Disease Survey Final Report

PI: Dr. Raghuwinder “Raj” Singh

During 2013, Citrus Insect and Disease Survey the LSU AgCenter Plant Diagnostic Center received 48 samples. Samples were collected by LDAF Inspectors and LSU AgCenter County Agents and delivered to the Plant Diagnostic Center. Samples consisted of foliage and/or fruits and Dr. Raj Singh processed them using the most appropriate diagnostic method.

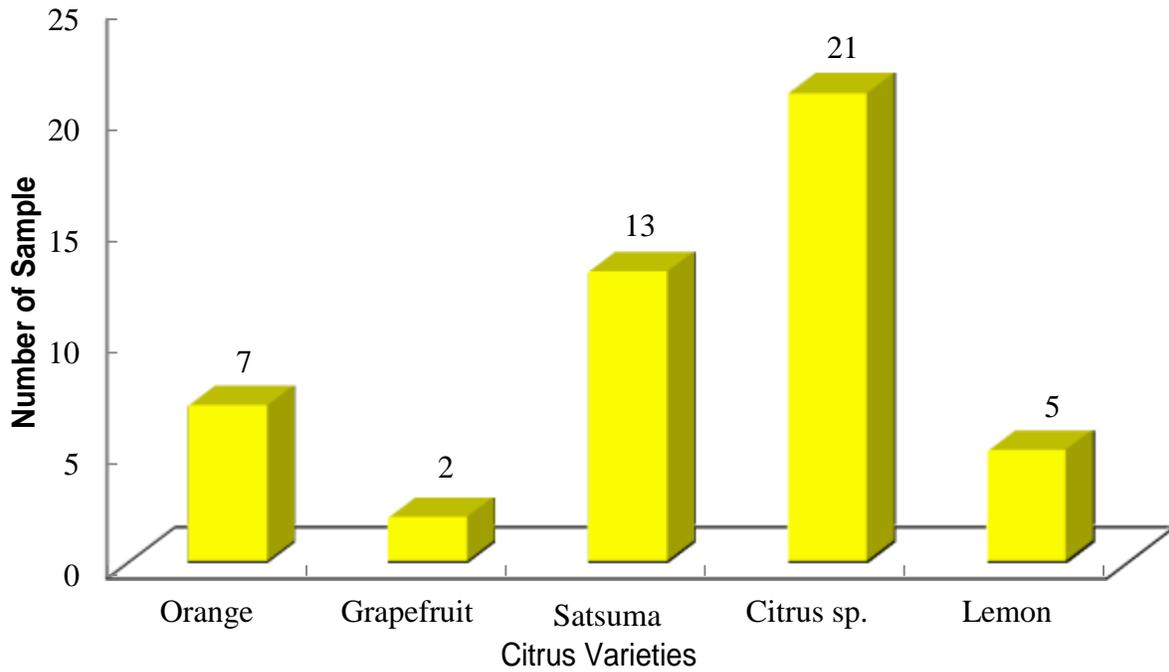
A. Citrus Growers:

Out of 48 samples, 36 came from homeowners and 12 from commercial citrus growers.



B. Citrus Variety:

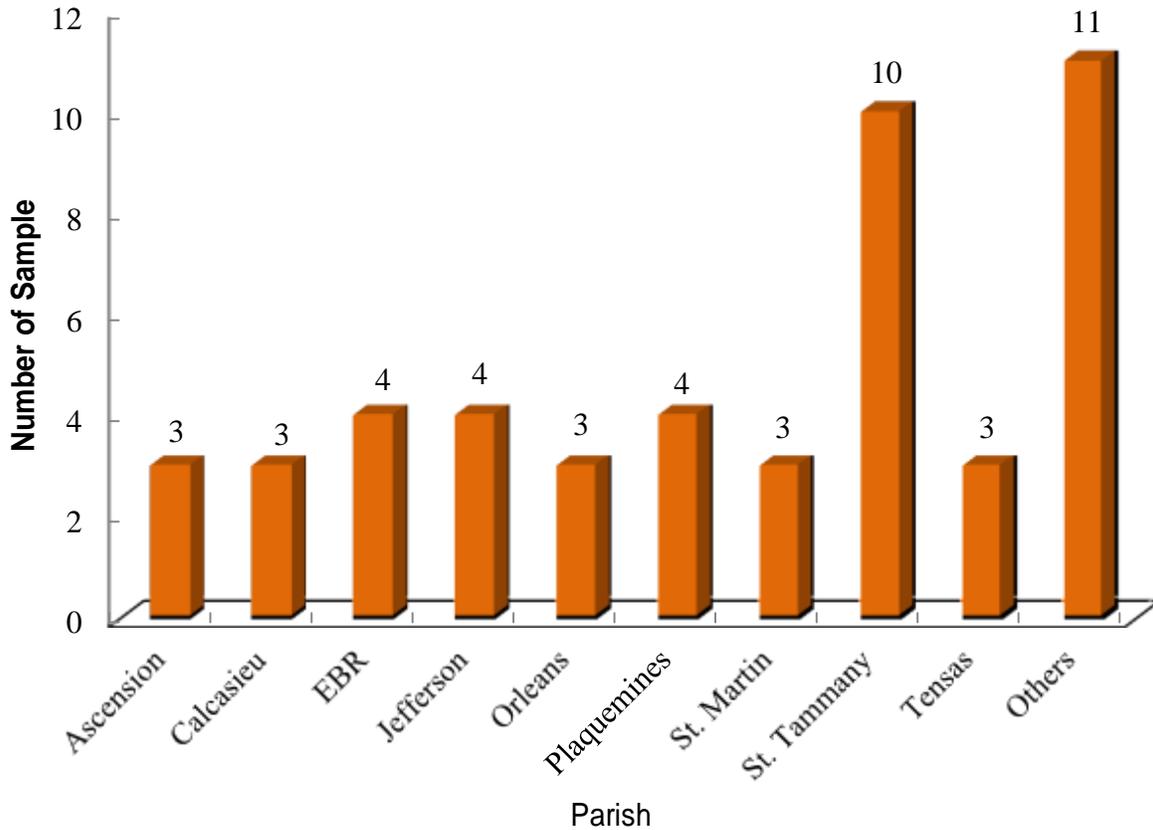
The samples were categorized into five varieties of citrus including, citrus sp., grapefruits, lemons, oranges and satsumas. The majority of samples were citrus sp. (21) followed by satsumas (13), oranges (7), lemons (5) and grapefruit (2). The oranges consisted of blood orange, navel orange and sweet orange.



C. Parish Sample Submission:

The samples came from 18 parishes and 77% of these were submitted from nine counties with majority of samples from St. Tammany (10) followed by EBR (4), Jefferson (4), Plaquemines (4), Ascension (3), Calcasieu (3), Orleans (3), St. Martin (3) and Tensas (3). Others consisted of 23% of the samples and came from nine counties including, Caddo (1), Iberia (1),

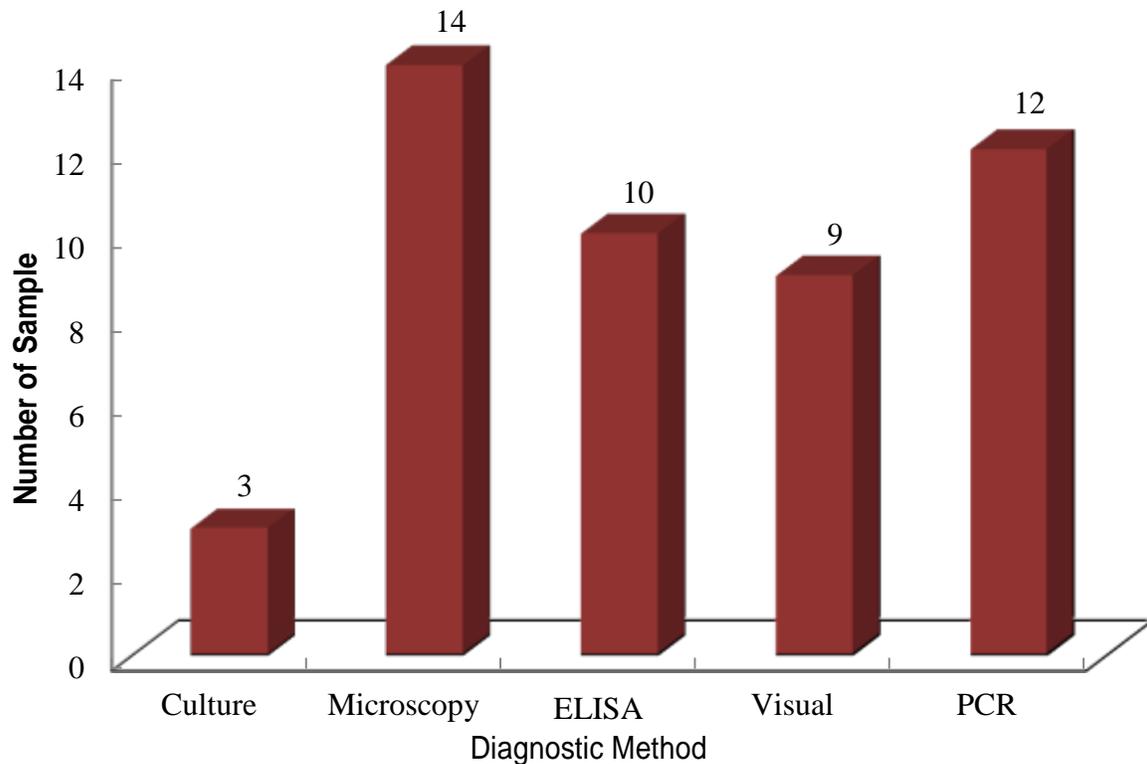
Lafayette (2), Lafourche (2), Livingston (1), Point Coupee (1), St. Charles (1), St. John (1) and Terrebonne (1).



D. Diagnostic Method:

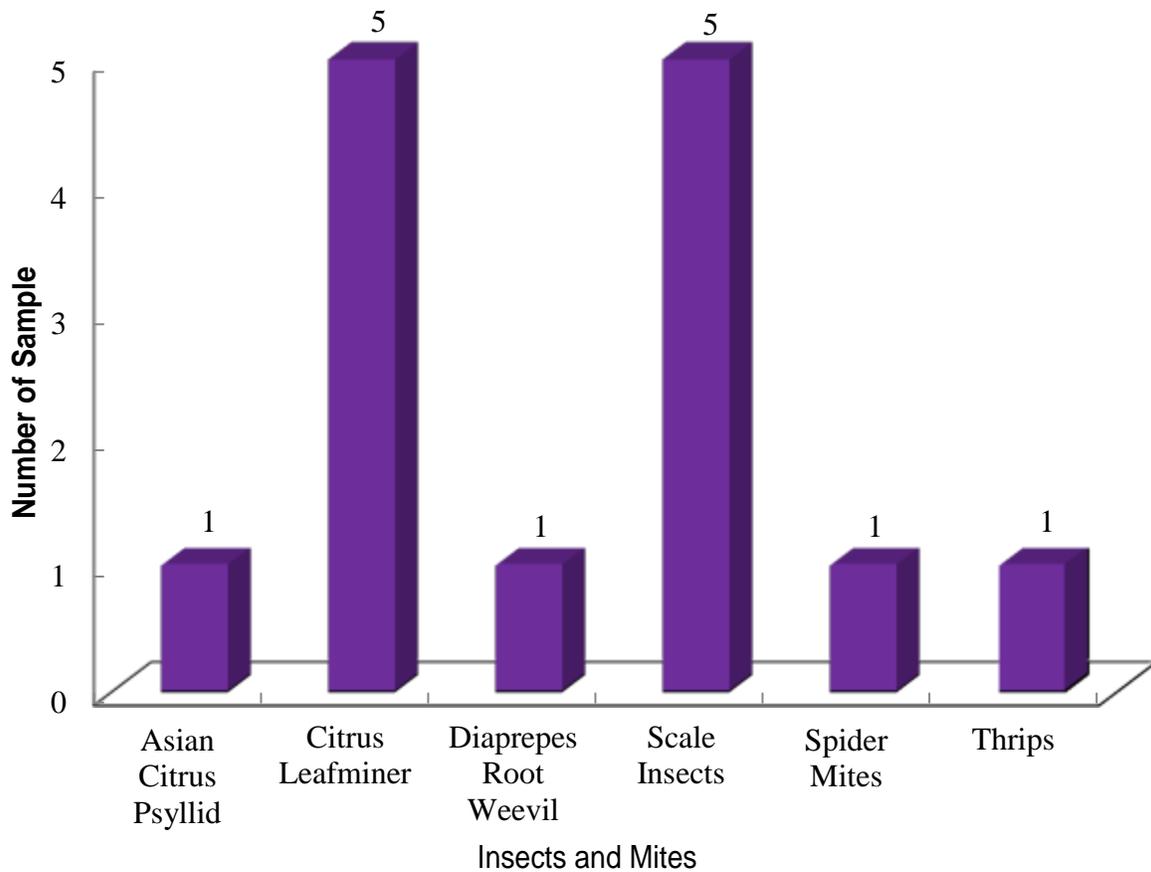
Based on the symptoms observed and client's request the samples were subjected to the most appropriate diagnostic technique including, microscopy, culture isolation, and polymerase chain reaction (PCR). All samples were examined under the dissecting microscope. Fourteen

samples were diagnosed using a microscope followed by 12 PCR, 10 ELISAs, nine visual and three cultural isolations.



E. Insects and Mites:

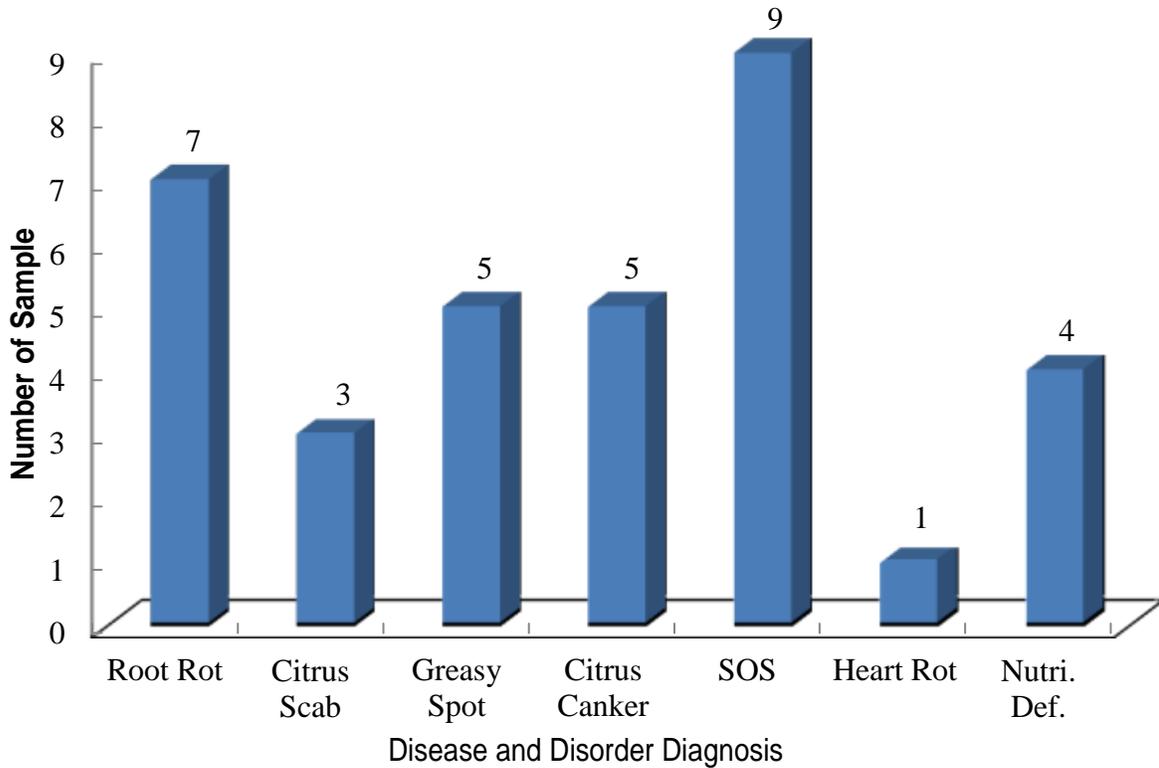
All samples were examined under a dissecting microscope to determine the presence of Asian and African citrus psyllid, brown citrus aphid, chili thrips, citrus longhorn beetle, citrus weevil, fruit piercing moth, glassy winged sharp shooter, Japanese wax scale, lobate lac scale, passion vine mealybug, spiny black fly, and white wax scale. None of the insect species listed above were found except Asian citrus psyllids (ACP) was found on one sample. The ACP sample was forwarded to USDA Identification Lab in New Orleans and the sample was confirmed negative for both strains of citrus greening. Other insects found on the samples included citrus leafminer (5), scale insects (5), spider mites (1), Diaprepes root weevil (1) and thrips (1).



F. Disease and Disorder Diagnosis:

Samples were examined for citrus black spot, citrus canker, citrus greening, citrus tristeza, citrus variegated chlorosis, and sweet orange scab. Based on the symptoms and client's request, samples were subjected to serological or molecular diagnostic methods. No signs and/or symptoms of citrus black spot, citrus tristeza, and citrus variegated chlorosis were observed. Five samples were tested for citrus canker using enzyme linked immunoassay and all were positive. Three and nine samples were tested positive for common citrus scab and sweet orange scab, respectively, with PCR. Greasy spot was detected on five samples based on visual observations. Five samples were submitted for citrus greening and all five were confirmed negative for both

strains of citrus greening disease. Root rot caused by *Phytophthora* sp. was identified from seven samples and Ganoderma heart rot was detected on one sample. Nutritional deficiency was suspected on four samples based on visual observations.



G. Citrus Canker Factsheet

Factsheets describing citrus canker epidemiology, symptoms with color pictures were produced to disseminate information about this disease. A total of 20,000 copies were produced and distributed to LDAF, 64 LSU AgCenter Parish offices and 20 research stations in Louisiana.

LOUISIANA PLANT PATHOLOGY

DISEASE IDENTIFICATION AND MANAGEMENT SERIES

LSU
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Citrus Canker

Xanthomonas citri sub sp. *citri* (synonym *X. axonopodis* pv. *citri*)

Citrus canker is a bacterial disease caused by *Xanthomonas citri* sub sp. *citri*. It is thought to have originated in Southeast Asia.

Different strains of the plant disease occur in citrus-growing regions of the world, but the Asiatic strain is considered to be the most severe and widespread form of citrus canker. It is a serious disease of citrus because it causes defoliation, premature fruit drop, blemished fruit and tree decline – and severely infected trees ultimately may stop producing fruit.

The disease was first detected in Florida in 1910. By 1914, it spread to seven Gulf and Atlantic coastal states including Louisiana. Until recently, the disease had not been seen in Louisiana since 1940, however. But it reappeared and was detected in the state on June 28, 2013.

Citrus canker is a highly contagious disease, and all citrus varieties are susceptible – although some varieties are less susceptible than others. Listed from the more susceptible to the less susceptible citrus fruits are: grapefruit, trifoliolate oranges, Mexican/Key limes, navel oranges, sour oranges, sweet oranges, lemons, satsuma oranges, tangerines, Mandarin oranges, king oranges and kumquats.



Figure 1. Canker lesions on the tops of leaves, with water-soaked margins surrounded by yellow halos.

The bacteria cause symptoms on all above-ground plant parts, including leaves, fruit and twigs. Young expanding tissue is highly prone to infection, and as the tissue becomes mature and hardens off, it becomes less susceptible. Natural infection requires free water on the leaf surface to permit bacterial access through stomates or wounds. The pathogen prefers a temperature range from 68 to 86 degrees Fahrenheit but is active over a wide temperature range. Lesions appear at about 10 days to two weeks after infection.

Symptoms on leaves and fruit start as tiny raised blisters that expand and become tan to brown as the disease develops. Lesions are visible on both sides of the leaves, with water-soaked margins surrounded by yellow halos (Figures 1 and 2). As a lesion ages, the center becomes raised and corky and can fall out, giving it a shot-hole appearance. The pathogen forms raised, corky craterlike lesions on the fruit (Figures 3 and 4). Those fruit lesions often also have water-soaked margins surrounded by yellow halos. Similar lesions are present on the twigs and leaf petioles, except the water-soaked margins may be reduced and the yellow halos are absent (Figure 5 and 6). As the disease intensifies, defoliation and twig dieback occur, and severely blemished fruit drop prematurely.



Figure 2. Canker lesions on bottom of a leaf. Notice the young lesion with yellow halo and the older lesions with tan to brown margins.

The bacterium enters the host tissue through natural openings (lenticels and stomates) and wounds. It is not carried by insects or other organisms, but the wounds caused by citrus leafminers may serve as infection sites. Bacteria survive in old lesions, and under wet and warm environmental conditions exude from these lesions and disperse short distances through wind-borne rain, lawnmowers, other landscaping equipment and people carrying the infection on their hands, clothing or equipment. Long-distance dispersal of citrus canker



Figure 3. Raised, corky lesions on a sweet orange.



Figure 4. Craterlike lesions on a sweet orange.



Figure 5. Canker lesions on young twig of a sweet orange tree.



Figure 6. Canker on leaf petiole of a sweet orange.

generally is attributed to human movement of infected or exposed citrus material and storms like hurricanes and tornadoes.

Louisiana residents are urged not to move any infected citrus plant material within or out of the state. Louisiana has a state quarantine that prohibits entry of citrus nursery stock from outside the state. Homeowners must buy citrus trees from certified Louisiana nurseries only.

If you believe your citrus trees have symptoms like those shown in this fact sheet about citrus canker, please do not take any samples or transport any part of the plant. Instead, contact the U.S. Department of Agriculture at 225-298-5410 or the Horticulture and Quarantine Division of the Louisiana Department of Agriculture and Forestry at 225-952-8100. More information about citrus canker can be obtained by calling Dr. Raj Singh with the LSU AgCenter at 225-578-4562 or emailing rsingh@agcenter.lsu.edu.

Author/Photographer

Dr. Raghuvinder "Raj" Singh, Assistant Professor
Department of Plant Pathology and Crop Physiology



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William B. Richardson, LSU Vice President for Agriculture
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The LSU AgCenter is a statewide campus of the LSU System and provides equal opportunities in programs and employment. Louisiana State University is an equal opportunity/access university.

H. LSU AgCenter, LDAF and USDA Inspector Training:

After positive confirmation of citrus canker in Louisiana, training on citrus diseases was organized at the LSU AgCenter's Horticulture Research Station in Hammond, Louisiana. Disease training was provided on citrus canker, citrus greening, scabs and black spot. Training on quarantine restrictions was also provided. A total of 36 inspectors and agents attended the training.

I. Student Worker

A student worker was hired at \$12 per hour rate to help prepare the samples for diagnostics.

J. Supplies

Supplies related to diagnostic methods (ELISA Kits, PCR reagents, Gel electrophoresis supplies, etc.) were also purchased to accommodate accurate and rapid diagnostic results.

Approved and signed by

Cooperator

Date: _____

ADODR

Date: _____