

The Incidence of Greening and Canker Infection in Florida Citrus Groves from September 2007 through August 2008¹

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Background

In early summer of 2008, representatives from the Florida Department of Citrus, Florida Citrus Mutual, the Florida Citrus Production Research Advisory Council, and the University of Florida's Institute of Food and Agricultural Sciences (UF/IFAS) met to discuss the potential economic impacts that citrus greening disease (huanglongbing or HLB) and citrus canker could have on the Florida citrus industry. The conclusion was that long-term projections of fruit production and prices and an evaluation of the impact of potentially reduced fruit volumes on the citrus processing, fresh packing, and input supply sectors, as well as on Florida's economy were needed to assist the industry in making business, policy, and research funding decisions. It was also decided that this work should be based on reliable estimates of the degree of greening infection currently present in Florida citrus groves. UF/IFAS agreed to lead the process of conducting a grower-based survey to obtain this information,

working in collaboration with the USDA's National Agricultural Statistics Service, Florida Field Office (Florida Agricultural Statistics Service), abbreviated as NASS, and the Florida Department of Agriculture and Consumer Services (FDACS) Division of Plant Industry (DPI).

Objective and Roles of Organizations

The objective of the greening portion of this project was to develop reliable estimates of the extent of citrus greening infection, measured by number and/or proportion of symptomatic trees in Florida citrus groves. The project also involved determining the extent to which growers were following management programs to slow the spread rate of greening to determine how often and how thoroughly growers were scouting, removing diseased trees, and applying pesticides to control psyllids. The objective of the canker portion of the survey was to develop reliable estimates of the current incidence of canker and the number of trees removed due to canker.

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Role of DPI

DPI was responsible for mailing the survey form to over 3,000 growers in its database. DPI and UF/IFAS were available to answer growers' questions about completing the survey. Follow-up telephone calls were made to a sample of non-respondents and some surveys were re-mailed. Telephone calls were also made to any respondents providing incomplete information or information requiring clarification, and the resulting information was entered on the survey form. DPI received the completed forms, captured raw data from the forms electronically, and provided these data to NASS.

Role of NASS

NASS tabulated, analyzed, and summarized the raw greening data from the survey over the period September 2007 through August 2008 to provide a weighted percentage of greening-symptomatic trees, number and/or percent of trees removed over the survey period due to greening, number of scouting trips used to detect greening over the survey period, and number of pesticide applications used for controlling psyllid populations over the survey period. NASS also tabulated, analyzed, and summarized the raw canker data to provide a weighted percentage of trees symptomatic for canker and the number of trees removed for canker. Results were summarized by fruit variety – orange, grapefruit, and specialty (tangerines and tangelos). Reported data were expanded to account for non-response or acreage not surveyed by comparing the reported net acreage to known net acreage in the Florida Agricultural Statistics Service 2008 Commercial Citrus Inventory. Following non-response adjustment, data were averaged using net acreage to provide a weighted mean. Results were provided at the state level by variety of citrus, for each of the five citrus producing regions – Indian River, northern, central, western, and southern (Figure 1), and by grower size category.

Role of UF/IFAS

UF/IFAS provided overall supervision of the project and, along with DPI, was available to answer growers' questions about completing the survey. All three organizations, UF/IFAS, NASS, and DPI were

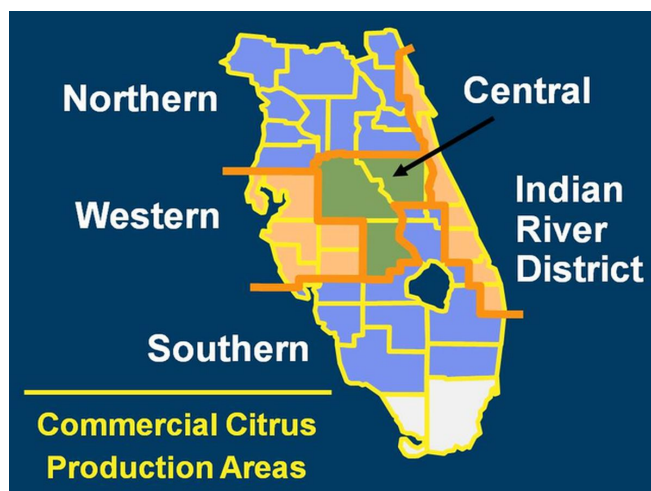


Figure 1. Florida commercial citrus production areas.

instrumental in developing the questions for the survey and the instructions for completing the survey form.

UF/IFAS will use the survey results to conduct and publish economic studies about greening and canker. These include long-term projections of orange and grapefruit production and prices as a result of the impacts of the two diseases, and long-term structural implications of greening and canker for Florida's citrus processing and fresh packing sectors.

Location of Greening and Canker in Florida

In order to identify the location of greening and canker in Florida and to track its spread, DPI collected data submitted by growers, USDA, and DPI scouts, showing each 640-acre section of citrus grove by county that had at least one positive find (Figures 2 and 3). Tree infection was confirmed based on tests conducted by labs operated by U.S. Sugar Corporation in Clewiston, the Southwest Florida Research and Education Center in Immokalee, and DPI in Gainesville. While this information does not show the incidence of greening and canker infection, or the rate of increase in the incidences of these diseases, it does show the locations where the diseases were found. It is not known what proportion of removed trees result from lab tests.



Figure 2. Known distribution of citrus greening (HLB) in Florida. Source: FDACS/DPI



Figure 3. Known distribution of citrus canker in Florida. Source: FDACS/DPI

The Survey

The survey was for the period September 1, 2007 through August 31, 2008. Growers were asked to identify groves or blocks in groves by their location

as shown by county, township, range and section. The total number of trees and net tree acres by location and fruit variety (orange, grapefruit, and specialty fruit) were requested. Citrus greening questions by location and variety included number and percent of trees symptomatic for greening during the survey period, number of trees removed due to greening during the survey period, number of scouting trips for greening, and the number of pesticide applications for psyllids during the survey period. The date greening was first detected in the acreage represented by the survey was also obtained.

For the canker portion of the survey, information was also gathered for total number of trees and net tree acres by location and fruit variety. Questions included the percent of canker and number of symptomatic trees in the acreage represented by the survey, and the date canker was first discovered in this acreage.

The survey was mailed to growers in mid-December of 2008. DPI began receiving completed surveys in January of 2009, with the last survey forms received in mid-April. Of the 3,037 survey forms mailed out, 949 (31%) were completed and returned. The 949 completed surveys represented 169,048 acres of citrus (29% of total state citrus acreage) and 20,163,049 bearing and non-bearing trees (27% of total state citrus trees).

Results were summarized by fruit variety (oranges, grapefruit, and specialty fruit), state total, production area (Indian River, northern, central, southern and western), and grower size category. Size categories were defined as: large – over 2,500 acres; medium – 250-2,500 acres; and small – less than 250 acres. As shown in Figure 1, counties making up each of the five production areas are: (1) Indian River – St. Lucie, and parts of Brevard, Indian River, Martin and Palm Beach; (2) central – Highlands, Polk, and most of Osceola; (3) western – Desoto, Hardee, Hillsborough, Manatee, Pinellas, and Sarasota; (4) southern – Charlotte, Collier, Glades, Hendry, Lee, Okeechobee, and parts of Indian River, Osceola, Palm Beach and Martin; (5) northern – Alachua, Citrus, Hernando, Lake, Orange, Pasco, Putnam, and Seminole.

Results

Reliability of Survey Results

Due to the relatively low response rate (31%), statistics are sufficiently reliable to be published only for oranges at the State level. Survey results for grapefruit and specialty fruit could not be published, nor results for any fruit varieties by production area or grower size category. Attempts were made throughout the survey process to promote responses. A cover letter from Florida Citrus Mutual, endorsed by each of the regional citrus organizations stressing the importance of the survey, was sent out with the survey, and growers were given from mid-December until mid-April to complete their responses. Even with the endorsements, there were still not enough growers participating to give reliable information in most of the areas covered by the survey. Reliable statistics on oranges statewide will certainly be useful since oranges are by far Florida's leading citrus crop, accounting for 86 percent of state citrus acreage. Plans are to repeat the survey for the coming season (2009-10) and to continue gathering data about types of citrus other than oranges, production area, and grower size.

Greening in Orange Groves

The survey included 153,000 net acres of oranges and 17,676,000 orange trees. Statewide, growers removed 847,208 trees over the survey period due to greening (Table 1). There were 1,025,024 trees visually symptomatic for greening, resulting in a greening infection incidence of 1.6 percent in these groves, which ranged from individual groves with no infection (primarily in the northern area) to groves with 100 percent infection (primarily in the Indian River and southern areas). Statewide, groves were scouted twice over the survey period for those growers who scouted for greening. The most frequently reported number of scouting trips for growers with greening was four. However, growers who had no greening either scouted once or did not scout at all over the survey period. Based on comments received from some growers with high levels of infection, they had stopped scouting, which lowered the average number of scouting trips. On a statewide basis, growers applied pesticides to control psyllids an average of four times annually.

Regression analysis was used to characterize any relationship between levels of greening infection and number of scouting trips, and levels of greening infection and number of psyllid pesticide applications. The correlation between number of scouting trips and greening was low, explaining only 9.7 percent of the variability between factors. The correlation between number of pesticide applications and greening was also low at 19.4 percent. These low correlations are not surprising. It is likely that growers with moderate to heavy greening are spraying and scouting the most, while those with high rates of infection and those with no infection were doing no scouting or spraying, which probably accounts for the low correlations.

Canker in Orange Groves

The average amount of canker infection for the state was 15 percent. This was computed as the number of trees with canker divided by the total number of orange trees in Florida. Canker infection rates were highest in the Indian River area and lowest in the northern area.

Conclusions

Since being discovered near Homestead, Florida in September of 2005, greening has spread into all commercial citrus producing counties in Florida. The overall incidence level in orange groves is now estimated to be 1.6 percent for greening and 15 percent for canker. In some areas, such as Indian River and the south, incidence levels are much higher and likely spreading rapidly. Repeating the survey in subsequent years should provide data to enable researchers to estimate the rate at which greening and canker are spreading.

Table 1. Citrus greening and canker survey results for Florida oranges over the period September 2007 through August 2008.

| Item | Number / Percent | Total |
|--|------------------|------------|
| State total acres | Number | 496,518 |
| State total trees | Number | 65,775,300 |
| State acreage in survey | Percent | 31 |
| State total trees in survey | Percent | 27 |
| Orange trees with greening | Number | 1,025,024 |
| Orange trees removed | Number | 847,208 |
| Greening in orange trees | Percent | 1.558 |
| Scouting trips in orange groves | Number | 2 |
| Psyllid pesticide applications in orange groves | Number | 4 |
| Canker in orange groves | Percent | 15 |
| Source: State total acres and trees taken from USDA/FASS, <i>Commercial Citrus Citrus Inventory 2008</i> , Orlando, Florida, April 2009. | | |