

COLD HARDY CITRUS CONNECTION



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Fruit is coloring up nicely and it won't be long until we're harvesting full swing! In this issue, we have an update on some of the cold hardy citrus research projects going on at the UF/IFAS NFREC from Dr. Shahid as well as articles on 'friendly fungus' and customizing your fertility plan!

The 2022-2023 Citrus Production Guides are now available, and copies will be available at the [Cold Tolerant Citrus Workshop in Perry, FL](#) on October 13th and at the [Cold Hardy Citrus Field Day in Quincy](#) on October 27th! I look forward to connecting with everyone at the meetings!

And, as always, please don't hesitate to reach out to our team if we can help in any way!



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New Research Initiatives on Cold Hardy Citrus at UF/IFAS NFREC - Quincy

By: *Dr. Muhammad Shahid, UF/IFAS NFREC Horticulturalist*

The Fruit Crop Physiology Lab at UF/IFAS North Florida Research and Education Center, Quincy is focused on developing a sustainable and profitable Cold Hardy Citrus industry in the Southern US by conducting research-driven extension projects. Taking cold hardy citrus from a niche to a sustainable and profitable industry is our main goal. Given that about one thousand new plants for different research projects on scion/rootstock evaluation, high density plantation and site-specific recommendations on nutrients have been done in spring this year. We collaborate with experts at various UF/IFAS stations and several multi-county extension agents around the state along with Alabama and Georgia to address establishment and production issues in cold hardy citrus production in southeast. We are also disseminating research results and improvements in Cold Hardy Citrus production with the goal of establishing a sustainable citrus industry for fresh market. We welcome grower's feedback and industry participation.

1) Evaluating UF950 on different rootstocks

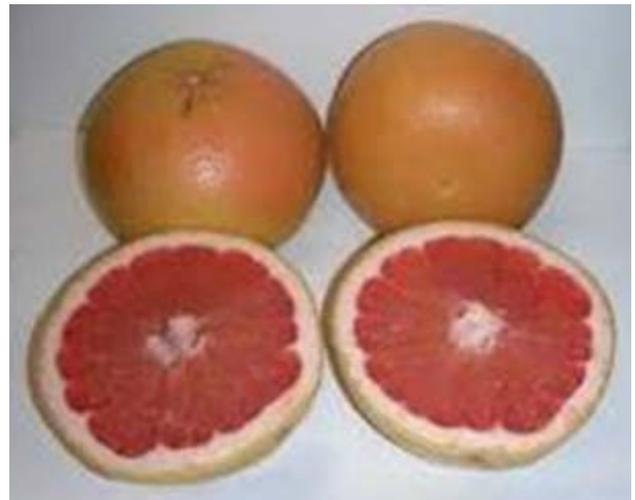
UF950 is a seedless and easy to peel mandarin cultivar developed by UF/IFAS Citrus Research and Education Center, Lake Alfred. Its fruit size is similar to clementine with dark orange in color both internally and externally. It is very sweet in taste and matures in December. Here at NFREC we have been evaluating this cultivar for more than six years. We have evaluated its yield and other fruit quality characteristics. It has shown



great cold tolerance in North Florida. In our previous research trials, UF950 was evaluated just on two rootstocks i.e., swingle and US897. In our new research project, we are evaluating UF950 on eight different HLB and cold tolerant rootstocks from citrus breeding programs at UF and USDA. The main objective is to identify the best rootstock for 950 which can produce good quality and high yield while limiting the chances of alternate bearing.

2) Investigating Cold Tolerance Potential and Yield of '914' Pummelo Grapefruit Hybrid for Fresh Market Production in North Florida

'914' is a Pummelo Grapefruit hybrid which produces large fruits with Brix about 10 or more while less acidity than grapefruit. Fruit gets ready for harvesting in October. It produces uniform red-fleshed and large fruit (680g approximately). Its skin shows a significant red blush enhancing its attractive appearance. The unique attribute in '914' is it is low in furanocoumarin compounds (FCs), which are high in grapefruit and cause the so-called "grapefruit juice effect". Due to the high FCs, consumers on various medications are advised not to consume grapefruit or its juice products. However, since '914' has very low FCs, clinical studies demonstrated that '914' juice behaves differently than grapefruit juice in cell culture studies, and clinical trials are underway to confirm this in human subjects. Currently, we are evaluating '914' on two rootstocks and will begin another trial with 10-12 additional rootstocks. Based on its growth and fruit characteristics, it could be an excellent addition to diversify fresh citrus market in North Florida



3) Nitrogen Management in Cold Hardy Citrus Production in North Florida

Cold Hardy Citrus (CHC) production particularly, Satsuma mandarins for the fresh market, is a newly emerging industry in North Florida, with acreage increasing each year. There is a lack of proper nitrogen (N) management guidelines for CHC fresh fruit market as current citrus nutrient guidelines are based on research conducted in Central and South Florida, where soils and climatic conditions differ compared to North Florida. Soils in North Florida tend to have a higher clay content that often results in greater cation/anion exchange and water retention capacities, thereby translating into potentially lower annual fertilizer requirements compared to the sandier soils of the South Florida Flatwoods and Central Ridge. Moreover, most current recommendations are for the juice market, while citrus in north FL is grown primarily for the fresh market. The objective of this project is to identify best N application rate and timing for getting optimum yield and good quality while having minimal environmental impacts.

4) Assessing the efficacy of different N and P sources for young and mature Cold Hardy Citrus groves in North Florida

Current citrus nutrient guidelines are based on studies of healthy citrus trees conducted in the pre-Huanglongbing (HLB) era and may no longer be valid for the present situation where 100% of mature citrus trees in Florida are HLB-affected. We are blessed having minimal HLB pressure in commercial groves. We are conducting research on different N and P sources and their application rates for young/mature citrus cultivars including

sweet oranges, grapefruits, and mandarins. Our project will evaluate different N and P sources and their application rates. Using fertigation and controlled release fertilizer (CRF) fertilization sources, we should be able to develop and provide site specific N and P guidelines for young and mature citrus trees of Satsuma mandarins in North Florida.



5) Effectiveness of Root Pruning in High Density Citrus Plantation for Fresh Market

Super high density and ultra-high-density plantation of fruit crops is an advanced production system to improve the efficiency and efficiency of inputs while getting maximum yield. Increasing the number of trees per acre could be a good strategy to increase production per acre, while increasing grower's profitability for cold hardy citrus industry in southeast. However, identifying more effective tree spacing, which can efficiently convert biomass into maximum number of good quality fruits is very critical. We are initiated a high-density research project on Owari at two locations, NFREC Quincy and UF/IFAS Plant Science Research Unit, Citra FL. In this project we will be regulating plant's reproductive and vegetative growth through root pruning. We will evaluate the effect of root pruning on nutrient use efficiency, plant physiology, production, and fruit quality characteristics under high density production system.

6) Cold Hardy Citrus Website

The Fruit Physiology Lab at UF/IFAS North Florida Research and Education Center Quincy has developed a Cold Hardy Citrus website. Currently, the site is partially active, but it will be fully active by the end October 2022. The objective of this website is to assemble all useful resources related to CHC in one place. Grower suggestions regarding the improvement of website will be highly appreciated. We will run an online survey very soon for getting grower feedback on the Cold Hardy Citrus website.



You can also follow along with our lab by following our Facebook page at [UF IFAS NFREC Fruit Physiology Lab!](#)



For more information on Cold Hardy Citrus research, please contact Dr. Muhammad Shahid at (850) 875 7150 or via email at mshahid@ufl.edu

Entomopathogenic Fungi: A Red and/or Yellow Color Fungus on Leaves in Citrus Groves

By: Dr. Muhammad Shahid, UF/IFAS NFREC Horticulturalist, Mujahid Hussain, UF/IFAS NFREC, and Danielle Sprague, UF/IFAS Gadsden County

Plant disease and insect identification is essential in agriculture production. A prime example that we are currently seeing here in North Florida citrus is the presence of ‘friendly fungi’, an entomopathogenic fungi that attacks citrus whitefly and cloudywinged whitefly nymphs. From first glance, it looks like the grove is being plagued with a new citrus disease or a new species of scale, when in fact, the whitefly nymphs are being controlled by a beneficial and naturally occurring biological control agent!



Aschersonia aleyrodis fungus feeding on whitefly nymphs on satsuma. Photo credit: Doug Mayo, UF/IFAS

The citrus whitefly (*Dialeurodes citri*) and the cloudywinged whitefly (*Singhiella citrifolii*) are two insect pest species of whiteflies that occasionally cause injury in citrus. Adults are small, white and resemble tiny moths. Adults lay eggs on the underside of leaves and eggs hatch into nymphs. Nymphs cause injury to the plant by feeding and consuming large quantities of sap. As a result of the large amount of sap

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consumed, nymphs excrete honeydew which causes growth of sooty mold fungi. Severe sooty mold infestations give plants an unhealthy appearance and can reduce plant photosynthesis. Luckily, for us, we are finding populations of whitefly nymphs are being suppressed by entomopathogenic fungi.



Aschersonia aleyrodis feeding on whitefly nymphs. Photo credit: Danielle Sprague

In Florida, there are two major strains of entomopathogenic fungi, the red strain (*Aschersonia aleyrodis*) and the yellow strain (*Aschersonia goldiana*). The red strain infects the citrus whitefly (as well as other species) and the yellow strain infects the cloudywinged whitefly. Both strains have been seen in various groves in North Florida. At the UF/IFAS NFREC, we have observed the red strain in several varieties including UF-Dawn, Fallglo, UF-Sunrise, and Bingo. We have also observed both strains in commercial groves of Owari and Brown Select. These friendly fungi are normally observed in the period from mid-August to mid-September after the rainy season.

The friendly fungi can be clearly seen from a distance with their bright red and/or yellow spots. While it may be a scary sight to see, the entomopathogenic fungi does not harm the tree and is making a bad situation better by attacking whitefly nymphs.

Customizing Your Fertility Plan based off Tissue Analysis



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By: Jake Price, UGA Extension Agent

At the first of August each year I conduct a tissue analysis of all of my research plots. When the results come back I use the numbers to adjust rates up or down for the following year. I base my rates on the Nitrogen. I try to keep N levels between 2.5%-2.7% as recommended by the UF citrus guidelines. Over 3.0% is considered excessive. With the Owari rootstock trial I have tried to adjust N to keep the levels between 2.5%-2.7% but it is often difficult. This year my N level was 3.19% which is considered



Figure 1. Dark green foliage with 3.19% Nitrogen in foliage. August 2022

excessive, and the trees are dark green which would indicate a high N level. I am not sure why N is excessive this year because I did not increase the N levels this year as I was expecting less fruit. I normally increase the N rate each year as trees age. I believe the Owari trial has reached maximum production so .90lbs N/tree may be the maximum N needed at my location. Other nutrients such as P and K can be adjusted up or down if you custom order your fertilizer. You can do the same with micronutrients or apply foliar sprays as needed.

In southern Georgia each grower has different soil types that retain N and other nutrients differently so a general recommendation is just an estimation as to what is needed. In Florida, recommendations are likely higher because soils are sandier and leach more than southern Georgia soils. In addition, Florida has a longer growing season. The chart below shows how much N that was applied to each tree at the Owari Rootstock trial over the years and the corresponding N levels in the tissue analysis. I did not apply any N year one because the trees were planted on August 19.

Customizing Your Fertility Plan based off Tissue Analysis



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Owari Tree Age	N applied to each tree at Owari trial	Tissue Analysis for N%	UF Nitrogen Recommendations for oranges based on 145 trees/acre	Total Yield in lbs/acre
1 2014	No N applied	NA	.15-.30	NA
2 2015	.325	2.93	.30-.60	NA
3 2016	.30	2.92	.45-.90	NA
4 2017	.66	3.29	.86-1.4	NA
5 2018	.53	3.00	.86-1.4	11,867
6 2019	.53	2.85	.86-1.4	23,000
7 2020	.66	2.45	.86-1.4	29,000
8 2021	.90	2.69	.86-1.7	61,000
9 2022	.90	3.19	.86-1.7	

As you can see the amount of N/tree I applied has been on the low side of the UF recommendations and I have still maintained optimal or excessive N levels. The yield/acre for the last 4 years has also been increasing as the trees age. I anticipate a yield decrease this year which indicates the trees may be at full production age. I would highly recommend growers base their fertility plan off of their tissue analysis instead of going by a general recommendation. You may be able decrease your fertility costs without decreasing yield or fruit quality.

For more information, please contact Jake Price at 229-333-5185 or by email at jprice@uga.edu.

Upcoming Grower Meetings

North Florida Annual Citrus Workshop - October 13th

Topics: soil fertility, marketing techniques, advanced soil augmentation techniques

UF/IFAS Taylor County, Perry, FL

[Click Here for More Information and To Register](#)

Produce Safety Alliance Grower Training

October 26th 2:30-5:30 PM EST

UF/IFAS NFREC-Suwannee Valley

[Click Here For More Information and To Register](#)

Cold Hardy Citrus Field Day - October 27th

UF/IFAS NFREC-Quincy

Topics: Update on new varieties, canopy management, post-harvest handling & citrus grove tour

[Click Here for More Information and To Register](#)

Citrus Health Forum - February 23, 2023

UF/IFAS NFREC-Quincy

Georgia Citrus Conference - February 28, 2023

UGA Tifton Campus



COLD HARDY CITRUS ASSOCIATION CORNER

All fruit is not created equal!

If you go to the grocery store and buy fruit when our Sweet Valley fruit is out of season, you get fruit from countries all around the world. I have noticed lately fruit from Spain, Peru, South Africa, and even Australia. Just think about how long it took for those shipments to be delivered to grocery outlets in the US. Weeks and weeks go by and what was possibly good fruit and had a good shelf life when shipped has been diminished to only a few days. And in many of those bags, there is already rotten fruit when you buy it.



Kim Jones, CHCA President

Think about what we have to offer as Sweet Valley Citrus Growers:

High quality fruit— and why?

Great soil with a clay base (holds nutrients and water in the root zone)

Ample supply of water (quality and quantity)

Temperatures allow fruit to mature on the tree (taste great)

Huge markets close to our production area (freight savings)

Fresher fruit for consumers to enjoy (tree ripened)

All these make for an opportunity for “Sweet Valley Citrus Growers” to build a reputation of the best fruit available for a few months of the year!!

Join us in building a citrus industry in the Sweet Valley Region with high quality fruit that consumers will be waiting on every fall. Join the “Cold Hardy Citrus Association” and pack your fruit under the “Sweet Valley Citrus” label!

For more information go to “contact us” on our website @ sweetvalleycitrus.com or email us @ coldhardycitrus@gmail.com

Kim B Jones
President
Cold Hardy Citrus Association

