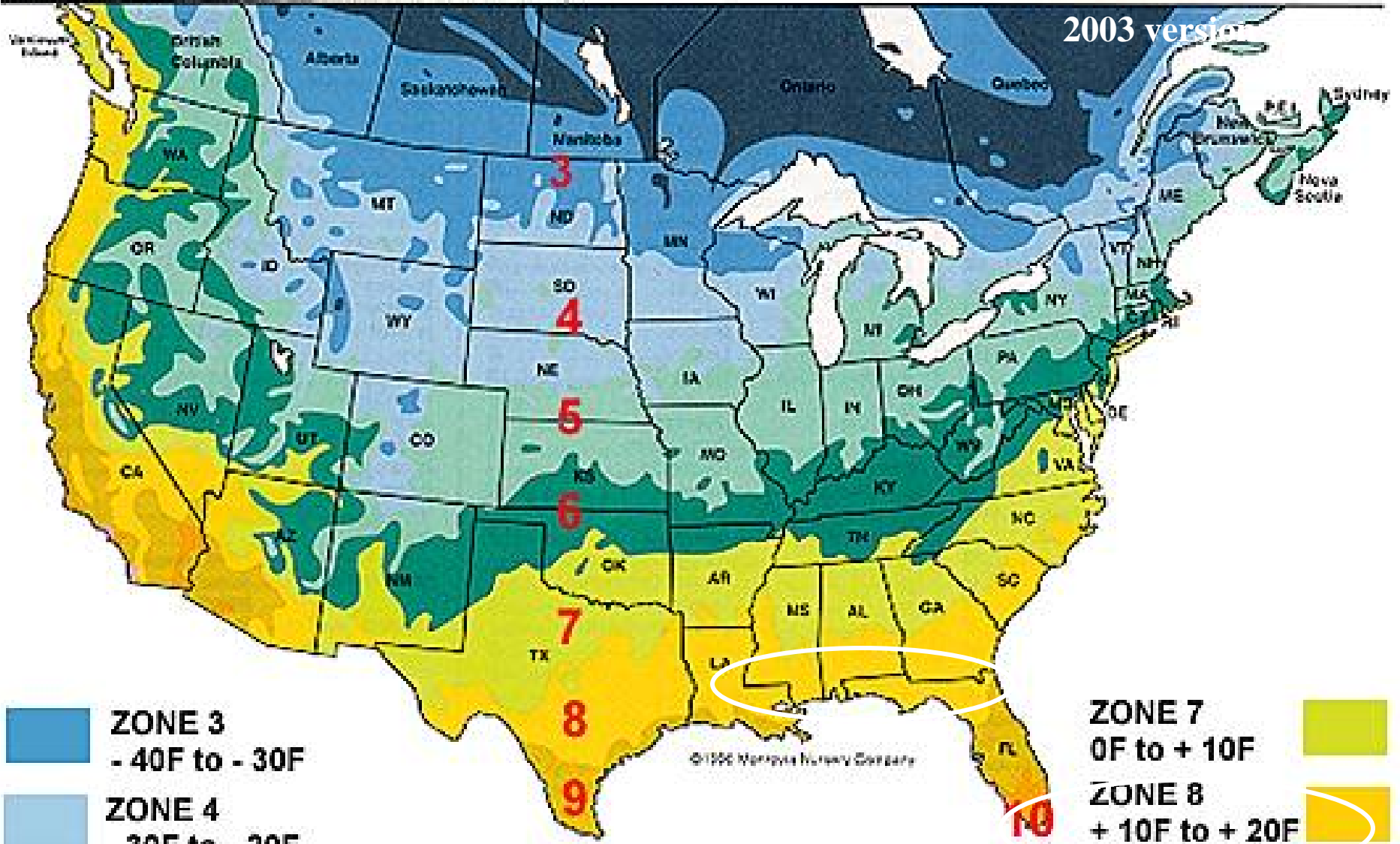


Growing Satsumas and Cold Hardy Citrus in Subtropical Climates

Jake Price
Lowndes County Extension Agent

2003 version

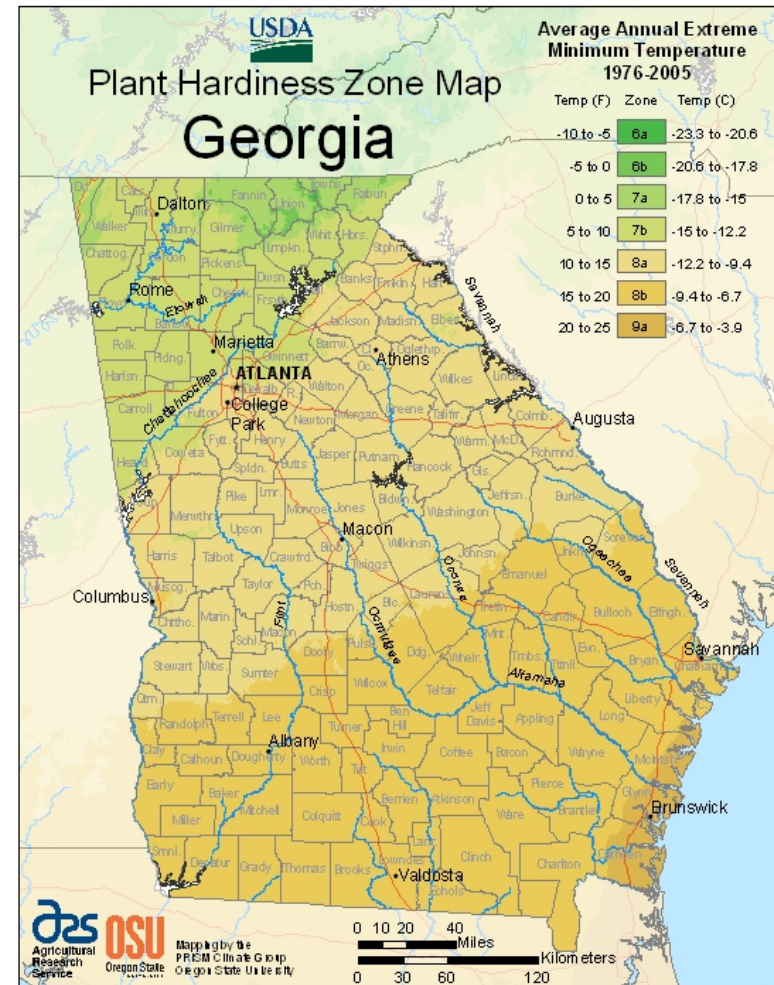
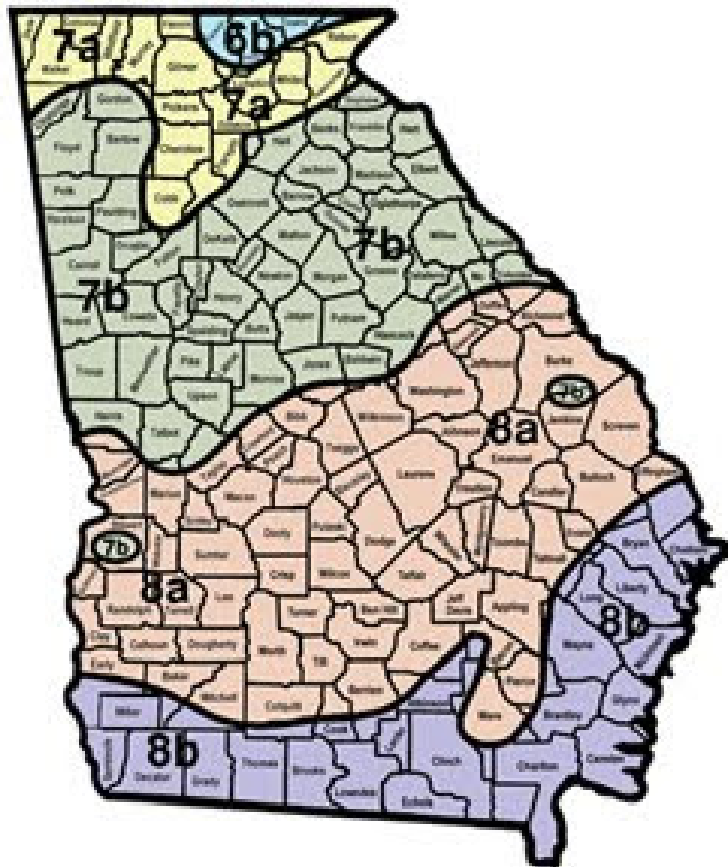


- ZONE 3**
- 40F to - 30F
- ZONE 4**
- 30F to - 20F
- ZONE 5**
- 20F to - 10F
- ZONE 6**
- 10F to - 0F

- ZONE 7**
0F to + 10F
- ZONE 8**
+ 10F to + 20F
- ZONE 9**
+ 20F to + 30F
- ZONE 10**
+ 30F to + 40F

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Old vs. New Planting Zone Maps



Cold Hardiness of Satsumas and other Citrus

Trifoliolate Orange	***** superior
Kumquat	**** excellent
Changsha	****
Satsuma	****
Trifoliolate Hybrids	**** excellent
Kumquat Hybrids	*** good
Clementine	***
Navel Orange	** fair
Valencia Orange	**
Lemons & Limes	* poor

Hardiness a function of genotype, growth rate, and cold weather conditioning.

Citrus trees are grown on rootstocks

- Rootstocks reproduced by seed
- Budded when pencil sized
- Buds taken from desired tree
- Trees can be budded in late spring or early fall

NEWLY BUDDED TREES



Why Use Rootstocks instead of Seed?

ADVANTAGES OF ROOTSTOCKS

- Produce fruit quicker 3-4 years instead of 7-8
- Choose rootstock adapted to the area
- Less thorns!
- More branched
- You know what your going to get
- Disease resistance

ADVANTAGES OF SEED

- Easy to plant
- Usually start disease free
- Less labor than budding
- Many citrus reproduce
- True from seed

ex. Grapefruit, sweet oranges, tangerines, key lime



**Early fruit harvest is important.
Fruit is less tolerant of freezing temps
than the trees themselves; injury
occurring at internal temp. of 28 F.**

- **Brix levels:**
 - Ratio of soluble solids (sugars or Brix),to acid is an indicator of quality
 - 10:1 is minimum in LA and 8:1 is minimum in California
 - As fruit matures the sugars rise and acidity falls

- **Other Marketing Qualities**
 - Color
 - Size
 - Texture
 - Seeds per fruit

Satsuma Varieties

"OCTOBERISH" RIPENING

- Dobashi Beni
- Okitsu Wase
- Kawano Wase
- Kuno Wase
- Armstrong
- Miho Wase
- Miyagawa
- Iwasaki
- Ueno
- China 9
- Xie Shan
- Miho
- Seto
- LA Early
- Early St. Anne

NOVEMBER RIPENING

- Owari
- Brown Select
- Silverhill
- Aoshima

Freeze Protection Strategies

- South side of building
- Under Pine Trees or other shelter
- Planting windbreaks
- Plant in high spots
- Use trifoliolate rootstocks





Banking Trees and Covering Trees

BANKED WITH SAWDUST

T-PEES WITH EMITTER INSIDE



Sprinkler Irrigation Freeze Protection

- Young Trees:
- Use Microjet type delivering 12 to 18 gph per tree.
- Position at or near ground level, northwest side of tree 12 to 24 inches high.
 - go to 180 fan pattern



Sprinkler placed incorrectly to high for young tree

Cold Damaged Citrus



Fertilize Early budbreak (March), Fruit Swell (May), 1" diam.fruit (June)

Year	Lbs N/tree	Amount of 13-13-13
Planting	.05	6 ozs
1	.20	1.5 lbs
2	.4	3.0 lbs
3-6	.75	5.8 lbs
7-8	1.0	7.7 lbs
9+	1.5	11.5 lbs

What pests should you be concerned about?

- Citrus Leafminers
- Rust Mites
- Orange dogs
- Red Spider Mites
- Birds (mockingbirds, thrushes, blackbirds)
- Citrus Scab
- Leaf-footed Bugs & Stinkbugs
- Scale/Whiteflies
- Citrus canker and citrus greening (HLB)
- Florida Citrus Pest Management Guide



Leaf-footed Bugs and Stink Bugs

LEAF-FOOTED BUG



Citrus Rust Mites and Spider Mites



Citrus Leafminers

CLOSE-UP OF LARVAE IN LEAF



ATTACK NEW GROWTH



Fresh Leaf Miner Damage



Giant Swallowtail (Orange Dog)



Citrus Scab

FUNGAL DISEASE

- Looks like bumps on foliage and fruit.
- Spread by water droplets
- Control needed on fresh market fruit
- Copper fungicides, Abound, Gem, or Headline
- 1 applications needed after petal fall
- Heavy infestations require 3



Citrus Sources

ONLY BUY FROM REPUTABLE SOURCES

- As of now from Alabama and Louisiana
 - Star Nursery – LA
 - Saxson Becnel –LA/TX
 - Phillips Nursery - AL
- Only USDA approved nurseries in Florida
 - Murphy Citrus Nursery
 - Briteleaf Citrus Nursery
 - Harris Citrus Nursery
 - Record Buck Citrus Nursery
 - Ruck's Citrus Nursery
 - Holmberg Farms Inc.
 - Magnolia Company

SEMI FULL OF TREES



Florida Department of Agriculture

Bureau of Citrus Budwood Registration (863) 298-3041

The following pathogens, and plants infected with or exposed to the pathogens, are declared to be endemic plant pests and nuisances:

- (a) Citrus psorosis virus and concave gum/blind pocket viruses
- (b) Citrus viroids including exocortis and cachexia
- (c) Severe strains of citrus tristeza virus (most destructive virus)
- (d) Citrus tatterleaf virus
- (e) Citrus leaf blotch virus
- (f) Citrus canker (bacteria)
- (g) Citrus greening (*Huanglongbing* or HLB) (bacteria)

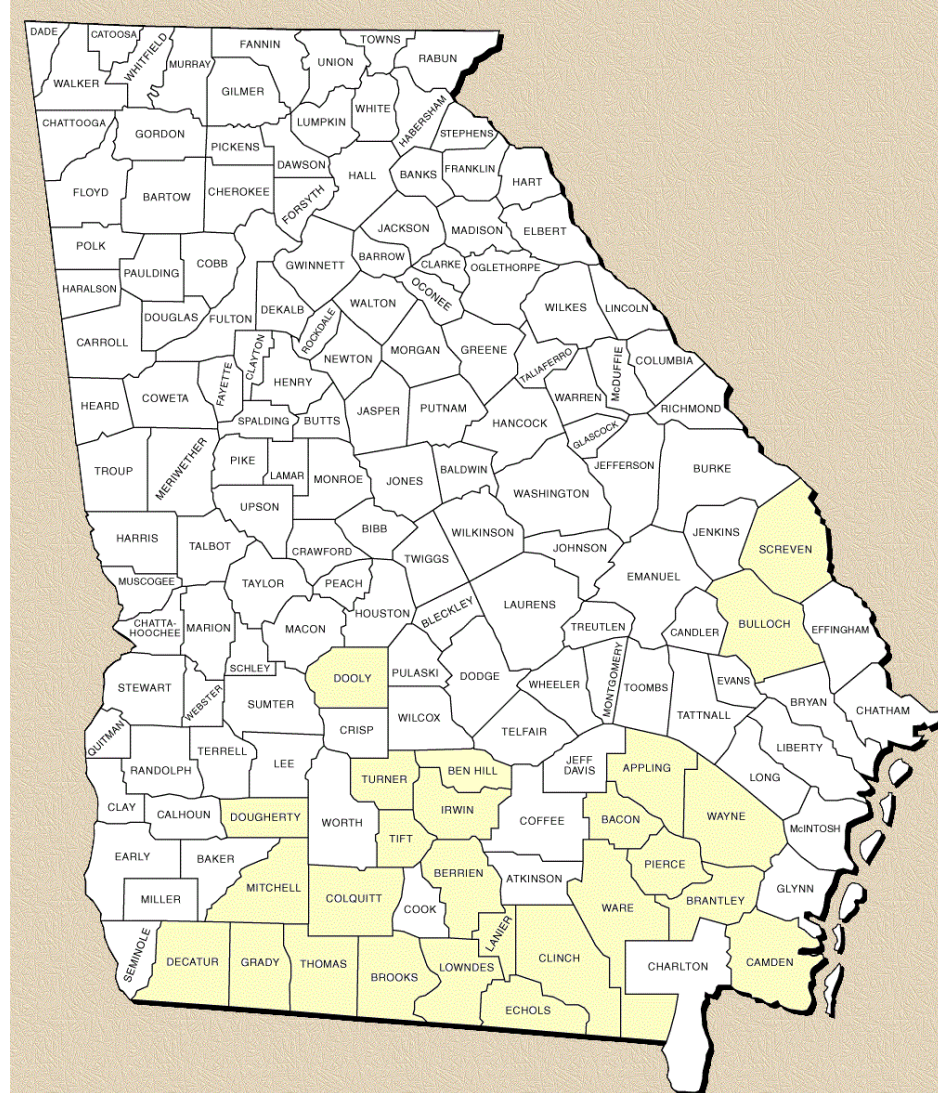
USDA inspectors must inspect and certify all citrus before leaving the state of Florida

Locations of Georgia Citrus Producers

- Thomas: 5317
- Lowndes: 4906
- Bullock: 4850
- Grady: 4525
- Echols: 2886
- Appling: 2856
- Wayne: 2476
- Brooks: 2275
- Pierce: 1932
- Lanier: 1620
- Screven: 1105
- Decatur: 1005
- Clinch: 990
- Mitchell: 899
- Bacon: 730
- Tift: 725
- Ware: 720
- Ben Hill: 500
- Dougherty: 410
- Berrien: 300
- Dooly: 300
- Irwin: 280
- Colquitt: 250
- Camden: 240
- Brantley: 108
- Turner: 55

26 Counties , 64 producers

42,260 trees / 291 acres/2017



Tree Numbers and Planting Year

Year	# Trees Planted
2017	19,867
2016	8,419
2015	4,466
2014	4,595
2013 Actual	3,455
2012	410
2011	40
2010 Actual	200
2009	300
Prior	400

'Owari 874' Satsuma Mandarin Rootstock Trial

J.L. Lomax
elementary
School

8/19/14

Sponsored by:

Langdale Corporation
United Irrigation
Lowndes County Farm
Bureau
Dasher Services
Loch Laurel Nursery
Hahira Nursery



Rootstock Trial 7/24/17



Trial Layout and Rootstocks Used

J.L. Lomax Elementary School

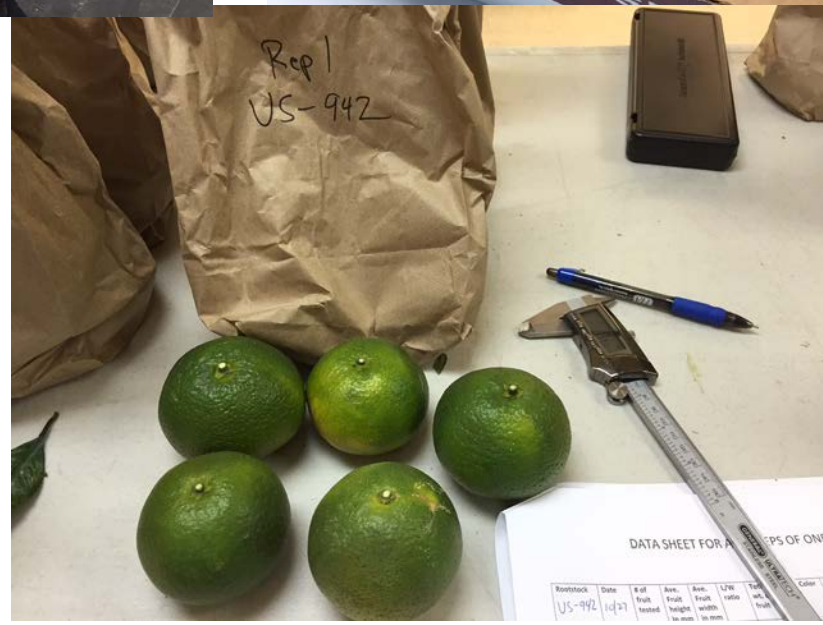
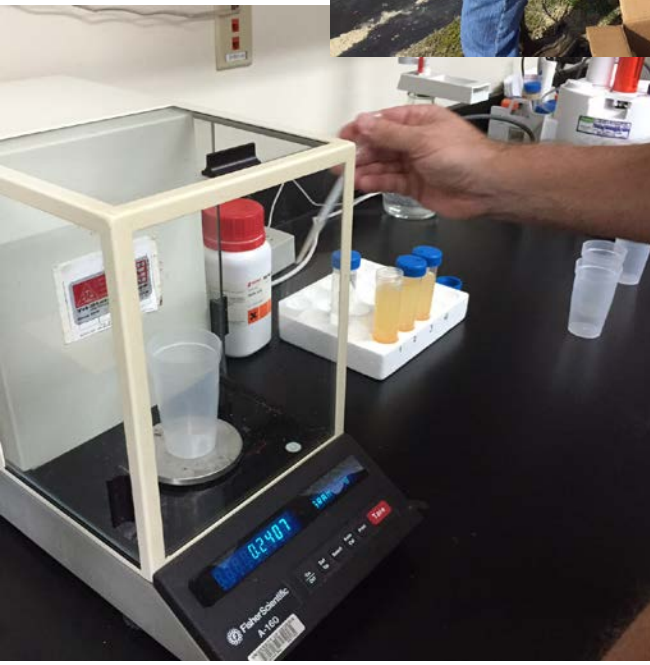
	1 and 2	3 and 4	5 and 6	
		North		
border rootstock	border rootstock	border rootstock	border rootstock	border rootstock
Carrizo	sour orange	Swingle	X-639	Carrizo
Carrizo	Rubidoux	Carrizo	Carrizo	Carrizo
Carrizo	Carrizo	US-942	US-942	Carrizo
Navel on SO	US-897	X-639	US-897	Navel on SO
Navel on SO	US-852	US-852	US-852	Navel on SO
Navel on SO	US-812	Rubidoux	US-812	Navel on SO
Navel on SO	US-942	US-812	Rubidoux	Navel on SO
Cleopatra	Cleo	Cleo	Cleo	Cleopatra
Cleopatra	X-639	sour orange	sour orange	Cleopatra
US-812	Swingle	US-897	Swingle	US-812
US-812	US-897	US-897	Cleo	US-812
US-942	US-852	Swingle	US-942	US-942
Cleopatra	X-639	Cleo	US-852	Cleopatra
Cleopatra	Rubidoux	US-852	Swingle	Cleopatra
Navel on SO	US-942	X-639	sour orange	Navel on SO
Navel on SO	US-812	US-812	Carrizo	Navel on SO
Navel on SO	Carrizo	US-942	US-812	Navel on SO
Carrizo	Swingle	sour orange	US-897	Carrizo
Carrizo	sour orange	Carrizo	Rubidoux	Carrizo
Carrizo	Cleo	Rubidoux	X-639	Carrizo
border rootstock	border rootstock	border rootstock	border rootstock	border rootstock
		South		

What will be Evaluated

- Cold tolerance
- Fruit quality (Brix/citric acid ratio)
- Ripening time
- Color
- Seed content
- Texture
- Productivity
- Fruit size

“Owari 874” Satsuma Rootstock Trial

Planted 8/2014



Rootstock Trial Results: So far

ROOTSTOCK	Total wt picked in lbs on 11/1/17	Total wt picked on 11/30	Total fruit yield per rootstock	Ave yield/tree lbs
11/30/2017				
Kuharski	0	18.2	18.2	3
US - 812	11.7	106.3	118	19.7
US - 942	11	132.9	143.9	24
Cleopatra	0	9.3	9.3	1.6
X - 639	0	21.3	21.3	3.6
Swingle	0	10.2	10.2	1.7

Variety Trial for Early Maturing Varieties

Several early varieties are being planted by growers in Georgia

THE QUESTION IS: WILL THESE VARIETIES TRULY RIPEN EARLY IN GEORGIA AND PRODUCE MARKETABLE FRUIT?

Early Maturing Satsuma Plot Layout

University of Georgia Extension Early Satsuma Variety Trial

Jake Price

Spring 2016

	Row	1	2	3	4	5	6	
	Rep			1 and 2	3 and 4	5 and 6		
Tree								
23					North			
22			Border trees	Border Trees	Border Trees	Border Trees	Border trees	
21			Border trees	Owari 25	Iveriya	Ueno	Border trees	
20			Border trees	Xie Shan	Brown Select	Miho Wase	Border trees	
19			Border trees	Iveriya	Okitsu Wase	Okitsu Wase	Border trees	
18			Border trees	Miyagawa	Ueno	Iveriya	Border trees	
17			Border trees	Miho Wase	Miyagawa	Iwasaki	Border trees	
16			Border trees	Iwasaki	Owari 25	Miyamoto	Border trees	
15			Border trees	Ueno	Iwasaki	Miyagawa	Border trees	
14			Border trees	Miyamoto	Miyamoto	Brown Select	Border trees	
13		West	Border trees	Okitsu Wase	Xie Shan	Owari 25	Border trees	East
12			Border trees	Brown Select	Miho Wase	Xie Shan	Border trees	
11			Border trees	Iwasaki	Miyagawa	Ueno	Border trees	
10			Border trees	Ueno	Okitsu Wase	Miyamoto	Border trees	
9			Border trees	Owari 25	Miyamoto	Iveriya	Border trees	
8			Border trees	Miho Wase	Xie Shan	Iwasaki	Border trees	
7			Border trees	Miyamoto	Iveriya	Miyagawa	Border trees	
6			Border trees	Miyagawa	Ueno	Okitsu Wase	Border trees	
5			Border trees	Okitsu Wase	Iwasaki	Brown Select	Border trees	
4			Border trees	Iveriya	Brown Select	Miho Wase	Border trees	
3			Border trees	Brown Select	Owari 25	Xie Shan	Border trees	
2			Border trees	Xie Shan	Miho Wase	Owari 25	Border trees	
1			Border trees	Border Trees	Border Trees	Border Trees	Border trees	

South

Border satsumas around plot

6 reps

10 varieties

60 test trees

Early Variety Trial



Comparing 8 Early
Maturing Satsuma
Varieties and UGA
Changsha to Owari 25
Satsuma.

Future Trials 2018 & 2019

- Comparing Owari 874 to Orange Frost and Artic Frost (Texas A&M) hybrid on Rubidoux rootstock.
- Comparing “Sugarbell” on US-942, US-812, US-897, and Rubidoux.
- Comparing “Silverhill” satsuma on HLB tolerant rootstocks, US-1279, 1281, 1282, 1283, 1284, 1516, and UFR-6, UFR-17, SO + 50-7 (whatever is obtainable)

Other Citrus Varieties



UGA Released Varieties



