

# Satsuma Cultivar Evaluations

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## Satsuma (*Citrus unshiu*)

- Satsuma on trifoliate orange rootstock is one of the most cold hardy commercial citrus plants.
- Tolerates temperatures as low as 12-14°F when acclimated, but damaged at 20-23°F when not acclimated.



# Introduction of Satsuma to the U.S.

- Introduced into Florida by George R. Hall in 1876 and again by Mrs. Van Valkenburg in 1878.
- “Satsuma” name credited to the wife of a U.S. minister to Japan, General Van Valkenburg, who sent trees of it home in 1878.
  - Satsuma is the name of a former province, now Kagoshima Prefecture, where it is believed to have originated.
- First planting in Alabama was in 1898.
- 1908 – 1911, approximately a million satsuma trees (‘Owari’) were imported to the U.S. from Japan.



Postcard c. 1910's,  
Mobile, AL.

# The Satsuma Belt of the early 1900's

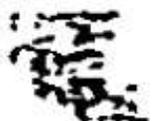


New York Times, April 18, 1915

# TURN FROM COTTON TO ORANGE GROWING

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Alabama Planters Find Fruit  
from Japan Thrives on  
Old Forest Tract.



# Passing of the Pine and Gold (satsuma) Fever

- Much of the longleaf pine forests, particularly along the MS, AL, FL Gulf Coast had been clear cut by early 1900's
- Various companies (e.g. Railroad companies) produced numerous publications to entice northerners to move south and buy portions of their extensive land holdings.
- Some large satsuma orchards >5000 acres.
- Subdivision of lands for small farms was popular.



Logging train at work – Pensacola, FL, 190?

# Orchard Homes at Grand Bay, Alabama

Developed by  
Grand Bay Land Company

- "No hard labor nor mad rush of work enter into this industry".
- "Pecans fall off trees to be gathered and marketed at one's leisure".
- "Satsumas when ripe hang on the trees for months, to be picked and shipped at convenience".
- "ONLY 100 ORCHARDS LEFT"

# A Grand Bay

ALABAMA

Satsuma Orange  
Paper Shell Pecan  
Magnolia Fig and  
Diversified Fruit

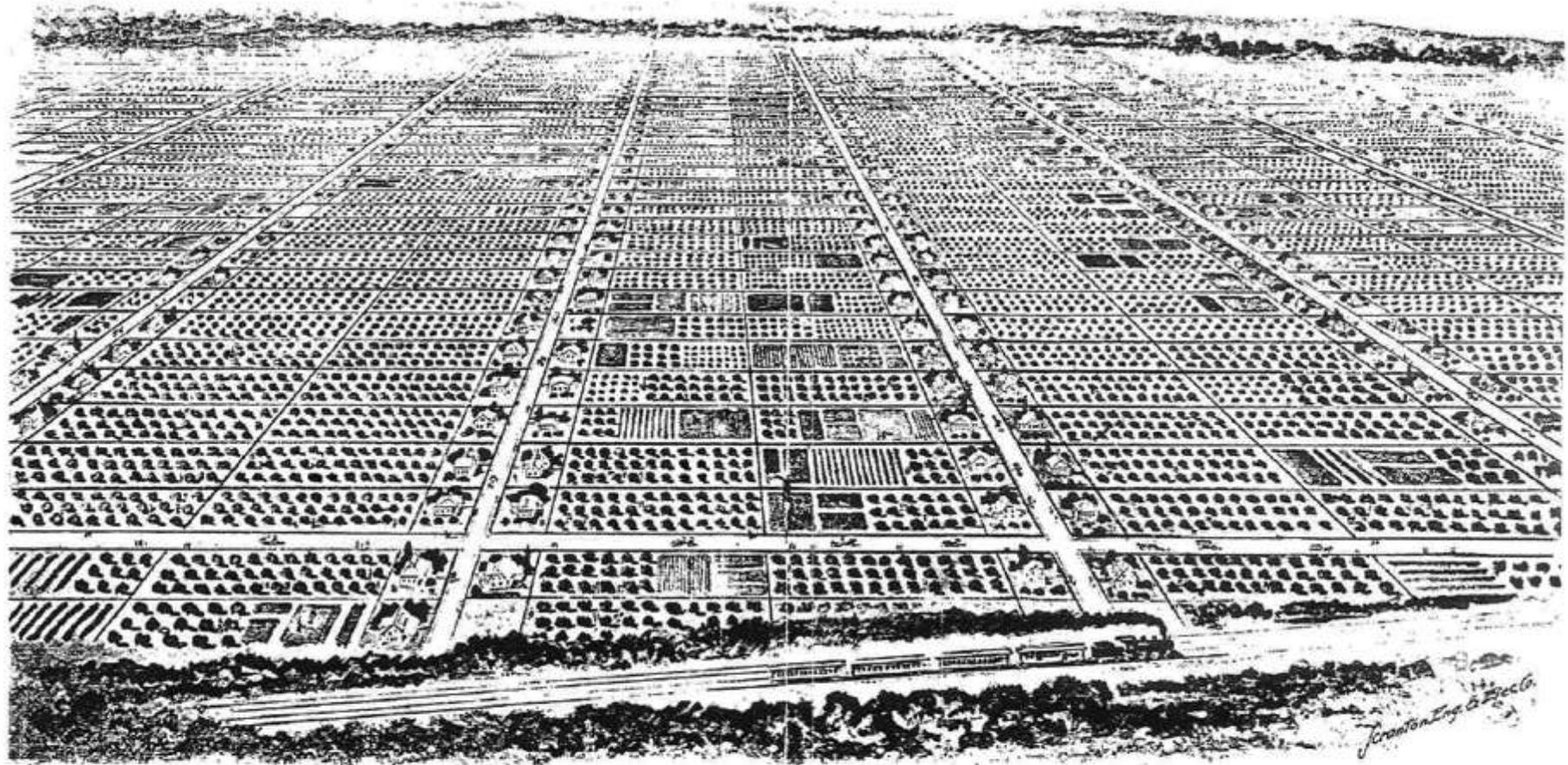
# Orchard

A Safe Investment  
Sure Income and a  
Congenial Home

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ORCHARD HOMES  
AT  
GRAND BAY-ALABAMA  
ON THE GULF OF MEXICO  
DEVELOPED BY THE  
GRAND BAY LAND COMPANY



# Gulf Coast Satsuma Industry early 1900's

- Satsumas were originally planted as interplants in pecan orchards.
- Plan was to let the satsuma trees bear for a few years, then remove.
- However, production of satsumas was so encouraging that many removed the pecan trees instead.



Pecan and satsuma grove with cover crop between rows, Milton, FL 1929.  
State Archives of Florida, Florida Memory. <https://floridamemory.com/items/show/156226>

# Gulf Coast Satsuma Industry early 1900's

- Originally, 3 varieties: 'Owari', 'Ikeda', and 'Zairai'.
- 'Owari' was (and still is) the preferred variety.
- Rootstock was (and still is) trifoliolate orange (*Poncirus trifoliata*).
- Rules and Regulations Governing the Propagation and Sale of Citrus Nursery Stock in Alabama
- Nursery Certification: Rule 27 required certificate bearing the name of nursery, variety, number of the block in nursery, and name of orchard where budwood obtained.



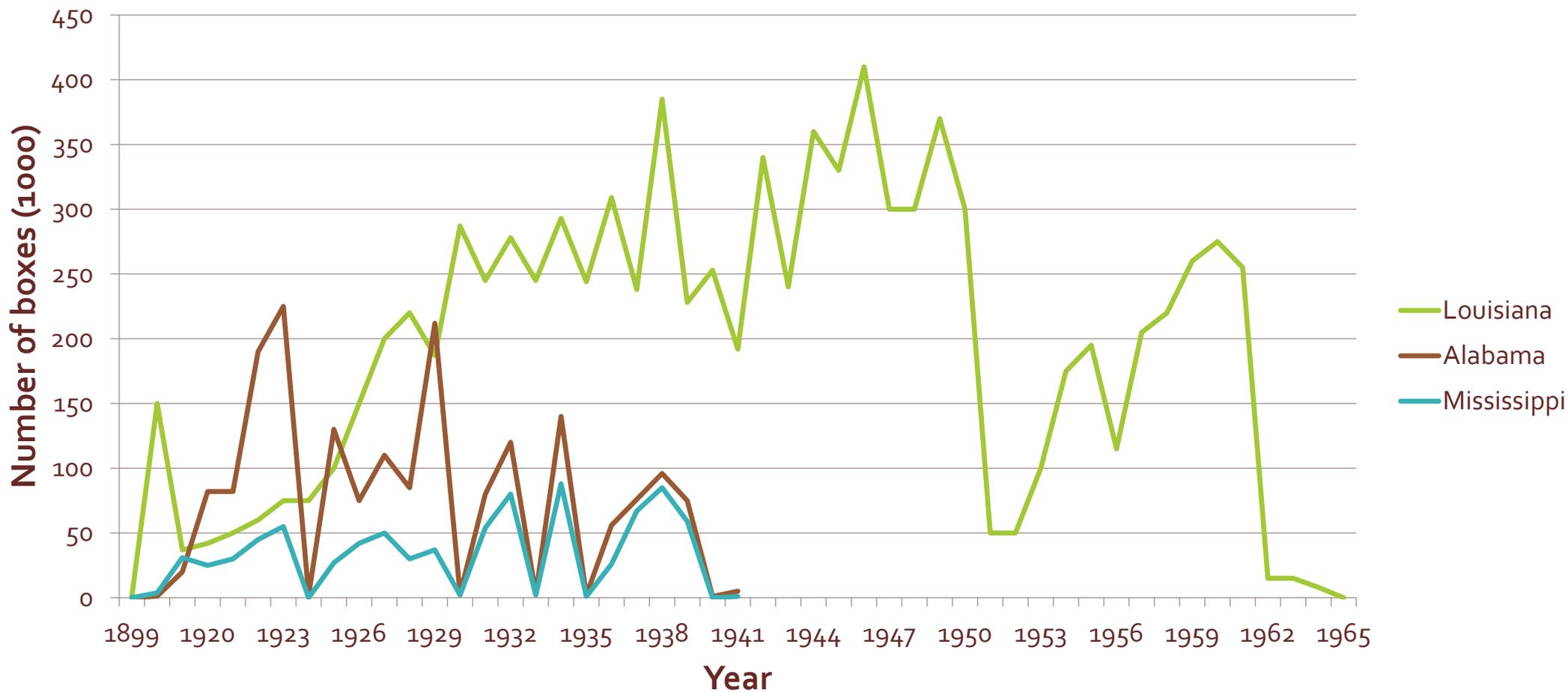
# Gulf Coast Citrus Exchange

- Gulf Coast Citrus Exchange originated in Mobile in 1915
- Responsible for grading, handling, and marketing ~75% of satsuma production
  - Marketed to cities throughout the North, including NYC and Chicago, eventually even to Europe.
- Gulf Coast Citrus Exchange marketed its fruits as follows:
  - 1st grade: Sugar Sweet
  - 2<sup>nd</sup> grade: Gulf Breeze
  - 3<sup>rd</sup> grade: Sunny South



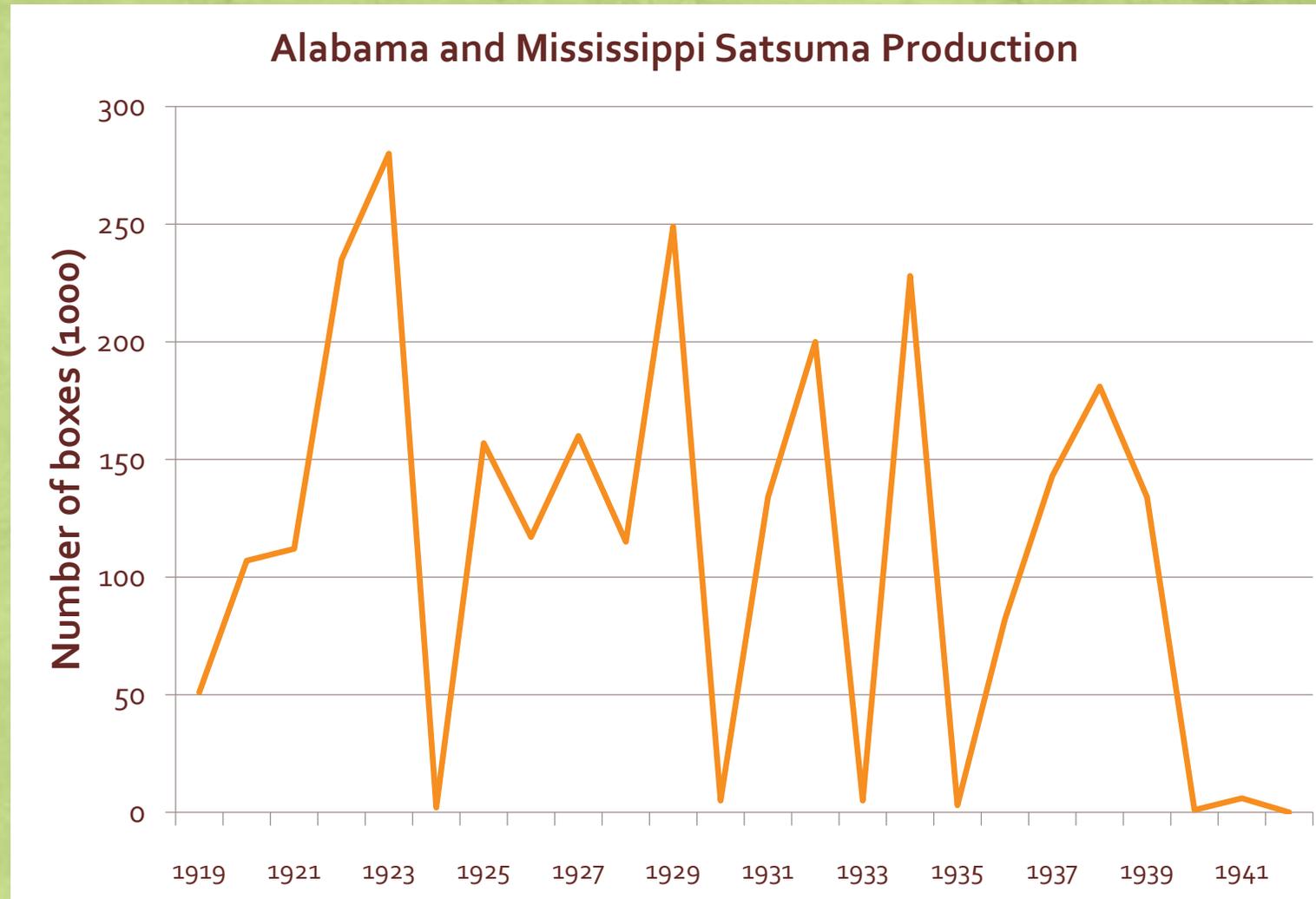
Satsuma packing plant in South Alabama, 1925.

# Number of 90 lb boxes produced by LA, AL, and MS (1899-1965)



# What happened?

- 1923 harvest – peak for AL (700 carloads)
- Jan. 6, 1924 – sudden temp. drop to 12F
- 1926 – severe storm early fall
- 1928 – freeze damage
- 1930 – severe freeze
- 1933 – severe freeze
- 1935 – 2 freeze events
- Gradual dying out of trees as a result of freeze injury (1930, 33, 35)
- Nov. 20, 1940 – sudden change in temp. from 80F to 20F. Also, very cold January.



# Production Practices: Freeze Protection

- Site selection was and still is a main focal point.
- Banking was the predominant recommendation and did save many trees.



# Production Practices: Freeze Protection

- Wood fires
- Coke heaters
- Oil-fueled heaters



Using smelt pots in orchard, South AL, 1927.

# Freeze Production Practices

## Interplanting with pine trees

- It is warmer under pine tree canopies during severe cold events.
- Fruit production may be greater in years where damaging freezes occur compared to open field.
- However, yields will be reduced under pine trees when severe freezes do not occur.



Grand Bay, AL (2 groves interplanted with pines)



Harrison, M.R., J.D. Spiers, E.D. Coneva, W. Dozier, and F. Woods. 2013. Orchard design influences fruit quality, canopy temperature, and yield of satsuma mandarin (*Citrus unshiu* 'Owari'). *International Journal of Fruit Science* 13(3):334-344

# Freeze Production Practices

## Interplanting with pecan trees

- Appears to be no advantage in terms of cold protection.
- Temperature was not different than open field during severe freeze events.



Harrison, M.R., J.D. Spiers, E.D. Coneva, F.M. Woods, J.R. Kessler, Jr., and W.A. Dozier, Jr. 2013. Influence of orchard design on 'Owari' satsuma mandarin *Citrus unshiu* (Marcovitch) fruit quality, physiology, and productivity. *Journal of the American Pomological Society* 67(1):34-46.

Harrison, M.R., J.D. Spiers, E.D. Coneva, W. Dozier, and F. Woods. 2013. Orchard design influences fruit quality, canopy temperature, and yield of satsuma mandarin (*Citrus unshiu* 'Owari'). *International Journal of Fruit Science* 13(3):334-344.

# Current freeze protection strategies: Windbreak on N and NW side



# Current freeze protection strategies: High tunnel or protective structure



Central Alabama

# Current freeze protection strategies: Microjet sprinklers



# Sprinkler Irrigation Freeze Protection

- Young Trees:
- Use Microjet type delivering 12-18 gph per tree.
- Position at or near ground level, NW side of tree 12 -24 inches high.
  - 90-180 degree pattern



Sprinkler placed incorrectly too high for young tree

# Sprinkler Irrigation for Freeze Protection

## Mature Trees:

- Place a second sprinkler delivering 18 – 25 gph among branches in center of tree
  - 4 ft high, 360 degree pattern



# Irrigation for Freeze Protection

- May be an “evaporative dip”, a 15-30 minute drop in ambient air temp due to evaporative cooling when the system is first turned on.
- If system fails for any reason during the night, it turns into a refrigeration system.
- When turning off system, wait until melting water is running freely between the ice and branches or if ice falls easily when branches are shaken.

Suggested starting temps for irrigation for frost protection

| Wet bulb temp | Starting temp |
|---------------|---------------|
| °F            | °F            |
| > 26          | 34            |
| 24 - 25       | 35            |
| 22 - 23       | 36            |
| 20 - 21       | 37            |
| 17 - 19       | 38            |
| 15 - 16       | 39            |

# Satsuma Yield

('Owari' on 'Rubidoux' trifoliolate orange)

## Tree Age - Growing Season

| <u>Unit</u> | <u>1</u> | <u>2</u> | <u>3</u> | <u>4</u> | <u>5</u> | <u>6</u> | <u>7</u> | <u>8</u> | <u>9+</u> |
|-------------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| lb/tree     | 0        | 0        | 70       | 120      | 190      | 250      | 350      | 350      | 400       |

| <b>Trees/<br/>Acre</b> | <b>Yield/<br/>Tree</b> | <b>\$.30/lb</b> | <b>\$.50/<br/>lb</b> | <b>\$.75/lb</b> |
|------------------------|------------------------|-----------------|----------------------|-----------------|
| 116                    | 200                    | \$6,960         | \$11,600             | \$17,400        |
| 116                    | 300                    | \$10,440        | \$17,400             | \$26,100        |
| 116                    | 400                    | \$13,920        | \$23,200             | \$34,800        |



# Rootstock Selection

- Common rootstocks
  - **Trifoliate Orange**, Sour Orange, Rough Lemon, Swingle Citrumelo, Cleopatra Mandarin, etc.
- Size Control—Dwarfing (Flying Dragon)
- Nematode and Phytophthora resistance
- CTV Resistance
- Soil pH tolerance
- Cold tolerance (Trifoliate Orange is best)

# Rootstocks



'Flying Dragon' Trifoliate Orange



'Rubidoux' Trifoliate Orange



'Swingle' Citrumelo

# Satsuma 'Owari' on 'Rubidoux' vs 'Flying Dragon'

- Typical spacing  
20' x 20' = 108 trees/A
- Year 4 production ~ 120  
lbs/tree = 12,960 lbs/A
- Year 8 ~ 350 lbs/tree  
= 37,800 lbs/A

- Spacing?  
8' x 16' = 340 trees/A
- Year 4 production ~ 30  
lbs/tree = 10,200 lbs/A
- Year 8 ~ 120 lbs/tree  
= 40,800 lbs/acre

- 'Rubidoux' provides much greater yield potential on a per tree basis.
- 'Flying Dragon' has comparable yield potential on a per acre basis...along with greater ease of management/harvest.
- Early satsuma cultivars are also less vigorous, so may want to stick with Rubidoux.

'Owari' on 'Rubidoux'



'Owari' on 'Flying Dragon'



# Rootstock selection is important

Pictures taken on 2/28/2014

Owari grafted onto different rootstocks

Swingle



Rubidoux



Flying Dragon



# Satsuma mandarins trialed at GCREC

- Armstrong Early
- Early St. Ann
- LA Early
- China 9
- Miho Wase
- Okitsu
- Brown's Select
- Kimbrough
- China 2
- China 6
- China 7
- Mr. Mac
- GCS-1 (Dogpen)
- Owari
- Silverhill
- Dobashi Beni

# Early Season Satsuma SS/TA Ratio

|            | 2005   |         | 2006     |         | 2007   |        | 2008    | 2009    |        | 2010   |        |
|------------|--------|---------|----------|---------|--------|--------|---------|---------|--------|--------|--------|
|            | Oct 27 | Nov. 18 | Sept. 29 | Oct. 23 | Oct 18 | Nov. 6 | Nov. 13 | Sept 24 | Oct. 7 | Oct. 7 | Nov. 1 |
| Armstrong  | 9.9    | 17.3    | 14.3     | 15.7    | 11.2   | 13.0   | 12.7    | 9.4     | 12.4   | 10.1   | 13.0   |
| China 9    | 7.9    | 15.0    | 11.8     | 12.1    | 8.3    | .      | 11.3    | 8.5     | 11.8   | 5.3    | 9.5    |
| E. St. Ann | 9.6    | 18.5    | 14.2     | 14.8    | 10.8   | 12.9   | 15.5    | 11.8    | 13.4   | 6.9    | 12.9   |
| LA Early   | 8.7    | 18.6    | 16.0     | 16.5    | 12.7   | 12.0   | 14.2    | 12.3    | 13.3   | 8.3    | 12.1   |
| Miho       | .      | .       | .        | .       | 11.4   | 11.4   | 12.3    | 12.8    | 11.5   | 9.3    | 14.6   |
| Okitsu     | 10     | 17.0    | 14.8     | 14.9    | 11.3   | 11.6   | 14.1    | 12.1    | 13.0   | 6.5    | 12.1   |
| Owari      | 6.0    | 11.4    | 7.0      | 10.8    | 6.4    | 8.2    | 8.6     | 5.7     | 6.7    | 4.8    | 6.9    |

# Satsuma color ratings



*1=Pre-Color Break; completely green colored fruit*



*2=Initial Color Break; predominantly green fruit with one to few isolated areas of yellow.*



*3=Significant yellow mottling; fruit has multiple areas of yellow, little to no orange color.*



*4=Market-ready color; predominantly yellow to orange; few areas of green remain.*



*5=Final Coloration; predominantly orange fruit; or yellow to orange transition; no green remaining.*

# Early Satsuma color ratings

|            | 2005   |         | 2006     |         | 2007   |        | 2008    | 2009    |        | 2010   |        |
|------------|--------|---------|----------|---------|--------|--------|---------|---------|--------|--------|--------|
|            | Oct 27 | Nov. 18 | Sept. 29 | Oct. 23 | Oct 18 | Nov. 6 | Nov. 13 | Sept 24 | Oct. 7 | Oct. 7 | Nov. 1 |
| Armstrong  | 3.0    | 4.3     | 2.6      | 3.8     | 2.8    | 3.9    | 4.3     | 2.7     | 2.8    | 2.3    | 3.2    |
| China 9    | 3.3    | 4.2     | 2.3      | 3.2     | 2.7    | 3.7    | 4.3     | 2.9     | 3.0    | 2.3    | 3.1    |
| E. St. Ann | 3.6    | 4.4     | 2.2      | 3.6     | 3.2    | 4.4    | 4.3     | 3.0     | 3.0    | 2.5    | 3.6    |
| LA Early   | 3.2    | 4.3     | 2.6      | 3.7     | 3.4    | 4.1    | 4.4     | 3.0     | 3.0    | 3.1    | 3.4    |
| Miho       | .      | .       | .        | .       | 3.0    | 3.0    | 3.5     | 3.0     | 2.8    | 2.9    | 3.9    |
| Okitsu     | 3.1    | 4.8     | 2.6      | 3.9     | 3.0    | 3.8    | 4.3     | 3.0     | 3.1    | 2.5    | 3.2    |
| Owari      | 1.6    | 3.4     | 1.4      | 2.1     | 1.4    | 2.4    | 2.8     | 1.4     | 1.8    | 2.0    | 2.8    |

# Early Satsuma Yields (lbs) (on Flying Dragon)

| Variety    | 2006 | 2007  | 2008  | 2009  | 2010 | 2011  |
|------------|------|-------|-------|-------|------|-------|
| Armstrong  | 46.1 | 17.4  | 80.7  | 77.5  | 25.3 | 80.5  |
| China 9    | 44.6 | 23    | 80.3  | 85.9  | 37.2 | 98.7  |
| E. St. Ann | 43.6 | 15.9  | 83.2  | 93.4  | 22.0 | 72.8  |
| LA Early   | 11.4 | 25.1  | 34.9  | 89.1  | 88.7 | 82.6  |
| Miho       | 35.5 | 10.5  | 44.6  | 48.4  | 29.7 | 26.3  |
| Okitsu     | 31.2 | 11.8  | 44.6  | 48.1  | 31.2 | 37.2  |
| Owari      | 82.1 | 108.4 | 122.5 | 187.4 | 55.7 | 171.7 |

Oct. 16, 2009



# Late season satsuma SS/TA ratio

|            | 2005   |        | 2006   |        | 2007  |       | 2008   |       | 2009  |       | 2010  |        |
|------------|--------|--------|--------|--------|-------|-------|--------|-------|-------|-------|-------|--------|
|            | 27-Oct | 18-Nov | 23-Oct | 30-Nov | 6-Nov | 7-Dec | 13-Nov | 4-Dec | 7-Oct | 5-Nov | 1-Nov | 15-Nov |
| B Select   | 6.8    | 13.4   | 9.0    | 13.0   | 9.9   | 11.1  | 11.2   | 13.8  | 10.1  | 14.2  | 7.7   | 12.4   |
| Kimbrough  | 6.8    | 14.4   | 8.9    | 14.6   | 8.9   | 11.2  | 10.8   | 12.8  | 9.6   | 14.4  | 10.4  | 13.2   |
| Silverhill | 7.2    | 13.2   | 8.3    | 16.4   | 8.8   | 12.7  | 10.8   | 12.2  | 8.9   | 15.5  | 9.6   | 12.1   |
| GCS-1      | 6.0    | 11.4   | 8.6    | 14.0   | 8.2   | 10.9  | 8.5    | 9.6   | 6.7   | 11.5  | 6.9   | 9.9    |
| Owari      | 8.3    | 16.8   | 8.5    | 14.3   | 10.3  | 10.5  | 12.7   | 13.0  | 10.3  | 15.4  | 10.0  | 14.5   |

# Late season satsuma color ratings

|            | 2005   |        | 2006   |        | 2007  |       | 2008   |       | 2009  |       | 2010  |        |
|------------|--------|--------|--------|--------|-------|-------|--------|-------|-------|-------|-------|--------|
|            | 27-Oct | 18-Nov | 23-Oct | 30-Nov | 6-Nov | 7-Dec | 13-Nov | 4-Dec | 7-Oct | 5-Nov | 1-Nov | 15-Nov |
| B Select   | 2.1    | 4.3    | 2.3    | 4.8    | 3.2   | 4.4   | 3.7    | 4.9   | 1.9   | 3.1   | 1.3   | 3.0    |
| Kimbrough  | 1.6    | 3.6    | 2.2    | 4.6    | 2.0   | 4.1   | 3.4    | 4.1   | 2.0   | 3.1   | 1.7   | 3.8    |
| Silverhill | 1.7    | 3.3    | 2.2    | 4.9    | 2.8   | 4.3   | 3.2    | 3.8   | 1.9   | 2.9   | 1.8   | 3.4    |
| GCS-1      | 1.6    | 3.4    | 2.1    | 5.0    | 2.4   | 4.2   | 2.8    | 4.6   | 1.8   | 2.9   | 2.0   | 4.2    |
| Owari      | 1.5    | 2.5    | 2.3    | 4.4    | 3.3   | 4.7   | 3.8    | 4.3   | 3.9   | 3.0   | 1.3   | 3.1    |

# Late season satsuma yields on 'Flying Dragon' (lbs)

| Variety       | 2006 | 2007  | 2008  | 2009  | 2010 | 2011  |
|---------------|------|-------|-------|-------|------|-------|
| Browns Select | 53.8 | 63.3  | 110.9 | 138.2 | 56.5 | 126.8 |
| Kimbrough     | 49.4 | 51.8  | 101.6 | 160.2 | 81.8 | 151.9 |
| Silverhill    | 30.3 | 50.0  | 92.8  | 137.0 | 32.8 | 141.5 |
| GCS-1         | 59.7 | 44.6  | 117.4 | 157.9 | 70.3 | 177.0 |
| Owari         | 74.9 | 106.4 | 122.5 | 187.4 | 55.7 | 171.7 |

# Other Citrus Trialed

- Algerion clementine
- Dancy tangerine
- Seedless Kishu
- Marisol clementine
- Russia #1
- Fina Sodea clementine



# Seedless kishu - Niche crop



# Evaluation of Satsuma Selections from China



Jay Spiers  
Bryan Wilkins  
Billy Dozier

# Evaluation of China Selections

## 2 Trials: GCREC, WREC

- Armstrong
- Brown Select
- Owari
- S-1
- S-2
- S-3
- S-5
- S-6
- S-7
- S-8
- S-9
- S-12
- S-15
- S-17
- S-18
- 6-15
- 6-18
- S-20
- 6-21
- 6-22

|              | OCTOBER 26, 2011 |         |         | NOVEMBER 10, 2011 |       |           |         |            |
|--------------|------------------|---------|---------|-------------------|-------|-----------|---------|------------|
| Variety      | SSC/TA           | COLOR   | TEXTURE | SSC/TA            | COLOR | TEXTURE   | WEIGHT  | YIELD      |
| Armstrong    | 15.8 A           | 5.8 A   | 1.0 B   | 14.9 A            | 5.8   | 1.6 CD    | 109 D   | 24.7 BCDEF |
| Brown Select |                  |         |         | 12.8 ABCD         | 5.4   | 2.0 BCD   | 139 CD  | 25.4 BCDEF |
| Owari        | 9.7 CDE          | 4.0 C   | 2.0 AB  | 10.5 DE           | 5     | 2.75 ABCD | 128 CD  | 11.4 EF    |
| S-1          | 12.6 ABCD        | 6.0 A   | 2.2 AB  | 13.4 ABC          | 6     | 1.8 BCD   | 100 D   | 32.1 ABCDE |
| S-2          | 9.4 DE           | 4.0 C   | 3.2 A   | 9.9 E             | 4.6   | 3.8 ABC   | 205 AB  | 22.1 CDEF  |
| S-3          | 11.5 BCDE        | 4.25 BC | 2.0 AB  | 10.7 CDE          | 4.75  | 2.0 BCD   | 174 BC  | 24.0 BCDEF |
| S-5          | 13.7 AB          | 5.0 ABC | 1.0 B   | 13.3 ABC          | 5.8   | 1.2 D     | 138 CD  | 42.2 ABC   |
| S-6          | 9.3 E            | 5.0 ABC | 2.5 AB  | 9.8 E             | 5     | 2.6 BCD   | 144 CD  | 19.4 DEF   |
| S-7          | 10.1 CDE         | 5.0 ABC | 1.0 B   | 8.8 E             | 5     | 3.0 ABCD  | 138 CD  | 14.5 EF    |
| S-8          | 9.9 CDE          | 5.25 AB | 2.0 AB  | 9.7 E             | 5.5   | 2.3 BCD   | 115 D   | 19.2 DEF   |
| S-9          | 12.8 ABC         | 6.0 A   | 1.0 B   | 13.1 ABCD         | 6     | 1.6 CD    | 114 D   | 36.4 ABCD  |
| S-15         | 12.7 ABC         | 5.0 ABC | 2.0 AB  | 12.9 ABCD         | 5.6   | 1.6 CD    | 130 CD  | 37.2 ABCD  |
| S-17         | 12.5 BCDE        | 5.0 ABC | 2.0 AB  | 12.7 ABCD         | 5.75  | 2.4 BCD   | 146 CD  | 30 ABCDEF  |
| S-18         | 13.5 AB          | 5.5 A   | 1.5 B   | 13.6 AB           | 5.5   | 1.75 BCD  | 114 D   | 50.4 A     |
| 6-15         | 13.4 AB          | 5.2 AB  | 1.0 B   | 14.0 A            | 5.6   | 1.8 BCD   | 107 D   | 43.5 AB    |
|              | <0.0001          | <0.0001 | <0.0001 | <0.0001           | NS    | <0.0001   | <0.0001 | <0.0001    |

# When to harvest?

## Internal quality (sugar and acid)

- Brix=soluble solids=Sugar
  - Measured by light refractometer
- Titratable acidity=% Citric Acid
  - Measured by acid titration procedure



### **Brix: Acid Ratio (10:1 desired)**

8.7 Brix: 0.87% Acid=10:1

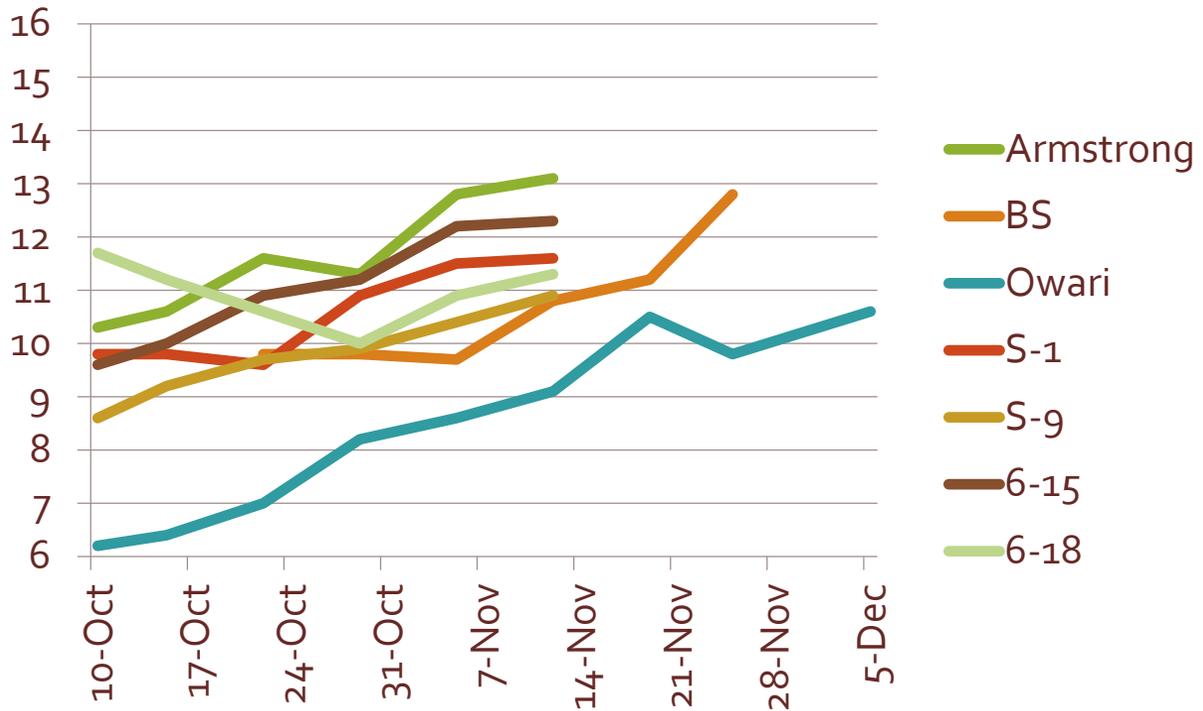
6.8 Brix: 0.68% Acid=10:1



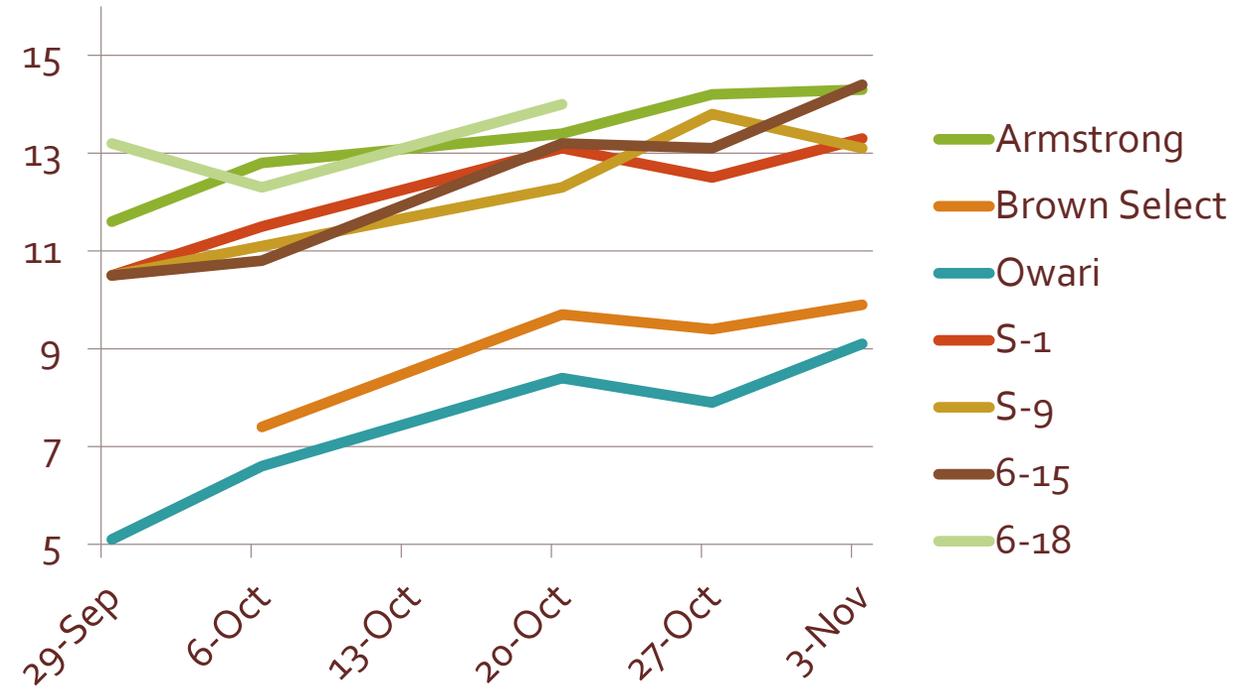
Not the same tasting fruit!!!

# Soluble Solids/TA ratio

2013

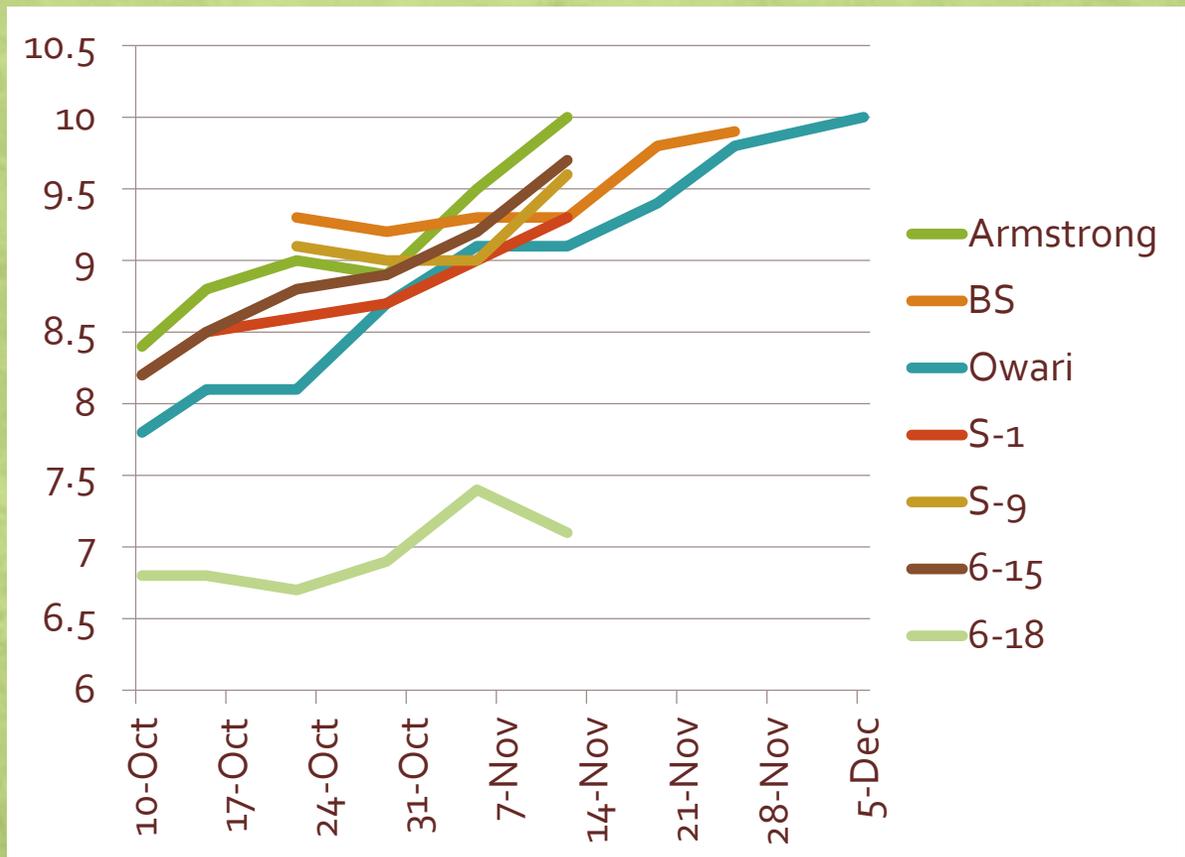


2016

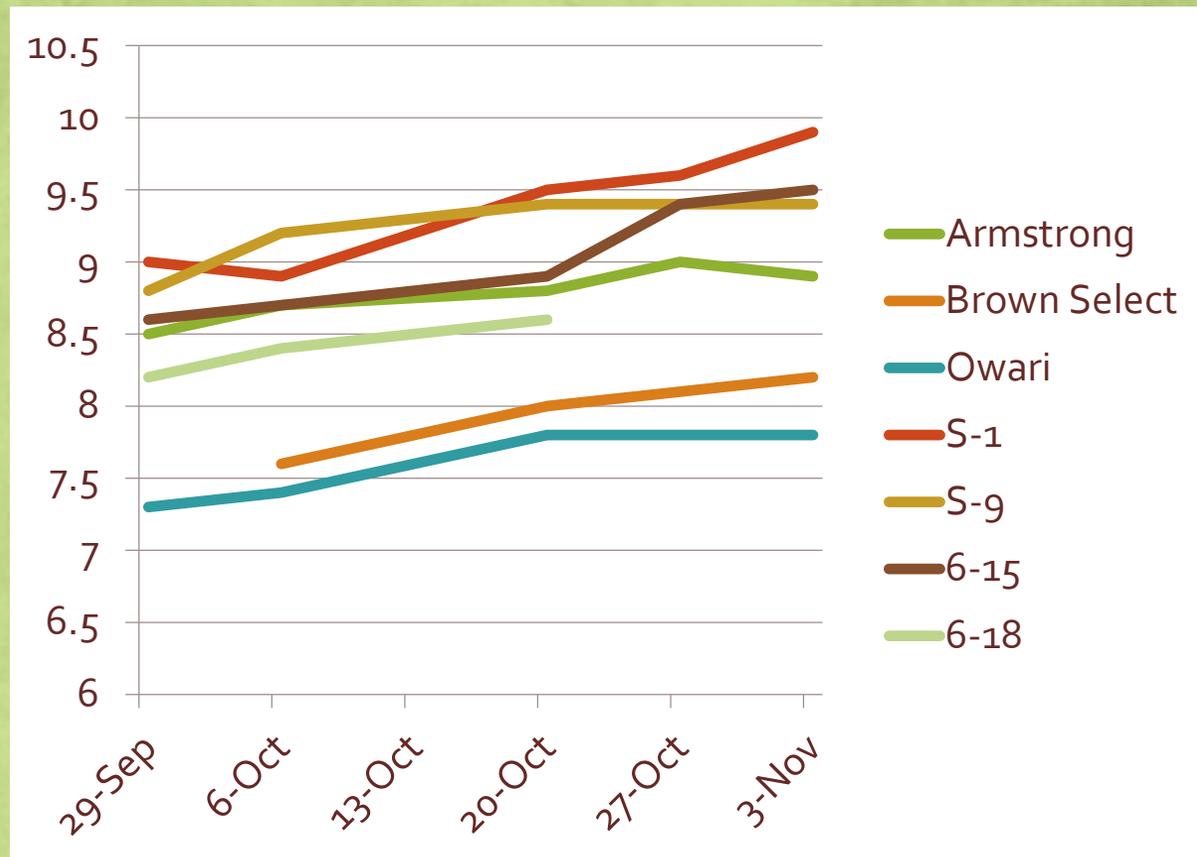


# Soluble Solids Content

2013

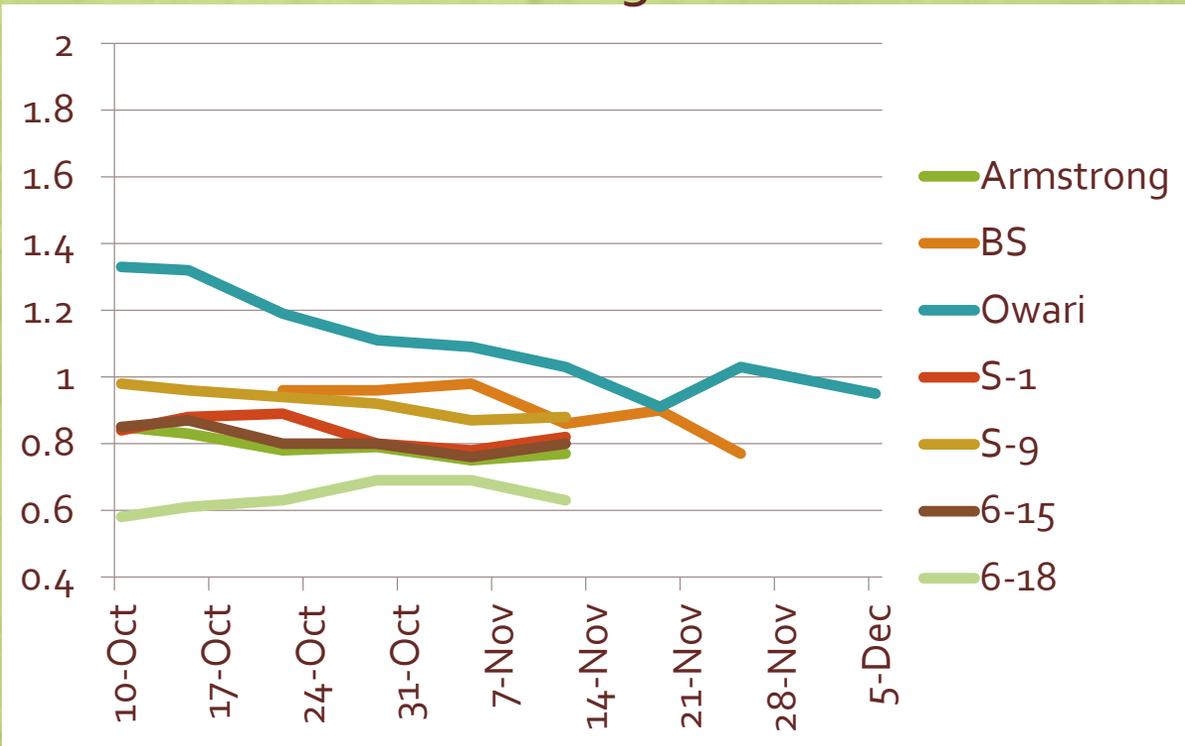


2016

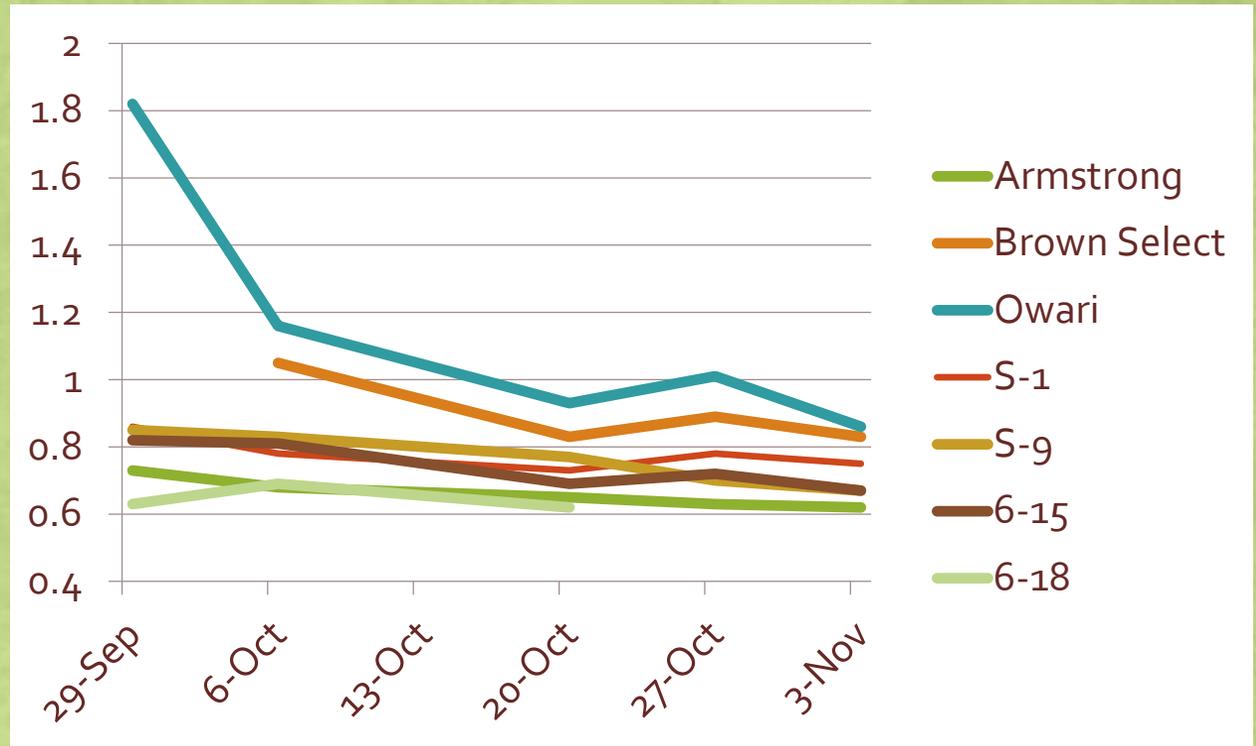


# Titratable Acidity

2013

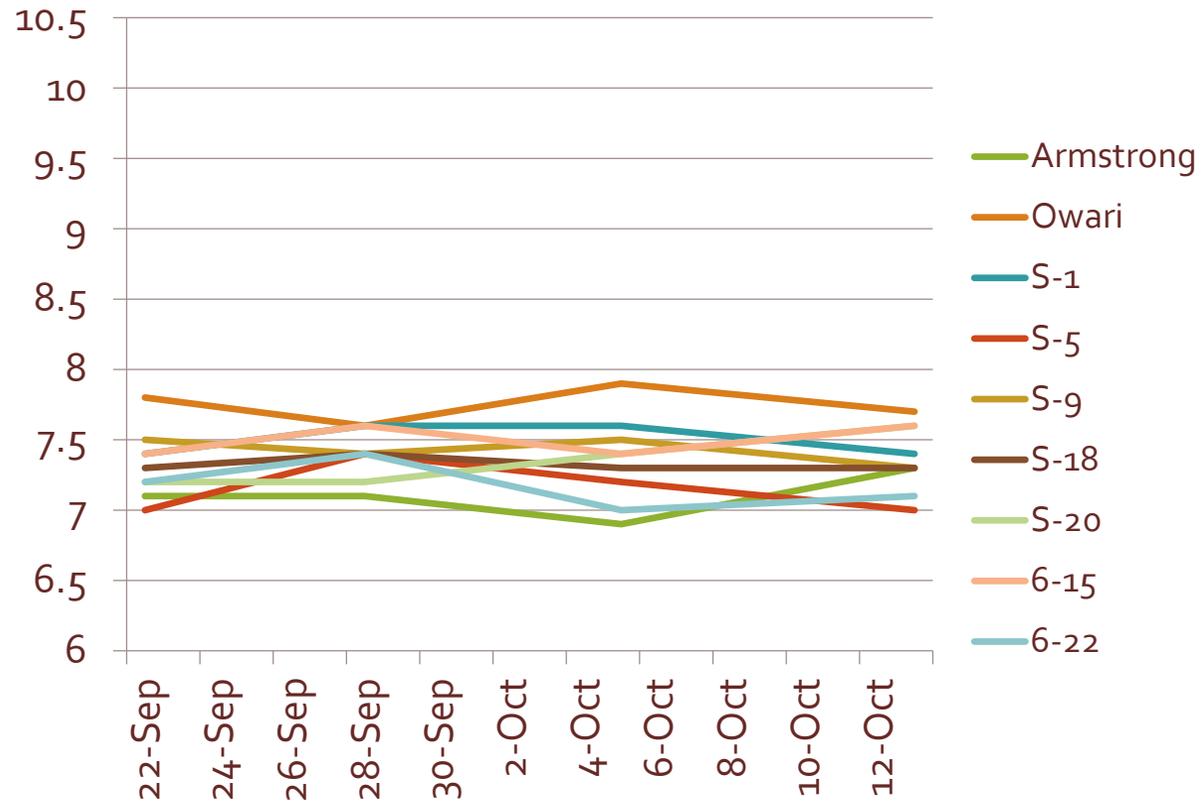


2016

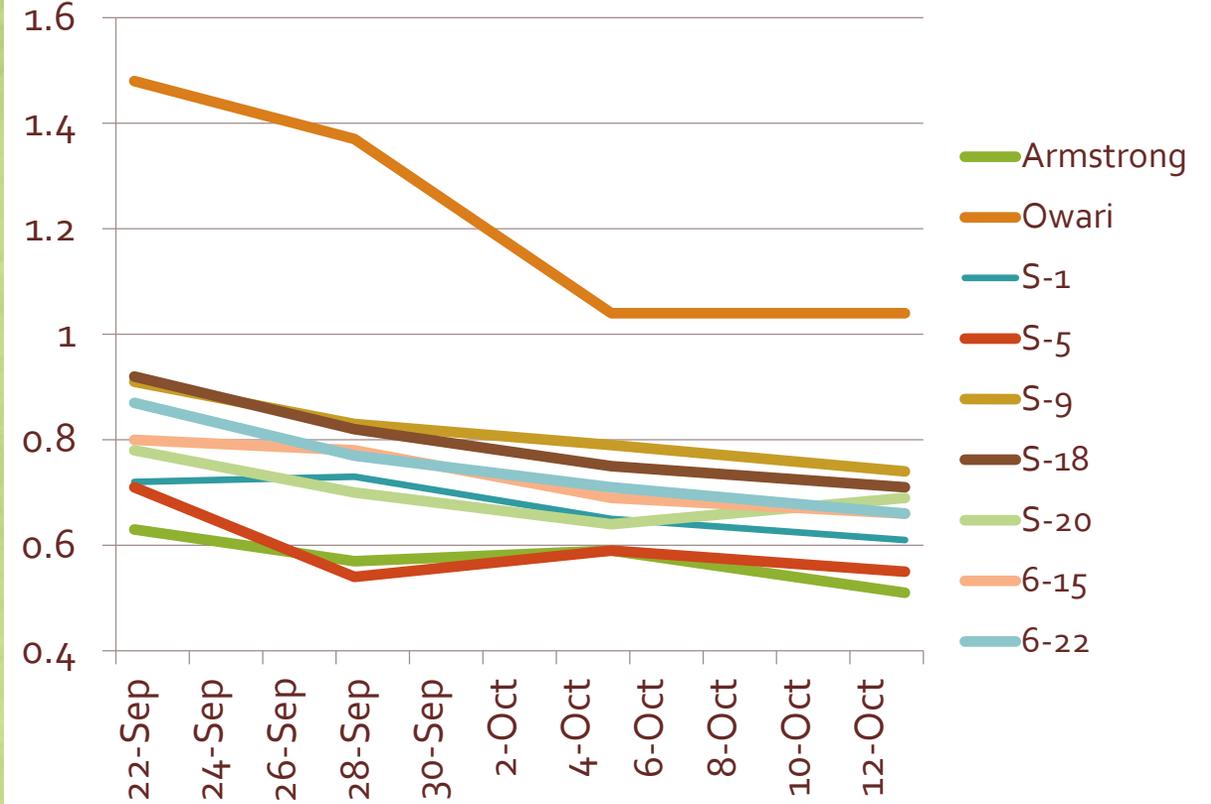


# 2017 GCREC

## Soluble Solids



## Titratable Acidity



# Size

- Can be highly variable within canopy
- Crop load is biggest factor
- Water is second biggest factor
- Fertilizer is a related factor



# What causes large, thick-skinned, rough fruit?

- Light crop or high leaf to fruit ratio
  - Common on young plants
- Freeze injury to foliage
  - Heavy fruit drop
- Alternate bearing
- Late blooming



You must set lots of blooms to get thin-skinned satsumas



# How to set lots of blooms

- Fertilize with nitrogen according to tree age and crop load.
- Fertilize early, well in advance of blooming.
- Protect foliage from winter damage to avoid leaf drop.
- Prevent injury to foliage by red mites, etc.
- Water trees diligently from budbreak through early fruit drop.

# China 6-18

## Oct. 22, 2010

- Looked promising because it is the earliest, but fruit quality is not good.



# China 9 (S-9)

11-1-11



9-28-11



10-19-11

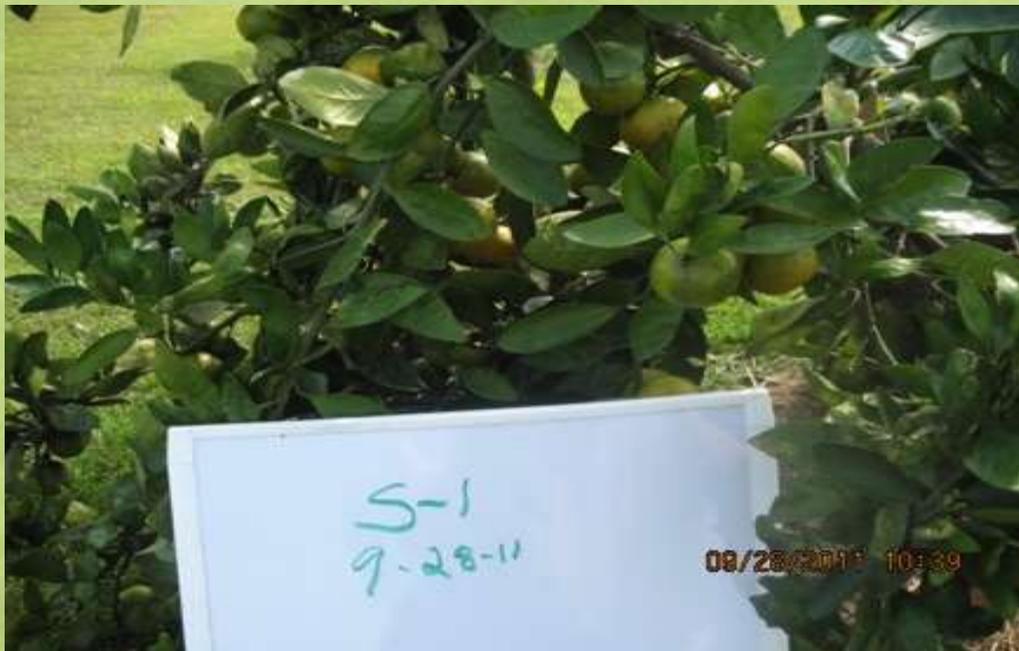


# China 1 (S-1)

11-1-11



9-28-11



10-19-11



# China 6-15



10/19/11



11/1/11



# China 18 (S-18)

11-1-11



9-28-11



10-19-11



# Armstrong



10-19-11



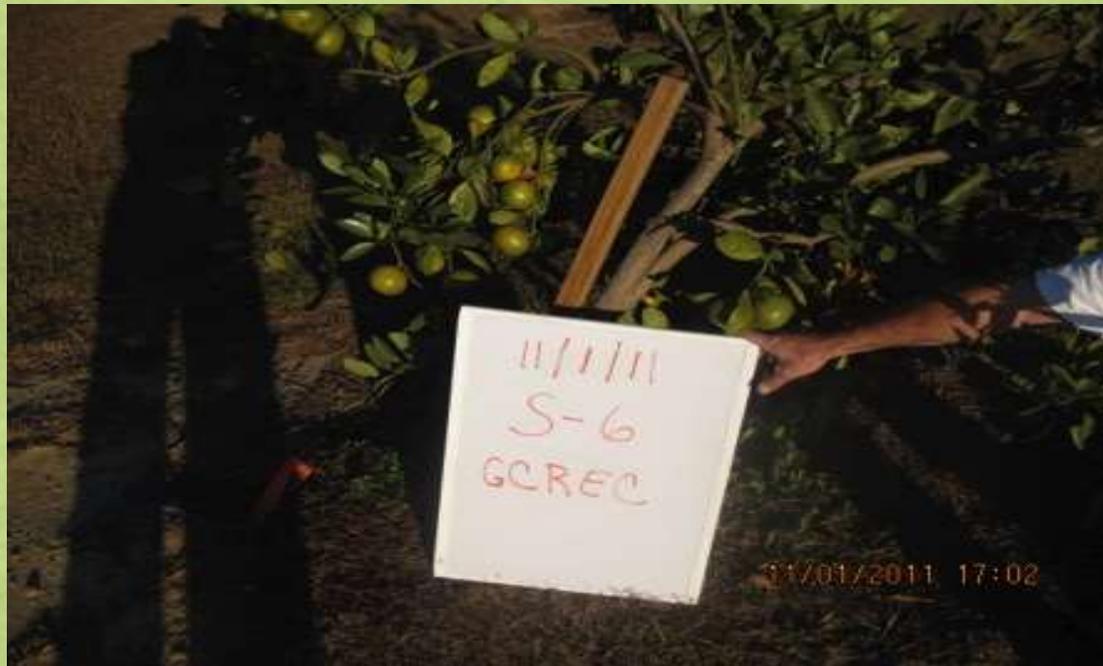
11-1-11



# China 6 (S-6)

Late

Nov. 1, 2011



# China 15 (S-15)

Early based on SSC/TA

Late peel color development

11-1-11



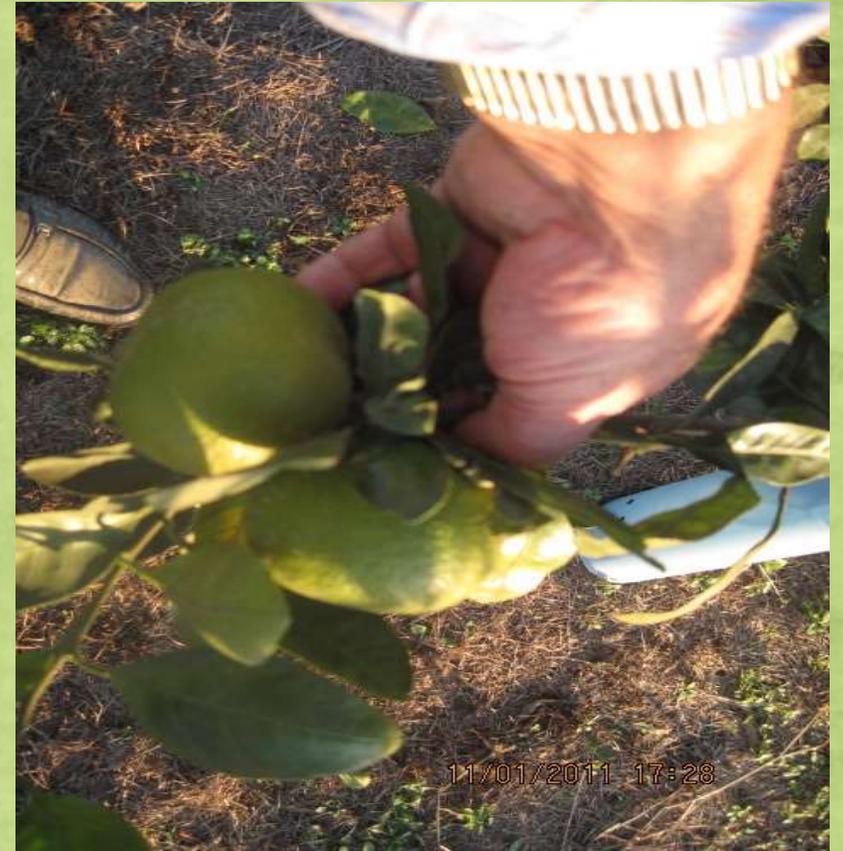
# China 5 (S-5)

11/1/11



# Owari

Nov. 1, 2011



# Brown's Select

11/1/2011



# Satsuma selections on 10/19/2011

China S-9

Armstrong

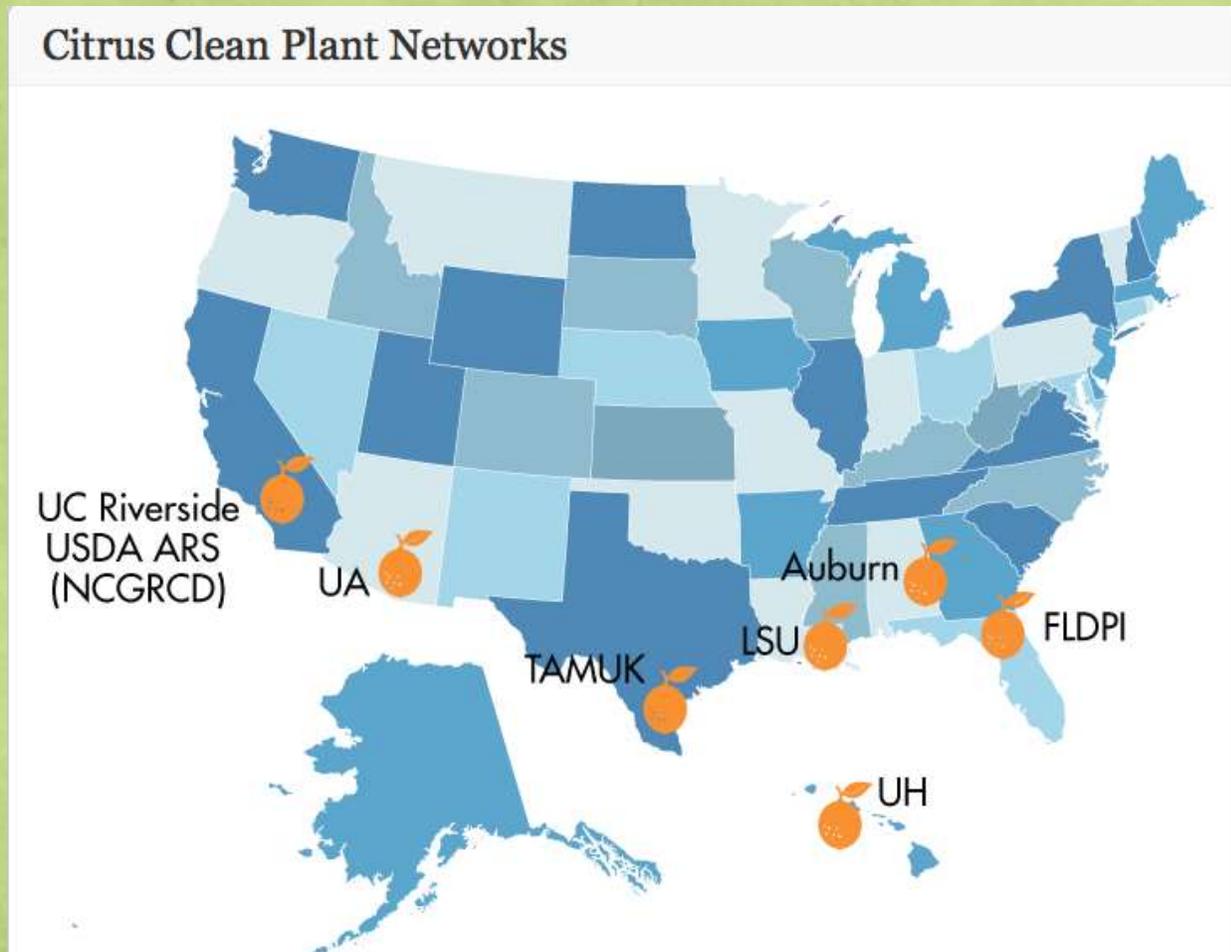
China 6-15



# About the National Clean Plant Citrus Network

The overall mission of the NCPN Citrus is to provide a reliable source of high-quality asexually propagated citrus propagative material to the citrus nursery industry and researchers that is free of graft-transmissible pathogens, ensuring that the U.S. citrus industry remains globally competitive.

<http://ncpncitrus.org>



# Alabama Citrus Clean Plant Network

- Establish and maintain pathogen-tested foundation block for future use and release
- Test citrus germplasm for graft-transmissible pathogens



# Citrus Varieties Currently in AL Foundation Block

- Owari
- Armstrong
- Kuno Wase
- Miho Wase
- China 9
- Okitsu
- Kawano Wase
- Dobashi Beni
- Early St. Ann
- Silverhill
- China S-18
- China S-1
- China 6-15
- Meyer Lemon
- Nagami kumquat
- Seedless Kishu



# Useful website:

<http://www.citrusvariety.ucr.edu>