



Jay Spiers, Associate Professor (Fruit Crops), Dept. of Horticulture, Auburn University  
 Dept. of Horticulture, Auburn, AL  
 Monte Nesbitt, Dept of Hort., Texas A&M University, College Station, TX  
 Bryan Wilkins, Research Associate, Auburn University, Gulf Coast Research and Extension Center,  
 Fairhope, AL

**Varieties**

All varieties of Satsumas have a very similar degree of freeze hardiness, bearing potential and fruit quality, but vary somewhat in ripening date. Each variety is self-fruitful, so no pollinizer trees are required. Bees probably help in pollination and fruit set, but are not required.

**Satsuma Varieties currently available in Alabama**

Variety	Ripening Date
Owari	Late October-Nov.
Kimbrough	Late October-Nov.
Brown's Select	Mid-Late October
Armstrong Early	Early October
Early St. Ann	Early October
LA Early	Early October
Okitsu Early	Early October

**Best Rootstocks for Alabama**

Trifoliolate Orange (*Poncirus trifoliata*) also called "Trifoliata". This plant stops active growth early in the Fall, which promotes cold acclimation. Trifoliolate Varieties: Rubidoux (standard form) and Flying Dragon (slightly more dwarfing).

Swingle Citrumelo. A hybrid cross between Trifoliata and Pummelo. Trees grow faster and will get larger, but is not as cold hardy as Trifoliata.

**Spacing and Planting**

Satsumas on Trifoliolate Orange should be spaced **no closer than 20 feet apart** if the tree is to be harvested as a free-standing tree. If a hedgerow is desired, trees can be spaced as close as 15 feet apart in the row, with a 20-25 ft row spacing to allow equipment passage through the grove. Satsumas on Flying Dragon can be spaced closer in the row (~10 feet apart).

Container plants should be set in the ground at the same depth they are in the pot, taking care not to place the graft union below ground level. Mulch the ground around the plants with pinestraw or bark nuggets, which improves moisture retention and limits weed competition. During the first few months of establishment, soil moisture should be monitored weekly to prevent drying. Established trees may need supplemental irrigation in dry years depending on soil type and rainfall, but do not like waterlogged, perpetually wet root conditions.

## Freeze Protection

Satsumas can sometimes tolerate freezes as low as 15 °F, but may freeze at temperatures of 23-25 F, if they are not fully acclimated to subfreezing weather. Growers on the Gulf Coast of Alabama should expect and be prepared for killing freezes every winter. Satsumas and other citrus can be protected in one or more ways.

- Greenhouse or cold frame structure: must be ventilated on warm winter days to prevent overheating. Supplemental heating will be needed if outside temperatures drop into the teens.
- Water sprinklers: Recommended output=10-20 gal./hour per tree on young trees and 20-35 gal/hour per tree on mature, bearing trees. Sprinklers should be positioned on the northwest side of the tree trunk at two positions: A) 1.5-2 ft above ground spraying the trunk base and B) 3.5 to 4.5 ft above the ground spraying the trunk and biggest scaffold limbs. One to five-year old trees need only one sprinkler in position A. When freezing weather is expected, water must be applied before air temperature drops below 32 °F, and should be continuously applied until air temperature gets warm enough to promote rapid thawing of ice.
- Soil Banking of the trunk and graft union: Create a mound of soil around the lower two feet of trunk and scaffold limbs to prevent freezing of the graft.
- Kerosene or other Petroleum Fuel Heater
- Insulated Blankets or wraps

## Pruning

No pruning is required to produce a crop of fruit, and heavy pruning forces vegetative, unfruitful growth. Light pruning can be performed as often as necessary to eliminate limbs growing “out of bounds”. “Skirting” or removal of lower limbs is a good practice that reduces incidence of fruit disease and facilitates mowing and herbicide application. Pruning can be done in spring, when budbreak occurs and in summer, but should not be done in fall or winter for freeze hardiness concerns.

## Fertilizing

Satsumas, like other citrus trees, are “heavy feeders” and need fertilizer every year to promote growth and fruiting. The nutrient that is needed in the greatest quantity is nitrogen (N), but attention should be given to other major and minor essential elements as well. The best times to fertilize are A) at first sign of budbreak in the Spring [late February or early March]; B) at fruit swell [May], and C) when fruit are one inch diameter [June]. Splitting the annual total amount of fertilizer into three applications per year is a good practice. Do not use fertilizer with N from September to mid February, or cold hardiness may be compromised.

Soil Testing/pH: A soil test should be performed before planting and every third year afterward to determine if pH is in an acceptable range (5.5 to 7.0); and if phosphorus (P), potassium (K), magnesium (Mg) and calcium (Ca) are present in sufficient quantities. Soil test results will not make a recommendation for N, because of its transient nature in the soil. If pH is below 5.5, add limestone according to soil test recommendations

### ***How much fertilizer to use:***

The amount of fertilizer per tree should increase annually after planting as trees grow and bear more fruit. Since N is the most critical nutrient and needed in the greatest quantity, it is advisable to target a baseline rate of N in lbs per tree, according to Table 2, and apply that amount as either a complete fertilizer (example 16-4-8; or 13-13-13), a straight N fertilizer [34-0-0 Ammonium nitrate or 15.5-0-0 Calcium nitrate], or a combination of complete fertilizer and straight N. Straight N fertilizers should only be used if soil and leaf testing has been done to show other

elements are not necessary. **If soil and leaf tests are not performed, a complete fertilizer with micronutrients should be used to prevent a hidden deficiency.** A 16-4-8 fertilizer is 16% N by weight. The lower the %N in the analysis, the more pounds of fertilizer will be required to meet the N requirement (as seen in Table 2).

**Table 2: Baseline Nitrogen rates for Satsuma trees of different ages, and examples of fertilizer sources and rates.**

Tree age (yrs)	Lbs N/per tree/year	Option 1 Lbs 8-8-8 /tree/year	Option 2 Lbs 13-13-13 /tree/year	Option 3 Lbs 16-4-8 /tree/year	Option 4 Lbs 34-0-0 /tree/year
Planting year	0.05	10 oz	6 oz	5 oz	2.4 oz
1 yr old	0.20	2.5	1.5	1.25	0.6
2 yr old	0.40	5	3	2.5	1.2
3-6	0.75	9.4	5.8	4.7	2.2
7-8	1	12.5	7.7	6.25	3
9	1.5	18.75	11.5	9.4	4.4
10+	1.5	18.75	11.5	9.4	4.4

Only one fertilizer source should be used at the rates shown. If a combination of more than one fertilizer is desired in the same year, the rates of each should be reduced to meet the correct Lbs N/per tree per year.

**Nutrition Troubleshooting:** If fruit production is low or trees appear to be suffering from a deficiency or toxicity, it is advisable to collect leaf samples for nutrient analysis. Leaf sampling also benefits commercial growers when done annually, by tracking excesses or deficiencies that may develop. **Leaf samples should be taken when the Spring flush leaves of the current year are 4-5 months old (normally July or August).** Collect 40 to 50 leaves randomly in the orchard from branches that do not have fruit. Rinse with distilled water and blot dry, and then combine in a paper bag for shipping. Only one sample is needed per grove, but if certain trees are more unhealthy than others, make a separate leaf sample for such trees in order to identify the particular problem. Table 3 can be used to compare with leaf tests results and determine whether fertilizer rates for specific nutrients should be increased or decreased in the next growing season.

**Table 3. Sufficiency tables for elemental analysis of Satsuma leaves:**

Element	Optimal Range	Element	Optimal Range
N*: Nitrogen	3.0-3.4%	B: Boron	25-100ppm
P: Phosphorus	0.15-0.25%	Zn: Zinc	5-30 ppm
K: Potassium	0.9-1.1%	Cu: Copper	6-35 ppm
Ca: Calcium	3.0-5.5%	Mn: Manganese	25-100 ppm
Mg: Magnesium	0.17-0.44%	Fe: Iron	60-120 ppm
S: Sulfur	0.2-0.4%	Mo: Molybdenum	0.1-1.0 ppm

- \*If levels of N fall below optimal range, lbs of N per tree should be increased the following year, unless a freeze has killed part of the canopy or the fruit crop is anticipated to be less. If other nutrients fall within or above the optimal range, those elements will not be needed in next year's fertilizer.

Leaf and Soil Samples can be sent to:

**Soil Testing Laboratory**  
**AIFA Building**  
**Auburn University, 36849**  
**(334) 844 3958**

*Soil Test Kits and Forms are available at your County Office of the Alabama Cooperative Extension System.*