

# Evaluating Fruit Quality of Citrus Varieties in Georgia, 2021–22

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*The commercial citrus industry in Georgia* has only recently been established, with most groves planted after 2014. Initially, satsuma mandarins (*Citrus unshiu*) on trifoliolate rootstocks (*Poncirus trifoliata*) were planted for their cold-hardiness, seedlessness, and ease of peeling. Satsuma fruits begin to attain commercial maturity in early November and usually avoid hard freezes in southern Georgia. As of 2022, approximately 75% of the 3,300 acres of citrus planted in Georgia are satsumas, but that proportion is trending downward. To strengthen the new Georgia citrus industry, growers recently have begun to diversify their citrus varieties. Little is known about how these varieties will perform under Georgia weather and soil conditions. Therefore, research is necessary to determine what varieties can best tolerate Georgia's winter weather and to determine cultural norms such as maturation time, fruit quality, and insect and disease tolerance.



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This annual publication contains additional harvest-year data to revise the summary and table found in UGA Extension [Circular 1275, Evaluating Fruit Quality of Citrus Varieties in Georgia](#). View Circular 1275 for information about the history of citrus production in Georgia and images of the fruits listed in Table 1.

## Evaluation of 30 Georgia-Grown Citrus Varieties

On December 15, 2021, and again on December 7, 2022, five citrus fruits were picked and juiced into one sample from each variety/rootstock combination represented in Table 1. The average of these 2 years of data is represented on the chart below (unless otherwise noted). All plantings were from Lowndes and Lanier counties except for ‘Pink Frost’ grapefruit (UGA) and ‘Grand Frost’ lemon (UGA), which came from a planting in Tift County.

For each sample, the Brix was tested using an Atago 3810 digital pocket refractometer and the acid was derived using a Mettler Toledo automatic titrator. Photos were taken of two to four of the fruit from each sample prior to juicing to show the exterior and interior of the fruit.

Table 1 provides data on varieties currently being grown in Georgia; when they were planted and the rootstocks on which they were grafted; measured TSS levels, measured titratable acidity (TA), and TSS/TA ratios; likely timing of each variety’s ripening. The values in the table provide information that may assist growers in choosing which varieties to plant and when they may mature. Fruit color is also a factor when deciding to harvest.

Table 1. Characteristics of 30 varieties and 45 variety/rootstock combinations collected in December 2021 and December 2022.

| Variety                    | Rootstock                  | Date planted | TSS <sup>†</sup> (Brix) | Titratable acidity (TA) | TSS/TA ratio | Likely to ripen by mid-Dec <sup>††</sup> |
|----------------------------|----------------------------|--------------|-------------------------|-------------------------|--------------|--|
| <b>SWEET ORANGES</b>       |                            |              |                         |                         |              |  |
| Southern Frost Navel (UGA) | Flying Dragon              | 2017         | 12.3                    | 0.62                    | 19.8         | Yes                                      |
| Glen Navel                 | Sour Orange                | 2014         | 10.0                    | 0.79                    | 12.7         | Yes                                      |
| Glen Navel                 | US-852                     | 2017         | 11.2                    | 0.76                    | 14.8         | Yes                                      |
| Cara Navel                 | US-897                     | 2018         | 10.0                    | 0.67                    | 14.9         | Yes                                      |
| Washington Navel           | US-852                     | 2017         | 10.3                    | 0.66                    | 15.6         | Yes                                      |
| Marr’s Orange              | <i>Poncirus trifoliata</i> | 2009         | 10.6                    | 0.78                    | 13.6         | Yes                                      |
| Ambersweet Orange          | US-852                     | 2009         | 9.1                     | 0.56                    | 16.3         | Yes                                      |
| Sweet Bessie Orange        | US-852                     | 2017         | 8.6                     | 0.79                    | 10.9         | Yes                                      |
| Early Gold Orange          | 16-6                       | 2008         | 10.6                    | 0.76                    | 13.9         | Yes                                      |
| Moro Blood Orange          | US-942                     | 2019         | 10.1                    | 1.05                    | 9.6          | Later                                    |
| Hamlin Orange              | US-812                     | 2016         | 10.2                    | 0.7                     | 14.6         | Yes                                      |



| Variety                       | Rootstock                  | Date planted | TSS <sup>†</sup> (Brix) | Titrateable acidity (TA) | TSS/TA ratio | Likely to ripen by mid-Dec <sup>††</sup> |
|-------------------------------|----------------------------|--------------|-------------------------|--------------------------|--------------|--|
| <b>MANDARINS</b>              |                            |              |                         |                          |              |  |
| Sugar Belle Mandarin          | US-942                     | 2018         | 13.7                    | 1.57                     | 8.6          | Later                                    |
| Sugar Belle Mandarin          | US-897                     | 2018         | 14.2                    | 1.71                     | 8.4          | Later                                    |
| Sugar Belle Mandarin          | US-852                     | 2018         | 13.4                    | 1.49                     | 8.9          | Later                                    |
| Sugar Belle Mandarin          | Rubidoux                   | 2018         | 14.3                    | 1.51                     | 8.3          | Later                                    |
| Sugar Belle Mandarin          | X-639                      | 2015         | 12.7                    | 1.50                     | 8.5          | Later                                    |
| Sugar Belle Mandarin          | Goutou                     | 2017         | 13.2                    | 1.26                     | 10.5         | Later                                    |
| Tango Mandarin                | US-852                     | 2020         | 9.6                     | 0.88                     | 10.9         | Yes                                      |
| Tango Mandarin                | X-639                      | 2018         | 10.9                    | 0.92                     | 11.8         | Yes                                      |
| **Tango Mandarin              | US-1282                    | 2020         | 10.9                    | 0.94                     | 11.6         | Yes                                      |
| **Tango Mandarin              | UFR-6                      | 2020         | 10.8                    | 0.93                     | 11.6         | Yes                                      |
| **Tango Mandarin              | Super Sour #2              | 2020         | 9.4                     | 0.86                     | 10.9         | Yes                                      |
| **Tango Mandarin              | US-942                     | 2020         | 10.9                    | 1.22                     | 8.9          | Yes                                      |
| Kishu Mandarin                | US-852                     | 2017         | 9.9                     | 0.54                     | 18.3         | Yes                                      |
| Kishu Mandarin                | Rubidoux                   | 2019         | 11.2                    | 0.67                     | 16.7         | Yes                                      |
| Shiranui Mandarin             | US-942                     | 2019         | 11.3                    | 1.02                     | 11.1         | Later                                    |
| Shiranui Mandarin             | US-852                     | 2018         | 11.5                    | 1.17                     | 9.8          | Later                                    |
| Shiranui Mandarin             | US-897                     | 2016         | 13.2                    | 1.29                     | 10.2         | Later                                    |
| Shiranui Mandarin             | Swingle                    | 2015         | 11.5                    | 1.42                     | 8.1          | Later                                    |
| Early Pride Mandarin          | X-639                      | 2017         | 11.4                    | 0.91                     | 12.5         | Yes                                      |
| Orange Frost Mandarin         | Own roots                  | 2017         | 10.4                    | 1.05                     | 9.9          | Later                                    |
| *Artic Frost Mandarin         | Own roots                  | 2015         | 12.2                    | 0.97                     | 12.6         | Yes                                      |
| Keraji Mandarin               | US-942                     | 2018         | 10.4                    | 0.42                     | 24.8         | Yes                                      |
| *US Superna (88-2)            | US-852                     | 2019         | 14.4                    | 0.82                     | 17.6         | Yes                                      |
| Sweet Frost Changsha (UGA)    | Rubidoux                   | 2016         | 12.5                    | 0.79                     | 15.8         | Yes                                      |
| Poncan Mandarin               | Rubidoux                   | 2010         | 11.7                    | 0.61                     | 19.2         | Yes                                      |
| Owari Satsuma Mandarin        | Kuharski Carrizo           | 2014         | 11.1                    | 0.72                     | 15.4         | Yes                                      |
| Fairchild Mandarin            | Flying Dragon              | 2009         | 15.4                    | 0.96                     | 16.0         | Yes                                      |
| **Bumper (Satsuma x Changsha) | Kuharski Carrizo           | 2019         | 9.8                     | 1.04                     | 9.4          | Later                                    |
| <b>GRAPEFRUIT</b>             |                            |              |                         |                          |              |  |
| Golden Grapefruit             | Flying Dragon              | 2009         | 9.9                     | 0.96                     | 10.3         | Yes                                      |
| Pink Frost Grapefruit (UGA)   | <i>Poncirus trifoliata</i> | 2009         | 8.2                     | 1.39                     | 6.3          | Yes                                      |

| Variety                 | Rootstock                  | Date planted | TSS <sup>†</sup> (Brix) | Titrateable acidity (TA) | TSS/TA ratio | Likely to ripen by mid-Dec <sup>††</sup> |
|-------------------------|----------------------------|--------------|-------------------------|--------------------------|--------------|--|
| <b>LEMONS</b>           |                            |              |                         |                          |              |  |
| Grand Frost Lemon (UGA) | <i>Poncirus trifoliata</i> | 2010         | 7.5                     | 3.3                      | 2.7          | Yes                                      |
| Meyer Lemon             | Own roots                  | 2009         | 7.9                     | 5.14                     | 1.54         | Yes                                      |
| <b>TANGELOS</b>         |                            |              |                         |                          |              |  |
| Page Tangelo            | US-852                     | 2018         | 13.1                    | 1.01                     | 13.0         | Yes                                      |
| Minneola Tangelo        | US-897                     | 2018         | 11.1                    | 1.25                     | 8.9          | Later                                    |

<sup>†</sup>TSS = Total soluble solids

<sup>††</sup>Yes = Data suggests that these varieties likely will ripen internally before or at mid-December; Later = Data suggests these varieties will begin ripening from mid-December to early January.

\*Only includes 1 year of samples, collected on December 15, 2021.

\*\*Only includes 1 year of samples, collected on December 7, 2022.

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