

‘TDE2’ Mandarin Hybrid – Shasta Gold[®] Mandarin

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Shasta Gold[®] (patented by the University of California under the variety name ‘TDE2’, PP15,461) is a late-maturing mandarin hybrid that combines large fruit size, attractive deep orange rind color, rich fruit flavor and the virtual absence of seeds even in mixed plantings. No other mandarin currently available combines this set of characteristics. It may be successful in a marketing window that currently has few low-seeded cultivars. The pedigree of Shasta Gold[®] is (‘Temple’ tangor x 4n ‘Dancy’ mandarin) x ‘Encore’ mandarin hybrid. The female parent was tetraploid. The variety is triploid and will be marketed under the trademarked name Shasta Gold[®].

Fruit Characteristics: Shasta Gold[®] fruit are oblate (moderately flat) in shape, with little or no neck. The fruit base (stem end) is slightly concave while the apex (blossom end) is truncate with a slight depression and a small (4 mm, 1/8-1/4 in.), occasionally open stylar scar. The average fruit size is large for a mandarin (classed as Mammoth by California state standards) with a mean width of 75mm (2.95 in.) and a height of 59 mm (2.32 in.), giving a height to width aspect ratio of 0.78, and a mean weight per fruit of 185 grams (6.5 oz., heavy for the fruit size). Rind color is deep orange for fruit harvested in Riverside in mid-February, with similar values for fruit from the San Joaquin Valley, Ventura and north San Diego County. The rind texture is variable, depending on tree age and crop. For older trees with a moderate to heavy crop, rind texture is smooth to slightly pitted, with depressed oil glands. The rind of fruit from trees with very light crops is often excessively rough or bumpy. The rind is fairly easy to peel when fruit are mature, but can be more adherent early in the season. The fruit is juicy averaging 49% juice content. Flesh is deep orange in color with a moderately fine texture.

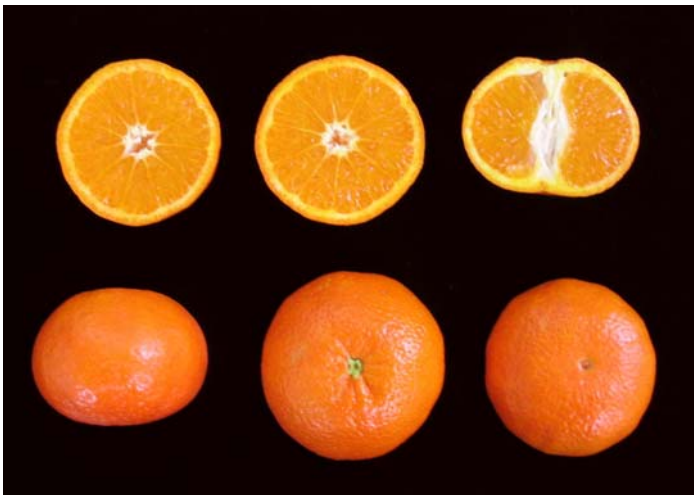


Figure 1: Fruit of Shasta Gold[®] from Riverside



Figure 2: Shasta Gold[®] tree on Carrizo at Riverside

Tree Characteristics: Tree shape (Figure 2) is approximately spheroid, rather similar to that of orange trees. Leaves are on the large size for a mandarin with leaf shape more orange than mandarin-like. Canopy density is very good and many fruit are born inside the canopy, which serves to limit sunburn and help maintain the very distinct rind color. Fruit exposed to excessive sun will lose significant color on the exposed surface. Overall trees are vigorous, more so than most mandarins. In comparison with most old-line citrus cultivars, trees of Shasta Gold[®] are fairly thorny, with normal branches having medium length (15 mm) thorns at about 50% of the nodes, and watersprouts having long (31 mm) thorns at about 73% of nodes. Thorniness will probably decrease as the cultivar ages. To reduce thorniness, budwood should be selected from thornless, upper canopy branches.

Rootstocks and Tree Performance: Several different rootstocks were used in Shasta Gold[®] evaluations including Carrizo citrange, C-35 citrange, Schaub rough lemon, Volkamer lemon (*C. volkameriana*), and trees topworked on Valencia orange on Troyer citrange rootstock. Overall trees performed well on all rootstocks with no indications of rootstock-scion incompatibility. Tree vigor varies greatly by location. At southern desert locations (Coachella Valley) trees are quite vigorous with canopy volumes of 7-year-old trees averaging 28.8-41.1m³ in two separate trials. In contrast, at the cooler Santa Paula and Ojai (Ventura County) locations, 7-year-old trees averaged 6.3 and 6.1 m³. Canopy volumes were greater for topworked trees in north San Diego County. Trees have performed best in locations with more moderate climates such as the coastal and inland valleys of southern California and the San Joaquin Valley. The topworked trees tested were quite vigorous being larger overall than trees on all other rootstocks at the same age. In the desert locations trees on Volkamer lemon were considerably larger than those on Carrizo citrange or C-35 citrange. Trees on Schaub rough lemon were larger than those trees on Carrizo citrange or C-35 citrange at the cooler trial locations. Tree spacing in field plantings will depend on vigor of the rootstock. For Carrizo citrange rootstocks, a recommended tree density would be 150 (15’

x 20') to 200 (11'x20') trees per acre. Higher densities are possible but will require more frequent pruning or hedging. In comparison with Carrizo, C-35 rootstock reduces the final size of sweet orange trees, but it appears that this is not the case with Shasta Gold[®]. Care of young trees should be similar to that used for other mandarins or oranges. Flowering occurs from early April into May at all locations except the desert where it is earlier. The normal flowering overlaps with many mandarin varieties including Clementines. Trees that were screened to exclude bees during flowering produced very few fruit for two consecutive years, but it is possible that Shasta Gold[®] is self-fertile but requires pollination for fruit set. Pollen viability is low (about 10%), suggesting that Shasta Gold[®] will have little effect on seediness of Clementines or other cultivars. Hand pollinations of Shasta Gold[®] onto Clementines support this suggestion. Optimal pruning practices have not yet been developed, but in many locations trees will perform well with relatively little pruning. If fruit set is very heavy, then trees should be pruned to reduce the crop in order to reduce future alternate bearing. The trees have not been noted as particularly susceptible to any diseases and, based on a freeze in 1999, appear only slightly more cold hardy than oranges of similar age.

Yields: Yield evaluations of Shasta Gold[®] indicate that alternate bearing is common in this cultivar, as in most mandarins, although at some trial sites the 'off' year crops are reasonably good. Using a rating scale ranging from 0 (no crop) to 5 (very heavy crop), a crop rating of 2.5 is considered to be commercially acceptable yield while a crop rating of 5 cannot be sustained over many years by most mandarins. Using this scale data indicate that topworked trees at Valley Center showed the highest and most consistent crops, ranging between 3 and 4.5 over the 4 years studied. It is not clear whether the more consistent yields at this location are due to tree propagation method, management, or location. Crop ratings at Lindcove were 4.6, 3.5 and 4.8 in the first three full years of production (2003-2005). Crops at Ojai were also good, being 2.5 or greater in all years. At Santa Paula, crop ratings indicated alternate bearing, with average values of 2.2, 3.7, 1.2, and 3.5 from 1998/9 to 2001/2 respectively. Trees planted at Thermal in 1994 showed similar behavior, but with lower values of 1.8, 0.5, 2.4, and 1.4. Overall, performance of the trees in the southern desert indicates that Shasta Gold[®] may not bear well enough for commercial use in desert areas. Trees tend to flower profusely at desert locations, but fruit set and fruitlet retention are not always good.

Fruit Maturity: An important determinant of maturity date for citrus fruit is the solids:acid ratio. The estimated dates on which fruit reached an 8:1 solids:acid ratio were December 6 for the southern deserts, January 2 for Ojai, February 20 for Valley Center (north San Diego County) and March 5 for Santa Paula. In California, state standards specify a solids:acid ratio of 6.5 for tangerines and mandarins. The 8:1 ratio is used for oranges. We believe that Shasta Gold[®] should not be marketed until fruit reach a solids:acid ratio of at least 10:1. Taste panel evaluations support this recommendation. This would delay maturity by about 3 weeks compared with the dates above and would result in a much better tasting and easier to peel fruit. Shasta Gold[®] holds especially well on the tree for an extended period. They maintain their marketable fruit qualities well into May at most locations. Fruit from trees on Volkamer lemon and Schaub rough lemon generally have slightly lower solids and acid than those from trees on Carrizo citrange, C-35 citrange, or Rich 16-6 trifoliate orange, but this effect is less noticeable than with oranges and does not preclude the use of Volk or Schaub as a rootstock with trees used for fresh fruit marketing.

Fruit Storage: Limited data indicate that fruit of Shasta Gold[®] store very well after harvest. Trial fruit taken from a late-February harvest at Valley Center which were run over the packline at the University of California Lindcove Research and Extension Center and waxed were evaluated by a taste panel prior to and after storage at three different temperatures, 11 days at 68° F (20.5° C), 12 days at 37° F (3.4° C) followed by 7 days at 55° F (13.3° C), or 12 days at 41° F (5.6° C) followed by 7 days at 55° F (13.3° C). These samples would represent peak maturity fruit of Shasta Gold[®]. Fruit quality ratings were good for all traits before storage, and were little changed or improved (peelability) by both cold storage treatments. Storage at a continuous 68° F (20.5° C) reduced the scores for visual appeal and peelability. Waxed fruit were similar to unwaxed fruit for nearly all traits in all temperature regimes.

Shasta Gold[®] is being released along with two sister siblings, Tahoe Gold[®] ('TDE3') and Yosemite Gold[®] ('TDE4'). In comparison with its siblings, fruit of Shasta Gold[®] are similar in size, shape and rind texture to Yosemite Gold[®], but have a less deep orange rind color. Shasta Gold[®] fruit are larger and flatter than those of Tahoe Gold[®] and without a neck and with less rind color. Fruit of Shasta Gold[®] mature later than those of Tahoe Gold[®] at all locations and hold on the tree past maturity much longer. In comparison with Yosemite Gold[®], both mature at approximately the same time (somewhat location dependent) but Shasta Gold[®] holds longer past maturity than Yosemite Gold[®] (both hold quite well). Shasta Gold[®] has a slightly less fine flesh texture and is slightly less juicy than Tahoe Gold[®] but is juicier and more finely textured than Yosemite Gold[®]. Shasta Gold[®] peels easier than Tahoe Gold[®], and similar to Yosemite Gold[®]. All three varieties are heavy for their size. Overall Shasta Gold[®] has yielded about the same as Tahoe Gold[®] and Yosemite Gold[®]. Alternate bearing habits are similar for all three varieties.

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