'TDE3' Mandarin Hybrid – Tahoe Gold® Mandarin

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Tahoe Gold® (patented by the University of California under the 'TDE3' name, PP 15,703) is a mid-season 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 Tahoe 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 Tahoe Gold®.

Fruit Characteristics: Tahoe Gold® fruit are oblate (slightly flattened) in shape (Figure 1). The fruit base (stem end) is convex with a small neck while the apex (blossom end) is depressed. The average fruit size is medium-large for a mandarin (classed as Jumbo by California state standards) with a mean width of 66mm (2.6 in.) and a height of 56 mm (2.20 in.), giving a height to width aspect ratio of 0.85, and a mean weight per fruit of 135 grams (4.75 oz., heavy for the fruit size). Rind color is very 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 areas. The rind texture is variable, depending on tree age and crop. For older trees with a moderate to heavy crop, rind texture is rather smooth to slightly grained with fairly conspicuous oil glands. The rind of fruit from trees with very light crops is often excessively rough or bumpy. The rind is of medium thickness and moderately easy to peel when fruit are mature, but can be much more adherent early in the season. The fruit is typically very juicy averaging 48% juice content. Flesh is deep orange in color, with a very fine, tender texture.

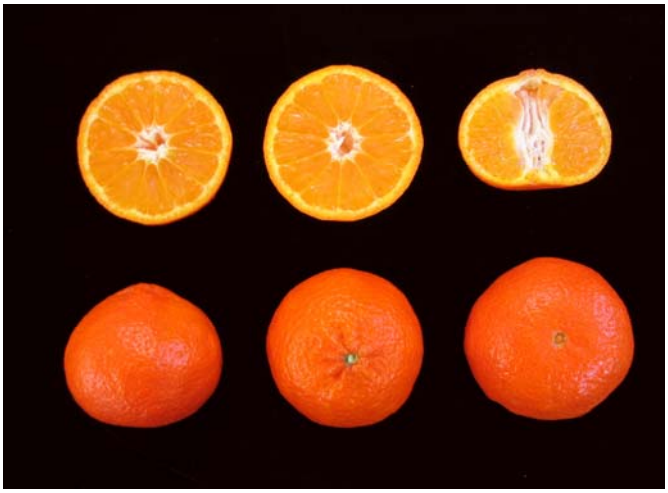

Figure 1: Fruit of Tahoe Gold® from Riverside

Figure 2: Tahoe 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 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 Tahoe Gold® are fairly thorny, with normal branches having short length (6 mm) thorns at about 13% of the nodes, with vigorous sprouts having long (27 mm) thorns at about 63% 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 Tahoe Gold® evaluations including Carrizo citrange, C-35 citrange, Rich 16-6 trifoliate, Cleopatra mandarin, Schaub rough lemon, and trees topworked on Valencia orange on Troyer citrange rootstock. Overall trees performed well on all rootstocks with no indications of rootstock-scion incompatibility although all trial trees are still too young to evaluate longevity and long-term performance. Tree vigor varies greatly by location. At southern desert locations canopy volumes of 7-year-old trees averaged 21.1 m^3 in trials. In contrast, at the cooler Santa Paula and Ojai (Ventura County) locations, 7-year-old trees averaged 6.2 and 3.6 m^3. 7-year-old trees at Lindcove and Orange Cove (San Joaquin Valley) averaged 9.9 and 7.3 m^3. 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. Trees on Schaub rough lemon were larger than those on Carrizo citrange or C35 citrange at Santa Paula and Ojai. At Lindcove and the southern desert sites, trees on Rich 16-6 trifoliate and Cleopatra were smaller than those on Carrizo and C-35 citranges. 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 size of sweet orange trees, but does not appear to reduce the final size of Tahoe Gold® trees to the same extent. 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 Clementinas. It is not known whether Tahoe Gold® trees require cross-pollination for fruit set because all experimental trees were grown in mixed plantings. Therefore, we do not recommend establishing large plantings without provision for cross-pollination. Trees should be grown with pollinizer cultivars such as Minneola, Valencia orange, or other mandarins that produce viable pollen until the requirement for cross-pollination is better understood. Trees that were screened to exclude bees during flowering produced very few fruit for two consecutive years, but it is possible that Tahoe Gold® is self-fertile but requires pollination for fruit set. Pollen viability is low (about 11%), suggesting that Tahoe Gold® will have little effect on seediness of Clementines or other cultivars, but direct experimental evidence to confirm this is not yet available. Optimal pruning practices have not yet been developed, but in many locations trees have performed well with relatively little pruning. Although not yet fully supported by experimental data on this cultivar, if fruit set is very heavy, then trees should be pruned to reduce the crop in order to reduce future alternate bearing. Harvesting fruit prior to planting enhances ensuing production. 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 Tahoe Gold® indicate that alternate bearing is common in this cultivar, as in most mandarins, although at some sites tested 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 rating scale data indicate that topworked trees showed the highest and most consistent crops, ranging between 2 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. Yields were also relatively consistent at Ojai on Schaub, Carrizo and C-35 rootstock, being 1.5 or greater in all years. At Lindcove, Orange Cove, and Santa Paula, crop ratings indicated alternate bearing on Rich 16-6, Carrizo, C-35 and Cleo rootstocks with values averaging about 3, 0.5, and 1.5-4 from 1999/2000 to 2001/2002 across all sites. Mean yields across all rootstocks at Lindcove in 1999/2000 and 2000/2001 were 28.7 and 4.6 kg per tree (63.1 and 10.1 lbs.), while at Orange Cove it was 63.2 and 0 kg (139 and 0 lbs.) per tree. Six-year-old trees on Rich 16-6 trifoliate have consistently had the highest yields (37-91kg in 'on' years, 81-200 lbs.) followed by C-35 (23-72 kg, 51-158 lbs.), Carrizo (23-64 kg, 51-141 lbs.) and lastly Cleo (25-39 kg, 55-86 lbs.). Overall, performance of the eight trees in the southern desert indicates that Tahoe Gold® may not bear well enough for commercial use in desert areas. However, the number of trees is small and additional plantings at more locations should be evaluated to better characterize adaptation to desert environments.

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 November 1 for the southern deserts, December 15 for Valley Center (north San Diego County) and Ojai, January 8 for Orange Cove, January 12 for Lindcove, and January 20 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 Tahoe 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. Tahoe Gold® does not hold especially well on the tree for an extended period. They become soft and develop slightly off flavors by late March at the warmer 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, C35 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 rootstocks with trees used for fresh fruit marketing.

Fruit Storage: Limited data indicate that fruit of Tahoe Gold® store very well after harvest. Trials of fruit taken from a mid-January harvest in the San Joaquin Valley, run over a packline at the University of California Lindcove Research and Extension Center and waxed were stored 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 Tahoe Gold®. Their storage ratings were good for all traits before storage, and were little changed or improved by both cold storage treatments. Storage at a continuous 68° F (20.5° C) reduced the scores for visual appeal and peelability.

Tahoe Gold® is being released along with two sister siblings, Shasta Gold® ('TDE2') and Yosemite Gold® ('TDE4'). In comparison with its siblings, fruit of Tahoe Gold® are not as flat as Shasta Gold® or Yosemite Gold® and has a small neck whereas the others rarely exhibit a neck. Rind color of Tahoe Gold® is slightly deeper orange than Yosemite Gold® and much deeper than Shasta Gold®. Fruit of Tahoe Gold® mature earlier than Shasta Gold® and Yosemite Gold® at all locations and do not hold their quality on the tree past maturity nearly as well as the others. Tahoe Gold® has a finer flesh texture and is slightly juicier than Shasta Gold®, significantly juicier than Yosemite Gold®. Tahoe Gold® is more difficult to peel than either of its siblings. All three varieties are heavy for their size. Overall yields of Tahoe Gold® have been similar to Yosemite Gold® and Shasta Gold®. Alternate bearing habits are similar for all three varieties.

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