

# 'TDE4' Mandarin Hybrid - Yosemite Gold™

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'TDE4' (patented by the University of California under the 'TDE4' name) is a mid-late season (mid-January to mid-February) maturing mandarin hybrid that combines large fruit size, an attractive very 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 'TDE4' is (Temple tangor x 4n Dancy mandarin) x Encore mandarin. The female parent was tetraploid. The variety is triploid. It will be marketed under the trademarked name Yosemite Gold.

**Fruit Characteristics:** 'TDE4' fruit are oblate (moderately flat) in shape (Figure 1), 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 (2 mm, 1/8 in.), usually closed, styler 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 58 mm (2.30 in.), giving a height to width aspect ratio of 0.78, and a mean weight per fruit of 175 grams (6 oz.-heavy for the fruit size). Rind color is very deep orange for fruit harvested at Riverside, Ventura and the San Joaquin Valley in mid-February. The rind texture is somewhat variable, depending on tree age and crop. For older trees with a moderate to heavy crop, rind texture is smooth, with conspicuous oil glands. The rind of fruit from trees with very light crops is sometimes excessively rough or bumpy. The rind is quite easy to peel when fruit are mature, but can be more adherent early in the season. The fruit is moderately juicy averaging 42% juice content. Flesh is deep orange in color with a medium texture.

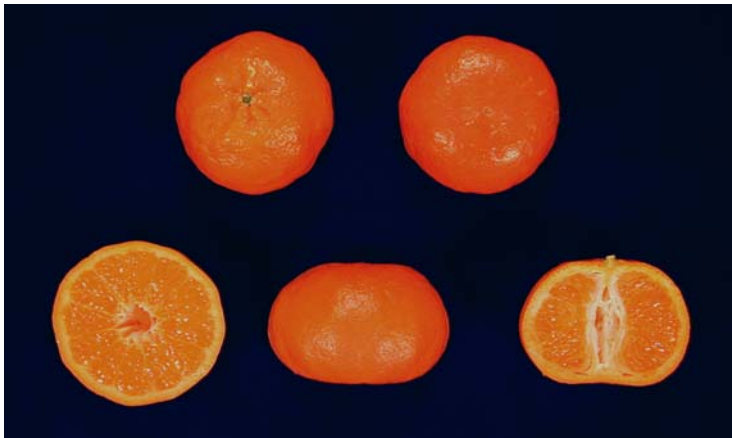


Figure 1: Fruit of 'TDE4' from Riverside



Figure 2: 'TDE4' tree on Carrizo citrange 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 with many fruit 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 'TDE4' are slightly thorny, with normal branches having short length (4 mm, 1/8-1/4 in.) thorns at about 13% of the nodes, with vigorous sprouts having short (4 mm) thorns at about 3% 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 'TDE4' evaluations including Carrizo citrange, C-35 citrange, Rich 16-6 trifoliolate, Cleopatra mandarin, and Schaub rough lemon. Overall trees performed well on all rootstocks with no indications of rootstock-scion incompatibility although trial trees are still relatively young. Tree vigor varies greatly by location. At the southern desert location (Coachella Valley) canopy volumes of 7-year-old trees averaged 23.0 m<sup>3</sup> (812 ft<sup>3</sup>). Trees in the desert locations have never produced fruit, perhaps contributing to greater vegetative growth. In contrast, at the cooler Santa Paula and Ojai (Ventura County) locations, 7-year-old trees averaged 4.3 and 5.6 m<sup>3</sup> (152 and 198 ft<sup>3</sup>). 7-year-old trees at Lindcove and Orange Cove (San Joaquin Valley) averaged 9.9 and 7.3 m<sup>3</sup> (350 and 258 ft<sup>3</sup>) 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 with rootstocks affecting tree size at some locations. At Lindcove and Orange Cove, trees on Carrizo were the largest, followed by C-35, and then Cleo and trifoliolate which were similar. At Ojai, the largest trees were on C-35, followed by Schaub rough lemon and Carrizo. At CVARS, trees on Carrizo, C-35 and Cleo were similar in size. 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 is not yet known if it will have a similar effect on 'TDE4' trees. 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 'TDE4' trees require cross-pollination for fruit set since 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 unrelated 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 'TDE4' is self-fertile but requires pollination for fruit set. Pollen viability is low (about 8%), suggesting that 'TDE4' 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 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 'TDE4' indicate that alternate bearing is common in this cultivar, as in most mandarins, although at some sites tested the off-year crops were reasonably good. Crops were rated on a 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. Crops at Ojai were fairly good, being 2-3.3 during the last three of the four years evaluated. At Santa Paula, crop ratings indicated moderate alternate bearing, with average values of 0.50, 2.60, 0.88, and 2.90 from 1998-99 to 2001-2002 respectively. Trees planted at Lindcove in 1994 showed ratings of 2.94, 1.88, 1.50, and 2.90 from 1998-99 to 2001-2002 respectively. At Orange Cove, trees showed rather severe alternate bearing with crop ratings of 1.88, 4.00, 0.06, and 1.60. These trees were, however, more affected by the 1999 freeze than other trees in the trials. Mean yield across all rootstocks at Lindcove in 2000 and 2001 was 29 and 14 kg (64 and 31 lbs.) per tree, while at Orange Cove it was 66 and 0 kg (145 and 0 lbs.) per tree. Trees on Rich 16-6 trifoliolate (six-years-old) have consistently had the highest yields (70-90 kg in 'on' years, 154-198 lbs.) followed by C-35 (40-70 kg, 88-154 lbs.), Carrizo (40-60 kg, 88-132 lbs.) and lastly Cleo (40-58 kg, 88-128 lbs.).

**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 January 2 for Ojai, January 15 for Orange Cove, January 16 for Lindcove, and January 27 for Santa Paula. In California, state standards specify a solids:acid ratio of at least 6.5 for tangerines and mandarins. The 8:1 ratio is used for oranges. We believe that 'TDE4' 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. 'TDE4' fruit hold quite well on the tree for an extended period. They maintain their marketable fruit qualities through April at most locations. Fruit from trees on Schaub rough lemon generally have slightly lower solids and acid than those from trees on Carrizo citrange, C-35 citrange, or Rich 16-6 trifoliolate orange, but this effect is less noticeable than with oranges and does not preclude the use of Schaub (and probably Volk) as a rootstock with trees used for fresh fruit production.

**Fruit Storage:** Limited data indicate that fruit of 'TDE4' store very well after harvest. Trials of fruit taken from late-February and late-March harvests at Lindcove and Orange Cove (San Joaquin Valley) trial sites, 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 'TDE4'. Fruit quality ratings were very 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 for nearly all traits in all temperature regimes.

'TDE4' is being released along with two sister siblings, 'TDE3' and 'TDE2'. In comparison with its siblings, fruit of 'TDE4' is similar in size, shape and rind texture to 'TDE2' but has a deeper orange rind color, while it is larger and flatter than 'TDE3' and without a neck but with similar rind color. Fruit of 'TDE4' mature later than 'TDE3' at all locations and hold on the tree past maturity much longer. In comparison with 'TDE2', both mature at approximately the same time (somewhat location dependent) but 'TDE2' holds longer past maturity than 'TDE4' (both hold quite well). 'TDE4' has a somewhat coarser flesh texture and is less juicy than either 'TDE3' or 'TDE2'. 'TDE4' peels easier than 'TDE3' and similar, at maturity, to 'TDE2'. All three varieties are heavy for their size. Overall 'TDE4' has yielded about the same as 'TDE2' and 'TDE3', except in the desert areas where it has not set a crop. Alternate bearing habits are similar for all three varieties

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