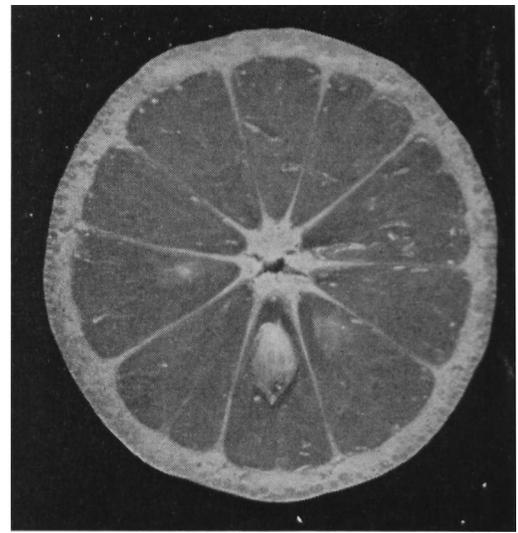


The Kara Mandarin

tangerine-type, late spring fruit of excellent eating quality is promising

James W. Cameron and Robert K. Soost



The Kara mandarin, as grown at Riverside. About natural size.

The Kara mandarin is a tangerine-type citrus fruit, which was first described in 1935. Its parents were the Satsuma mandarin and the King—probably a tangor. Because of its high quality, additional studies were made in 1952 on the behavior of the Kara.

The fruit of the Kara is rich and of pleasant flavor with an attractive, deep-orange pulp color. At Riverside it is usually edible from about March 1 to late June, its season extending somewhat beyond that of the Washington Navel. It peels well, is usable by segments, and until after its midseason is satisfactory for juicing. In April or May it begins to become puffy but is excellent for eating out of hand. The fruit is not inclined to granulate and at Riverside adheres well to the tree. The rind color is a deep orange-yellow. The rind is more brittle than that of oranges and the fruit requires care in handling and shipping.

In recent small-scale marketing tests at Los Angeles and New York, Kara fruit was sold at 10¢ to 25¢ per pound, wholesale. Only a small quantity of the fruit which brought these prices was available at the auctions; the market might not support such prices on large shipments. However, there is growing interest in dessert types of citrus fruit for the late spring months, and the Kara—in the Riverside area—is at its best when such types are no longer in season in the competitive regions.

The Kara fruit is smaller than the Washington Navel orange but is consid-

erably larger than the Dancy and Clementine tangerines when grown in the same location. The Kara is moderately seedy, but scarcely more so than the Dancy and Clementine. Early in its season it is rather high in acid but it is also high in solids which are usually maintained over a relatively long period—three to four months at Riverside.

Between 1930 and 1932, 12 Kara trees, one or more on each of several rootstocks, were planted at the Citrus Experiment Station. At about the same time a few trees were set in co-operative plantings in the Coachella Valley near Indio and a few were planted in Tulare County near Porterville and in Kern County near Delano. Data taken from time to time have indicated promise for the Kara at Riverside and to some extent at Indio. The behavior of the variety in other areas is still uncertain.

Juice analyses made in 1952 of fruit from trees of the 1930-1932 plantings—together with one assay from two 7-year-old trees near Piru, in Ventura County—are summarized in the table on this page. For the analyses from the Riverside planting one tree on each of seven rootstocks was included during the main season.

Some variability was found in the juice percentages of fruit from the Riverside trees on any one date. This variability was at least partly because of rootstock. As expected, there was a decrease in juice percentage at the end of the season, in June and July. The analyses show characteristically high soluble solids for the

Kara throughout the season. The lowest value, 13.3%, was from a tree on Rough lemon stock. The acid percentage was still high—about 2%—in the assays made on February 13, but it was generally satisfactory at the later dates. The high value of 1.71% shown for the March 31 sampling occurred from only one tree. This fruit sample also had 16.3% soluble solids so that the solids:acid ratio was still 9.5:1.

At the Indio location the assays made on February 28 showed high juice content, high solids, and an acid percentage which gave about a 10:1 ratio. In some years the acid is considerably lower in the Coachella Valley by this date, but the Kara is definitely a late season fruit in that area and is not ready for use at Christmas. Its season there is rather short and can be affected by a browning of the stem end, which causes drop. When grown in full sun the tree is more vigorous and the fruit sweetens earlier than in the shade of date groves.

At Delano, Porterville, and Piru the assays showed high solids, moderate to low juice content, and rather high acid on the dates of sampling. Tree vigor was good in all three locations.

Yield and fruit size of the Kara were very good at Riverside in 1952. Yields of 12 trees ranged from 110 pounds to 341 pounds, with an average of 235 pounds. The low yield of 110 pounds was from a tree in its off-bearing year, and with a rather small top volume. Fruit size, based on counts of several hundred fruits from each of seven trees, averaged 0.24 pound per fruit with a considerable range of smaller and larger sizes. The average size at Riverside over a period of several years is not as large—0.19 pound per fruit.

At Indio the fruit size is much larger. The average of nine samples obtained between 1946 and 1952 from trees with medium or heavy crops was 0.37 pound per fruit. The Kara is more nearly annual

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Fruit Characters of the Kara Mandarin, 1952 Season

Location	Date	No. of trees ¹	Range of ²		
			% juice	% solids	% acid
Riverside	Feb. 13	2	44.5-44.7	16.0-17.0	2.01-2.02
	Mar. 31	7	39.5-45.1	14.2-16.5	1.28-1.71
	Apr. 30	7	38.0-47.3	14.0-16.1	1.09-1.29
	June 3	7	36.6-42.6	13.3-15.3	0.95-1.14
	July 8	2	34.4-39.8	13.8-15.0	0.91-0.92
Indio	Feb. 28	2	46.7-48.3	15.8-15.9	1.50-1.60
Delano	Mar. 5	1	37.7	14.2	1.74
Porterville	Mar. 5	1	38.8	17.0	2.16
Piru	Apr. 19	2	44.3	16.2	1.65
		(mixed)			

¹ Trees were from 18 to 27 years of age except at Piru, 7 years. Rootstocks varied; some are discussed in text.

² One sample from each tree was assayed on each date. Usual sample size was 20 fruits.

AVOCADO

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heim, Dickinson, Itzamna, Nabal, Hass, Challenge, and Taft—and 45 on six Mexican varieties—Ganter, Topa Topa, Duke, Northrop, Mexicola, and Blake. Two trees are on Waldin, a West Indian variety from Florida. As in the first plot, all Guatemalan seeds were of mixed origin, but seeds of the Mexican, except Ganter, came from single trees. The trees were propagated in the Subtropical Horticulture Nursery at the University of California, Los Angeles. This nursery also furnished trees for three additional plots.

In June, 1950, one year after planting, 78%—43 trees—of the trees on Guatemalan stocks showed chlorosis in varying degrees. Only one tree on Mexican stock was affected, but it soon recovered. The two trees on West Indian stock remained normal. As of September, 1951, a little over a year after the disease appeared, 56%—24 trees—of the chlorotic trees were recovered or nearly so and 44%—19 trees—were either dead or worthless. The loss on the basis of the 55 trees on Guatemalan planted was 35%, as compared to a 40% loss in the other plot. As in the other plot, chlorotic trees are scattered throughout the area and in some cases affected and normal trees on the same rootstock variety are side by side.

Five commercial trees—presumably on Mexican stock—which were planted in place of severely chlorotic ones, so far have shown no symptoms of the disease. Also, of several hundred commercial Fuerte trees on Mexican stock—planted by the grower in 1948 and 1949 in the same orchard in which the experimental plot is located—only three show chlorosis. Neither the old nor the young orange trees are chlorotic.

Three additional plots were planted in 1949 with trees from the same nursery which furnished the Fuerte trees for the plot in Orange County. Two of them are located in Ventura County and one in Los Angeles County. Only three trees—all in one plot in Ventura County—of about 200 on Guatemalan stocks planted have shown chlorosis. None of a similar number on Mexican stock and three on West Indian are affected.

In the same orchard in which the three chlorotic Fuerte trees are located, 96 Hass and 54 Anaheim on Guatemalan as well as a similar number on Mexican and 11 on West Indian stocks were planted in 1950. A year later 5% of the Hass and 10% of the Anaheim on Guatemalan stocks showed chlorosis. However, practically all seem to be recovering. None of the trees on Mexican or West Indian are affected. Paradoxically, in the same orchard eight of about 40 Mexican seedlings planted by the grower showed the disorder a few months, then recovered.

The observations obtained during these studies, to the effect that Guatemalan stocks are far more susceptible to whatever soil condition causes chlorosis, are limited in scope. Perhaps, as the root systems expand, trees now considered recovered may again become chlorotic or hitherto normal trees on both types of stocks may show the disease.

Whether the occurrence of chlorotic and normal trees in some cases only about 20' apart and on the same rootstock variety, is due to soil variation or genetic differences in the rootstock seedlings is an open question. All that can be said at present is that none of the 10 Guatemalan rootstock varieties used in the two severely affected rootstock plots is immune. The number of trees on these stocks varied from three to 18. This, and the fact that in one plot 14 trees on a certain variety showed 43% chlorosis and in the other, eight trees on the same variety showed 100%, stress the necessity for more extensive information for valid comparison.

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The late F. A. White was Farm Advisor, Santa Barbara County, University of California, at the time the study reported here was made.

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DORMANCY

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day and greenhouse temperatures plants continued active growth, but those grown under long-day and subjected to the high temperature stresses ceased growth and within one week after the last high temperature exposure lost all or virtually all visible green tissue. These plants were dormant as they could be induced to resume growth under favorable conditions two to three months later.

When pine bluegrass was permitted to grow in a warm greenhouse under natural day-length and without the high temperature exposures, the plant was dormant by early June even though watered daily. This is similar to the field behavior. Two weeks after such dormancy had set in, watering was stopped on a series of these plants. The pots then remained dry on greenhouse benches for 5, 7, 11, 17, and 20 months. At the end of each interval, six pots were removed to a section of greenhouse having daily maximum temperatures not exceeding 75° F, and daily watering was resumed. All plants of the groups dormant 5, 7, 11, and 17 months resumed growth by the fifth day after the resumption of watering. The majority of these plants developed vigorous new shoots $\frac{3}{8}$ " to $\frac{3}{4}$ " long on the fourth day.

In the group dormant 20 months, only two plants—out of 18—failed to grow.

New shoot growth was rapid. The average length of eight shoots of the group dormant 20 months measured $\frac{1}{2}$ " on the fourth day, $1\frac{1}{8}$ " on the fifth, $1\frac{5}{8}$ " on the sixth, and $2\frac{1}{8}$ " on the seventh day after watering was resumed. Seven days after the first watering, vigorous plants averaged 27 green shoots per plant.

The greenhouse studies demonstrate that the initiation of summer dormancy in pine bluegrass is associated with long day-length and high temperatures.

Growth resumption, after extended periods of dormancy, was obtained when the plants were subjected to relative coolness and were watered. These conditions parallel those which normally prevail in the field when the plant enters and breaks dormancy.

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The above progress report is based on Research Project No. 1194A.

KARA

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in bearing habit than most mandarins and mandarin hybrids. In off years it usually produces at least light and often medium crops. The combination of heavy yield and large size on the Riverside trees in 1952 is resulting in light crops for 1953 on most trees.

In the Riverside planting the Kara has made vigorous trees on sweet orange, sour orange, grapefruit, and Cleopatra mandarin rootstocks. On trifoliolate and Rough lemon rootstocks the trees are smaller and on Cunningham citrange tree condition is poor. Fruit quality in 1952 was best on the sweet orange, grapefruit, and trifoliolate stocks.

Some young plantings of Karas have been established recently in the Riverside area. One orchard of about 280 trees and another of some 170 trees are just coming into bearing. A group of Karas topworked on grapefruit in 1946 seem vigorous, and averaged moderate crops in 1952, with rather light crops set for 1953.

Near Fullerton, in Orange County, a Kara topworked on a large grapefruit tree gave fruit of good size and color in 1952. In the Piru area of Ventura County a block of 86 three-year-old Karas is just beginning to bear.

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