Mandarin Selection Trials in Arizona – 2007-08[1]

Glenn C. Wright
Department of Plant Sciences, U. of A., Yuma Mesa Agriculture Center, Yuma, AZ

Abstract

Third year yield and packout data from a trial containing 'Fina', 'Fina Sodea', 'Sidi Aissa', 'Oroval', 'W. Murcott Afourer', 'Fremont', and 'Gold Nugget; selections were collected in 2007-08. For the year, 'Fremont' had the greatest yield, 'Gold Nugget' and 'W. Murcott Afourer' had the largest fruit size, while 'W. Murcott Afourer' had the smallest yield, and 'Fremont' had the smallest fruit size.

Introduction

Mandarins are becoming increasingly important to the US citrus industry. Mandarins are seen by the consumer as good to eat and convenient, because of their flavor, seedlessness and ease of peeling. All three of these characteristics must be exhibited by a successful mandarin cultivar. The clementine is the cultivar that has been most popular because of these characteristics. Spanish imported Clementines that used to appear on grocery shelves are being replaced by California-grown fruit. The objective of this study is to test the adaptability of Clementines and other mandarins to the Arizona conditions.

Materials and Methods

This trial was established in March 2003 in Block 21 of the Citrus Agricultural Center, near Waddell, Arizona. Trees were planted on a 24-ft x 24-ft spacing. Mandarin selections in the trial include:

- 'Fina' – The original clementine cultivar imported from Algeria into Spain in 1925. Reportedly late, with small fruit.
- 'Fina Sodea' – A mutation of Fina clementine discovered in Morocco.
- 'Fremont' – A variety developed at the USDA station at Indio, CA. This variety is a clementine x Ponkan mandarin hybrid and is mid-season and sweet.
- 'Gold Nugget' - A seedless mid- to late-season mandarin developed at the University of California, Riverside. 'Gold Nugget' is a hybrid of 'Wilking' x 'Kincy' parentage.
- 'Oroval' – A spontaneous mutation of Fina, discovered in 1950.
- 'Sidi Aissa' – Another mutation of Fina clementine discovered in Morocco. Valued there because of its large fruit size and durable peel.
- 'W. Murcott Afourer' ('W. Murcott') – An easy peeling mandarin that originated as an open-pollinated seedling in Morocco. Seedless when grown in isolated blocks.

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The original plan was for there to be 15 trees of each variety. However due to mistakes while the trees were propagated and subsequent tree death, there range between 10 and 21 trees of each variety, except for 'W. Murcott Afourer' with 6 trees, and 'Gold' Nugget' with 4. All trees are on Carrizo citrange rootstock.

Irrigation is border flood, and normal cultural practices are used. Yield data is collected during the winter, and 2004-05 was the first harvest year for this trial. For 2007-08, trees were strip-picked on 12-18-07, except the 'W. Murcott Afourer' and the 'Gold Nugget' which was picked on 1-25-08. Bird damage led to some yield loss for the two late-harvested selections. For each harvest date, the entire quantity of harvested fruit from each tree was passed through an automated electronic eye sorter (Autoline, Inc., Reedley, CA), which provides weight, color, exterior quality (blemish) and size data for each fruit. Fruit packout data is reported on a percentage basis. Ten fruit per tree were selected for fruit quality analysis. This analysis included % juice, juice pH, total solids, total acids, total solid to total acid ratio, peel thickness, and granulation.

All data was analyzed using SPSS 11.0 for Windows (SPSS Inc., Chicago, Illinois).

Results and Discussion

Third year yield for the trial is shown in Figure 1. There was no significant difference between any of the four clementine selections, 'Fina', 'Fina Sodea' and Sidi Aissa' had about 150 lbs. of fruit per tree, while 'Oroval' produced 187 lbs. of fruit per tree. 'Gold Nugget' had significantly less fruit, about 91 lbs. per tree, a 35 to 50% reduction compared with the clementines. 'W. Murcott Afourer' produced only 51 lbs. of fruit per tree, an amount 50% less than the yield of 'Gold Nugget'. Yields since the initiation of the experiment are shown in Figure 2. The 2007-08 harvest season represented the greatest increase in yield for all the selections, except for 'W. Murcott Afourer'. Yield increases over the previous year ranged from 50% to more than 100%, but yield for 'W. Murcott' decreased by about 33%.

Packout of the cultivars is shown in Figure 3. 'W. Murcott Afourer' and 'Gold Nugget' had the largest fruit; both selections peaked on sizes 80 and 100. The four clementine selections had the next largest fruit, typically peaking on sizes 125 and 150. Of the four clementines, 'Sidi Aissa' was the smallest, while 'Oroval' was slightly larger. 'Fremont' had the smallest fruit of the seven selections tested, peaking on sizes 150 and 180.

'Fina' fruit had significantly higher juice content, lower pH, and higher TA, compared to the other clementine selections (Table 1). This is undoubtedly related to the lesser degree of granulation found in this selection, compared to the other clementines (Table 2). 'W. Murcott' and 'Gold Nugget' had juice contents that were neither the highest nor the lowest among the selections tested. Among the clementines, 'Fina Sodea' 'Oroval' and Sidi Aissa' had the lowest juice contents, somewhat higher pH levels, and lower TA. 'W. Murcott' had the highest pH, but an intermediate level of acids, while 'Gold Nugget' had an intermediate pH level, and intermediate levels of acids. There was no significant effect of any of the selections upon TSS or TSS:TA.

Although there were significant differences, all the selections had peel thicknesses between 2.5 and 3.1 mm, with the smaller-fruited 'Fremont' having the thinnest peel, and 'W. Murcott Afourer' and 'Gold Nugget' having the thickest peel (Table 2). Granulation varied significantly, 'Fina' and ''W. Murcott' had the least granulation, while 'Fina Sodea' and 'Sidi Aissa' had the greatest level. It is worthwhile to note that we never found noticed any granulation in a 'W. Murcott' fruit. 'Gold Nugget' had the roundest fruit, while fruit of 'Fina' clementine was the most flattened. All four clementine selections, as well as 'Fremont' had the reddest color, while color of the 'W. Murcott Afourer' and the 'Gold Nugget' selections were the least red. For exterior quality, most of the selections were similar, except for 'Fina' which had the most blemish, leading to significantly less fancy grade and significantly more choice and juice grade fruit than the others.

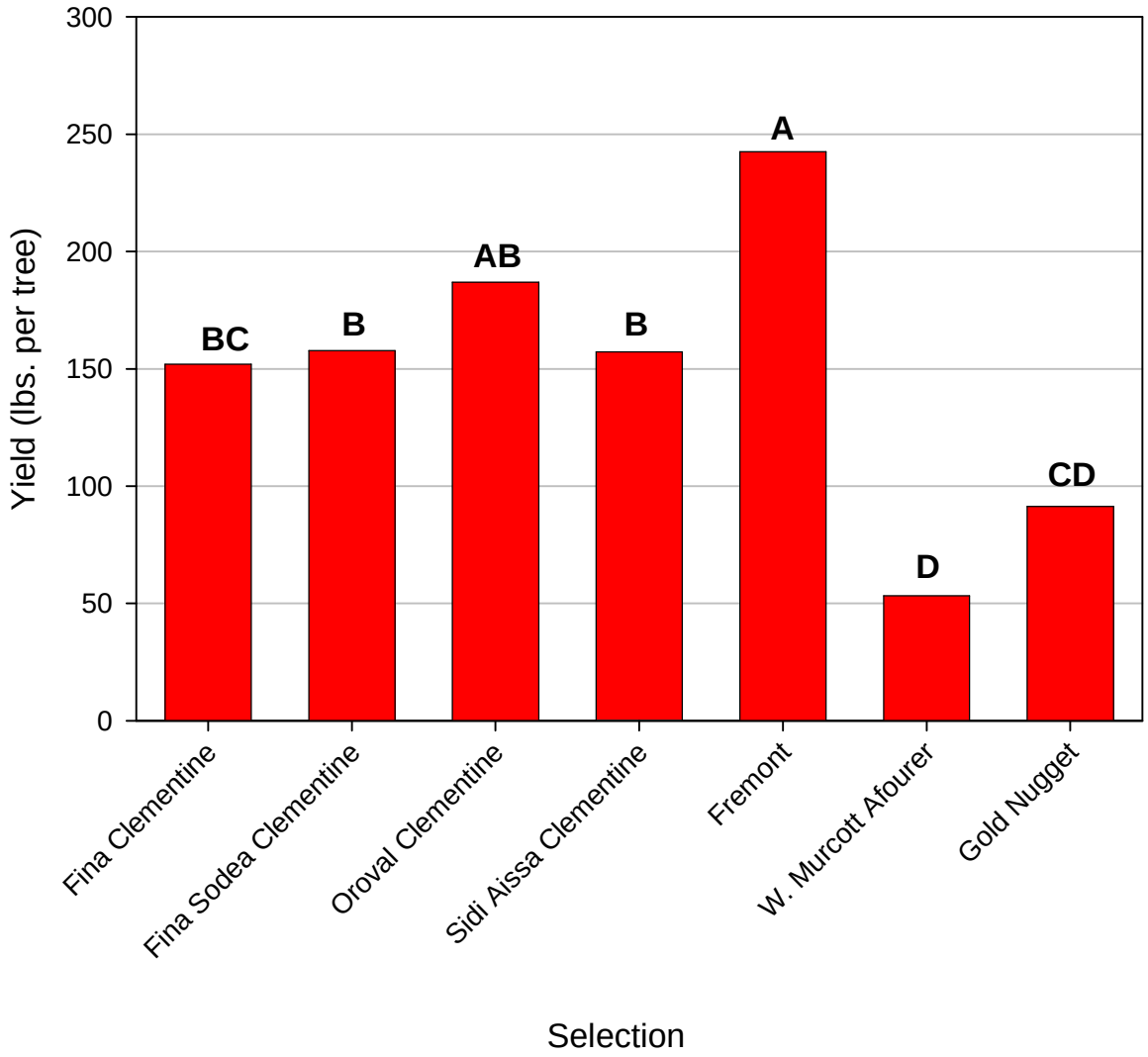

Figure 1. Yields of five mandarin selections on Carrizo citrange rootstock for 2007-08 season. Overall yield for the year can be compared using the uppercase letters above each stacked bar.

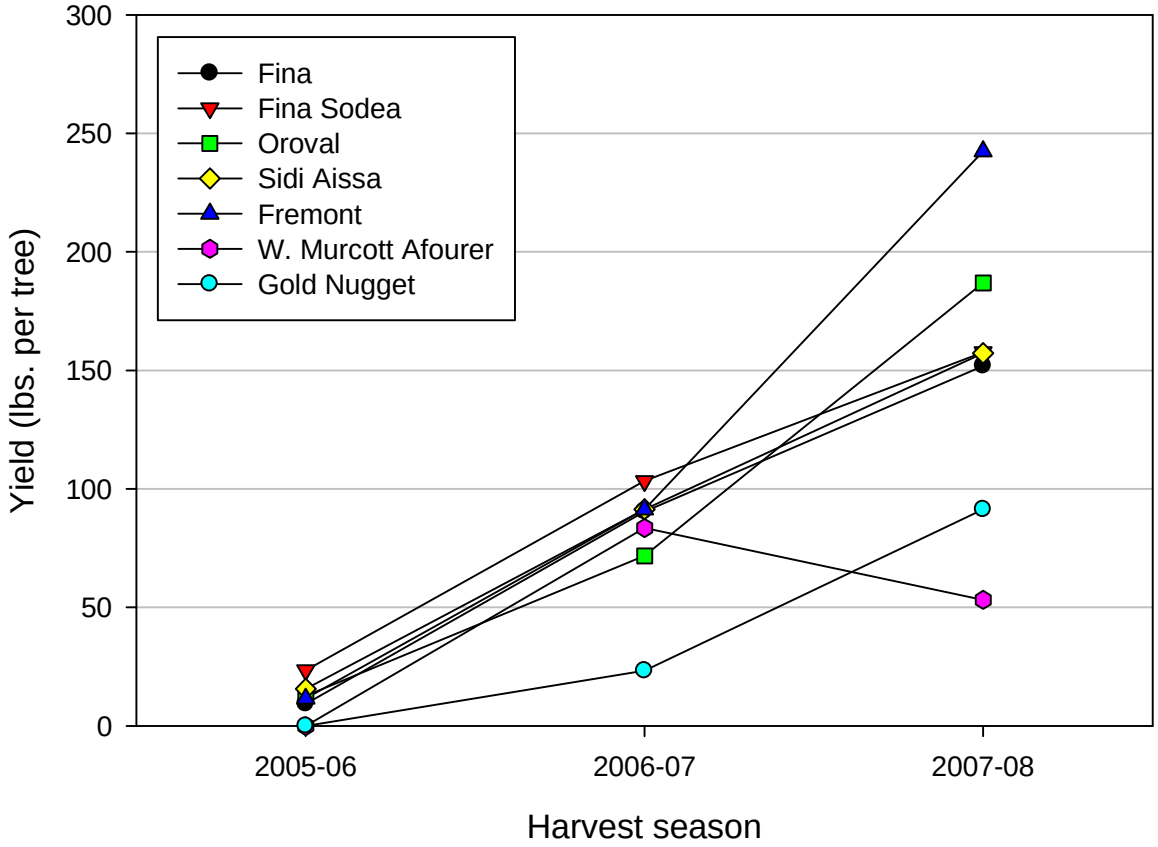

Figure 2 2005 through 2007 yields for seven mandarin selections on Carrizo rootstock.

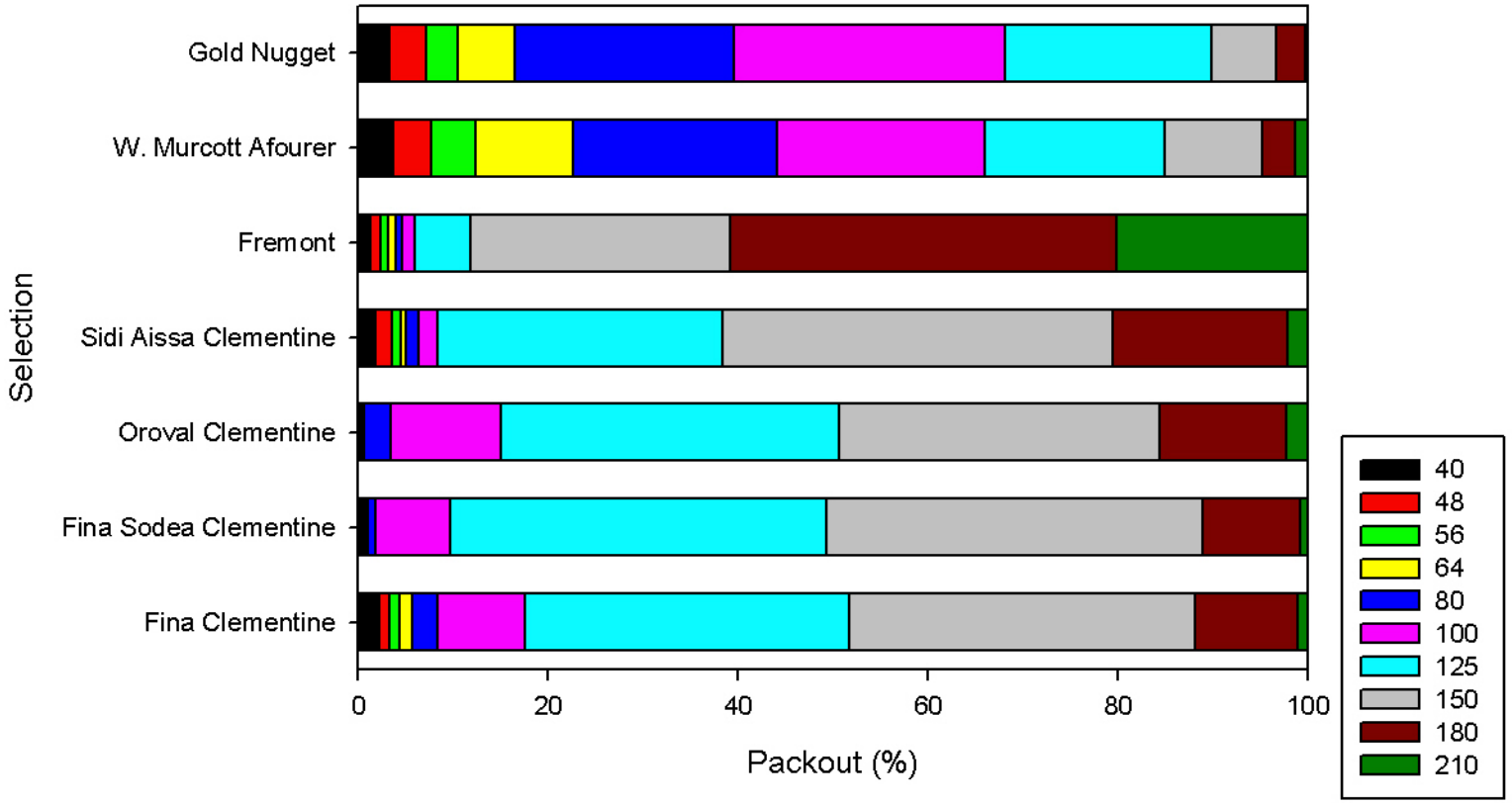

Figure 3. Packout of seven mandarin selections on Carrizo citrange rootstock for the 2007-08 season.

Table 1. 2006-07 Fruit quality of six mandarin cultivars budded to Carrizo rootstock.

Cultivar	Juice Content (%)	pH	TSS (%)	Total Acids (%)	TSS:TA
Fina	44.55 a[z]	2.68 c	14.76	1.21 a	12.55
Fina Sodea	24.09 bc	2.98 b	13.31	0.87 b	15.49
Oroval	27.25 bc	2.89 bc	14.05	1.06 ab	13.31
Sidi Aissa	21.32 c	2.90 bc	13.63	0.89 b	15.46
Fremont	28.17 bc	2.93 bc	13.57	0.97 b	14.14
W. Murcott Afourer	29.48 bc	3.25 a	14.74	0.99 b	15.26
Gold Nugget	32.58 b	2.90 bc	15.20	1.01 ab	15.54

[z] Means separation in columns by Duncan's Multiple Range Test, 5% level.

Table 2. 2007-08 Additional fruit quality parameters of six mandarin cultivars budded to Carrizo rootstock.

Cultivar	Peel Thickness (mm)	Granulation[y] (%)	Fruit Shape[x]	R/G[w]	Fruit Grade		
					Fancy (%)	Choice (%)	Juice (%)
Fina	2.32 b[z]	2.85 ab	3.27 a	0.924 ab	39.51 c	43.88 a	16.61 a
Fina Sodea	2.63 ab	27.67 a	2.95 b	0.936 a	81.52 a	14.36 b	4.12 b
Oroval	3.05 a	10.00 ab	2.64 c	0.940 a	74.94 ab	16.58 b	8.48 b
Sidi Aissa	2.51 ab	27.72 a	3.01 b	0.932 a	79.97 a	17.69 b	2.34 b
Fremont	2.54 ab	13.67 ab	2.94 b	0.932 a	86.87 a	11.44 b	1.69 b
W. Murcott Afourer	3.14 a	0.00 b	2.70 c	0.875 c	65.76 b	13.88 b	20.36 a
Gold Nugget	3.10 a	6.67 ab	2.29 d	0.907 b	77.57 ab	15.24 b	7.19 b

[z] Means separation in columns by Duncan's Multiple Range Test, 5% level.

[y] Granulation values are taken from 10 fruit per tree. Values represent the percentage of fruit in the entire fruit sample with more than 20% granulation

[x] A value of 1.00 signifies a completely round fruit. Values greater than one signify increasingly flattened fruit.

[w] Signifies the red to green intensity ratio of the fruit. A greater value signifies more orange or red color.