THE EVALUATION OF WALNUT VARIETIES FOR CALIFORNIA'S CENTRAL COAST REGION – 2007 HARVEST

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ABSTRACT

Walnut varieties sometimes have different tree and nut characteristics in the cool Central Coast climate when compared to the same varieties in the warmer Central Valley climate. In 2007, 26 samples were collected from 8 commercial orchards located in San Benito and Santa Clara Counties. The heaviest nuts (mean nut weight) were from one sample of '64-57' (15.2 g), and the lightest were from the CLRV-hypersensitive variety '93-045-1' (8.5 g). The highest percentage of large sound nuts was a sample of 'Tulare' (100%) and the lowest percentage was the CLRV-hypersensitive variety '92-016-1' (31.8%).

Kernel shrivel was highest for one sample each of 'Tulare' (4.9%), '64-57' (4.5%) and the CLRV-hypersensitive variety '92-16-1' (4.6%). One sample of 'Payne' had highest percent edible yield at 61.8% followed by one sample of 'Serr' at 60.4%. The sample with the lowest percent edible yield was a sample of 'Hartley' at 42.6%. Two samples of 'Chandler' had the highest percent extra-light colored kernels (92.4% and 90.4%) while one sample of 'Payne' had the lowest at 11.2%. The highest relative light index (RLI) reading was recorded for one sample of 'Payne' at 59.7 and the lowest RLI reading was for another sample of 'Payne' at 51.3. The highest relative value (RV) figures were for one sample of 'Payne' (1.3430) followed by one sample each of 'Serr' (1.2246) and '93-045-1' (1.2169) while the lowest was for one sample of 'Payne' at 0.8422. The 2007 season was highlighted by a very mild summer with no temperatures as high as 100 deg F and by significant WHF damage in many orchards.

OBJECTIVES

The objective of this project was to evaluate established standard varieties as well as some newer varieties from several locations in San Benito County with different management practices and microclimates. The performance of some varieties may differ when grown in a cooler climate than found in the Central Valley where most of the evaluation of new varieties is conducted. The field evaluation of CLRV-hypersensitive varieties continued for a third year.

PROCEDURES

Samples of walnuts were collected at random during the normal harvest timing from eight commercial orchards in San Benito County including variety trials. Samples were dried in mesh bags in a laboratory drying oven with a maximum temperature of 110°F. These were then transported to Diamond Foods, Inc., Stockton, CA who provided the crackout information listed in table 1 and table 2.

RESULTS AND DISCUSSION

External nut characteristics are shown in table 1 and kernel characteristics are shown in table 2. The results were derived from approximately 1000 g samples of in-shell dried walnuts selected at random from orchards at or near commercial harvest.

The heaviest sample based on mean nut weight (g) was one sample of ’64-57’ (15.2 g), followed by one sample of ‘Tulare’ (13.0 g). The lightest nuts based on mean nut weight were of the CLRV-hypersensitive variety ’93-045-1’ (8.5 g). The highest percentage of both baby (41.7%) and medium-sized (29.6%) nuts was in CLRV-hypersensitive variety ‘92-016-1’. One sample of ‘Tulare’ had the highest percentage of large sound nuts (100%) while the lowest percentage (31.8%) occurred in the ‘92-016-1’. Stained shells were uncommon with the highest percentage at 3.4% for ‘93-045-1’. Broken shells were also uncommon with only the ‘Tehama’ sample (2.4%) having any broken shells. Only two samples of ‘Chandler’ had any adhering hull. The percent external damage was low for all varieties with the highest being ‘Pedro’ at 3.5%. Eight out of the 26 samples were from organic orchards.

In more than two-thirds of the samples, there was no internal insect damage which refers mostly to codling moth with an occasional navel orangeworm. The maximum insect damage was 5% in a conventional ‘Howard’ orchard. Mold was zero in all samples. Shrivel was highest for one sample of ‘Tulare’ at 4.9% followed by ’92-016-1’ at 4.6% and ’64-57’ at 4.5%. Percent edible yield was highest for one sample each of ’Payne’ at 61.8%, ’Serr’ at 60.4% and ’93-045-1’ at 59.7%. The lowest percent edible yield was found in samples of ‘Hartley’ at 42.6%, 45.3% and 45.9% and one sample of ‘Payne’ at 45.1%. The sample with the highest percent of extra-light kernels was one sample of ‘Chandler’ at 92.4% followed by a second ‘Chandler’ sample at 90.4%. The lowest percentage of extra-light kernels was one sample of ‘Payne’ at 11.2%. Amber-colored nuts were low in all samples with the highest being 4.8% in one ‘Payne’ sample.

Reflected light index (RLI) is an objective color rating derived from bouncing light off of a given sample – a higher rating is desirable. The average RLI for each variety is shown in table 2. Overall, the highest overall RLI was for one sample of ‘Payne’ at 59.7. The lowest RLI was one another sample of ‘Payne’ at 51.3.

Relative value (RV) values are listed in table 2. RV is now determined by the formula *Edible Yield X RLI X .0364* which sets the value of a sample with a 50% yield and a RLI of 55 equal to an RV of 1.00. An overall relative value rating of 1.00 or higher generally indicates very high quality nuts. This is different than in years previous to 2004 so the data is not comparable. The highest RV was for a sample of ‘Payne’ at 1.34 followed by a sample of ‘Serr’ at 1.22 and ’93-045-1’ also at 1.22. The lowest RV was a sample of ‘Payne’ at 0.8422 followed by ‘Hartley’ at 0.8885. The average RV for named varieties ranged from 1.16 for Serr (three samples) to ‘Hartley’ (four samples) at 0.94.

CONCLUSIONS

‘Payne’: This variety normally suffers from inferior kernel color and low relative value, as well as high susceptibility to blackline (CLRV), codling moth, walnut husk fly, walnut blight, and sunburn. In 2007, a relatively dry spring and a cool summer favored good quality with a mean RV of 1.10 (3 samples). One sample was excellent with a high RLI and RV. It is still difficult to recommend ‘Payne’ for further planting because of poor quality compared to newer varieties and extreme blackline susceptibility.

‘Serr’: This variety has always excelled in % edible yield. The RV of ‘Serr’ was also high (mean=1.16) this year as it was during the last three years. It is susceptible to many of the same problems as ‘Payne’ but heat damage was not a major factor this year. This variety is noted for low and variable yield and is not recommended unless this problem can be resolved with the use of growth regulators or other methods.

‘Howard’: This variety was good but not exceptional in any particular characteristic. The mean RV in 2007 was 1.04. This variety has had some grower concerns involving weak tree growth, limb breakage and kernel spotting in the past but it does have high yields. This variety is recommended for planting but only when planted on better soils to improve vigor. Use higher density planting layouts. Remove all nuts from young trees to improve early growth.

‘Tulare’: The mean RV of ‘Tulare’ was the third highest (1.09) of all conventional varieties. Tree vigor is better than ‘Howard’ and harvest date is earlier than ‘Chandler’ which are pluses when considering a replacement variety. A few growers have complained of poor shell seal. The nuts are susceptible to WHF. This variety is recommended for trial.

‘Hartley’: For cracking purposes, ‘Hartley’ had a low mean RV (0.94) based mainly upon low % edible yield. Most other parameters were good or excellent. Most ‘Hartley’ nuts in the Central Coast are cracked so this variety is not usually recommended. The tree is relatively vigorous but has low early yields. Mature tree yields are good. The nuts are fairly resistant to walnut blight and codling moth but susceptible to WHF.

‘Pedro’: This variety did better in 2007 than in most years with an RV of 1.03 (one sample). This variety is usually of lower quality and value than ‘Chandler’, ‘Howard’ and ‘Tulare’ and is not a recommended variety.

‘Tehama’: This variety performed similarly compared to past tests. This was the only variety with a shell breakage problem, which is typical of this variety. There was also some shrivel. RV was 0.97 – in the bottom quarter of all samples. This is not a recommended variety.

‘Chandler’: This variety is the recognized standard for kernel quality based upon color but mean nut weight, % large sound nuts and % edible yield were no more than average this year. Its greatest fault is late harvest although in 2005, 2006 and 2007 it was harvestable by mid- to late-October. This is a recommended variety especially for organic production due to the relatively low incidence of codling moth, WHF (susceptible, but mostly late damage requiring fewer sprays) and walnut blight.

’64-57’: This is a local variety that was never released by the University of California. It has very distinctive, large nuts that are pointed at both ends (dirigible-shaped). In 2007, as in most years, ’64-57’ had the heaviest nuts at 15.2 g. The RV was 1.03. This variety can have a lot of blanks, shrivel (4.5% in 2007) and shell seal problems in some years and is sensitive to adverse climatic or cultural conditions. It is worthy of continued planting in the Central Coast region.

‘92-016-1’: This was the first CLRV-hypersensitive (i.e.: blackline-resistant) selection from the UC Davis breeding program that came into production in local test plots. It is located in an orchard with nearby blackline-infected trees. It has small nuts (9.3g, 31.8% large sound) with some shrivel (4.6% in 2007). Kernel color was okay as measured by both light and extra-light kernels and RLI. The RV of the one sample (.996) was better than ‘Tehama’ and the composite average for ‘Hartley’. There will be increasing interest locally in any CLRV-hypersensitive variety with decent quality and yield but this variety has nuts that are possibly too small for commercial production.

‘93-045-1’: This is the second CLRV-hypersensitive selection from UC Davis to come into production in local test plots. It is located in an orchard with nearby blackline-infected trees. The percent edible kernel (59.8%) was excellent. The RV was among the highest of all tested varieties at 1.22. Mean nut weight (8.5g) was low and the nuts are possibly too small for commercial production.

ACKNOWLEDGEMENT

Thank you to Diamond Foods, Inc. for providing crackout data for the walnut samples reviewed in this report.

TABLE 1: WALNUT VARIETY EVALUATION, SAN BENITO COUNTY, 2007
NUT SIZE, EXTERNAL DEFECTS AND ORGANIC STATUS

VARIETY	#	LOC	WT(g)	% BABY	% MEDIUM	% LG SND	% STAIN	% BROKEN	% ADH HULL	% EXT DAM	STATUS
PAYNE	901	1	9.4	10.3	16.8	77.3	0.0	0.0	0.0	0.0	CONV
PAYNE	902	2	11.8	0.0	5.9	94.2	0.0	0.0	0.0	0.0	ORGANIC
PAYNE	903	3	12.2	0.0	2.4	97.1	1.2	0.0	0.0	1.2	CONV
SERR	904	1	11.9	3.2	18.9	82.3	0.0	0.0	0.0	0.0	CONV
SERR	905	2	10.8	2.2	4.3	95.3	0.0	0.0	0.0	0.0	ORGANIC
SERR	906	4	10.3	2.1	18.6	98.1	1.0	0.0	0.0	1.0	CONV
HOWARD	907	1	10.8	2.2	4.3	87.3	0.0	0.0	0.0	0.0	CONV
HOWARD	908	3	11.2	0.0	1.1	90.5	0.0	0.0	0.0	0.0	CONV
HOWARD	909	5	9.5	0.0	15.2	87.3	0.0	0.0	0.0	0.0	ORGANIC
HOWARD	910	6	12.5	0.0	3.8	90.5	2.5	0.0	0.0	2.5	CONV
HARTLEY	911	3	11.1	4.4	11.1	87.3	0.0	0.0	0.0	0.0	CONV
HARTLEY	913	4	11.6	3.1	1.2	97.9	1.2	0.0	0.0	1.2	CONV
HARTLEY	914	7	11.8	0.0	3.5	97.6	0.0	0.0	0.0	0.0	ORGANIC
HARTLEY	915	8	12.8	0.0	0.0	99.5	0.0	0.0	0.0	0.0	ORGANIC
TULARE	916	1	12.7	1.3	0.0	98.9	0.0	0.0	0.0	0.0	CONV
TULARE	917	4	12.4	1.2	0.0	95.5	2.0	0.0	0.0	2.0	CONV
TULARE	918	5	13.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	ORGANIC
PEDRO	920	1	10.3	0.0	3.1	96.2	1.0	0.0	0.0	1.0	CONV
TEHAMA	921	1	9.6	5.9	5.9	85.3	1.2	2.4	0.0	3.5	CONV
CHANDLER	922	1	10.3	3.1	6.2	90.0	0.0	0.0	3.1	3.1	CONV
CHANDLER	923	3	9.6	8.7	26.9	64.8	0.0	0.0	2.9	2.9	CONV
CHANDLER	926	7	11.8	1.2	9.4	91.6	0.0	0.0	0.0	0.0	ORGANIC
CHANDLER	927	8	11.8	0.0	2.4	96.2	0.0	0.0	0.0	0.0	ORGANIC
64-57	928	1	15.2	0.0	1.5	97.0	0.0	0.0	0.0	0.0	CONV
92-016-1	929	1	9.3	41.7	29.6	31.8	0.0	0.0	0.0	0.0	CONV
93-045-1	930	1	8.5	11.0	28.0	59.9	3.4	0.0	0.0	3.4	CONV

WT(g) = weight of whole nut in grams
% BABY, % MEDIUM, %LG SND = nut size grades - baby, medium and large, sound nuts
% STAIN = % with stained shells % BROKEN = % with broken shells
% ADH HULL = % with adhering hull
% EXT DAM = % with external shell damage
STATUS = conventional or certified organically grown

TABLE 2: WALNUT VARIETY EVALUATION, SAN BENITO COUNTY, 2007
INTERNAL DEFECTS, KERNEL QUALITY, RELATIVE VALUE

VARIETY	#	LOC	% INSECT	% MOLD	%SHRIVEL	%ED YIELD	% EX LT	% LT	% LT AMB	% AMB	RLI	RV
PAYNE	901	1	0.0	0.0	0.0	61.8	86.6	11.7	1.8	0.0	59.7	1.3430
PAYNE	902	2	1.2	0.0	2.4	45.1	11.2	46.6	36.1	4.8	51.3	0.8422
PAYNE	903	3	0.0	0.0	0.0	54.5	62.8	32.3	5.0	0.0	56.2	1.1149
SERR	904	1	0.0	0.0	0.0	60.4	27.5	66.9	4.6	1.0	55.7	1.2246
SERR	905	2	0.0	0.0	0.0	55.2	58.7	35.3	6.0	0.0	56.7	1.1393
SERR	906	4	1.0	0.0	0.0	55.4	63.9	30.9	3.4	0.0	56.2	1.1333
HOWARD	907	1	0.0	0.0	0.0	51.7	41.8	43.9	14.3	0.0	54.1	1.0181
HOWARD	908	3	0.0	0.0	2.2	49.9	87.0	12.6	0.0	0.0	58.5	1.0626
HOWARD	909	5	0.0	0.0	1.0	52.5	55.9	28.9	14.8	0.0	55.2	1.0549
HOWARD	910	6	5.0	0.0	0.0	50.7	37.5	50.6	4.0	0.0	55.9	1.0316
HARTLEY	911	3	0.0	0.0	0.0	45.9	73.6	23.5	2.8	0.0	57.9	0.9674
HARTLEY	913	4	0.0	0.0	0.0	42.6	75.8	21.6	2.6	0.0	57.3	0.8885
HARTLEY	914	7	0.0	0.0	0.0	45.3	72.6	22.3	5.1	0.0	57.9	0.9547
HARTLEY	915	8	0.0	0.0	1.3	46.9	31.5	63.6	2.8	1.7	55.6	0.9492
TULARE	916	1	1.3	0.0	1.3	55.8	37.6	48.9	10.6	0.0	55.8	1.1334
TULARE	917	4	2.5	0.0	4.9	52.2	30.0	55.4	7.3	2.8	54.8	1.0412
TULARE	918	5	0.0	0.0	0.0	54.0	73.2	21.8	5.0	0.0	55.9	1.0997
PEDRO	920	1	1.0	0.0	0.0	51.7	41.9	54.8	2.1	0.0	54.5	1.0256
TEHAMA	921	1	2.4	0.0	3.5	47.7	34.4	57.9	2.9	0.0	55.6	0.9654
CHANDLER	922	1	0.0	0.0	1.0	54.3	90.4	7.7	1.5	0.0	57.9	1.1444
CHANDLER	923	3	0.0	0.0	1.0	51.3	70.4	19.6	9.5	0.0	55.6	1.0382
CHANDLER	926	7	0.0	0.0	0.0	48.8	92.4	5.5	2.0	0.0	57.8	1.0267
CHANDLER	927	8	3.5	0.0	2.4	52.0	82.4	7.8	2.0	0.0	56.9	1.0770
64-57	928	1	0.0	0.0	4.5	52.4	19.2	60.0	15.7	2.8	54.1	1.0319
92-016-1	929	1	0.0	0.0	4.6	51.8	36.2	45.4	14.8	2.1	52.8	0.9956
93-045-1	930	1	0.0	0.0	0.8	59.7	67.6	29.8	2.3	0.0	56.0	1.2169

% INSECT = percent of kernels with insect damage (mostly codling moth)
% MOLD = percent of kernels with visible mold
% SHRIVEL = percent of kernels with shriveled portions
% ED YIELD = percent of nut that is edible kernel
KERNEL COLOR: EX LT= extra light, LT = light, LT AMB = light amber, AMB = amber
RLI= reflected light index (higher is lighter) RV=relative value (higher is better)