

COMPARISON OF BLACKLINE-RESISTANT AND CONVENTIONAL WALNUT VARIETIES IN THE CENTRAL COAST – 2014

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ABSTRACT

Samples of seven conventional walnut varieties were compared to samples of nine blackline-resistant varieties from the UC Davis Walnut Improvement Program for several walnut quality parameters including mean nut weight, percent large sound nuts, percent edible yield, reflected light index and relative value. Overall, the highest value walnuts, as measured by relative value, were two samples of ‘Serr’, and one each of 94-022-24 and ‘Chandler’. Blackline-resistant walnuts are approaching the level of commercial acceptability necessary for variety introduction.

OBJECTIVES

Blackline is serious virus disease of English walnuts when grafted onto rootstocks that are hypersensitive to the cherry leafroll virus (walnut strain). The UC Davis Walnut Improvement Program is developing selections that are resistant to blackline by incorporating hypersensitivity from Northern California black walnuts and then back-crossing to English walnuts. The objective of this project was to compare the nut characteristics of commercial interest of conventional walnut varieties versus blackline-resistant numbered selections from the UC Davis Walnut Improvement Program.

SIGNIFICANT FINDINGS

- Some numbered blackline-resistant varieties from the UC Davis Walnut Improvement Program are approaching the level of commercial acceptability necessary for commercial introduction.
- Continued breeding of blackline-resistant varieties is essential to be able to release one or more of these varieties for commercial use in the near future.

PROCEDURES

One thousand gram (g) samples of each selected walnut variety were collected at harvest, placed in mesh bags and dried at 110 degrees F in a laboratory drying oven. Samples were submitted to Diamond Foods, Inc, Stockton, CA for crackout analysis. Samples collected included the conventional varieties ‘Serr’ (3 samples), ‘Howard’ (3), ‘Tulare’ (4), ‘Hartley’ (2), ‘Chandler’ (3), ‘Gillet’ (2), and ‘Bonturi’ (64-57) (2). Blackline-resistant varieties included 92-016-1, 93-045-1 (3), 94-022-24, 94-026-20, 95-027-11, 95-027-19 (2), 95-029-4, 97-027-24 and 97-027-55.

RESULTS

The results of the crackout analysis for San Benito County samples in 2014 are shown in table 1. The characteristics summarized in the table are nut weights, percent large, sound nuts, percent mold, percent shrivel, percent edible yield, percent extra-light colored kernels, percent light colored kernels, percent light amber colored kernels, percent amber colored kernels, reflected light index (RLI) and relative value (RV). The 2014 season was characterized by many warm but few hot days in the Central Coast. Sunburn damage was not prominent in most orchards. Leafing, bloom and harvest were very early. Size, color and RV were down overall versus 2013 but yield was up, especially noticeable for ‘Serr’. Codling moth damage was light but walnut husk fly damage was mild to severe. Nuts damaged by walnut husk fly were not collected in samples utilized by this project due to their potential impact on nut quality. Each grower/location is shown in the column labeled “LOC” for location. All trees were mature or near mature trees.

The nut weights are mean nut weights per nut in grams and varied from 14.55 to 7.53 g this season. The percent, sound nuts are the percentage of the nuts that are both in the large size category and where the shell is free from defects. The range this season was 99 down to 18 percent. The percent mold and percent shrivel are the percentage of the walnuts showing those defects on the kernel. Mold varied from 0 to 1 percent. Insect varied from 0 to 9 percent. Mold and insect damage are not presented in the tables. The four color groups (extra-light, light, light-amber and amber) are determined by comparison to a standard walnut color chart. There were very few amber kernels this season but a higher number of light-amber kernels. The RLI is a color determination for a whole sample made by bouncing light off the sample. Higher is lighter or better and the samples this year ranged from 59.2 to 48.5. RV is a way of determining the relative value of each sample based upon the formula used in previous years. A value of 1.00 (no units) is equivalent to a baseline variety with a 50.0% edible yield and a 55.0 RLI. A higher value is better and RV’s ranged from 1.126 to 0.832 this year. Both RLI and RV were slightly lower than in 2013.

In table 2, the same crackout analyses are arrayed in order of high to low for each characteristic by variety name. Variation between growers and locations can be seen in some cases as more important than variety

DISCUSSION

The heaviest nuts (all above 14 g mean nut weight) were in samples of ‘Tulare’, ‘Bonturi’ and two samples of ‘Gillet’. The lightest nuts (all less than 9 g mean nut weight) were in three samples of 93-045-1. The highest percentage of large, sound nuts (all 97 to 99 percent) was found in samples of ‘Gillet’ (two samples), ‘Howard’, ‘Tulare’ and ‘Hartley’. The lowest percentage of large, sound nuts (less than 50 percent) was found in samples of 93-045-1 (two samples), 95-027-19 and 97-027-24. The highest percent edible yield (55% or higher) was found in samples of ‘Serr’ (two samples), 95-027-19, 94-022-24 and 95-027-19. The lowest percent edible yield (lower than 49%) was 95-027-11, two samples of ‘Hartley’, and two samples of

‘Howard’. ‘Hartley’ might bring a higher price in-shell but most Central Coast ‘Hartley’ walnuts are shelled.

The highest percent of extra-light kernels (all above 75%) was found in ‘Tulare’ followed by all three ‘Chandler’ samples. Four samples had no extra-light kernels – 93-045-1, 95-027-19, 97-27-24 and 97-027-55. For RLI, the top varieties (55.0 or higher) were ‘Chandler’ (two samples), ‘Tulare’ (two samples), ‘Serr’, 94-022-24 and ‘Hartley’. The varieties with the lowest RLI (below 50.5) were 95-027-19 (two samples), 97-027-55 and 93-045-1.. Finally for RV, the varieties with the highest value (all at 1.07 or above) were ‘Serr’ (two samples), 94-022-24, ‘Chandler’ and ‘Tulare’ (two samples).The lowest RV’s (all less than 0.90) were ‘Howard’, 95-027-11 and two ‘Hartley’ samples.

Several of the numbered blackline-resistant varieties were competitive with conventional varieties in the common factors that result in high walnut value. A good example is 94-022-24 which has high yields and is competitive in most quality factors. This does not necessarily mean these varieties are ready for commercial introduction. There has been inadequate testing in the Central Valley with higher temperature extremes and greater blight and codling moth pressure. However, it does indicate that the UC Davis Walnut Improvement Program is close to achieving a desirable blackline-resistant variety and some may already be suitable for locations with the highest incidence of the disease.

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TABLE 1: CRACKOUT COMPARISON OF BLACKLINE-RESISTANT AND CONVENTIONAL WALNUT VARIETIES - 2014

| VARIETY | ID # | LOC | NUT WT (g) | % LARGE SOUND | % MOLD | % SHRIVEL | % EDIBLE YIELD | %EXTRA-LIGHT | | % LIGHT AMBER | | REFLECTED LIGHT INDEX | | RELATIVE VALUE |
|-----------|------|-----|------------|---------------|--------|-----------|----------------|--------------|--------------|---------------|---------------|-----------------------|-------|----------------|
| | | | | | | | | LIGHT | %EXTRA-LIGHT | AMBER | % LIGHT AMBER | AMBER | AMBER | |
| SERR | 901 | 1 | 10.67 | 86 | 0 | 0 | 53.0 | 68 | 23 | 9 | 0 | 52.5 | 1.002 | |
| SERR | 902 | 2 | 10.75 | 92 | 0 | 2 | 57.2 | 63 | 35 | 2 | 0 | 54.7 | 1.126 | |
| SERR | 903 | 3 | 11.26 | 88 | 0 | 0 | 55.6 | 69 | 31 | 0 | 0 | 55.8 | 1.117 | |
| HOWARD | 904 | 2 | 9.82 | 80 | 0 | 0 | 47.7 | 39 | 50 | 11 | 0 | 52.0 | 0.893 | |
| HOWARD | 905 | 4 | 11.52 | 98 | 0 | 1 | 49.4 | 44 | 39 | 17 | 0 | 52.5 | 0.934 | |
| HOWARD | 906 | 5 | 12.20 | 93 | 0 | 0 | 48.5 | 68 | 27 | 5 | 0 | 53.8 | 0.939 | |
| TULARE | 907 | 1 | 12.05 | 96 | 0 | 1 | 53.9 | 62 | 31 | 7 | 0 | 53.9 | 1.046 | |
| TULARE | 908 | 2 | 11.13 | 94 | 0 | 0 | 53.0 | 54 | 37 | 9 | 0 | 56.3 | 1.074 | |
| TULARE | 909 | 3 | 12.38 | 94 | 0 | 1 | 50.4 | 82 | 18 | 0 | 0 | 54.8 | 0.995 | |
| TULARE | 910 | 6 | 14.55 | 97 | 0 | 3 | 53.1 | 67 | 33 | 0 | 0 | 56.0 | 1.070 | |
| HARTLEY | 911 | 3 | 10.21 | 80 | 0 | 0 | 41.9 | 57 | 38 | 5 | 0 | 55.2 | 0.832 | |
| HARTLEY | 912 | 4 | 12.82 | 97 | 0 | 1 | 44.3 | 43 | 54 | 3 | 0 | 54.3 | 0.866 | |
| CHANDLER | 913 | 2 | 10.35 | 87 | 0 | 1 | 52.8 | 81 | 17 | 2 | 0 | 54.0 | 1.022 | |
| CHANDLER | 914 | 4 | 11.54 | 92 | 0 | 0 | 52.1 | 76 | 21 | 2 | 0 | 57.4 | 1.076 | |
| CHANDLER | 915 | 6 | 11.27 | 92 | 0 | 4 | 49.9 | 81 | 19 | 0 | 0 | 59.2 | 1.062 | |
| GILLET | 916 | 2 | 14.11 | 99 | 1 | 0 | 51.0 | 57 | 27 | 14 | 2 | 53.0 | 0.973 | |
| GILLET | 917 | 6 | 14.30 | 99 | 0 | 0 | 51.7 | 28 | 65 | 7 | 0 | 53.8 | 1.002 | |
| BONTURI | 918 | 1 | 12.87 | 94 | 1 | 9 | 48.8 | 27 | 56 | 15 | 2 | 51.0 | 0.896 | |
| BONTURI | 919 | 2 | 14.31 | 96 | 0 | 1 | 51.5 | 65 | 25 | 10 | 0 | 53.2 | 0.986 | |
| 92-016-1 | 920 | 1 | 11.14 | 65 | 0 | 0 | 49.6 | 5 | 87 | 8 | 0 | 51.3 | 0.915 | |
| 93-045-1 | 921 | 2 | 7.53 | 18 | 1 | 3 | 54.5 | 52 | 34 | 14 | 0 | 51.7 | 1.014 | |
| 93-045-1 | 922 | 6 | 8.88 | 61 | 0 | 4 | 52.3 | 49 | 43 | 8 | 0 | 52.1 | 0.981 | |
| 93-045-1 | 923 | 7 | 8.51 | 36 | 1 | 0 | 53.7 | 0 | 73 | 25 | 2 | 49.7 | 0.961 | |
| 94-022-24 | 924 | 6 | 10.02 | 96 | 0 | 4 | 55.5 | 58 | 33 | 8 | 0 | 55.8 | 1.115 | |
| 94-026-20 | 925 | 1 | 11.67 | 81 | 0 | 8 | 51.7 | 20 | 57 | 21 | 3 | 50.7 | 0.944 | |
| 95-027-19 | 926 | 2 | 9.10 | 38 | 1 | 3 | 55.9 | 6 | 33 | 61 | 0 | 48.5 | 0.976 | |
| 95-027-11 | 927 | 6 | 10.88 | 76 | 0 | 8 | 46.0 | 44 | 53 | 3 | 0 | 51.3 | 0.849 | |
| 95-027-19 | 928 | 7 | 10.64 | 87 | 0 | 1 | 55.0 | 0 | 65 | 35 | 0 | 50.4 | 0.998 | |
| 95-029-4 | 929 | 6 | 9.13 | 61 | 0 | 18 | 49.8 | 40 | 40 | 18 | 1 | 51.8 | 0.929 | |
| 97-027-24 | 930 | 7 | 10.24 | 45 | 0 | 3 | 53.0 | 0 | 60 | 40 | 0 | 50.5 | 0.963 | |
| 97-027-55 | 931 | 7 | 9.36 | 61 | 0 | 0 | 51.9 | 0 | 80 | 20 | 0 | 50.1 | 0.937 | |

**TABLE 2: CRACKOUT COMPARISONS OF BLACKLINE-RESISTANT AND CONVENTIONAL WALNUT VARIETIES -2014
VARIETIES ARRAYED FROM HIGH TO LOW FOR EACH CHARACTERISTIC**

| NUT WT (g) | % LARGE SOUND | % EDIBLE YIELD | % EX-LIGHT | REFLECTED LIGHT INDEX | RELATIVE VALUE |
|------------|---------------|----------------|------------|-----------------------|----------------|
| TULARE | GILLET | SERR | TULARE | CHANDLER | SERR |
| BONTURI | GILLET | 95-027-19 | CHANDLER | CHANDLER | SERR |
| GILLET | HOWARD | SERR | CHANDLER | TULARE | 94-022-24 |
| GILLET | TULARE | 94-022-24 | CHANDLER | TULARE | CHANDLER |
| BONTURI | HARTLEY | 95-027-19 | SERR | SERR | TULARE |
| HARTLEY | TULARE | 93-045-1 | SERR | 94-022-24 | TULARE |
| TULARE | BONTURI | TULARE | HOWARD | HARTLEY | CHANDLER |
| HOWARD | 94-022-24 | 93-045-1 | TULARE | TULARE | TULARE |
| TULARE | TULARE | TULARE | BONTURI | SERR | CHANDLER |
| 94-026-20 | TULARE | SERR | SERR | HARTLEY | 93-045-1 |
| CHANDLER | BONTURI | TULARE | TULARE | CHANDLER | SERR |
| HOWARD | HOWARD | 97-027-24 | 94-022-24 | TULARE | GILLET |
| CHANDLER | SERR | CHANDLER | HARTLEY | HOWARD | 95-027-19 |
| SERR | CHANDLER | 93-045-1 | GILLET | GILLET | TULARE |
| 92-016-1 | CHANDLER | CHANDLER | TULARE | BONTURI | BONTURI |
| TULARE | SERR | 97-027-55 | 93-045-1 | GILLET | 93-045-1 |
| 95-027-11 | CHANDLER | GILLET | 93-045-1 | SERR | 95-027-19 |
| SERR | SERR | 94-026-20 | HOWARD | HOWARD | GILLET |
| SERR | 95-027-19 | BONTURI | 95-027-11 | 93-045-1 | 97-027-24 |
| 95-027-19 | 94-026-20 | GILLET | HARTLEY | HOWARD | 93-045-1 |
| CHANDLER | HOWARD | TULARE | 95-029-4 | 95-029-4 | 94-026-20 |
| 97-027-24 | HARTLEY | CHANDLER | HOWARD | 93-045-1 | HOWARD |
| HARTLEY | 95-027-11 | 95-029-4 | GILLET | 92-016-1 | 97-027-55 |
| 94-022-24 | 92-016-1 | 92-016-1 | BONTURI | 95-027-1 | HOWARD |
| HOWARD | 93-045-1 | HOWARD | 94-026-20 | BONTURI | 95-029-4 |
| 97-027-55 | 95-029-4 | BONTURI | 95-027-19 | 94-026-20 | 92-16-1 |
| 95-029-4 | 97-027-55 | HOWARD | 92-016-1 | 97-027-24 | BONTURI |
| 95-027-19 | 97-027-24 | HOWARD | 93-045-1 | 95-027-19 | HOWARD |
| 93-045-1 | 95-027-19 | 95-027-11 | 95-027-19 | 97-027-55 | 95-027-11 |
| 93-045-1 | 93-045-1 | HARTLEY | 97-027-24 | 93-045-1 | HARTLEY |
| 93-045-1 | 93-045-1 | HARTLEY | 97-027-55 | 95-027-19 | HARTLEY |