

New Germplasm and Training Systems for High Density Catch Frame Almond Systems

Project No.: Hort33-Lampinen

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A. Summary

Trees in this trial grew well. Since the goal was to investigate genetic propensity towards central leader architecture, minimal pruning was done. Photo 2 shows the minimal amount of pruning that was done to try to stimulate the growth of the central leader. By the end of the second year, although some trees still had a central leader, it would have taken a lot of pruning to maintain a true central leader architecture. We do not think this is practical or beneficial.

B. Objectives (300 words max.)

1. This project was designed to develop compact central leader trees that are compatible with high density plantings and catch frame harvesting. This will include 8 advanced selections from the UC Davis Almond Breeding Program that show promising architecture for central leader tree architecture as well as 3 items from the a commercial breeding program and commercial varieties 'Nonpareil', 'Monterey', 'Wood Colony', 'Winters' and 'Shasta'.
2. The goal for the current year (year 2) was to evaluate the varieties and selections to see which were most compatible with central leader training.

C. Annual Results and Discussion

Only a minimal amount of pruning was done to attempt to maintain a central leader (Photo 1). After the first year, about half of the items looked promising with a fairly strong tendency towards a central leader architecture (Table 1). The fact that the tendency towards a central leader was directly related to vigor (Fig. 1) suggests that the likelihood of developing low vigor central leader trees is unlikely. By the end of the second year, all trees had a similar shape and appearance (Photo 3). In order to maintain a central leader such as we can generate in walnut, multiple, repeated cuts would have had to have been made as shown in the right image in Photo 2. After 2 years of following these items, we do not think that it is possible (or necessary) to generate central leader almond trees without a great deal of manipulation of the canopy. This trial will be integrated into Tom Gradziel's breeding program evaluation plots in 2020.



Photo 1. Tree before (left) and after (right) removal of shoot competing with central leader. Photos taken on July 25, 2018.



Photo 2. Shasta bareroot tree, which had the strongest central leader rating in the first year. Photo on the left was taken on May 1, 2018 several months after planting. The photos in the middle was taken on Jan. 13, 2020. The photo on the right shows where cuts would have had to have been made to maintain a central leader training system.

Table 1. Tree diameter, height, central leader tendency rating and vigor ratings in 2018 and 2019

Number	Variety or selection	Diameter 6/1/18 (mm)	Diameter 11/27/18 (mm)	Diameter 10/10/19 (mm)	Height 6/1/18 (cm)	Height 11/27/18 (cm)	Height 10/10/19 (cm)	Central leader rating Oct. 2018	Vigor rating Oct. 2018
1	UCD 4, 5-252	9.27 b	27.9 f	55.1 f	90.8 g	223.7 gh	251.2 h	1.50 efg	1.50 f
2	UCD A05, 11-60	11.08 b	39.7 bc	224.5 abcde	122.8 f	245.9 defgh	314.6 fg	1.00 g	2.50 de
3	UCD A05, 8-69	9.82 b	37.4 cde	231.4 abc	103.5 g	238.5 defg	350.8 bcde	2.83 bcd	3.17 bcd
4	UCD A06, 3-542	11.87 b	40.0 abc	234.9 ab	147.3 d	237.2 efgh	347.6 bcde	3.33 bcd	3.17 bcd
5	UCD A07, 2-292	9.24 b	35.7 e	217.7 bcde	104.3 g	235.2 fgh	345.1 cde	3.33 abc	3.50 abc
6	Monterey	12.93 b	40.4 abc	235.2 ab	163.9 c	263.1 abcde	342.9 cde	2.00 def	3.50 abc
7	Monterey BR	14.51 b	39.4 bcd	213.0 cde	196.8 b	250.4 cdefg	328.6 efg	3.83 ab	3.66 abc
8	P16.022	12.41 b	37.4 cde	220.2 abcde	134.2 def	236.9 efgh	353.3 bcde	3.50 ab	3.12 bcd
9	Pyrennes (P14.095)	13.12 b	40.4 abc	238.9 a	139.0 de	220.6 h	343.3 efg	1.25 fg	2.17 ef
10	Shasta (P10.022)*	11.89 b	35.9 de	212.6 de	131.1 ef	264.1 abcd	367.5 abcd	2.33 de	3.50 abc
11	Shasta BR	28.72 a	43.5 a	228.4 abcd	204.5 ab	277.2 ab	390.1 a	4.33 a	4.25 a
12	Shasta's sister (P10.023)	12.17 b	40.3 abc	231.7 ab	146.9 d	236.0 efgh	348.4 bcde	2.50 cd	2.83 cde
13	UCD 1-232	15.75 b	41.8 ab	228.6 abcd	162.3 c	255.6 abcdef	354.0 bcde	3.50 ab	4.00 ab
14	UCD 8-201	14.17 b	40.5 abc	228.2 abcd	145.5 de	226.2 gh	309.2 g	2.83 bcd	2.83 cde
15	Winters	11.48 b	39.7 bc	232.9 ab	120.6 f	262.0 abcdef	335.4 efg	3.67 ab	3.50 abc
16	Winters BR	13.72 b	39.7 bc	220.5 abcde	163.1 c	236.7 efgh	330.2 efg	3.67 ab	3.33 bcd
17	Wood Colony BR	17.01 b	39.1 bcde	209.0 e	216.6 a	227.1 gh	339.5 def	4.12 ab	2.83 cde
18	Nonpareil BR	.	39.0 bcde	218.2 bcde	.	284.0 a	375.5 ab	2.75 def	3.00 bcde
19	Nonpareil	.	40.7 abc	222.6 abcde	.	272.4 abc	370.0 abc	3.35 abcd	3.00 bcde

Table 2. Varieties and selection planted, source

Number	Variety/selection	Source	Rootstock
1	4, 5-252	UCD Almond Breeding Program	Cornerstone
2	A05, 11-60	UCD Almond Breeding Program	Cornerstone
3	A05, 8-69	UCD Almond Breeding Program	Cornerstone
4	A06, 3-542	UCD Almond Breeding Program	Cornerstone
5	A07, 2-292	UCD Almond Breeding Program	Cornerstone
6	Monterey	Commercial nursery	Cornerstone
7	Monterey BR	Commercial nursery	Nemaguard
8	P16.022	Burchell Nursery	Cornerstone
9	Pvrennes (P14.095)	Burchell Nursery	Cornerstone
10	Shasta (P10.022)*	Burchell Nursery	Cornerstone
11	Shasta BR	Burchell Nursery	Nemaguard
12	Shasta's sister (P10.023)	Burchell Nursery	Cornerstone
13	UCD 1-232	UCD Almond Breeding Program	Cornerstone
14	UCD 8-201	UCD Almond Breeding Program	Cornerstone
15	Winters	Commercial nursery	Cornerstone
16	Winters BR	Commercial nursery	Nemaguard
17	Wood Colony BR	Commercial nursery	Nemaguard
18	Nonpareil BR	Commercial nursery	Nemaguard
19	Nonpareil	Commercial nursery	Cornerstone

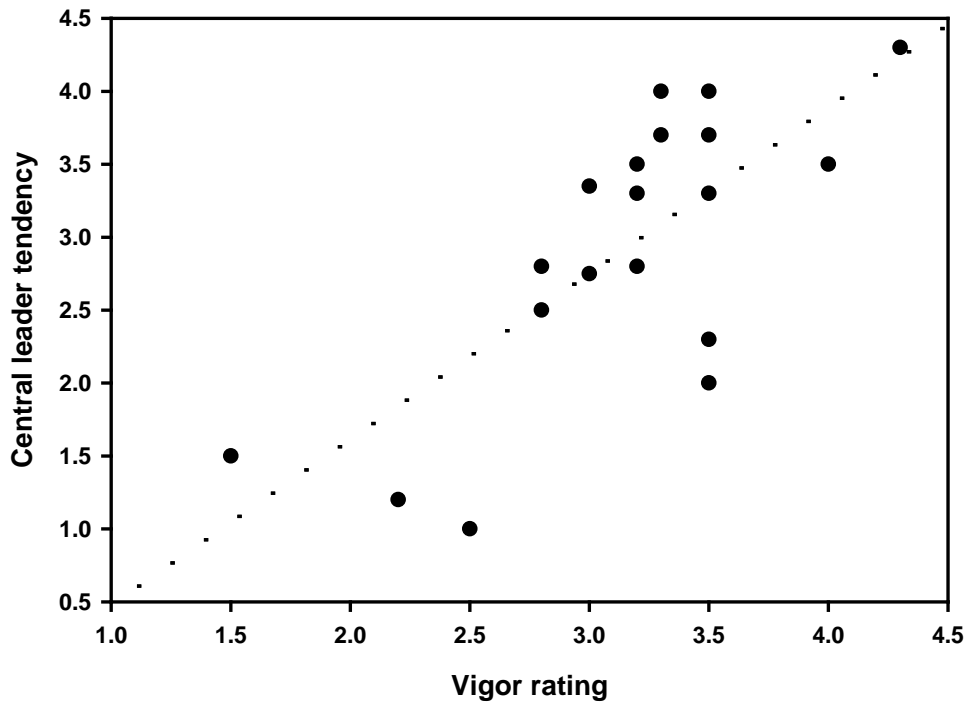


Figure 1. Visual rating of vigor versus tendency towards forming a central leader in 2018.



Wood Colony bareroot



selection A06, 3-542



UCD 8-201



Monterey bareroot



Shasta



UCD 1-232



P16.022



Monterey potted



Winters



UCD 4, 5-252



UCD A07, 2-292



Winters bareroot



P10.023



Shasta bareroot



Pyrennes



UCD A05, 11-60



Winters bareroot



Nonpareil bareroot



Nonpareil

Photo 3. One photo of a tree from each variety or selection on January 13, 2020.

D. Outreach Activities

Results were presented at the Annual Almond Board Conference in December 2018 and December 2019.

E. Materials and Methods (500 word max.):

Tree were planted in April 2018 at a spacing of 7' x 17' in a randomized block design with 3 replicates and 4 trees in each replicate (Photo 4). All trees were left unheaded from the nursery. Initial measurements taken included height and circumference at planting. Trees were left unpruned except for removing branches that were too low and minor thinning of shoots competing with the central leader in the first year. The ratings for vigor and central leader tendency were done independently by Tom Gradziel and Bruce Lampinen and average results are presented.



Photo 4. Planting day on May 4, 2018

The only pruning cuts made were a few minor thinning cuts of shoots near the central leader in the first year (Photo 1).

F. Outreach

This project has not had enough results to publish refereed publications but it has been presented at the Almond Board Conference in 2018 and 2019.
