Field Evaluation of Almond Varieties

Project No.: **09-HORT2-Lampinen**

Project Leader: Bruce Lampinen
Department of Plant Sciences
UC Davis
One Shields Ave.
Davis, CA 95616
E-mail: bdlampinen@ucdavis.edu

Project Cooperators: Tom Gradziel, Sam Metcalf, William Stewart, Maria Contador, Mary Ann Thorpe, and Warren Micke, UC Davis
Joe Connell, UCCE - Butte County
Paul Verdegaal, UCCE - San Joaquin County
Mario Viveros and Peggy Shrader, UCCE - Kern County
The Billings Ranches (Kern County)

Objectives:

The objective of this project is to evaluate performance of pollenizers and Nonpareil clones (including yields) in a replicated field trial in McFarland California. Bloom and maturity data for the 2009 season for the McFarland Variety Trial as well as light interception and yield data

Interpretive Summary:

This report will concentrate on a replicated variety trial of eight varieties and eight Nonpareil clones that was planted in 2004 in Kern County near McFarland. Soils at the site consist of McFarland loam and Wasco sandy loam (both Class I soils). The irrigation system is double line drip. Tree spacing is 20 feet between tree rows and 18 feet between trees for a density of 121 trees per acre. Varieties planted included Chips, Kahl, Kochi, Marcona, Selection 2-19e, Sweetheart and Winters, Nonpareil clones planted include Nonpareil 3-8-2-70, Nonpareil 5, Nonpareil 6, Nonpareil 7, Nonpareil Dr., Nonpareil-J, Nonpareil-Newell and Nonpareil-Nico. There are six replications of each variety and Nonpareil clone with 34 trees per replication. Pollenizer and Nonpareil rows alternate in the orchard.

The objectives of the trial are to evaluate pollenizers and Nonpareil clones in a replicated trial where relative yield performance as well as bloom dates, maturity dates, disease/insect susceptibility, etc. can be assessed.

Weather during bloom was generally good at the McFarland trial site. Bloom was generally advanced by 1-3 days in 2009 compared to in 2008 (**Table 1**). Sweetheart and Marcona were the varieties to reach full bloom the earliest and Kochi and Selection

2-19e were the latest. Bloom overlap was very good in 2009. Hullsplit data for the 2009 season has been misplaced.

In 2009, hullrot was again severe in Kochi (**Table 2**) as it was in 2008. Unlike during the 2008 season, there was little hullrot in the Nonpareil clones in 2009 (**Table 2**). There were no significant differences in hull rot for all other varieties besides Kochi for the 2009 season (**Table 2**).

Yield data for the McFarland trial from the 2006 through 2009 seasons are shown in **Table 3**. Selection 2-19e and the Nonpareil clones have had the highest cumulative yields at the McFarland trial (**Table 4**). Cumulative yields at the end of the 2009 season show that Nonpareil-Nico, Nonpareil-Newell, selection 2-19e, Nonpareil-Driver, and Nonpareil 3-8-2-70 have had significantly higher yields than all of the other varieties (**Table 3**). The top yielding cultivars are producing yields in the range of 4000 kernel pounds per acre which is very high for a 6th leaf orchard. The replication provided in this trial adds much value to the data compared to earlier unreplicated variety trials but it comes at a cost in terms of the time required for maintaining, rating and harvesting the plots.

The automatic lightbar (described in report for Almond Board project titled "Development and Testing of a Mobile Platform for Measuring Canopy Light Interception and Stress in Almond") was used to measure midday canopy light interception in the McFarland trial on July 19-20, 2009. **Table 4** shows the photosythetically active (PAR) interception, yield and yield per unit PAR intercepted by variety for the 2009 season. The productivity per unit canopy light interception tended to be quite high for the size of the tree since our previous data has suggested somewhere around 50 pounds per unit light intercepted is near the normal maximum for almond. This trial produced between 52 and 85 kernel pounds per unit light intercepted. In general, this does not appear to be due to alternate bearing effects since yields for most varieties and Nonpareil sources was also high in the 2008 season (**Table 3**). These yields are high for the age of the orchard as well. **Figure 1** shows average yield by orchard age for all varieties, selections and Nonpareil sources for the Butte, Delta and Kern trials planted in 1993 compared to the McFarland trial planted in 2004. Part of the difference is likely due to the fact that the McFarland trial has a much smaller selection of varieties included.

Acknowledgements

The authors wish to thank the Almond Board of California for their continued support of this project. We also want to thank the Billings Ranches for their excellent cooperation in managing and maintaining this trial.

Table 1. Bloom data for the McFarland Trial for the 2008 and 2009 season. Crosshatched area indicates period from onset of bloom to 100% petal fall.

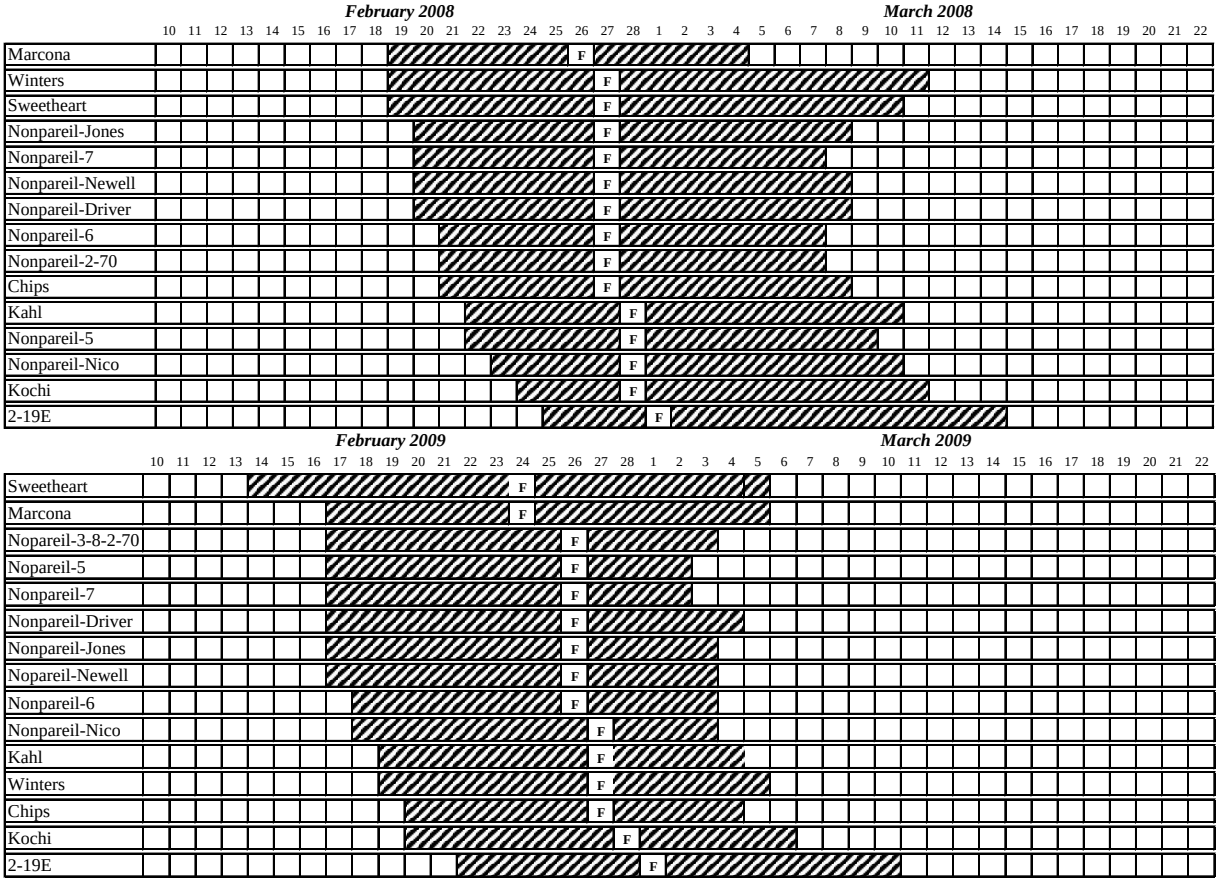

Table 2. Hullrot strikes per tree for the 2009 season at the McFarland trial. Letters indicate significant difference at the 5% level of significance

2009 Hull rot strikes/tree

Kochi	122	b
Sweetheart	18	a
Marcona	18	a
Winters	16	a
2-19E	11	a
Chips	8	a
Nonpareil-Newell	5	a
Nonpareil-5	5	a
Nonpareil-7	4	a
Nonpareil-J	4	a
Nonpareil-DR	4	a
Nonpareil 3-8-2-70	3	a
Nonpareil-Nico	2	a
Nonpareil-6	1	a
Kahl	1	a

Table 3. Yield, number of nuts, average kernel weight, shelling percentage and kernel pound per acre yield for the 2006 through 2009 seasons. Data for each year is sorted by cumulative yield.

2006				Kernel pounds per		Cumulative kernel
Variety	No. of nuts/tree	Average kernel wt (g)	Shelling percentage	Tree	Acre	lbs/acre
2-19e	6852 a	0.94 g	53.0 d	14.2 a	1718 a	1718 a
Winters	6648 a	0.87 h	53.4 d	12.7 a	1540 a	1540 a
Marcona	3611 bcd	1.31 a	30.7 f	10.4 b	1258 b	1258 b
Nonpareil-Ni	4246 b	1.09 cde	67.2 a	10.2 b	1232 bc	1232 bc
Nonpareil-5	3713 bcd	1.12 bcd	67.9 a	9.1 bcd	1110 bcd	1110 bcd
Nonpareil-D	3867 bc	1.07 def	63.4 abc	9.1 bcd	1103 bcd	1103 bcd
Nonpareil-3-8-2-70	3848 bc	1.07 cde	64.6 ab	9.1 bcd	1101 bcd	1101 bcd
Nonpareil-Ne	3815 bc	1.07 cde	67.7 a	9.0 bcd	1086 bcd	1086 bcd
Nonpareil-6	3886 bcd	1.12 bc	67.0 a	8.9 bcd	1075 bcd	1075 bcd
Nonpareil-J	3717 bcd	1.08 cde	64.0 abc	8.8 bcd	1066 bcd	1066 bcd
Chips	3623 bcd	1.02 f	53.8 d	8.1 bcde	985 bcde	985 bcde
Kochi	3134 cd	1.16 b	59.9 c	8.0 cdef	965 cdef	965 cdef
Nonpareil-7	3288 bcd	1.08 cde	65.1 a	7.8 def	940 def	940 def
Kahl	3139 cd	1.06 ef	47.8 e	7.3 def	889 def	889 def
Sweetheart	2777 d	0.95 g	67.8 a	5.8 f	588 f	588 f

2007				Kernel pounds per		Cumulative kernel
Variety	No. of nuts/tree	Average kernel wt (g)	Shelling percentage	Tree	Acre	lbs/acre
2-19e	13149 a	0.78 e	54.3 d	22.8 a	2756 a	4474 a
Winters	11972 ab	0.83 de	60.2 b	21.8 ab	2634 ab	4173 a
Nonpareil-Newell	10659 bc	0.90 bc	67.3 a	20.9 abc	2536 abc	3626 b
Nonpareil-Nico	9260 cde	0.92 bc	66.0 a	18.8 abcde	2279 abcde	3511 b
Nonpareil-Driver	9793 cd	0.91 bc	65.6 a	19.6 abcd	2370 abcd	3474 b
Nonpareil-3-8-2-70	9340 cde	0.92 bc	66.3 a	18.9 abcde	2291 abcde	3393 b
Nonpareil-5	8905 cdef	0.95 b	67.0 a	18.6 abcde	2251 bcde	3323 bc
Marcona	6938 fg	1.08 a	29.8 f	16.5 defg	1995 defg	3252 bcd
Kahl	9594 cd	0.91 bc	47.6 e	19.3 abcd	2332 abcd	3222 bcd
Nonpareil-J	9137 cde	0.89 bcd	65.5 a	17.8 bcde	2152 bcdef	3218 bcd
Nonpareil-6	8396 def	0.94 b	67.1 a	17.4 def	2103 def	3178 bcd
Nonpareil-7	9517 cd	0.92 bc	67.9 a	19.3 abcd	2332 abcd	3140 bcd
Chips	7681 defg	0.87 cd	54.4 d	14.7 efg	1780 efg	2766 bcd
Kochi	6006 g	1.08 a	59.4 bc	14.3 fg	1729 fg	2694 de
Sweetheart	6767 fg	0.89 bcd	66.6 a	13.1 g	1588 g	2165 e

2008				Kernel pounds per		Cumulative kernel
Variety	No. of nuts/tree	Average kernel wt (g)	Shelling percentage	Tree	Acre	lbs/acre
2-19e	13472 a	0.93 g	54.3 d	27.5 cd	3321 cd	7795 a
Nonpareil-Nico	13879 a	1.10 cd	66.0 a	33.5 a	4056 a	7567 ab
Nonpareil-Newell	11916 bcd	1.09 de	67.3 a	28.6 cd	3456 cd	7110 bc
Nonpareil-3-8-2-70	12506 bcd	1.17 cd	66.3 a	30.7 b	3714 b	7106 bc
Nonpareil-Driver	12729 abc	1.07 de	65.6 a	29.8 bc	3611 bc	7085 bc
Nonpareil-5	12883 ab	1.08 de	67.0 a	30.5 b	3692 b	7001 bc
Winters	9872 e	1.02	60.2 b	22.1 fg	2670 fg	6843 c
Nonpareil-7	13250 ab	1.06 de	67.9 a	31.1 ab	3763 ab	6802 c
Nonpareil-6	10707 de	1.16 c	67.1 a	27.3 cd	3300 cd	6478 cd
Nonpareil-J	11071 d	1.09 cde	65.5 a	26.6 de	3224 de	6442 cd
Kahl	10720 de	0.96 fg	47.6 e	22.6 fg	2733 fg	5954 de
Chips	11465 cd	0.97 fg	54.4 d	24.4 ef	2956 ef	5722 e
Sweetheart	13149 ab	0.82 g	66.6 a	23.9 ef	2893 ef	5059 f
Marcona	4721 f	1.39 a	29.8 f	14.4 h	1748 h	5001 f
Kochi	5882 f	1.28 b	59.5 bc	16.5 h	2002 h	4996 f

2009				Kernel pounds per		Cumulative kernel
Variety	No. of nuts/tree	Average kernel wt (g)	Shelling percentage	Tree	Acre	lbs/acre
Nonpareil-Nico	13773 ab	1.05 bcd	74.7 ab	32.9 a	3977 a	11417 a
Nonpareil-Newell	14513 a	1.03 bcd	74.8 ab	33.1 a	4004 a	11145 ab
2-19e	14706 a	0.84 f	65.6 f	27.1 c	3285 c	11080 ab
Nonpareil-Driver	13856 ab	1.08 ab	75.8 a	32.9 a	3977 a	11062 ab
Nonpareil-3-8-2-70	13756 ab	1.04 bcd	74.6 ab	31.4 ab	3798 ab	10905 abc
Nonpareil-5	12070 bcd	1.08 ab	74.2 ab	28.7 bc	3476 bc	10494 bcd
Nonpareil-7	13051 ab	1.03 bcd	72.6 abc	29.5 bc	3571 bc	10393 bcd
Nonpareil-6	13505 ab	1.02 bcd	71.2 cd	30.3 abc	3661 abc	10139 cd
Nonpareil-J	12803 abc	1.04 bcd	71.6 bcd	29.0 bc	3513 bc	9955 de
Winters	9434 ef	0.96 bcde	61.6 g	20.0 e	2415 e	9258 ef
Kahl	11035 cde	0.87 ef	59.1 g	21.1 de	2559 de	8513 fg
Chips	9771 ef	0.93 def	58.6 g	20.0 e	2422 e	8144 gh
Sweetheart	12798 abc	0.85 ef	73.3 abc	24.0 d	2906 d	7965 gh
Marcona	8977 fg	1.07 abc	32.5	21.2 de	2562 de	7563 hi
Kochi	7252 g	1.17 a	68.9 de	18.7 e	2259 e	6955 i

Table 4. Midday canopy light interception, yield and yield per unit light intercepted by variety for 2009. Letters indicate significant difference at the 5% level of significance

Variety	Midday canopy PAR interception (%)	Yield (kernel pounds/acre)	Yield per unit PAR intercepted
Nonpareil-J	57.1 a	3512.8 bc	63.4 cd
Nonpareil- 38270	54.1 a	3798.5 a	71.8 bc
Nonpareil- Newell	53.9 a	4004.2 a	72.8 abc
Nonpareil- Nico	53.3 a	3850.7 a	69.3 bc
Nonpareil- 6	52.9 a	3660.6 bc	68.9 bc
Nonpareil- 5	52.5 a	3476.2 bc	72.0 bc
Nonpareil- DR	51.5 a	3976.6 a	76.1 abc
Sweetheart	50.7 a	2906.4 d	69.6 bc
Selection 2-19E	45.7 bc	3284.8 c	71.6 bc
Chips	44.0 c	2558.7 de	55.9 d
Kochi	43.5 c	2259.0 e	52.6 d
Winters	35.9 d	2415.1 e	63.9 cd
Kahl	33.4 d	2558.7 de	85.2 a
Marcona	33.0 d	2561.9 de	77.7 ab

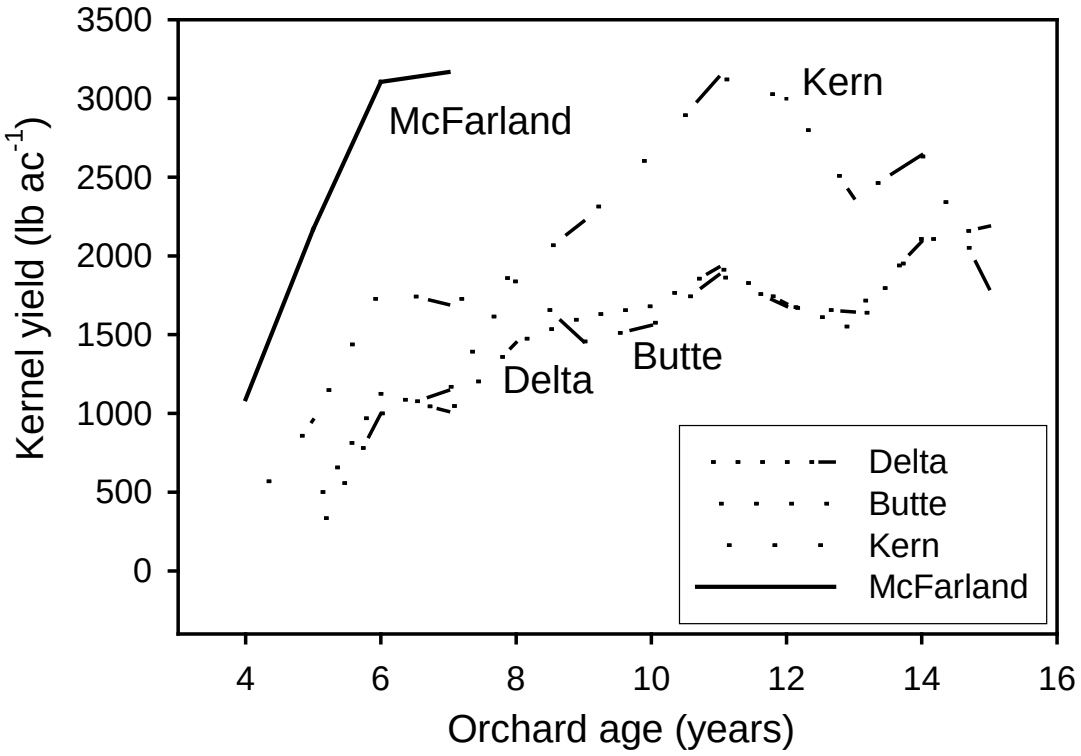

Figure 1. Average yield for all varieties, selections and Nonpareil sources by orchard age for 1993 regional variety trials as well as the McFarland variety trial that was planted in 2004.