

2003

Progress Report

**REGIONAL ALMOND
VARIETY TRIALS**

Planted in 1993

University of California

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REGIONAL ALMOND VARIETY TRIALS

Planted in 1993

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Background

Regional Almond Variety Trials (RAVTs) were designed to evaluate newer varieties in a semi-commercial (20 to 40 trees per variety) manner and to compare them to standard varieties such as Nonpareil, Mission and currently accepted pollenizers.

Previous RAVTs were established between 1974 and 1981 in Kern, Colusa, Butte, San Joaquin and Fresno Counties. These trials were planted over several years and had trees of different ages and variety combinations. Thus, the data from these earlier trials were not directly comparable and at this point data collection has ended.

1993 Trials

This leaflet presents data collected in 2003 from the three new RAVT trials established in 1993. These RAVTs are located in Butte County at the California State University at Chico farm (CSU-Chico), in San Joaquin County at the San Joaquin Delta College farm (Delta College) near Manteca and in Kern County at a Paramount Farming Company orchard (Kern) located south of Shafter and just off of 7th Standard road. Signs are in place at all locations to identify each variety.

To be comparable, these three new trials were all planted in the same year and with essentially the same variety composition. Thus, any differences in varietal performance among various regions should become evident. The only differences in variety composition among the trials were that Fritz was not included at the CSU-Chico trial (it was in the previous trial at this location) and Dottie Won was added to the Delta College plot. Some trees were planted/replanted after 1993. A few trees of several varieties were not available in 1993, especially for the Delta College trial. Vandalism and a tornado destroyed a few trees at CSU-Chico and normal replanting has occurred at all locations.

Varieties were planted on peach rootstock; Lovell for those at CSU-Chico and Nemaguard for trees in the Delta College and Kern plots. One exception, Kapareil, was planted on both peach and peach-almond hybrid rootstocks at all locations, but data is not always included in this publication for the trees on peach-almond hybrid.

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The Kern plot is planted on a Milham sandy loam soil and is irrigated with a drip system (it was irrigated with micro-sprinklers prior to 1999). The trial at CSU-Chico is on a Vina loam soil and is irrigated with solid-set sprinklers. The Delta College trial is on a Delhi loamy sand soil and is flood irrigated. Probably as a result of the coarse textured soil and flood irrigation, the trees in the Delta trial are generally somewhat smaller than those in the other two RAVTs. In the Delta College trial there appears to be a sandier area in the middle of the orchard where trees are more subject to periodic moisture stress.

Varieties Included

Standard varieties are planted 1:1 with new varieties; Nonpareil for the early-mid blooming varieties and Mission for the late blooming varieties to ensure adequate pollination. In the Kern and Delta College trials, varieties are planted as a full row of 29 to 38 trees. The rows at CSU-Chico are longer so each row has three different variety sections, with 21 to 25 trees per section. In addition to Nonpareil and Mission, a plot of each of seven "new standard" varieties (other varieties commonly planted today) has been included. These new standard varieties are Butte, Carmel, Fritz (not at CSU-Chico), Monterey, Padre, Price and Sonora.

The new varieties being tested in these trials are Aldrich, Chips, Donna, Dottie Won (Delta College only), Kahl, Kapareil, Jenette, Jiml, Johlyn, Livingston, Morley, Plateau, Rosetta, Ruby, Sano, Savana, Wood Colony and Yokut. While several of these varieties are not new to the almond industry, they had not been adequately tested in the uniform RAVT concept. In addition, six numbered selections from a University of California at Davis almond breeding program were included in these trials. These are 1-87, 1-102W, 2-19E, 2-43W, 13-1 and 25-75.

Selection 1-102w and selection 2-43w were removed from the Butte trial in 2002 since their potential was deemed to be limited under the conditions in this trial. In 2001, half rows of Kochi, Durango, Avalon and Carmel (as a standard) were planted in place of the removed selections. Kapareil on peach almond hybrid rootstock was removed from the Delta trial in 2001 due to poor productivity and the row was replanted with Avalon in the spring of 2002. Selection 25-75 and Savana were removed from the Delta trial in 2002 due to poor productivity. Kochi and Nonpareil were planted in place of Selection 25-75 in the spring of 2003 at the Delta trial.

2003 Data and Observations

This 2003 report includes information, on bloom time, hullsplit/harvest time, yields, shelling percentage (percent kernel) and kernel defects. In addition previous years and accumulated yield data are given. Some information on disease susceptibility is also included.

Bloom time weather was variable this spring. At the CSU-Chico trial, there were 61 good bee hours, which is identical to the number in 2002. However, it was cool and windy during much of the bloom with 25 of the 61 good bee hours occurring after full bloom in Butte. At the Delta trial, there were good conditions for bees on days spread throughout the bloom period. At the Kern trial bloom was prolonged, most likely due to the low number of chilling hours (582). This resulted in a prolonged hull split period and delayed maturation.

Overall average yield for all varieties was down 12% at the CSU-Chico trial, 14% at the Delta trial, and 4% at the Kern trial (Fig. 1).

In 2003, the CSU-Chico, Delta and Kern trials had 15, 13 and 10 varieties, respectively, with 6% or more kernel doubles (for details see Kernel Defects, page 23-24). The Butte and Delta trials had 6 varieties each while the Kern trial had only 2 varieties with 6% or more twin kernels. The CSU-Chico, Delta and Kern trials had 4, 8 and 3 varieties, respectively, with 6% or more blank kernels in 2003. The Kern trial had the most worm damage with 23 varieties having 6% or higher worm damage. The CSU-Chico trial had 14 and Delta only had 2 varieties with 6% or higher worm damage in 2003.

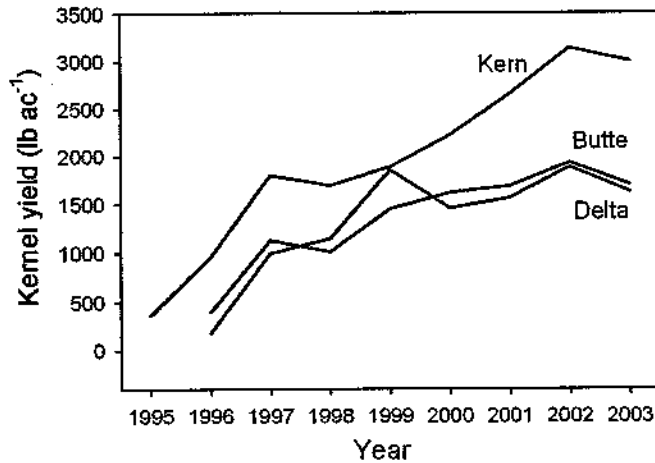


Fig. 1. Average annual yield for all varieties and selections combined at each trial.

Over the last seven years, Kahl, Sano and Plateau have had the most double kernels. Kahl and Donna have had six percent or more blank kernels in at least one of the trials each year. Kapareil has had six percent or more worm damage every year in at least one trial.

In 2003, a study of seasonal patterns of Nonpareil leaf nitrogen was carried out at the three RAVT's. Leaf nitrogen was sampled from non-bearing spurs approximately monthly starting in early to mid-April. Leaf nitrogen levels were highest at the Kern trial throughout the season and fell at a steady rate, with perhaps a slight slowing of the rate during July (Fig. 2). The slight increase in leaf nitrogen at the CSU-Chico trial in late July was due to a mid-July fertilizer application.

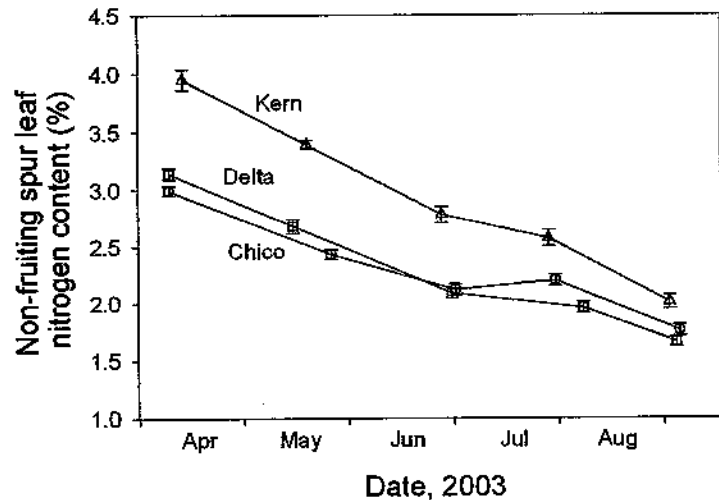


Fig. 2. Leaf nitrogen levels on non-bearing spurs sampled through the 2003 season.

Considerable splitting (breakage) and loss of scaffold limbs, and some entire trees, has occurred in both the CSU-Chico and Delta College trials. The exact cause of this splitting is uncertain, but it may be a result of the wide tree spacing and tree damage from a 1995 tornado at the CSU-Chico trial and the prevailing wind, heavy crops and lack of sufficient tree tying at the Delta College plot. Loss of scaffold limbs and trees has been taken into account in calculating per acre yields. Even without the above conditions, scaffold splitting may be a problem for the Aldrich variety with its upright growth habit and narrow crotch angles. Thus, this variety will require special care in tree training.

Until the 2002 season, only Yokut at the CSU-Chico trial had shown indications of possible noninfectious bud failure (BF) symptoms, and these symptoms might be due to a virus condition that mimics BF.

However, in the spring of 2002, minor bud failure was observed on the tops of 14% of the Carmel trees in the Kern trial and 12% of the Carmel trees in the Butte trial. This followed a warm 2001 May-June period that was extremely conducive to bud failure. In 2003, bud failure was again observed at the Butte and Kern sites but it was not significantly worse than in 2002. To date, no bud failure has been observed on the Carmel trees at the Delta College trial.

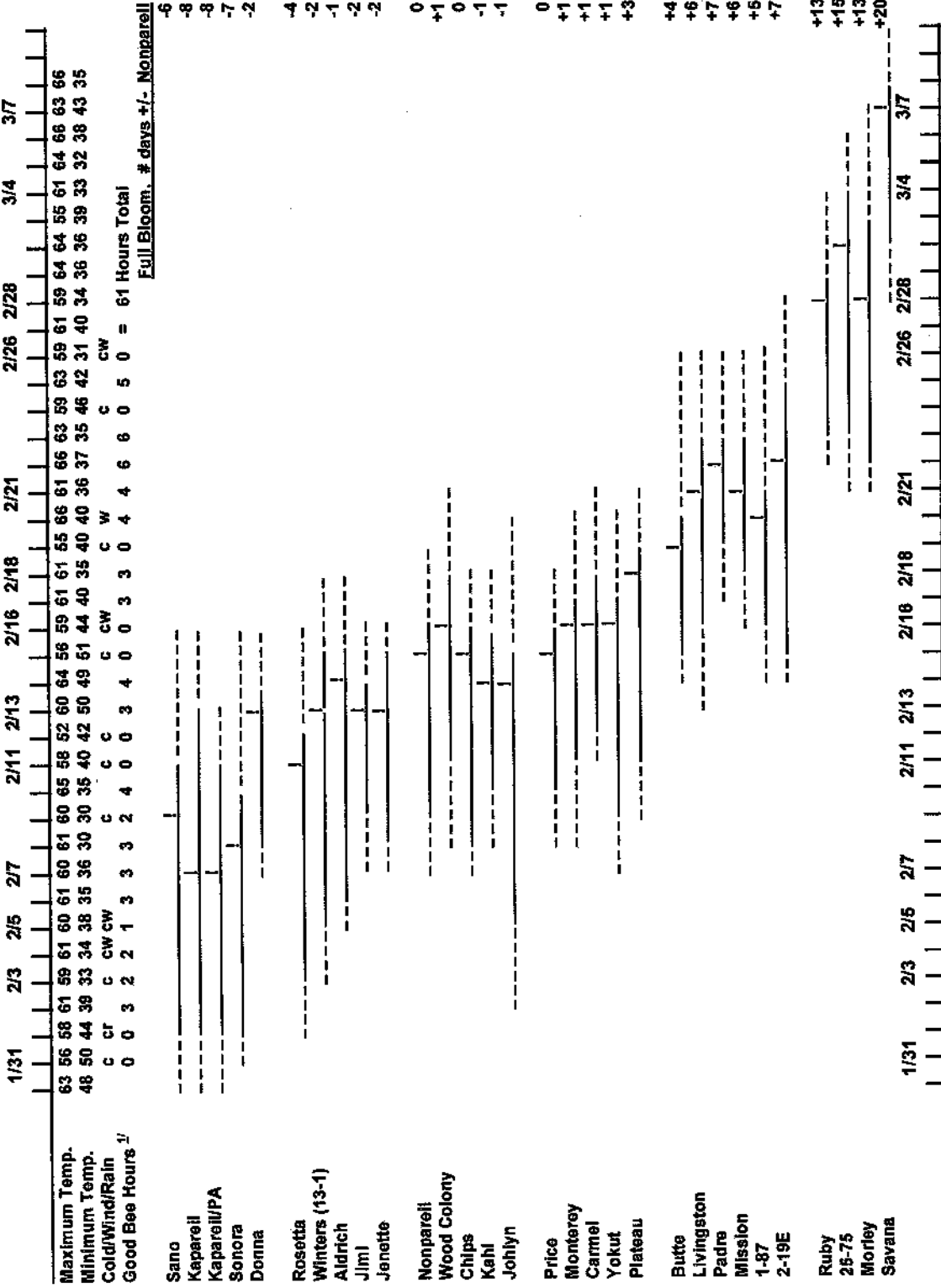
Selection 13-1 was recently released with the name 'Winters'. It has shown good production (particularly at the CSU-Chico trial) and should be a good pollenizer for Nonpareil. However, the high susceptibility of Winters to diseases (especially *Alternaria* and *Anthraco*) and worm damage continues to be a concern.

Acknowledgements

The authors wish to thank the Almond Board of California for helping with tree purchase and for continued support of this project. The following nurseries supplied trees at reduced cost for these trials: Bright's Nursery, Burchell Nursery, Dave Wilson Nursery, Fowler Nursery, Sierra Gold Nurseries and Spoto Nursery. We particularly want to express our appreciation and thanks to the staffs of California State University at Chico, San Joaquin Delta College and Paramount Farming Company for excellent cooperation in managing and maintaining these trials. The assistance of retired farm advisor Donald Rough, Cooperative Extension field assistants in Kern, Butte and San Joaquin Counties and field personnel of the University of California Pomology Department is gratefully acknowledged.

ALMOND REGIONAL VARIETY TRIAL - 2003 BLOOM

Planted in 1993 at the California State University Farm, Chico



Dashed line encompasses 1 to 100% bloom, solid line covers 10 to 90% bloom, full bloom date marked with a | = 80% bloom.
^{1/} Good Bee Hours = total daylight hours between 1% bloom on Sonora and 100% bloom on Mission when temperatures are ≥ 59 F, wind ≤ 10 mph, and no rain.
 This is a cooperative project between The Almond Board of California, California State University-Chico, and University of California Cooperative Extension.
 Prepared by: Joseph H. Connell and Katharine Padgett, U.C. Farm Advisor and Intern, Butte County, October 15, 2003.

Full Bloom Timing -- Almond Regional Variety Trial, CSU Chico.

Variety	# Days before or after Nonpareil Full Bloom 1/								Average
	1996	1997	1998	1999	2000	2001	2002	2003	
Sonora	-8	-6	-9	-5	-7	-8	-1	-7	-6.4
Sano	-12	-4	-4	-3	-7	-3	-3	-6	-5.3
Kapareil	-11	-2	-5	-3	-7	-3	-2	-8	-5.1
Kapareil/PA	-8	-3	-6	-4	-7	-3	-2	-8	-5.1
Rosetta	-4	-4	-5	-2	-7	-7	-4	-4	-4.6
Winters (13-1)	-4	-6	-6	-2	-4	-3	0	-2	-3.4
Donna	-6	-4	-2	-4	-4	-3	-1	-2	-3.3
Aldrich	-3	0	0	1	-5	-2	-1	-1	-1.4
Chips	0	-2	-1	-1	-2	-2	0	0	-1.0
Jenette	-1	3	4	2	-5	-5	-2	-2	-0.8
Jiml	-2	0	1	3	-3	-1	0	-2	-0.5
Nonpareil	0	0	0	0	0	0	0	0	0
Price	2	0	3	1	-1	-1	-1	0	0.4
Yokut	2	-2	4	2	0	0	2	1	1.1
Carmel	2	1	6	2	0	-1	0	1	1.4
Kahl	0	1	5	3	1	2	0	-1	1.4
Wood Colony	0	-1	7	2	2	0	0	1	1.4
Johlyn	1	6	3	4	0	2	0	-1	1.9
Monterey	2	0	6	4	0	2	0	1	1.9
Plateau	0	0	8	4	4	1	2	3	2.8
Butte	3	6	8	6	4	0	3	4	4.3
2-19E	3	6	5	5	4	3	2	7	4.4
2-43W	1	0	9	5	7	---	---	---	4.4
Padre	4	8	9	6	4	0	3	7	5.1
1-102W	4	6	8	3	6	---	---	---	5.4
1-87	4	11	8	5	4	5	3	5	5.6
Livingston	4	4	7	10	7	4	3	6	5.6
Mission	4	8	10	6	6	5	4	6	6.1
Ruby	6	11	17	10	10	6	5	13	9.8
25-75	11	13	10	12	15	9	9	15	11.8
Morley	6	11	19	18	16	12	10	13	13.1
Savana	11	17	20	18	17	12	16	20	16.4
Good Bee Hours 2/	77	74	43	37	24	42	61	61	

1/ Full bloom as defined here equals the day when 80% of the flowers are open.

2/ Good bee hours = total daylight hours between 1% bloom on Sonora and 100% bloom on Mission when temperatures are ≥ 59 F, wind ≤ 10 mph, and no rain.

Bloom Conditions

1996 - Cold, rainy & windy prior to Nonpareil full bloom, excellent weather from then on.

1997 - A low chilling year, cool during entire blooming period but generally good weather.

1998 - Cold, rainy & windy through much of bloom, a few good days for Butte through Mission bloom.

1999 - Cold throughout bloom, 1 good day each at Sonora & Carmel full bloom, 3 good days for last 10% of late varieties

2000 - Cold, windy & rainy throughout bloom, 3 ok days around Sonora full bloom, 1 good day after Butte full bloom.

2001 - Cold, windy & rainy throughout bloom, 3 good days Winters-Nonpareil full bloom, 2 good days-last 10% of late varieties.

2002 - Early bloom was cold, good weather from 10% Nonpareil bloom through Mission bloom. 3 windy days during peak Mission bloom.

2003 - Cool to cold & windy through much of bloom, warmer late in bloom with 25 of the 61 bee hours occurring after Buttes full bloom.

Bloom Density -- CSU Chico, Regional Variety Trial

<u>Variety</u>	<u>Bloom Density*</u>							
	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>1999</u>	<u>2000</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>
Sonora	4	2	5	4	4	3	5	3
Sano	4	4	3	4	4	4	4	5
Kapareil	5	5	5	5	5	5	5	5
Kapareil/PA	5	5	5	5	5	5	5	5
Rosetta	3	4	2	3	4	4	3	5
Winters (13-1)	5	4	3	4	4	3	2	5
Donna	3	3	3	4	3	3	4	2
Aldrich	4	5	3	5	5	4	5	5
Chips	3	4	4	4	4	3	3	4
Jenette	4	5	3	5	5	4	5	3
Jiml	2	3	2	2	3	3	4	1
Nonpareil	4	4	3	4	3	3	3	2
Price	1	1	4	2	4	3	3	3
Yokut	1	3	1	2	1	4	2	4
Carmel	3	3	3	5	3	4	3	5
Kahl	2	3	2	3	2	4	3	5
Wood Colony	4	3	3	3	3	4	4	3
Johlyn	4	4	1	4	3	3	3	2
Monterey	4	4	2	3	3	2	4	2
Plateau	2	3	3	3	4	3	3	1
Butte	4	4	3	4	4	4	4	4
2-19E	3	3	2	5	2	5	2	5
2-43W	4	3	2	3	4	---	---	---
Padre	3	3	4	5	4	5	5	5
1-102W	4	4	4	4	4	---	---	---
1-87	3	3	3	3	3	4	3	3
Livingston	3	4	3	4	4	4	4	3
Mission	3	3	3	3	4	4	4	4
Ruby	3	3	3	3	4	3	4	4
25-75	2	3	3	3	4	3	3	3
Morley	3	3	3	3	4	4	4	4
Savana	4	3	3	3	2	3	2	3

* The density of bloom is rated annually for each variety on a subjective scale of 1 to 5 with a rating of 5 being the heaviest bloom. Consistency of bloom from one year to the next and tendencies toward alternate bloom/bearing may be indicated by these ratings. Consistently heavy bloom may also indicate consistently light cropping (see Kapareil).

San Joaquin Delta College Almond Regional Variety Trial

2003 Bloom Dates

Manteca

Row	February																											March									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	1	2	3	4	5	6			
Nonparell												12	13	14	15	16	17	18																			
Chips											12	13	14	15	16	17	18																				
Johlyn									10	11	12	13	14	15	16	17	18	19																			
Dottie Won									11	12	13	14	15	16																							
Jenette										12	13	14	15	16																							
Kahl											12	13	14	15	16	17																					
Sano																																					
Yokut																																					
Plateau																																					
2-43W																																					
Moriey																																					
Savana																																					
Kaparell																																					
Avalon																																					
Sonora																																					
Rosetta																																					
Winters (13-1)																																					
Price																																					
Alditch																																					
Wood Colony																																					
Fritz																																					
Jiml																																					
Donna																																					
Carniel																																					
Monterey																																					
Mission																																					
Butte																																					
Livingston																																					
1-87																																					
Padre																																					
2-19E																																					
1-102W																																					
Ruby																																					
Kochi																																					

■ = 10 TO 90%

**SAN JOAQUIN DELTA COLLEGE
REGIONAL ALMOND VARIETY TRIAL
2003 RAINFALL
MANTECA**

February	Rain (inches)	Air Temperature			March	Rain (inches)	Air Temperature		
		Max	Min	Wind > 5 mph			Max	Min	Wind > 5 mph
1	0	66	47	5.6	1	0	62	36	
2	0	62	38	5.7	2	0	66	32	
3	0	65	31		3	0	60	35	
4	0	62	32		4	0	62	38	
5	0	61	31		5	0	67	34	
6	0	59	26		6	0	69	35	
7	0	60	33		7	0	66	31	
8	0	58	26		8	0	69	35	
9	0	61	27		9	0	68	35	
10	0	62	29		10	0	71	42	
11	0	61	36		11	0	73	44	
12	0.47	56	38		12	0	75	45	
13	0	66	52		13	0	68	50	
14	0	62	49		14	0.12	74	57	
15	0	63	49	5.3	15	0.67	65	49	
16	0.24	63	44		16	0.28	58	41	
17	0	58	40		17	0	64	43	
18	0	62	33		18	0	67	45	
19	0.08	60	39		19	0.04	66	35	
20	0	62	42	5.2	20	0	65	43	
21	0	64	38		21	0	70	42	
22	0	66	37		22	0	71	42	
23	0	66	35		23	0.08	66	45	
24	0	59	49		24	0	68	39	
25	0.08	62	47	5.1	25	0	73	41	
26	0	60	35		26	0	70	50	
27	0.08	58	43		27	0	68	44	
28	0	61	33		28	0	73	45	
					29	0	78	38	
					30	0	82	44	
					31	0	80	48	

Rainfall subtotal for:

January	0.95
February	1.03
March	1.19
TOTAL	3.17

Shaded dates = Bloom period

EFFECTIVE BLOOM PERIOD
Kern RVT - Paramount Farming Company

Early Blooming Varieties			
	Bloom Period		
	Beginning	Full	End
Sano	02-02-03	02-16-03	02-27-03
Kapareil	02-04-03	02-18-03	02-22-03
Rosetta	02-05-03	02-13-03	02-21-03
Sonora	02-07-03	02-16-03	02-21-03
13-1	02-05-03	02-16-03	02-23-03

Mid-Season Blooming Varieties			
	Bloom Period		
	Beginning	Full	End
Nonpareil	02-13-03	02-19-03	02-27-03
Price	02-11-03	02-18-03	02-22-03
Jenette	02-10-03	02-18-03	02-22-03
Yokut	02-10-03	02-18-03	02-28-03
Johlyn	02-10-03	02-18-03	02-26-03
Plateau	02-13-03	02-19-03	02-28-03
Chips	02-12-03	02-19-03	02-26-03
Kahl	02-12-03	02-20-03	02-22-03
Fritz	02-11-03	02-18-03	02-25-03
Monterey	02-13-03	02-20-03	02-28-03
Aldrich	02-10-03	02-21-03	02-23-03
Wood Colony	02-13-03	02-21-03	02-28-03
1-102W	02-14-03	02-25-03	03-10-03
Jim1	02-11-03	02-21-03	02-26-03
Donna	02-11-03	02-21-03	02-26-03
Carmel	02-14-03	02-18-03	03-03-03
2-19E	02-14-03	02-18-03	03-10-03
2-43W	02-13-03	02-20-03	03-06-03

Late Season Blooming Varieties			
	Bloom Period		
	Beginning	Full	End
Butte	02-18-03	02-25-03	03-10-03
Livingston	02-17-03	02-25-03	03-11-03
Padre	02-19-03	02-25-03	03-11-03
1-87	02-14-03	02-25-03	03-06-03
25-75	02-14-03	02-25-03	03-13-03
Mission	02-17-03	02-25-03	03-11-03
Ruby	02-22-03	03-08-03	03-14-03
Morley	02-20-03	03-01-03	03-10-03
Savana	03-01-03	03-11-03	03-10-03

Bloom Observations:

Good Blooming Varieties:

Chips, Jenette, Sano, Yokut, Plateau, Kapareil, Aldrich, Wood Colony, Monterey, Butte, 219E, Mission, Ruby, Donna, Padre

Average Blooming Varieties:

Johlyn, Kahl, Ruby, Morley, Carmel

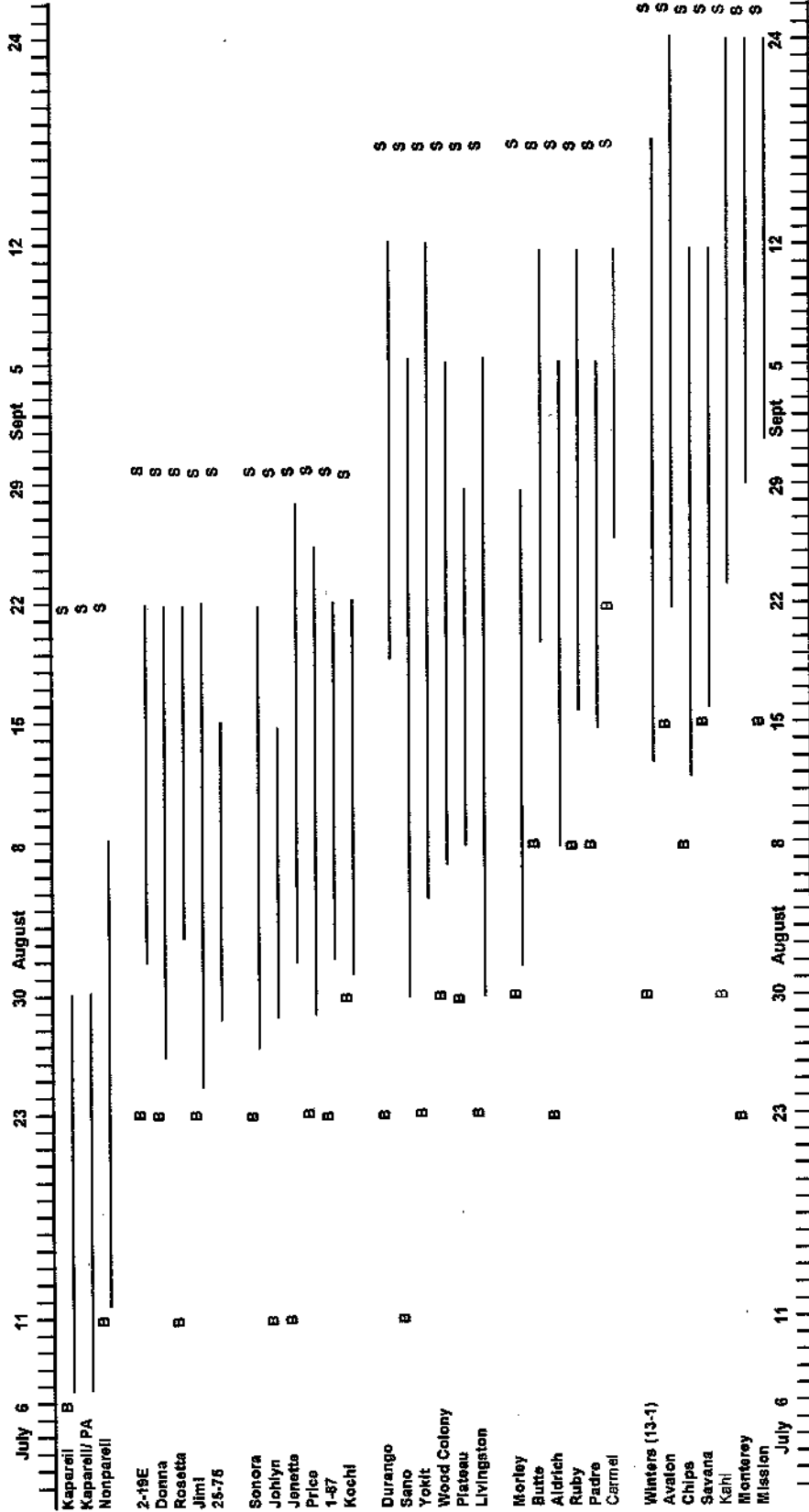
Poor Blooming Varieties:

Nonpareil, Sonora, Rosetta, 13-1, Price, Fritz, Jiml, Livingston, 1-87, 1-1-2W and 25-75

Chilling Hours: 582

ALMOND REGIONAL VARIETY TRIAL - 2003 HARVEST MATURITY

Planted in 1993 at the California State University Farm, Chico



Solid line=1 to 100% hullsplit. B--denotes blank nuts beginning to split. S--indicates when the variety was shaken to the ground. Four harvests were conducted this year. Kochi, Durango and Avalon are young trees in their 3rd growing season. This is a cooperative project between the Almond Board of California, California State University Chico, and University of California Cooperative Extension. Prepared by: Joseph H. Connell, U.C. Farm Advisor and Katharine Padgett, Butte County CE Intern. 11/17/03.

Almond Regional Variety Trial
2003 Hull Split Dates
Delta College, Manteca

Variety	10%	90%	Average Progression
			1997-2003
Kapareil	15-Jul	20-Jul	1
Nonpareil	18-Jul	29-Aug	2
Johlyn	30-Jul	8-Aug	3
Jimi	15-Jul	22-Jul	4
Sonora	2-Aug	14-Aug	5
2-43W	9-Aug	19-Aug	6
Price	13-Aug	13-Aug	7
Yokut	5-Aug	17-Aug	8
Donna	28-Jul	6-Aug	9
Chips	26-Aug	5-Sep	11
Jenette	21-Jul	5-Aug	12
Winters (13-1)	18-Aug	1-Sep	13
Dottie Won	13-Aug	20-Aug	14
Morley	7-Aug	18-Aug	15
Plateau	13-Aug	29-Aug	16
Rosetta	13-Aug	13-Aug	17
2-19E	4-Aug	13-Aug	18
Savana	19-Aug	10-Sep	19
Aldrich	17-Aug	17-Aug	20
Wood Colony	16-Aug	26-Aug	21
Sano	8-Aug	29-Aug	22
1-87	19-Aug	26-Aug	23
1-102W	9-Aug	19-Aug	24
Carmel	26-Aug	7-Sep	25
Monterey	29-Aug	9-Sep	26
Livingston	13-Aug	29-Aug	27
Butte	26-Aug	2-Sep	28
Kahl	5-Aug	27-Aug	29
Mission	30-Aug	9-Sep	30
Padre	20-Aug	1-Sep	31
Ruby	27-Aug	5-Sep	32
Fritz	26-Aug	7-Sep	33
Avalon	NA	NA	—
Kochi	NA	NA	—

HULLSPLIT PERIOD
RAVT - Paramount Farming Company (Kern Co.)

EARLY - SEASON		
	Hullsplit Period	
	Beginning*	End**
Kapareil	07-02-03	08-11-03
Nonpareil	07-09-03	08-21-03
2-19E	08-01-03	09-01-03
Sonora	07-25-03	09-11-03
Rosetta	07-25-03	08-28-03
2-43W	07-23-03	09-18-03
1-102W	08-05-03	09-01-03
Donna	07-27-03	09-11-03
Aldrich	08-08-03	09-05-03
Jiml	07-25-03	09-11-03
Jenette	08-10-03	09-15-03
Johlyn	08-01-03	09-11-03

MID - SEASON		
	Hullsplit Period	
	Beginning*	End**
25-75	08-08-03	09-15-03
13-1	08-10-03	09-21-03
1-87	08-08-03	09-01-03
Price	07-27-03	09-18-03
Plateau	08-01-03	09-20-03
Chips	08-12-03	09-19-03
Savana	08-22-03	09-26-03
Morley	08-12-03	09-28-03
Wood Colony	08-03-03	09-15-03

MID to LATE SEASON		
	Hullsplit Period	
	Beginning*	End**
Sano	08-19-03	09-18-03
Yokut	08-08-03	09-18-03
Padre	08-12-03	09-24-03
Butte	08-12-03	09-22-03
Livingston	08-08-03	09-22-03
Kahl	08-19-03	09-29-03
Carmel	08-12-03	09-18-03
Ruby	08-29-03	10-02-03

LATE - SEASON		
	Hullsplit Period	
	Beginning*	End**
Mission	08-25-03	09-26-03
Monterey	08-22-03	10-02-03
Fritz	09-01-03	10-14-03

*Beginning means one to five percent of hullsplit.

**End means 100% hullsplit.

NOTE: The length of the hullsplit period depended on crop load. Varieties that had a big crop took longer to complete hullsplit than varieties with a light crop.

**2003 Yield Summary for the Regional Almond Variety Trial at California
State University at Chico Farm, Butte County. Planted in 1993**

Variety	No. of nuts/tree	Average kernel weight (g)	Shelling percentage	Kernel pounds per	
				tree	acre ¹
Winters (13-1)	20561	1.15	53.0	52.1	3333
Mission	14665	1.17	43.7	37.6	2409
Carmel	13726	1.20	53.4	36.4	2330
Kahl	12999	1.14	44.9	32.8	2096
Butte	10450	1.40	50.2	32.2	2064
Chip's	12359	1.18	54.3	32.2	2063
2-19E	14465	0.99	46.2	31.6	2023
Rosetta	9468	1.51	47.9	31.5	2015
Ruby	10990	1.29	53.2	31.3	2002
Nonpareil	9946	1.43	65.0	31.2	2000
Johlyn	10478	1.26	64.1	29.1	1864
Livingston	10456	1.22	56.8	28.1	1795
Sonora	7980	1.53	69.9	27.0	1726
Savana	10951	1.11	59.5	26.8	1717
Yokut	8444	1.43	59.3	26.6	1700
Plateau	7428	1.60	57.0	26.2	1675
Jenette	8896	1.33	60.7	26.1	1670
Morley	11438	1.03	47.2	25.9	1661
Price	10366	1.10	60.8	25.0	1602
Aldrich	9566	1.15	53.1	24.1	1545
Sano	7376	1.46	49.9	23.7	1514
Padre	9682	1.07	52.4	22.9	1466
Wood Colony	8225	1.20	44.8	21.7	1387
Kapareil	9050	0.97	68.4	19.3	1237
1-87	8309	0.89	49.6	16.2	1038
Donna	4749	1.43	55.6	15.0	957
Monterey	4321	1.34	40.7	12.8	816
25-75	5638	0.91	59.3	11.3	722
Jiml	3567	1.43	57.0	11.3	720
2-43W	Selection was removed from the Butte RAVT				
1-102W	Selection was removed from the Butte RAVT				

¹Based on a spacing that gives 64 trees per acre.

2003 Yield Summary for the Regional Almond Variety Trial at San Joaquin Delta College Farm, Manteca, San Joaquin County. Planted in 1993.

Variety	No. of nuts/tree	Average kernel weight (g)	Shelling percentage	Kernel Pounds Per	
				tree	acre ¹
Butte	17661	0.98	54.4	38.2	2865
Monterey	11334	1.37	50.1	34.1	2558
Ruby	12155	1.24	54.5	33.3	2494
Padre	12947	1.11	58.2	31.7	2374
Dottie Won	14506	0.96	46.9	30.5	2291
Chips	11507	1.18	44.8	29.9	2243
Livingston	11280	1.19	61.9	29.5	2214
Nonpareil	9673	1.27	66.7	27.0	2028
Wood Colony	8924	1.29	60.1	25.4	1908
Mission	9759	1.17	48.5	25.2	1887
Carmel	9025	1.25	56.2	24.8	1861
Fritz	9490	1.16	53.7	24.2	1819
Morley	10786	0.97	50.0	22.9	1721
Jenette	8760	1.18	67.5	22.8	1713
1-87	10431	0.92	60.0	21.1	1582
Donna	7394	1.26	60.5	20.5	1539
Sano	6675	1.37	54.4	20.1	1506
Kahl	7848	1.13	50.5	19.5	1462
Winters (13-1)	7492	1.17	57.9	19.3	1446
2-19E	7661	1.11	54.3	18.7	1405
Johlyn	6839	1.20	69.8	18.1	1356
Aldrich	7365	1.09	56.4	17.7	1329
Price	7019	1.14	68.6	17.7	1327
Yokut	5936	1.34	51.4	17.6	1318
Sonora	5500	1.36	74.0	16.5	1234
2-43W	6176	1.15	61.0	15.7	1177
Savana	5667	1.19	66.3	14.9	1116
Rosetta	4825	1.39	45.6	14.7	1105
1-102W	3963	1.48	64.9	12.9	970
Jiml	4382	1.28	60.3	12.4	927
Kapareil	5201	0.99	70.0	11.3	851
Plateau	1299	1.32	53.0	3.8	282
25-75	Selection was removed from the San Joaquin RAVT				
Kapareil PA	Selection was removed from the San Joaquin RAVT				

¹Based on a spacing that gives 75 trees per acre.

2003 Yield Summary for the Regional Almond Variety Trial at Paramount Farming Company, Shafter, Kern County. Planted in 1993.

Variety	No. of nuts/tree	Average kernel weight (g)	Shelling percentage	Kernel pounds per	
				tree	Acre ¹
2-19E	25016	1.03	66.5	56.9	4890
Butte	24081	0.97	63.9	51.7	4443
Livingston	21250	1.09	70.8	51.1	4396
Padre	21029	1.02	57.5	47.4	4079
Sano	15192	1.38	61.4	46.3	3983
Ruby	17674	1.18	54.3	46.1	3964
Morley	19561	1.02	51.6	44.0	3787
1-102W	14090	1.42	69.3	44.0	3785
Jenette	15415	1.25	73.6	42.3	3638
1-87	20781	0.90	60.8	41.2	3543
Mission	16970	1.09	46.2	40.9	3516
Rosetta	11409	1.49	53.9	37.4	3216
Yokut	13062	1.26	61.5	36.3	3118
Kahl	15513	1.06	55.8	36.2	3115
Wood Colony	13106	1.24	64.8	35.7	3068
Fritz	14884	1.06	54.8	34.9	3000
Plateau	11590	1.36	54.0	34.6	2977
Johlyn	11758	1.30	68.0	33.7	2900
Monterey	13340	1.14	54.7	33.6	2886
Chip's	14092	1.05	58.9	32.5	2798
2-43W	11608	1.22	66.4	31.2	2683
Carmel	11306	1.24	63.2	30.8	2651
Nonpareil	9781	1.36	69.1	29.3	2523
Aldrich	10296	1.19	64.0	29.0	2491
Price	12566	1.17	66.2	26.5	2282
Donna	8104	0.93	55.0	25.8	2218
Jiml	7549	1.39	64.0	24.8	2137
Sonora	9499	1.44	73.2	23.9	2056
Savana	8590	1.09	68.0	22.8	1961
Winters (13-1)	7670	1.18	64.3	22.4	1927
25-75	10251	0.94	56.9	21.3	1833
Kapareil/PA	9273	1.01	67.2	20.5	1767
Kapareil	6706	1.00	68.9	14.8	1273

¹Based on a spacing that gives 86 trees per acre.

Annual Yield Summary (1996-2003) and Accumulative Yield (1996-2003) for the Regional Variety Trial at California State University at Chico Farm, Butte County. Planted in 1993.

Variety	Yield (kernel pounds/acre ¹)								
	1996	1997	1998	1999	2000	2001	2002	2003	Accum.
Winters (13-1)	425	2076	784	2736	2446	2677	2479	3333	16956
Plateau	360	1215	2367	2007	1943	2160	2361	1675	14089
Carmel	741	1240	1260	1700	1934	2070	2320	2330	13595
Nonpareil	494	1427	1127	1952	1762	1846	2587	2000	13195
Livingston	425	1449	1275	1765	1607	2283	2350	1795	12949
Ruby	448	1208	1315	1823	1828	1676	1859	2002	12158
Aldrich	275	1813	1005	1388	1494	1663	2920	1545	12104
Monterey	749	1535	1531	1410	2279	1541	2032	816	11894
Butte	443	1169	1549	1404	1509	1705	2001	2064	11844
Chip's	344	817	1188	1030	1434	1490	3195	2063	11561
Johlyn	537	1047	1046	1870	1595	1457	2036	1864	11452
Wood Colony	724	978	951	1464	1695	1781	2318	1387	11298
Morley	219	1102	1189	1364	1846	2053	1741	1661	11176
Sano	372	1036	1020	1558	2128	1552	1918	1514	11098
Mission	383	941	890	1018	1616	1483	2304	2409	11044
Rosetta	248	1039	840	1422	1727	2041	1451	2015	10783
Padre	541	1013	832	1258	1402	1833	1929	1466	10274
Jenette	279	868	672	1407	1932	1290	1939	1670	10057
Jiml	262	873	738	1633	1948	1484	2371	720	10029
1-87	190	1295	1074	1340	1454	1711	1802	1038	9903
Yokut	359	765	896	1204	1126	1964	1621	1700	9634
Sonora	732	494	1152	1262	1510	1165	1498	1726	9538
Kahl	208	672	1070	1301	1034	1491	1280	2096	9153
2-19E	276	1299	454	1345	906	1828	964	2023	9095
Price	538	931	990	1230	1066	1469	1244	1602	9069
25-75	308	668	815	1103	1910	1433	1835	722	8794
Savana	451	1079	815	992	958	1106	1169	1717	8287
Donna	582	913	712	1003	1255	1118	1294	957	7835
Kapareil	68	1129	280	941	1029	1364	1093	1237	7141

¹ Based on a spacing that gives 64 trees per acre.

Annual Yield Summary (1996-2003) and Accumulative Yield (1996-2003) for the Regional Variety Trial at San Joaquin Delta College Farm, Manteca, San Joaquin County. Planted in 1993.

Variety	Yield (kernel pounds/acre ¹)								
	1996	1997	1998	1999	2000	2001	2002	2003	Accum.
Butte	328	1631	2075	2641	2243	2311	2459	2865	16552
Carmel	114	2111	1893	2695	2538	2206	2697	1861	16113
Ruby	419	1274	1890	1985	2518	1505	2432	2494	14517
Livingston	73	683	1572	2779	1736	2133	2856	2214	14045
Padre	221	579	1502	1340	2784	2123	2995	2374	13918
Fritz	134	1692	1539	2086	2024	1648	2645	1819	13587
Dottie Won	100	1287	1757	1667	2133	2019	2302	2291	13557
Monterey	153	1315	1660	2006	1718	1570	2513	2558	13492
Chips	420	920	1798	2134	1828	1464	2299	2243	13106
Plateau	²	1198	2301	2511	1968	2201	2626	282	13088
Janette	226	1313	1530	2579	1667	1927	1783	1713	12738
Yokut	251	1288	1882	1956	2060	1674	1812	1318	12242
Mission	219	813	1332	1780	2001	1754	2203	1887	11990
Nonpareil	115	1165	918	2252	1333	1794	2093	2028	11699
Sano	²	1213	995	2299	2205	1762	1590	1506	11570
Wood Colony	211	1131	1168	2176	1543	1677	1579	1908	11393
Winters (13-1)	²	1591	192	2223	392	2671	1922	1446	10437
Kahl	²	757	1320	1836	1605	1246	1778	1462	10005
Jiml	²	534	744	2509	1098	1179	2313	927	9303
1-87	79	486	1207	1601	1296	1238	1787	1582	9276
Sonora	123	²	965	2407	1194	1651	1514	1234	9088
Aldrich	34	937	636	2169	902	1307	1724	1329	9037
Rosetta	²	1323	600	1745	1487	1611	1083	1105	8953
Donna	169	1000	990	1394	1153	1137	1515	1539	8897
Johlyn	²	634	997	1510	1246	1188	1822	1356	8752
Morley	²	559	576	1401	842	1702	1672	1721	8473
Price	²	947	573	1731	932	1075	1422	1327	8007
1-102W	217	457	892	939	519	1379	1209	970	6583
2-19E	²	503	507	1010	903	1008	1245	1405	6581
2-43W	²	²	776	1198	632	767	1334	1177	5885
Kapareil	²	361	183	1200	485	1346	783	851	5209
Savana	²	²	184	750	109	536	245	1116	2939

¹ Based on a spacing that gives 75 trees per acre.

² Because of poor production in 1996 and poor production and a harvesting error in 1997, some varieties were not harvested in these years. Thus, cumulative yields for these varieties should be somewhat higher than what is shown in the table.

Annual Yield Summary (1995-2003) and Accumulative Yield (1995-2003) for the Regional Variety Trial at Paramount Farming Company, Shafter, Kern County. Planted in 1993.

Variety	Yield (kernel pounds/acre ¹)									
	1995	1996	1997	1998	1999	2000	2001	2002	2003	Accum.
Ruby	664	1406	2413	2180	2550	3164	3482	4113	3964	23936
Padre	802	1624	1624	1883	2416	2841	4068	4559	4079	23896
Jenette	294	952	3085	1574	2692	2810	4177	2862	3638	22085
2-19E	341	963	2347	1944	2496	2646	3479	2434	4890	21540
Plateau	282	1340	2525	2419	2239	3197	3653	2827	2977	21458
Butte	377	1364	2400	2353	1670	1178	3401	4101	4443	21287
Monterey	591	1141	2184	1914	2194	2429	3342	3293	2886	19974
Livingston	323	760	1972	1749	3054	1608	2233	3660	4396	19754
Fritz	²	1261	1706	2234	1700	2805	3199	3451	3000	19356
Nonpareil	259	782	2428	1963	2560	2216	3022	3504	2523	19257
Aldrich	422	459	2230	1295	2936	1410	3230	4576	2491	19049
Carmel	634	1260	1944	1427	1359	2534	3819	3398	2651	19027
Sano	291	1209	1345	1754	2446	3702	3033	990	3983	18753
Mission	545	1353	1949	1816	1716	2285	2296	3161	3516	18637
Yokut	382	1316	1519	1835	2023	3184	2059	3150	3118	18586
Kahl	383	1319	1852	1683	1926	2696	2634	2874	3115	18482
Morley	176	372	1091	1871	1516	1742	3531	3706	3787	17793
Johlyn	291	1221	2195	1936	1287	2084	2313	3453	2900	17679
Chip's	401	882	1417	2004	1709	3106	2419	2905	2798	17641
Rosetta	93	481	2164	1123	2308	1808	2308	3473	3216	16974
Winters (13-1)	599	1224	2076	2152	1643	2073	2475	2788	1927	16957
Price	297	746	1118	1772	1235	2997	2819	3684	2282	16950
Sonora	337	843	1315	1120	2218	3181	1822	3928	2056	16821
1-87	228	607	1598	1594	2171	1008	2260	3752	3543	16760
1-102W	304	464	2143	1742	1755	661	1685	3958	3785	16497
2-43W	477	1028	2056	1794	1516	1254	1526	3967	2683	16300
Jiml	107	626	1565	1887	1631	2039	1391	4287	2137	15670
Wood Colony	559	1136	1545	1024	760	1923	2193	3245	3068	15453
25-75	167	808	1184	1138	1298	2072	2150	2044	1833	12694
Donna	324	935	766	955	1069	2281	1549	1540	2218	11638
Savana	418	697	1008	1271	656	1480	1771	1449	1961	10712
Kapareil	41	110	733	670	1576	618	1486	2010	1520	8764

¹Based on a spacing that gives 86 trees per acre.

²Yield data for Fritz was lost in 1995 due to a harvesting error. Thus the accumulative yield should be somewhat higher than what is shown in this table.

KERNEL DEFECTS OBSERVED IN 2003

Significant defects noted in the 2003 harvest nut samples of the three RAVTs are outlined below. The trees were in their eleventh growing season. Defects listed may only become important if they continue to show in the same varieties over several years as the trees mature.

Varieties with defect	Trial		
	CSU-Chico	Delta College	Kern
6% or more double kernels:	Donna (32%) Monterey (32%) Kahl (24%) Sano (24%) Wood Colony (14%) Kapareil (13%) Price (12%) Mission (8%) Livingston (8%) Jiml (6%) Carmel (6%) Winters (6%) Morley (6%) Plateau (6%) Jenette (6%)	Monterey (26%) Donna (24%) Sano (22%) Dottie Won (18%) Kahl (18%) Price (14%) Carmel (10%) Yokut (8%) Plateau (8%) Savana (6%) Aldrich (6%) Wood Colony (6%) Fritz (6%)	Plateau (36%) Sano (22%) Kahl (18%) Donna (18%) Mission (14%) Price (6%) Fritz (6%) Aldrich (6%) Monterey (6%) Ruby (6%)
6% or more twin kernels (two kernels within the same pellicle):	Price (14%) Sonora (10%) Kapareil (12%) 25-75 (6%) 1-87 (6%) Butte (6%)	Price (12%) Jiml (10%) Sonora (10%) Donna (6%) 2-19E (6%) Johlyn (6%)	Price (14%) Jenette (10%)
6% or more blank kernels:	Morley (8%) Monterey (6%) 2-19E (6%) Kahl (6%)	Price (12%) Dottie Won (8%) Jiml (6%) 1-87 (6%) Butte (6%) Kapareil (6%) Wood Colony (6%) Padre (6%)	Kahl (10%) Price (6%) Fritz (6%)

Varieties with defect	CSU-Chico	Delta College	Kern
6% or more kernels with gum:	Yokut (12%) Jenette (8%) Johlyn (8%) Sano (6%)	Yokut (14%) 1-102W (12%) Winters (10%) Fritz (8%) Johlyn (8%) Rosetta (6%)	Livingston (10%) Winters (10%) 1-102W (8%) Price (6%)
6% or more worm damage:	Johlyn (18%) Sano (16%) Winters (12%) Yokut (10%) Nonpareil (9%) Price (8%) Donna (8%) Monterey (8%) Jiml (8%) Kapareil (8%) Sonora (6%) Livingston (6%) Chips (6%) Ruby (6%)	Dottie Won (6%) Chips (6%)	Kapareil (34%) Johlyn (32%) Plateau (24%) Sano (20%) Chips (18%) Butte (14%) 2-43W (12%) Savanna (12%) Jiml (10%) Sonora (10%) Kahl (10%) Livingston (10%) Carmel (10%) Price (8%) Jenette (8%) Donna (8%) Fritz (8%) Aldrich (8%) Monterey (8%) 1-87 (6%) 25-75 (6%) Winters (6%) 1-102W (6%)

**Regional Almond Variety Trial
Leaf Tissue Analyses - Manteca
Average of 1996-2000**

Sample	Description	N-Total %	P-Total %	K-Total %	S-Total ppm	Ca %	Mg %	Na ppm	Cl %	B ppm	Zn ppm	Cu ppm
1	Chips	2.189	0.16	2.34	1663	5.17	0.71	119	0.15	48	40	5.6
2	Johlyn	2.349	0.16	1.81	1548	4.26	0.68	86	0.11	55	31	4.0
3	Dottie Won	2.339	0.16	1.76	1663	5.12	0.76	76	0.13	52	37	4.9
4	Jenette	2.325	0.17	2.04	1830	5.47	0.75	105	0.14	58	43	5.2
5	Kahl	2.446	0.15	1.82	1700	4.66	0.70	67	0.09	49	37	4.9
6	Sano	2.222	0.18	2.34	1663	5.10	0.75	93	0.13	56	43	6.1
7	Yokut	2.197	0.13	1.92	1658	5.17	0.77	87	0.11	50	47	6.1
8	Plateau	2.313	0.17	1.96	1673	4.66	0.67	78	0.10	48	43	6.3
9	2-43W	2.374	0.17	1.79	1515	4.01	0.68	97	0.10	56	21	5.0
10	Morley	2.190	0.16	1.92	1625	4.37	0.64	99	0.09	52	26	9.0
11	Savana	2.373	0.18	1.47	1733	4.33	0.66	82	0.08	53	20	6.0
12	Kapareil	2.161	0.15	1.97	1515	4.38	0.71	89	0.10	56	33	6.3
13	Sonora	2.187	0.19	1.85	1518	4.81	0.70	67	0.09	50	37	6.1
14	Nonpareil #2	2.154	0.16	1.79	1570	4.84	0.76	72	0.08	48	35	5.5
15	Rosetta	1.980	0.15	1.91	1880	5.21	0.70	108	0.12	52	47	6.7
16	Nonpareil #6	2.291	0.16	1.77	1733	4.85	0.75	93	0.10	58	43	5.6
17	13-1	2.152	0.14	1.69	1528	4.85	0.73	101	0.11	55	35	5.0
18	Price	2.254	0.16	1.86	1805	5.09	0.75	96	0.11	52	40	5.6
19	Aldrich	2.131	0.15	1.56	1628	5.57	0.70	124	0.13	51	42	6.2
20	Wood Colony	2.269	0.14	1.49	1673	6.45	0.78	89	0.12	50	39	6.1
21	Fritz	2.266	0.15	1.49	1693	5.69	0.76	104	0.13	50	46	5.9
22	Jiml	2.531	0.14	2.07	1808	4.61	0.65	86	0.11	54	42	6.7
23	Donna	2.369	0.15	1.45	1580	5.90	0.70	87	0.13	50	44	6.2
24	Carmel	2.408	0.13	1.71	1600	5.65	0.78	83	0.14	49	38	5.8
25	Monterey	2.391	0.15	2.12	1605	4.24	0.66	76	0.11	53	38	5.3
26	Butte	2.339	0.14	1.85	1600	4.88	0.78	85	0.12	52	35	5.5
27	Livingston	2.538	0.17	1.93	2013	4.57	0.61	94	0.12	61	27	9.8
28	Mission #2	2.445	0.15	1.85	1650	4.71	0.62	82	0.11	52	27	8.4
29	1-87	2.323	0.16	2.00	1633	4.94	0.65	71	0.11	56	19	6.1
30	Mission #5	2.369	0.15	1.83	1753	4.89	0.62	93	0.11	56	31	13.0
31	Padre	2.450	0.13	1.95	1638	4.54	0.64	101	0.12	50	31	9.2
32	2-195	2.569	0.15	2.06	1778	4.45	0.64	86	0.08	61	29	7.0
33	1-102W	2.491	0.15	1.92	1645	3.90	0.57	76	0.09	56	22	5.2
34	Ruby	2.293	0.13	1.64	1515	6.03	0.78	93	0.11	54	40	6.7
35	25-75 Kap/.pa	2.631 1.968	0.16 0.17	2.19 1.37	1725 1760	3.33 4.36	0.57 0.77	82 84	0.09 0.07	55 47	33 12	4.5 4.9

ALTERNARIA LEAFSPOT 2003
RAVT - Paramount Farming Company (Kern Co.)

Variety	Infestation in 100 Leaf Samples (08-07-03)	Infestation of Leaves Per 30 Sec. Counts (07-17-03)	Percent of Defoliation (09-23-03)
2-43W	86	125	80
Monterey	8	124	60
Price	48	112	50
Winters (13-1)	100	111	60
Morley	96	103	80
Carmel	72	101	80
Sonora	58	101	70
Butte	54	95	60
Wood Colony	40	82	85
Ruby	16	82	20
Kahl	61	79	70
1-102W	41	77	90
Savana	35	69	60
Rosetta	44	67	5
Livingston	57	65	70
1-87	2	63	50
Yokut	92	58	60
Nonpareil	36	57	27
Kapareil	31	55	80
Jiml	61	55	80
Aldrich	4	53	30
2-19E	51	52	30
Plateau	27	50	60
Sano	42	45	60
Mission	37	40	16
Jenette	81	34	40
Johlyn	16	30	30
Donna	44	25	40
25-75	51	24	60
Chips	0	11	30
Fritz	38	6	50
Padre	26	3	0

HULL ROT 2003
RAVT - Paramount Farming Company (Kern Co.)

Variety	No. Strikes / Tree
Johlyn	1372
Kapareil	1187
Sonora	976
2-19E	752
Jenette	740
1-102W	701
1-87	664
Winters (13-1)	651
Nonpareil	502
Rosetta	499
25-75	491
Donna	462
Jiml	437
Savana	420
Sano	396
2-43W	208
Aldrich	96
Chips	91
Livingston	67
Kahl	58
Plateau	52
Butte	45
Wood Colony	38
Price	28
Yokut	24
Ruby	20
Padre	18
Morley	18
Fritz	8
Mission	7
Monterey	3
Carmel	1