

ANNUAL REPORT

Almond Board of California
Project 82-J9 (continuation of 81-K8)

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ALMOND BOARD

Project: Tree and Crop Research
Part A - Noninfectious Bud Failure (BF) & Bull Mission Syndrome (BMS)
Part B - Genetic and Breeding Studies
Part C - Variety Evaluation

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Dr. A. H. Kuniyuki

Collaborators on RVT Plots:

UC Davis: Warren C. Micke, Cooperative Extension Specialist

<u>Location</u>	<u>Plot Owner/Cooperator</u>	<u>Cooperative Extension</u>
Kern	Warren Carter, Orchard Owner	Mario Viveros, Bakersfield
Arbuckle	Nickels Estate	Tom Aldrich, Colusa
Durham	CA State University, Chico	Joe Connell, Oroville
	Richard Baldy	
	Richard Jacobs	
Manteca	Delta Junior College	Don Rough, Stockton
	Gary Blongren	
	Dave Dias	
Fresno	CA State University, Fresno	Mark Freeman, Fresno
	Allen Hewitt	

PART A: Noninfectious Bud Failure (BF) & Bull Mission Syndrom (BMS)

Objectives:

- BF: 1) To test specific biochemical techniques as "fingerprinting" procedures for unique proteins and nucleic acids associated with BF (in collaboration with Dr. A. Kuniyuki, Department of Pomology, Project No. 82-JA1).
2) To continue tissue and shoot tip culture procedure studies as test procedures for BF.
3) To continue field observations on BF distribution within and between plants in relation to temperature and moisture stress.
- BMS: 1) To continue to survey BMS in relation to variety, source identity, and cultural practices in order to establish cause of the problem.
2) To apply "fingerprinting" techniques as they are developed to test if the same procedures for BF might be applicable to BMS.

PART B: Breeding and Genetic Studies

Objectives:

- 1) To study the segregation of BF gene in F_1 hybrid population of peach and almond into the F_2 generations in order to establish BF-free breeding lines.
- 2) To determine the segregation of the dwarf peach in F_1 and F_2 populations of almond and to establish the effect of the dwarf gene on the BF gene.
- 3) To determine the inheritance of thin shell, reduce tree size, precocity and self fertility in crosses of commercial almond varieties with wild almonds which have these characters.

PART C: Variety Evaluation

Objectives:

- 1) To obtain and evaluate data from regional variety test plots to be used to evaluate yield, performance and nut characteristics of test varieties.
- 2) To begin work on a computer model for almond tree and yield forecasting.
- 3) To extend the selection indexing procedure to additional almond varieties and selections.

Interpretive Summary

PART A: Noninfectious Bud Failure (BF) & Bull Mission Syndrome (BMS)

BF investigations involve three main areas: a) studies on the physiological effects of the disorder, b) variation within varieties and c) inheritance studies. Bud culture assays made at regular intervals during summer and fall continue to show that the time that necrosis develops in vegetative buds, the severity of injury and possibly the amount of flowers initiated varies greatly in different years and with different soil moisture conditions. The high temperature pattern in summer 1981 produced significantly higher levels of BF in spring 1982 in contrast to the cool summer of 1980 producing less BF in spring 1981. Under the cool summer conditions of 1982 we have already seen less bud damage in experimental trees.

Although the several clonal selections of Nonpareil being studied continue to show no BF, the pattern of appearance in a long-term budwood source study (since 1972) and in commercial orchards indicate that the BF factor is latent in many (if not all) Nonpareil trees. Thus, emphasis is being placed on biochemical and genetic methods to identify the BF factor even in the absence of specific symptoms (see Project, Kuniyuki).

Bull Mission Syndrome (BMS) is so called because of the wide range of associated symptoms, including nonproductivity and modification of tree and nut characteristics. Nature of the nonproductivity and other symptoms in affected Mission, Carmel and Nonpareil was investigated in progeny trees grafted from source trees in commercial orchards. Specific virus-tested clones of Mission and Nonpareil distributed from FSPMS and represented in the RVT plots continue to show absence of BMS characteristics.

PART B: Breeding and Genetic Studies

Emphasis remains on the seed transmission of BF factor in progenies of both almond x almond BF and almond x peach. Thus, we find BF and RB (rough-bark) individuals in specific progenies of both types of crosses but the F_1 almond x peach is now the most interesting.

F_1 peach x almond progenies of Nonpareil (both normal and BF), Carmel, Sel 3-63, Titan and certain other experimental selections produce varying percentages of BF offspring. Price, Butte, Padre (5-58) and certain experimental selections produced none.

In another part of the study hybrids of dwarf peach and BF almond did not produce BF offspring in the F_1 generation and trees were normal sized and not dwarf. F_2 populations from various individual F_1 parents are being grown and preliminary observations indicate that BF segregates in the F_2 generation. Dwarf and normal size segregates but detailed data on BF in these populations have not been obtained.

Other populations are being studied for shell characteristics but data have not been analyzed.

PART C: Variety Evaluation

Summary data sheets for each plot for 1982 is provided but more detailed analysis of accumulated information of each plot is in progress.

Five years of production data for varieties in the RVT plots at Kern and Arbuckle and four years at Chico indicate Nonpareil to be at a par with or better than other major pollinizers as Carmel, Merced, Price, Fritz, Harvey and others under the conditions of these plots. Butte was consistently the most productive.

Three new almond cultivars are being released for distribution: SOLANO (5A-3), SONORA (5A-20) and PADRE (5-58).

In the RVT plots, Padre shows consistently similar production to Mission. Solano and Sonora show some tendency to alternate, Sonora more than Solano.

Experimental Results

PART A: Noninfectious Bud Failure (BF) & Bull Mission Syndrome (BMS)

1. Seasonal Patterns of Symptoms

Severity of symptoms on BF affected experimental Nonpareil trees at Davis and Winters, California, and the amount of flowering in the spring has fluctuated greatly from year to year. Examination of developing buds shows that the proportion of flower buds and the percent of failing vegetative buds is determined prior to August and September of the preceding year. Necrotic buds appeared from August through November depending on location, year and irrigation treatment. Bud necrosis was extremely pronounced under moisture stress treatments. Severity of BF symptoms and reduced flower density in spring 1982 occurred in these trees and can be directly associated to very high summer temperatures in 1981, an effect accentuated by moisture stress. In contrast, less BF severity and higher flower bud densities in spring 1981 can be directly related to cool temperatures in summer 1980 in these same plots. Very cool temperatures have again prevailed this summer (1982) and bud collections to date with Nonpareil show somewhat less tendency toward necrotic buds and higher flower bud densities.

These patterns parallel the occurrence of BF in spring 1982 and 1981 in commercial orchards in California. Very severe BF this spring (1982) has been reported, sometimes in orchards and trees where none had occurred previously.

2. Effect of Overhead Sprinkling in BF Trees

Mature trees were subjected to overhead sprinkling during June, July and August, 1980 and 1981 in an orchard in Kern County. Shoot samples were collected. Somewhat lesser necrosis of vegetative buds was observed in treated as compared to check and differences were slight and of uncertain significance. In the high temperatures of 1981, necrosis was severe. The picture seems to be that some benefit may result from cooling by sprinkling but of doubtful economic value.

3. Tissue and Bud Cultures

These studies have continued. Lou Fenton (graduate student) has maintained cell cultures of normal and BF Nonpareil for several years and has found differences in growth and temperature response. A new series of tissue and cell cultures were started this year from normal and BF clones of Jordanello, Nonpareil and Harpareil. Significant differences in growth have been shown by the two types of cell lines in each variety. This phenomenon continues to indicate some basic differences between the normal and BF. These culture sources are being used in biochemical and genetic studies by Fenton and Kuniyuki (see Project, Kuniyuki).

4. Development of BF Within Nonpareil Clones and Sources

Separate source clones and nursery sources planted at the West Side Field Station have maintained the same relative BF patterns as established about 1974.

A long-term test of budwood from different source orchards in the Wasco and Manteca areas continued to show gradual increase in numbers of BF affected trees. A very slight increase from the previous year was observed in 1981 (spring) but a significantly larger increase was evident in the inspection in spring 1982.

Nine separate Nonpareil clones growing in RVT plots have continued to show no BF symptoms. Analysis of yield records indicate no significant differences among this group.

PART B: Breeding and Genetic Studies

Segregation studies for BF in almond x peach and almond x almond are continuing. Data was obtained on flowering, tree character and nut maturity on two groups of almond seedling populations. One was a group of hybrids of almond and various almond species to study tree stature, growth habit, productivity and nut characters. The other was a group of Mission seedlings to study productivity. Nut samples were collected but data has not been analyzed.

Details of this project will not be given in this report since the analysis is still in progress. Some of the main findings are listed in the summary.

Fingerprinting studies have shown that characteristic bands of isozymes for particular enzymes are characteristic of particular varieties. These can be used for variety identification and genetic studies.

PART C: Variety Evaluation

Data on tree and nut characteristics were again obtained on varieties of the RVT plots in Kern, Colusa, Butte and San Joaquin Counties. The plot at Fresno is not yet in bearing. Carrying out the objectives of these plots and of this project is a complex affair involving cooperation and coordination

from many individual and separate institutions. These are listed on an accompanying sheet.

Summary data sheets for each plot for 1982 is provided but more detailed analysis of accumulated information of each plot is in progress.

Three new almond cultivars are being released for distribution: SOLANO (5A-3), SONORA (5A-20) and PADRE (5-58).

Sonora blooms early, has a large sized, high quality smooth kernel with high shelling percentage. Solano blooms and cross-pollinates with Nonpareil and ripens very shortly afterward. It has a high quality, attractive kernel closely resembling Nonpareil. Padre blooms and cross-pollinates with Mission; it ripens shortly ahead. Kernel closely resembles Mission. It has a hard shell. Yielding potential has been good and consistent. It is compatible with Marianna 2624 rootstock.

Solano has yielded comparably with Nonpareil most years but may have more tendency to alternate, possibly due to bearing on long shoots. Sonora has yielded well when young due to tendency to bear on long shoots. Some tendency to alternate has been noted. Neither Solano nor Sonora should be planted on Marianna 2624 rootstock, although we do not have experience with Sonora on Marianna 2624.

Collaborators:
 Mario Viveros, Cooperative Extension Kern Co.
 D. E. Kester, Pomology UCD
 W. Micke, Extension Specialist, UCD

Kern RVT Almond Trial 1982
 Planted 1974 and 1976

Variety	Full Bloom dates	Mature date (1)	Number of Nuts Per Tree	Average Kernel Size (no/oz)	Lbs. Per Tree	Estimated Yld/Acre (lbs.) @ 76 T/A	% Kernel	% Sealed	Shape				
									W/L(2)	Thick-ness(cm.)	% Doubles	% Rejects	% Worms
<u>Group I. Early Bloom</u>													
NePlus Ultra	2-22	8-14	5,993	20	19.5	1,485	63	82	50	.80	2	1	0
Sonora (5A-20)	2-25	8-19	5,879	20	18.9	1,433	73	76	48	.81	0	6	4
Jordanolo	2-18	8-19	3,951	18	14.4	1,095	64	60	46	.80	0	5	1
<u>Group II. Mid-Bloom</u>													
Nonpareil Clones:													
Nonp. 3-8-5-72	2-25	8-12	15,476	24	39.7	3,016	65	78	56	.82	0	2	2
Nonp. 3-8-2-70	2-25	8-12	13,157	25	33.1	2,588	66	88	54	.81	2	0	0
Nonp. 3-8-6-72	3-1	8-12	11,251	24	29.7	2,256	64	74	55	.76	0	0	0
Nonp. 3-8-4-72	2-25	8-12	10,947	25	27.8	2,115	64	76	56	.81	0	0	0
Nonp. Comm.	2-25	8-12	10,026	24	27.5	2,159	65	64	55	.79	1	4	.5
Nonpareil Pollinizers													
Granada	2-25	8-19	15,288	34	28.3	2,150	62	96	72	.87	0	6	0
Milow	2-25	8-12	14,246	33	27.7	2,104	73	98	59	.79	2	2	0
Carmel	2-28	9-11	11,513	27	26.9	2,047	57	100	49	.82	0	0	0
K-13N	2-25	8-19	11,495	29	24.8	1,884	58	74	62	.68	0	0	0
Robson	2-25	8-28	10,275	24	26.5	2,011	61	90	55	.87	0	0	0
Price	2-28	8-28	9,469	29	20.5	1,556	62	62	49	.81	0	4	0
Jeffries	2-25	8-19	9,877	26	20.1	1,831	64	68	56	.78	0	6	2
Solano (5A-3)	2-25	8-19	9,158	27	21.4	1,625	62	86	55	.79	0	0	0
Norman	2-25	8-28	8,767	29	19.5	1,479	58	80	62	.82	0	12	2
69-60	2-25	8-28	7,207	26	17.5	1,327	53	94	59	.73	0	2	0
Merced	2-28	9-4	7,175	24	18.7	1,419	65	90	60	.85	0	8	2
Vesta	2-28	8-12	7,102	26	17.3	1,314	55	86	53	.80	0	0	0

Kern RVT Almond Trial 1982
Planted 1974 and 1976

Variety	Full Bloom dates	Mature date (1)	Number of Nuts Per Tree	Average Kernel Size (no/oz)	Lbs. Per Tree	Estimated Yld/Acre (lbs.) @ 76 T/A	% Kernel	% Sealed	Shape		% Doubles	% Rejects	% Worms
									W/L(2)	Thick-ness(cm.)			
Nonpareil Pollinizers: (continued)													
Harvey	2-28	9-4	6,764	28	15.4	1,173	65	86	55	.87	2	8	8
23-122	2-25	8-12	5,853	21	17.2	1,305	62	100	55	.77	0	2	0
Money Tree	2-22	8-19	4,160	17	15.5	1,177	67	42	48	.83	0	16	12
Profuse	2-28	8-5	1,051	20	3.4	260	60	50	58	.76	0	20	18
<u>Group II Late Bloom</u>													
Mission Clones													
Miss. comm.	3-1	9-11	10,014	28	22.6	1,719	46	100	64	.97	3	1	0
Miss. 3-6-1-65	3-1	9-11	9,067	28	20.4	1,550	46	100	64	.96	1	1	0
Miss. 3-6-2-71	3-1	9-11	8,815	28	19.9	1,515	46	100	65	.93	0	0	0
Miss. 3-6-5-67	3-1	9-11	8,107	28	18.2	1,387	45	100	64	.94	10	0	0
Mission Pollinizers:													
Ripon	3-4	8-28	13,509	32	26.8	2,041	47	100	62	.80	0	0	0
Fritz	3-2	9-11	12,911	27	30.0	2,282	55	94	55	.90	0	0	0
3-24E	3-1	8-19	12,732	38	21.6	1,640	50	100	61	.98	2	0	0
Padre (5-58)	2-28	9-11	12,593	27	29.3	2,226	52	100	68	.84	2	2	0
Ruby	3-4	9-11	12,097	29	26.9	2,038	57	100	60	.91	0	2	0
Butte	2-28	8-28	11,206	28	25.3	1,920	61	100	56	.81	2	2	2
Thompson	3-1	9-11	9,043	26	22.4	1,704	64	88	52	.94	4	0	0
Carrion	2-28	9-4	8,950	23	25.0	1,900							

(1) 100% hull split.

(2) Width/length.

Almond Variety Trials
Nickels Estate, Arbuckle
Accumulated Yield

	Full Bloom Dates				Yield in Pounds Kernel Per Tree								1982		
	Days Before Nonpareil = -				Ave.	Nearest Pollinizer	3rd Leaf	4th Leaf	5th Leaf	6th Leaf	7th Leaf	8th Leaf	Total	Kernel Size in Gms	No./ Oz.
	1979	1980	1981	1982											
<u>TRIAL NO. 1</u>															
	PLANTED 1975														
Jordanolo	-8	-12	-10	-6	-9.0	NePlus	-	1.81	4.22	5.38	11.12	5.00	27.5	1.58	18
NePlus Ultra	-3	-9	-7	-7	-9.0	Peer	-	1.81	4.50	5.71	8.10	7.39	27.5	1.32	21
Sonora (5A-20)	-2	-8	-7	-6	-6.0	Peer	-	3.19	2.54	6.20	11.50	.93	24.4	1.79	16
Peerless	-2	-6	-5	-6	-5.5	NePlus	-	2.97	2.75	5.16	7.98	7.32	26.2	1.28	22
Milow	-3	-5	-5	-2	-3.75	Nonp.	-	.88	3.15	1.40	6.65	3.84	15.9	.86	33
K13N	-2	-6	-2	-5	-3.75	Nonp.	-	1.16	3.26	1.45	6.28	6.33	18.5	1.12	26
Money Tree	+1	-4	+1	-5	-1.75	Nonp.	-	1.09	1.84	3.58	2.62	4.87	14.0	1.50	19
Solano (5A-3)	0	-1	0	-6	-1.75	Nonp.	-	1.28	3.44	3.77	8.78	3.68	20.9	1.17	25
69-60	0	-2	+1	-3	-1.0	Nonp.	-	.98	1.72	4.06	6.75	4.78	18.3	1.22	23
Fritz	+3	-3	0	-4	-1.0	Miss.	-	2.07	4.41	5.15	12.04	4.82	28.5	1.11	26
Robson	0	0	0	-3	-7.5	Nonp.	-	1.61	4.75	3.31	9.94	5.44	25.1	1.17	25
Nonpareil	0	0	0	0	0	-	-	2.20	3.45	6.58	8.37	7.00	27.6	1.21	24
Vesta	0	0	0	0	0	Nonp.	-	1.17	1.95	3.79	7.09	4.64	18.6	1.36	21
Carmel	+1	+1	+1	-3	0	Nonp.	-	3.19	2.34	9.11	11.22	4.94	30.8	1.26	23
Granada	+1	0	0	0	+2.5	Miss.	-	1.33	2.92	4.71	6.19	7.14	22.3	.95	30
23-122	+1	+1	+1	+1	+1.0	Nonp.	-	2.20	2.62	7.31	6.46	9.67	28.1	1.15	25
Norman	+2	+1	+1	+2	+1.5	Nonp.	-	2.15	4.31	9.09	10.95	7.23	33.8	.92	31
Harvey	+2	+2	+3	0	+1.75	Nonp.	-	1.81	4.22	6.30	7.02	3.59	22.9	1.21	24
Price	+2	+1	+3	+1	+1.75	Nonp.	-	1.40	3.05	6.51	9.98	4.59	25.5	1.14	25
Carrion	+3	+2	+1	+2	+2.0	Miss.	-	1.81	3.68	4.93	6.87	3.85	21.1	1.15	25
Butte	+3	+3	+1	+2	+2.25	Miss.	-	2.45	5.02	10.64	11.63	7.11	36.9	1.08	26
Thompson	+4	+3	0	+2	+2.25	Miss.	-	2.31	5.47	6.24	8.06	6.63	28.7	1.14	25
Mission	+4	+4	+3	+3	+3.5	-	-	2.27	4.11	7.36	11.01	7.00	31.8	1.09	26

Almond Variety Trials
Nickels Estate, Arbuckle
Accumulated Yield

Full Bloom Dates					Yield in Pounds Kernel Per Tree							1982		
Days Before Nonpareil = - Days After Nonpareil = +					Nearest	3rd	4th	5th	6th	7th	8th	Total	Kernel Size in Gms	No./ Oz.
1979	1980	1981	1982	Ave.	Pollinizer	Leaf	Leaf	Leaf	Leaf	Leaf	Leaf			
<u>TRIAL NO. 2</u>														
													PLANTED 1977	
Nonpareil	0	0	0	0	-	1.51	4.38	5.52	9.88			21.3	1.14	25
Mission	+4	+3	+3	+2.5	-	3.10	6.64	8.50	6.70			24.9	1.09	26
Padre (5-58)	+5	+3	+2	+2.5	Miss.	1.70	5.40	8.01	6.98			22.1	1.05	27

Original chart prepared May, 1982 by Tom Aldrich, Cooperative Extension, Colusa County. Modified December 1982 by Dale E. Kester and Richard N. Asay.

Collaborators:
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 Colusa County
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 W. Micke, UCD Extension Specialist

Arbuckle Colusa Co.
 RVT Almond Trial 1982
 Planted 1975

Variety	Full Bloom dates	Harvest date	Number of Nuts Per Tree	Average Kernel Size (no/oz)	Lbs. Per Tree	Estimated Yld/Acre (lbs.) @ 75 T/A	% Kernel	% Sealed	Shape				
									W/L	Thick- ness(cm.)	% Doubles	% Rejects	% Worms
TRIAL 1													
<u>Group I. Early Bloom</u>													
Peerless 3-10-1-65	2-19	8/24	2,781	23	7.3	549	34	100	61	.81	9	2	0
NePlus 3-7-1-65	2-18	8/24	2,601	22	7.4	554	58	79	51	.77	18	8	0
NePlus 3-7-2-63	2-18	8/24	2,474	21	7.1	535	55	92	50	.75	10	8	0
Peerless 3-10-2-70	2-17	8/24	2,098	21	6.2	463	33	100	61	.81	9	2	0
Jordanolo	2-18	8/27	1,474	18	5.0	375	53	71	46	.75	1	5	4
Sonora (5A-20)	2-19	8/24	244	16	.9	70	65	43	52	.78	8	1	1
<u>Group II. Mid-Season</u>													
Nonpareil Clones:													
Nonpareil 3-8-5-72	2-25	8/17	2,741	23	7.4	558	60	73	57	.72	1	8	1
Nonpareil 3-8-7-72	2-25	8/17	2,528	25	6.7	502	57	67	53	.71	3	6	1
Nonpareil 3-8-4-72	2-25	8/17	2,486	23	6.6	495	59	63	59	.73	1	7	1
Nonpareil 3-8-2-72	2-25	8/17	2,387	24	6.5	484	58	74	57	.72	4	11	2
Nonpareil Pollinizers:													
23-122	2-26	8/17	3,874	25	9.7	725	50	99	61	.68	15	3	0
Norman	2-27	8/25	3,643	31	7.2	542	58	44	60	.75	0	7	1
Granada	2-25	8/17	3,374	30	7.1	536	53	100	70	.80	11	4	0
K-13N	2-21	8/17	2,598	26	6.3	475	55	17	63	.68	0	9	3
Robson	2-21	8/17	2,157	25	5.4	408	48	91	56	.81	0	7	0

Arbuckle Colusa Co.
RVT Almond Trial 1982
Planted 1975

Variety	Full Bloom dates	Harvest date	Number of Nuts Per Tree	Average Kernel Size (no/oz)	Lbs. Per Tree	Estimated Yld/Acre (lbs.) @ 75 T/A	% Kernel	% Sealed	Shape			% Doubles	% Rejects	% Worms
									W/L	Thick- ness(cm.)				
Nonpareil Pollinizers: (continued)														
Milow	2-22	8/17	2,025	33	3.8	288	63	92	60	.73	0	4	1	
Fritz	2-20	8/29	1,984	26	4.8	382	48	52	59	.85	3	7	1	
Price	2-25	8/17	1,912	25	4.6	344	58	76	56	.83	1	9	0	
69-60	2-21	8/17	1,782	23	4.8	359	47	99	64	.75	1	11	3	
Carmel	2-21	9/2	1,770	23	4.9	371	51	93	51	.79	1	1	0	
Vesta	2-24	8/17	1,532	21	4.6	348	48	68	60	.79	1	8	1	
Money Tree	2-19	8/25	1,451	19	4.8	365	65	5	52	.79	4	2	0	
Solano (5A-3)	2-18	8/17	1,439	24	3.7	276	55	92	55	.77	0	0	0	
Harvey	2-24	9/2	1,358	24	3.6	269	63	15	59	.83	4	2	0	
<u>Group III. Late Bloom</u>														
Mission Clones:														
Mission 3-6-5-67	2-27	9/10	2,978	26	7.1	539	43	100	66	.93	5	1	0	
Mission 3-6-1-65	2-27	9/10	2,932	27	6.7	501	41	100	66	.91	3	1	0	
Mission 3-6-2-65	2-27	9/10	2,552	26	6.0	449	41	100	67	.91	4	1	0	
Mission Pollinizers:														
Butte	2-26	9/2	2,950	26	7.1	533	48	87	64	.85	4	3	1	
Thompson	2-26	8/25	2,691	25	6.6	497	58	75	60	.85	1	1	0	
Carrion	2-26	9/2	1,547	25	3.9	289	53	67	58	.88	3	7	0	
TRIAL 2														
Nonpareil 3-8-5-67	2-24	8/17	3,440	25	8.7	654	61	81	56	.77	1	10	2	
Mission 3-6-2-70	2-27	9/10	3,205	26	7.6	572	41	100	68	.91	5	0	0	
Padre (5-58)	2-26	8/29	2,756	27	7.0	524	44	100	63	.90	0	0	0	

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Chico RVT Almond Trial 1982
 Planted 1976

Variety	Full Bloom dates	Harvest date	Number of Nuts Per Tree	Average Kernel Size (no/oz)	Lbs. Per Tree	Estimated Yld/Acre (lbs.) @ 75 T/A	% Kernel	% Sealed	Shape W/L	Shape Thickness	% Doubles	% Rejects	% Worms
<u>Group I. Early Bloom</u>													
NePlus Ultra													
3-7-1-63	2-27	9-25	8,357	21	25.4	1,907	88	55	43	.81	28	20	4
Sonora (5A-20)	2-26	9-25	5,215	18	18.2	1,366	68	44	49	.81	0	8	8
Jordanolo	2-19	9-25	4,993	18	17.4	1,308	62	84	43	.83	4	24	20
<u>Group II. Mid-Season</u>													
Nonpareil Clones													
" 3-8-4-72	3-1	9-5	6,294	21	18.9	1,419	65	32	55	.78	2	8	4
" 3-8-2-70	3-1	9-5	5,976	20	18.2	1,367	66	30	53	.81	3	13	9
" 3-8-5-72	3-1	9-5	5,707	20	18.1	1,354	67	23	54	.79	3	13	10
" 3-8-7-72	3-1	9-5	5,642	21	17.2	1,291	67	24	54	.79	2	8	6
Nonpareil Pollinizers:													
Carmel	3-3	9-25	9,677	20	29.5	2,214	58	84	49	.87	8	4	4
Merced	3-3	9-25	7,557	22	21.9	1,644	63	80	60	.80	4	20	20
23-122	3-1	9-25	6,921	23	18.6	1,391	51	100	66	.80	28	4	0
Harvey	3-4	9-25	6,204	25	15.7	1,178	63	76	57	.85	12	12	8
Solano (5A-3)	3-1	9-25	5,953	24	15.8	1,181	65	72	52	.79	0	4	4
Norman	3-3	9-25	5,654	25	13.9	1,040	66	32	59	.80	0	8	8
Fritz	3-1	10-11	5,524	23	15.2	1,140	49	60	57	.94	4	0	0
Milow	3-1	9-12	4,893	29	10.5	780	69	60	55	.72	4	4	4
Robson	3-1	9-25	4,700	21	14.0	1,054	66	52	54	.89	0	0	0

Chico RVT Almond Trial 1982
Planted 1976

Variety	Full Bloom dates	Harvest date	Number of Nuts Per Tree	Average Kernel Size (no/oz)	Lbs. Per Tree	Estimated Yld/Acre (lbs.) @ 75 T/A	% Kernel	% Sealed	Shape		% Doubles	% Rejects	% Worms
									W/L	Thickness			
Nonpareil Pollinizers: (continued)													
Vesta	3-1	9-25	4,289	21	12.7	950	57	56	52	.81	0	32	32
Price	2-28	9-25	4,171	22	11.6	872	60	64	48	.88	36	4	4
K-13N	2-27	9-25	4,101	22	11.6	868	59	40	60	.67	0	16	16
<u>Group III. Late Bloom</u>													
Mission Clones:													
" 3-6-1-65	3-6	10-11	9,610	26	23.1	1,733	43	100	67	1.09	8	0	0
" 3-6-2-71	3-6	10-11	8,564	26	20.5	1,534	43	100	67	1.09	10	0	0
" 3-6-5-67	3-5	10-11	8,245	25	20.3	1,523	43	100	65	1.13	16	0	0
Mission Pollinizers:													
Butte	3-4	9-25	10,929	25	27.4	2,053	55	60	57	.92	4	12	8
Padre	3-6	9-25	10,451	29	22.8	1,707	48	100	61	.93	8	0	0
Thompson	3-6	9-25	9,237	27	21.8	1,631	55	92	56	.85	8	0	0
Ripon	3-12	9-12	7,651	28	17.2	1,291	44	100	61	.78	0	8	0
Carrion	3-3	9-25	6,741	21	20.2	1,516	63	60	52	.95	12	12	8
Granada	3-1	9-25	2,519	26	6.1	457	54	68	72	.88	28	4	0

Collaborators:
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Delta College
 RVT Almond Trial 1982
 Planted 1978

Variety	Number of Nuts Per Tree	Average Kernel Size (no/oz)	Lbs. Per Tree	Estimated Yld/Acre (lbs.) @ 76 T/A	%	%	Shape (cm.)				
							Kernel	Sealed	W/L	Thick- ness	% Doubles
<u>Group I. Early Bloom</u>											
Sonora	4649	21	13.6	1,037	73	32	44	.85	12	0	0
NePlus Ultra 2-70	4080	21	12.4	943	62	84	45	.84	16	4	0
NePlus Ultra 1-63	3825	22	10.7	812	61	88	42	.85	16	0	0
Peerless	3180	23	8.8	671	41	100	58	.90	12	0	0
Jordanolo	2716	17	10.1	770	65	68	43	.84	0	20	8
<u>Group II. Mid-Bloom</u>											
Nonpareil 3-8-4-72	5255	25	13.4	1,015	64	46	53	.82	1	11	1
Nonpareil 3-8-7-72	5226	26	12.7	963	68	47	51	.82	3	15	4
Nonpareil commercial	5146	23	14.1	1,068	68	47	52	.84	1	8	2
Nonpareil commercial	4653	23	12.3	938	69	68	52	.82	1	20	0
Nonpareil 3-8-5-72	4416	24	11.5	877	69	57	52	.81	3	17	3
Nonpareil 3-8-2-70	3648	23	9.5	720	70	55	52	.82	1	8	1
<u>Nonpareil Pollinizers</u>											
Sauret No. 1	8726	26	20.7	1,573	65	72	62	.94	0	0	0
Fritz	6738	28	15.4	1,173	55	64	53	.90	0	0	0
Merced	6101	22	17.0	1,296	72	44	57	.98	8	12	0
Monterrey	5792	21	17.1	1,300	50	96	47	.93	12	0	0
Solano	5263	28	11.6	882	64	76	47	.78	0	0	0
Carmel	4949	20	15.2	1,157	65	48	49	.93	8	0	0
Price	4201	25	10.3	783	64	44	51	.88	24	0	0
Sauret No. 2	3893	24	10.3	785	59	84	42	.88	4	4	4
Monarch	3432	25	8.7	658	52	100	51	.85	4	0	0
Grace (1)	873	31	1.7	132	59	88	53	.92	0	0	0

(1) Planted 1979

Delta College
RVT Almond Trial 1982
Planted 1978

Variety	Number of Nuts Per Tree	Average Kernel Size (no/oz)	Lbs. Per Tree	Estimated Yld/Acre (lbs.) @ 76 T/A	% Kernel	% Sealed	Shape (cm.)		% Doubles	% Rejects	% Worms
							W/L	Thick- ness			
<u>Group III. Late Bloom</u>											
Mission 3-6-1-65	4914	24	12.7	968	48	100	65	1.03	8	0	0
Mission commercial	4870	24	12.5	950	50	100	61	.98	8	0	0
" 3-6-5-67	4157	23	11.2	847	48	100	65	1.03	8	0	0
" 3-6-2-70	4144	22	11.6	883	52	100	62	.97	4	0	0
" commercial	3843	24	10.1	768	51	96	61	1.00	8	0	0
" commercial	3154	23	8.7	662	58	80	64	.98	4	0	0
Mission Pollinizers:											
Butte	7517	27	17.2	1,309	60	60	58	.97	12	0	0
Livingston	6149	23	16.4	1,245	68	56	51	.88	4	4	0
Padre	5550	25	13.6	1,037	55	100	61	.96	0	0	0
Thompson	5370	24	14.1	1,069	64	56	56	.88	4	0	0
Ruby	4267	22	12.3	938	59	88	66	.95	0	4	0
Mono	5394	25	13.7	1,037	51	100	53	.84	4	0	0
Yosemite	4941	29	10.6	805	58	48	60	.90	4	0	0
Tokyo	2789	20	8.9	673	55	32	58	.87	0	0	0
<u>Group IV. Very Late</u>											
Planada	2257	20	7.1	541	56	100	55	.84	0	20	0
Ripon	2075	26	8.0	380	51	100	56	.86	0	8	0
<u>Group V. Self-Fertile</u>											
LeGrand	5996	22	16.9	1,282	65	48	60	.99	4	0	0