

Lima Beans, *Phaseolus lunatus*

Nine tables of this report are devoted to presenting the data from varietal and cultural trials with lima beans. Because of the hot temperatures in the summer of 1984, lima yields were not outstanding, but some good yields were obtained. We have had more difficulty getting adequate stands with lima beans since we began testing than with any other class of beans. They are also more difficult to thresh with our portable thresher and the seeds more difficult to clean. The data we present in the following tables are comparative for the varieties and treatments and may differ from yield data obtained by the growers with whom we cooperated.

Sutter County — Lima Bean Test

Nine baby lima cultivars and one large lima were compared for yield and seed size on a sub-irrigated field near Meridian. Initial stands were poor and we observed considerable seedling loss due to diseases. Seed placement at planting was about 1 to 1-1/2 inches deeper than desirable since sub-water permitted the saturated zone to rise above the seed. We also lost our initial center rows of some plots due to spotty stands, and as a result, we took some of the more complete guard rows for yield determination. The yields reported in Table 14 may or may not be representative of the field yields, but we believe they do show the relative potential of the different cultivars. The varieties Wilbur, Pat and Mezcla were best yielders in the test and the one large bush lima Dompe 95 was poorest. Interestingly, Dompe 95 had a relatively good stand in all plots and its growth and appearance were good throughout the season despite its poor yield performance.

The results of this test tend to confirm that Wilbur is the best variety for this growing area, though the variety Pat was almost as good and not significantly poorer yielding.

Stanislaus County — Large Lima Test

The large lima test planted on the Cox-Perez Ranch consisted of five vine-type cultivars and three bush-type cultivars. Though there were big differences between highest and lowest yields (756 lbs/A), we could not say this was statistically significant because of the wide variability from plot to plot even within a variety. We did have some skips in plots of the variety Maria, but even with a slight adjustment to stand it made no difference in ranking of the cultivars.

Generally, the bush type limas yielded poorer than the vine types (Table 15). Perhaps the 33-inch row spacing was too wide to obtain maximum yields with the bush types, but may have been more near optimum for the large vine types.

Cultivar 79180 which showed a slight edge in earliness over most other cultivars, yielded well in this test. Its earliness may be deceptive, however, since foliar yellowing does not necessarily mean earlier maturity of pods and beans. We will have to observe these characteristics more closely in future plantings.

West Side Field Station — Large Lima Test

Seven cultivars of large limas were planted at the West Side Field Station on July 5 following an oat hay crop. A poor stand of White Ventura N eliminated this variety from the results reported in Table 16. Results of this test show that all the vine-type cultivars significantly outyielded the bush-types Dompe 95 and Maria. No differences in yields were observed between Maria and Dompe 95 nor between the four vine-type cultivars. Selections 79179 and 79180 were slightly but not significantly higher yielding than Lee and Dompe 101. Dompe 101 appears to be a bit more viney than Lee.

West Side Field Station — Baby Lima Test

Nine baby lima cultivars were compared for yield at the West Side Field Station in 1984. Planting was done July 5. Seed yields fell into two groups with the varieties Pat and Mezcla and cultivar 7716 yielding very significantly more than the other six cultivars. Henderson Bush, a hundred year old variety, topped the list for yield of the six lower yielding cultivars.

Wilbur is a selection from Henderson Bush and Baird is a mutant selection out of Wilbur. Interestingly, seed sizes do not differ significantly between Henderson Bush and Wilbur, but seed of Baird is significantly smaller (Table 17).

Solano County — Baby Lima Test

The same nine baby lima cultivars that were planted in Sutter county and at West Side Field Station were planted near Dixon. This is generally a pink bean area or occasionally a kidney bean area, and in the past, has not had much of a lima production history. Because of our testing procedure and results, it looks like this area could successfully produce baby limas. Yields up to 39 sacks per acre (Table 18) are very encouraging. Pat and Wilbur were the highest producing varieties with Baird and Henderson Bush yielding the least. These last named varieties were significantly lower yielders than Pat at odds of 99 to 1. The numbered selections showed no improvement in yield over the established varieties.

South Coast Field Station — Large Lima Selection Test

In 1979 we selected many "off-type" plants from a commercial lima field near Santa Maria. We wanted to know if these plants were late-emerging plants or if they were natural hybrids. Over the years, we have maintained these selections and tested them in comparison with the variety Maria, but with no definitive answers. These selections, along with Maria, Dompe 95, Henderson Bush, and three Santa Maria selections of Carl Tucker's were planted at the South Coast Field Station in 1984.

Results of the 1984 planting are summarized in Table 19. Seed yields ranged from 1194 lbs per acre to 1642 lbs per acre. Unfortunately, yields were poorer than desired and were so variable as to negate the ability to separate poor yielders from high yielders. Seed sizes ranged from 95.4 grams per 100 seeds to 78.2 grams per 100. This is a spread of 17.2 grams per 100 seeds, enough to justify speculation that many of these selections were undoubtedly derived from genetically different materials or likely outcrosses. Some of these selections

should be tested again in 1985 in a lima-producing area. However, since none of them were significantly better yielding than Maria, it is doubtful if any of them would be a potential replacement for the variety Maria.

South Coast Field Station — Lima Row-Spacing Test

For the second year, a row-spacing by variety yield test was established at the South Coast Field Station. We grew Dompe 95, a bush large lima; Henderson Bush, a bush baby lima; Lee, a viney large lima; and Mezcla, a viney baby lima at each of three row spacings. The combined two-year data (Table 20) show that 30-inch rows gave the highest yields, but this was significant only at odds of 19 to 1. Single rows on a 40-inch bed yielded equal to two rows on a 40-inch bed.

We noted that 40-inch beds were higher than 30-inch beds and that water penetration from furrow irrigation was not as complete as on 30-inch beds. Despite the fact that all of our plantings on 40-inch beds were on the side rather than the center of beds, we felt that plantings on the 40-inch beds did lack adequate soil moisture when compared to 30-inch bed plantings. This may be a critical factor to consider in wide-bed plantings, particularly if water is slow to move laterally through the beds.

Seeding rates were held constant for all row spacings. New row spacing tests should have three seeding rate comparisons or plant populations to better evaluate the responses of the different lima types.

West Side Field Station — Lima Row-spacing Test

A row-spacing test with large and baby limas (Table 21) with bush and vine types of each class was planted at the West Side Field Station. Soil moisture was not fully adequate at planting time, and when emergence of plants showed a spotty stand would prevail, the test was irrigated. Apparently, the procedure failed to give us the desired results and we were only able to harvest some varieties fully over some row spacings. We did get one or more plots of all varieties at each row spacing and the yields are shown in Table 21. Since the data are derived from incomplete treatments or an irregular number of replications, the data could not be statistically analyzed and should not be used to draw firm conclusions. The data should only be used as guidelines in helping to establish future plots for the same type of study. Experience showed that our east row of 2-row plots failed to emerge. We have no answer to the questions this phenomenon poses.

Santa Barbara County — Large Lima Irrigation Test

A study designed to help determine the water needs or the most efficient times of application of water to large lima, variety Maria, was undertaken. Four moisture regimes were maintained and the results are shown in Table 22.

Results of the test did not define the optimum amount of water needed to maximize crop yields. They did indicate that frequent light irrigations may be more beneficial than fewer, but heavier irrigations. For example, treatment 3 received 4 irrigations totaling 4 inches of water. Treatment 4 received only 3 irrigations, but totaled 5.4 inches of applied water, yet the yield was 281 lbs less than for Treatment 3. There was an indication that more water increased yields. There was a linear yield decline as water amounts declined from 7.7

inches (Treatment 1) to 4.4 inches (Treatment 3). These decreases in yield were highly significant, but because of differential times of application, it could not be determined whether the differences were due to the amount or timing of the irrigations.

Cowpeas (Blackeyes), Vigna unguiculata

Four tests involving blackeyes are reported under this section. 1984 was not a particularly good year for blackeyes because of the excessively prolonged high temperatures. However, all the tests we planted were harvested and results are reported in the following pages.

South Coast Field Station — Blackeye Selection Test

In 1979 we space-planted a 100 lb lot of seed obtained from Pat Vernola in the Chino basin. Since this seed had been maintained by the Vernola family for two generations, we felt that it may be able to provide us with valuable genotypes for breeding purposes. The seeds were spaced about 30 inches apart in rows 30 inches apart so we could look at individual plants. From this large field, we tagged and selected early and other unusual plants. Over the years, we have tested and reduced the number of lines and we now have saved only 13 of the original 250. At this point, we believe we have selected materials which will be useful to incorporate into the blackeye breeding program. The seed will be made available to Dr. Tony Hall and Dr. Ivan Buddenhagen.

Selection provided plants which resembled both California Blackeye #3 and California Blackeye #5. A test in 1982 indicated further that CB #3 types appeared to be wilt resistant (Table 23) whereas CB #5 types were wilt susceptible. The yield data in Table 23 show there are no significant differences between the established varieties and the numbered selections (cultivars). The data also show that accumulative yield averages are higher for some selections than for California Blackeye #3 or #5. Other supporting data on seed size, plant habit, and wilt susceptibility would indicate that several of the selections should be saved to incorporate into the breeding program.

Selection 39 is a chlorophyll mutant Blackeye #3 type. It has yielded as well as Blackeye #3 and Blackeye #5, and in the 1982 test in Tulare County, it appeared to be wilt resistant. It should be maintained in the germplasm bank for photosynthetic studies.

Selection 18 has yielded very well over the four years of testing. It is a composite of six selected high yielding lines. Reselection out of #18 would derive plants similar to CB #5 and CB #3.

Selections 36, 29, 18, 37, and 38 yielded 109, 111, 112, 119, and 121 percent of California Blackeye #5 respectively over the four years. These are mostly Blackeye #5 types. Blackeye #3 yielded but 96% of Blackeye #5. Several of the Blackeye #3 types: selections 20, 39, and 22 yielded 101, 106, and 107 percent of Blackeye #5 respectively. These should be useful since they appeared to have some wilt resistance.

Table 14 Average seed yields and seed sizes of lima beans grown in Sutter County in 1984.

Cooperators: Bob Bryant (Grower); Leonard Buschmann (Farm Advisor); W. H. Isom (Extension Agronomist); and Miguel Vilchez (Staff Research Associate).

Location: Moroni Road near Meridian, Sutter County, California

Cultivar	<u>Class</u>	<u>Yield</u> <u>lbs/A</u>	<u>Seed size</u> <u>gms/100</u>	<u>Estimated</u> <u>% stand</u>
Wilbur	Baby lima	3248	42.6	94
Pat	Baby lima	3183	39.0	96
Mezcla	Baby lima	2957	41.6	98
Baird	Baby lima	2777	39.2	97
7703	Baby lima	2708	43.5	98
7705	Baby lima	2694	40.4	92
7716	Baby lima	2627	40.5	93
7710	Baby lima	2492	37.4	91
Henderson Bush	Baby lima	2266	43.0	98
Dompe 95	Large lima	1253	96.8	94
LSD @ 5%		399	2.9	
LSD @ 1%		539	4.0	
CV %		10.5	4.4	

Date Planted: May 18, 1984
Irrigation: Sub-irrigated

Note: Because of stand problems, some guard rows were used for yield determination. Yields are on an as-is basis and were not adjusted for stand. Stand estimates were on the 2 rows harvested as a percent of a perfect stand.

Table 15 Average yields of large lima cultivars grown in Stanislaus County in 1984.

Cooperators: J. S. Cox and D. Perez (Growers); Phil Osterli (Farm Advisor); W. H. Isom (Extension Agronomist); and Miguel Vilchez (Staff Research Associate).

Location: Westley, Stanislaus County, California

Cultivar	Yield <u>lbs/A</u>	Seed size gms/100	Growth Habit
79180	3156	92.9	Vine
Lee	3019	101.7	Vine
Dompe 101	2912	102.4	Vine
White Ventura N	2900	107.1	Vine
79179	2689	98.5	Vine
Maria	2417	106.4	Bush
Dompe 95	2404	94.9	Bush
White Ventura N Bush	2400	106.9	Bush
LSD @ 5%	n.s.	5.5	
LSD @ 1%	n.s.	7.5	
CV %	15.0	3.7	

Date planted: May 17, 1984

Harvested: October 10, 1984

Winds destroyed 1 plot of 79180 and a missing value was calculated for this missing plot. Some adjustments for plot skips were made for the variety Maria.

Table 16 Average yields and seed sizes of large lima cultivars grown at the West Side Field Station, 1984.

Cooperators: R. M. Hoover (Station Superintendent); W. H. Isom (Extension Agronomist); H. Yamada and Miguel Vilchez (Staff Research Associates).

Location: About 5 miles south of Five Points, Fresno County, California.

Cultivar	Yield <u>lbs/A</u>	Seed size gms/100 seeds
Dompe 95	1123	93.4
Dompe 101	1692	92.3
Lee	1557	96.1
Maria	1023	101.7
79179	1774	99.5
79180	1713	89.8
LSD @ 5%	281	7.1
LSD @ 1%	387	n.s.
CV %	12.6	4.9

Planted: July 5, 1984

Table 17 Average yields and seed sizes of baby limas grown at the West Side Field Station in 1984.

Cooperators: R. M. Hoover (Station Superintendent); W. H. Isom (Extension Agronomist); H. Yamada and Miguel Vilchez (Staff Research Associates).

Location: About 5 miles south of Five Points, Fresno County, California.

Cultivar	Yield <u>lbs/A</u>	Seed Size gms/100 seeds
Pat	2530	34.2
7716	2519	34.7
Mezcla	2402	34.4
Henderson Bush	1887	35.2
7710	1830	29.2
7705	1817	33.1
Baird	1612	32.2
Wilbur	1526	36.8
7703	1430	35.7
LSD @ 5%	350	2.4
LSD @ 1%	474	3.7
CV%	12.3	4.8

Planted: July 5, 1984

Table 18 Average yields of baby lima cultivars grown in Solano County in 1984.

Cooperators: Jim Cooley (Grower); Larry Clement (Farm Advisor); W. H. Isom (Extension Agronomist); and Miguel Vilchez (Staff Research Associate).

Location: west of Dixon, Solano County, California.

Cultivar	Seed yield lbs/A	Mean Separation*
Pat	3926	A
Wilbur	3874	AB
7710	3857	AB
7716	3705	AB
Mezcla	3621	ABC
7705	3509	ABC
7703	3245	ABC
Henderson Bush	3159	BC
Baird	2913	C
LSD @ 5%	499	
LSD @ 1%	676	
CV %	9.7	

* Any 2 means accompanied by the same letter are not different at odds of 99 to 1.

Date Planted: May 5, 1984
 Soil Type: Yolo clay
 No. irrigations: 7, sprinkler followed by furrow
 Pesticides: Treflan preplant

Table 19 Average yields and other data from large lima bean cultivars grown at the South Coast Field Station in 1984.

Cultivar	Seed Yield lbs/A	Seed Size gms/100	% Mature 8-23	Regrowth* 8-23	APD Score	
					8-23	Seedling Score
SM #43	1642	94.4	10	5.8	7.2	.6
79-6	1536	82.6	12	3.2	8.2	3.1
Henderson Bush	1492	31.2	20	9.7	6.2	1.2
79-11	1485	95.4	5	3.2	8.2	2.4
Dompe 95	1468	87.6	11	8.0	5.2	.4
SM #41	1452	89.6	17	4.0	8.2	2.6
79-4	1449	82.3	24	3.5	8.5	2.5
Maria	1440	86.8	17	3.5	8.5	2.2
79-15	1431	94.2	4	3.0	7.8	2.1
SM #44	1414	93.0	5	6.2	6.8	1.0
79-7	1399	83.8	21	3.0	8.5	1.4
79-18	1397	94.2	8	3.8	7.5	1.6
79-12	1387	90.5	6	1.8	8.5	2.2
79-13	1382	94.1	20	5.2	7.5	.9
79-8	1377	78.2	25	2.2	8.8	2.5
79-17	1341	81.1	18	2.8	8.8	2.0
79-5	1340	90.4	6	4.5	8.0	1.8
79-10	1280	92.7	8	3.5	8.0	1.2
79-14	1252	89.2	18	3.5	7.6	1.6
79-16	1194	86.2	24	4.0	7.8	1.6
LSD @ 5%	n.s.	5.6				1.3
LSD @ 1%	n.s.	7.4				1.8
CV %	18.0	4.6				53.5

* Regrowth was estimated on 8-23 on a 0-10 scale where 10 = all plants alive and starting new growth.

APD score is on a 0-10 scale where 10 is total damage to all the leaf surface. Seedling score was taken at the first primary leaf stage.

Table 20 Effect of row spacing on yields and seed sizes of large and baby lima beans grown at the South Coast Field Station in 1983 and 1984.

Row Spacing and Variety	Seed Yields lbs/A		Seed Size gms/100 seeds		Thousands of seeds/A	
	<u>1983</u>	<u>1984</u>	<u>1983</u>	<u>1984</u>	<u>1983</u>	<u>1984</u>
30" single row						
Henderson Bush	1648	3177	21.9	35.7	4033	
Mezcla	1563	3363	21.7	37.7	4029	
Dompe 95	2262	3476	74.3	102.9	1544	
Lee	1942	3132	85.8	98.9	1455	
40" single row						
Henderson Bush	1438	2602	21.7	36.1	3274	
Mezcla	1464	3284	21.4	37.0	4021	
Dompe 95	1996	3506	77.0	105.2	1510	
Lee	2012	2847	81.5	98.0	1312	
40" double row						
Henderson Bush	1385	2879	20.3	37.7	3458	
Mezcla	1618	2882	20.5	36.7	3585	
Dompe 95	2006	3344	70.6	104.5	1462	
Lee	2073	2924	83.7	98.3	1356	
	LSD @ 5%		LSD @ 1%		CV %	
	<u>1983</u>	<u>1984</u>	<u>1983</u>	<u>1984</u>	<u>1983</u>	<u>1984</u>
For varieties (yield)	148	390 lbs/A	199	526 lbs/A	9.9	14.9
For varieties (seed size)	—	3.24 gms/100	—	4.38 gms/100	9.3	5.6
For varieties (seed no.)	—	420 (thousands)	—	567 (thousands)	—	19.4
For row spacings (yield)	n.s.	n.s.	n.s.	n.s.	9.5	11.9
For row spacings (seed size)	—	n.s.	—	n.s.	10.7	6.2
For row spacings (seed no.)	—	n.s.	—	n.s.	—	14.3

Planting dates: May 12, 1983 and April 20, 1984

Table 21 Effect of row spacing on seed yield and seed size of lima beans at the West Side Field Station in 1984.

Cooperators: R. M. Hoover, Don May, Mike Gonzales, W. H. Isom, Miguel Vilchez, and H. Yamada.

Row Spacing and Variety	Yield <u>lbs/A*</u>	Seed Size gms/100*
30-inch single row		
Henderson Bush	1371	34.0
Mezcla	1503	29.8
Dompe 95	1152	87.5
Lee	1060	89.7
40-inch single row		
Henderson Bush	1282	30.0
Mezcla	1918	34.2
Dompe 95	875	89.9
Lee	1282	88.1
40-inch double row		
Henderson Bush	1210	32.6
Mezcla	1640	34.1
Dompe 95	1118	93.4
Lee	1309	96.0

* Note: This test was a virtual loss because of a very poor stand in one-half of the plots. One replication was salvaged in the 30-inch row spacing of Dompe 95 and Lee. The above data are presented only as guidelines for future planning.

Table 22 Effect of different irrigation treatments on yield and seed size of large lima beans.

Cooperators: Owen and Jim Rice (Growers); W. E. Bendixen (Farm Advisor); W. H. Isom (Extension Agronomist); and Miguel Vilchez (Staff Research Associate)

Location: East of Santa Maria, Santa Barbara County, California

Irrigation Treatment No.*	Seed yield in lbs/A**		% cleanout	Seed size gms/100 seeds
	dirt wt.	clean wt.		
1	2309 A	2153 A	7.2	102.0
2	1928 B	1834 B	5.1	103.5
3	1759 C	1648 C	6.7	106.7
4	1470 D	1367 D	7.5	102.7
LSD @ 5%	115	99	—	n.s.
LSD @ 1%	165	142	—	n.s.
CV %	3.8	3.5	—	5.7

* Irrigation treatments were made on the dates shown below. The field was pre-irrigated before planting.

** Any 2 means not accompanied by the same letter differ at odds of 99 to 1.

Dates Applied	Irrigation Treatment No. & Amount of Water in Inches			
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
June 26	1.0			
July 4		1.0	1.0	
July 21	1.3			1.3
July 26		1.0	1.0	
July 27		.5	.5	
July 28	2.6			2.6
August 11			1.5	
August 14	1.5	1.5		1.5
August 22	<u>1.3</u>	<u>1.3</u>	—	—
Total applied after emergence	7.7	5.3	4.0	5.4