

**UNIVERSITY OF  
DELAWARE**



# LIMA BEAN

**VARIETY**

**TRIAL**

**RESULTS**

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**University of Delaware  
Research and Education Center  
16483 County Seat Highway  
Georgetown, DE 19947**

**2009**

## 2009 University of Delaware Lima Bean Variety Trial

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The 2009 Lima Bean Variety Trial included a total of 26 lines. Eleven of the lines were entered by the two participating seed companies: ADM Seedwest and Ben Fish & Son. Eleven lines were from the University of Delaware lima bean breeding program. The remaining four lines were standard varieties planted as checks. The purpose of this trial is to evaluate new processing lima bean varieties for yield, maturity, and quality under Delaware growing conditions.

### Varieties Entered in the 2008 Delaware Lima Bean Variety Trial

Variety Name	Company
GBL 21-04-DA	Ben Fish
GBL 24-04-DA	Ben Fish
GBL 25-04-DA	Ben Fish
GBL 26-04-DA	Ben Fish
G200430	ADM
G418267	ADM
G200394	ADM
G200381	ADM
G418274	ADM
G417274	ADM
G422266	ADM
Cypress	Check (ADM)
184-85	Check (Ben Fish)
C-elite Select	Check (Ben Fish)
Concentrated Fordhook	Check (Charter Seed)
DE0401711	University of Delaware
DE0402701	University of Delaware
DE0407902	University of Delaware
DE0407903	University of Delaware
DE0407905	University of Delaware
DE0407906	University of Delaware
DE0407907	University of Delaware
DE0407910	University of Delaware
DE0407911	University of Delaware
DE0505002A	University of Delaware
DE0505002B	University of Delaware

**Location:**

Field 21 at the University of Delaware Research and Education Center Farm, Georgetown, DE

**Cultural Practices:**

The trial was planted on June 11, 2009 with a Monosem planter. Varieties were planted in one-row plots with 30 inch between row spacing and 3 inch in-row spacing. Plots were 25 feet in length. Plots were arranged in a randomized complete block design with four replications. Only replications 1 through 3 were harvested, however, after flooding damaged part of replication 4. The field was fertilized according to soil test results — 150 lbs/A of K applied on March 29, 2009 and 38 lbs/A of nitrogen in the form of 30% UAN was applied at planting. Pre-emergence herbicides (0.6 oz./A Sandea + 0.5 pint/A Dual II Magnum) were applied on June 11, 2008. Plots were cultivated on July 10, 2009 and cultivated and sidedressed with 40 lbs/A nitrogen in the form of 30% UAN on July 24, 2009. Plots were irrigated, when necessary, with a traveling, linear system. No applications were made for insect or disease control.

**Harvest:**

As harvest approached, five-plant samples were pulled from the maturing plots and the number of full, flat and dry pods was counted. Not all replications for a variety were harvested on the same day. Plots were harvested as close to ten percent dry pods as possible. There were no significant differences between the varieties in percent dry pods at harvest (Table 1). Harvest began on August 25 (75 DAP) and ended on September 16 (97 DAP).

A 15-foot section from each plot was harvested. The plants were cut off at soil level and weighed. To determine maturity at harvest, pods were stripped from five harvested plants from each plot and counted as full, flat or dry. The plants and pulled pods were fed into a stationary FMC viner. Trash was removed from the shelled beans by hand, and the cleaned beans were weighed to determine yield.

**Downy Mildew Resistance Testing**

Eight of the lines from the University of Delaware Lima Bean Breeding Program as well as Concentrated Fordhook were screened for resistance to lima bean downy mildew, an important disease of lima beans in Delaware which is caused by *Phytophthora phaseoli*. Screening took place in field plots. Plants were screened for resistance to race F at the University of Delaware research farm at Georgetown and for resistance to race E at the University of Delaware research farm at Newark. Approximately 50 seeds of each line were planted in single-row plots in each location. The Newark location was planted on July 6, 2009 and the Georgetown location on July 7. Plants were inoculated three times during flowering. To encourage infection susceptible check varieties were planted in every fifth row within the plot and additional moisture was applied via misters timed to come on for four 15 minute intervals during the night. Plants were evaluated several times in September and October 2009 for disease reaction.

**Results and Discussion**

Yields did differ significantly among the varieties in the trial this year, however, overall, yields were lower this year than in past trials. Weather conditions were cooler than usual this season, however a sustained period with daytime highs at or near 90°F and nights above 70°F (67-71 DAP) did occur during peak flowering (Table 2 & Chart 1) which may have contributed to lower

yields. Additionally, weed control in the trial was not as good as in past years, probably in part due to the >2” of rain received seven days after planting (this was the same rain event which flooded out the fourth replication of the trial).

There were significant differences in yield among the 26 varieties in the trial. The highest yielding standard variety in the trial was 184-85, which had a significantly higher yield than Cypress, but was not significantly higher yielding than C-elite Select. Concentrated Fordhook, which was one of the highest yielding varieties in 2008, was the lowest yielding variety in the trial this year. The highest yielding experimental varieties in the trial were DE0505002A, DE0407911 and DE0401711. The yield of DE0505002A was significantly higher than the three standard baby lima varieties. DE0407911 and DE0401711 had significantly higher yields than Cypress but were not significantly different from 184-85 or C-elite Select. DE0407911 and DE0401711 were also in the 2008 trial, and DE0401711 was among the top yielding varieties in that trial.

There were significant differences among the varieties in stand count at harvest (Table 1). Stand counts were uniformly high for varieties where treated seed had been planted, but varied from 100% survival (40 plants) to 53% survival for varieties that had not been treated. Flowering time among the varieties was quite variable this year and earlier flowering varieties should have had the more favorable conditions for pod set (Table 2 & Chart 1).

### **Acknowledgements**

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James Adkins, who maintains the viner.

Brian Hearn and the REC Farm Crew for help with field operations.

Dr. Tom Evans and Nancy Gregory for assistance with downy mildew disease screening.

**Table 1. Yield, Days to Harvest, Maturity at Harvest, Number of Pods per Plant, Plant Weight, Stand Count at Harvest, and Downy Mildew Disease Reactions for Entries in the 2009 Lima Bean Variety Trial**

Variety	Days to Harvest	Yield (Lbs/A)	% Full	% Flat	% Dry	# Pods/Plant	Plant Weight (Lbs/15 ft)	# Plants/15 ft <sup>1</sup>	Downy Mildew Resistance <sup>2</sup>	
									Race E	Race F
DE0505002A	83 c	3531 a	84 abc	8 de	8 a	45 ab	23.2 a	37 abcd	?	?
DE0407911	84 c	2890 ab	86 a	6 e	7 a	43 abc	20.0 abcde	28 fgh	S	R
DE0401711	83 c	2815 ab	80 abcd	13 cde	7 a	42 abcd	22.3 ab	36 bcde	R	S
DE0402701	84 c	2735 bc	83 abc	11 cde	6 a	40 abcde	21.5 abc	37 abcd	S	R/S
184-85	89 b	2675 bcd	78 abcdef	13 cde	10 a	39 abcdef	18.6 bcdef	34 cdef	R	S
G200381	77 fg	2582 bcde	69 efghi	14 cde	17 a	27 h	16.5 ef	39 abc	?	?
DE0407905	82 cd	2491 bcdef	82 abc	8 de	10 a	36 bcdefgh	21.2 abc	43 a	S	R
DE0407903	77 fg	2489 bcdef	75 bcdefgh	14 cde	11 a	35 bcdefgh	20.1 abcde	37 abcd	S	R
DE0407907	84 c	2486 bcdef	80 abcd	8 de	11 a	37 bcdefgh	18.5 bcdef	28 fgh	S	R
C-elite Select	87 b	2475 bcdef	79 abcde	8 de	12 a	43 abc	17.3 cdef	31 defg	R	S
DE0407910	79 ef	2351 bcdefg	79 abcdef	6 e	15 a	44 ab	18.1 bcdef	27 ghi	R	R/S
GBL 25-04-DA	83 c	2225 bcdefg	76 abcdefg	16 bcde	8 a	45 ab	16.2 ef	30 efg	?	?
G422266	77 fg	2168 bcdefg	70 defghi	16 bcde	13 a	28 gh	18.1 cdef	39 abc	?	?
GBL 26-04-DA	83 c	2061 cdefg	82 abc	12 cde	7 a	42 abcd	18.6 bcdef	36 bcde	?	?
DE0407902	80 de	2049 cdefg	84 ab	8 de	7 a	41 abcd	18.8 bcde	40 abc	S	R
GBL 21-04-DA	84 c	1962 defgh	77 abcdef	16 bcde	7 a	48 a	16.6 ef	21 i	?	?
G418274	77 fg	1957 defgh	55 j	29 a	16 a	30 fgh	20.2 abcde	43 ab	?	?
G417274	79 ef	1951 defgh	69 fghi	10 cde	21 a	38 abcdefg	19.2 abcde	41 abc	?	?
Cypress	75 g	1936 efgh	74 cdefgh	18 abcd	8 a	28 gh	17.8 cdef	36 cde	R	R/S
DE0505002B	78 ef	1924 efgh	76 bcdefgh	12 cde	12 a	38 abcdefg	16.7 def	28 fgh	?	?
G200394	76 fg	1923 efgh	65 hij	20 abcd	15 a	29 fgh	16.3 ef	41 abc	?	?
G418267	75 g	1914 efgh	62 ij	26 ab	11 a	30 efgh	17.5 cdef	39 abc	?	?
G200430	78 ef	1903 efgh	67 ghi	21 abc	12 a	33 cdefgh	20.8 abcd	41 abc	?	?
DE0407906	84 c	1781 fgh	75 bcdefgh	17 bcde	8 a	29 fgh	19.5 abcde	40 abc	?	?
GBL 24-04-DA	83 c	1723 gh	78 abcdef	18 abcde	4 a	44 ab	18.4 bcdef	32 defg	?	?
CFH <sup>3</sup>	97 a	1234 h	67 ghi	17 bcde	16 a	32 defgh	14.6 f	22 hi	S	S
<b>LSD</b>	<b>2.61</b>	<b>727.88</b>	<b>10.38</b>	<b>11.79</b>	<b>NA</b>	<b>10.40</b>	<b>4.13</b>	<b>6.90</b>		
<b>p-value</b>	<b>&lt;0.0001</b>	<b>0.0001</b>	<b>&lt;0.0001</b>	<b>0.0234</b>	<b>0.3924</b>	<b>0.0003</b>	<b>0.0192</b>	<b>&lt;0.0001</b>		

<sup>1</sup> Stand counts are highlighted for varieties for which treated seed was planted. Seeding rate was 4 seeds/ft except for CFH, for which the rate was 2 seeds/ft.

<sup>2</sup> Resistance to lima bean downy mildew (*Phytophthora phaseoli*) R=resistant, S=susceptible, PR=partial resistance, ?=disease reaction unknown

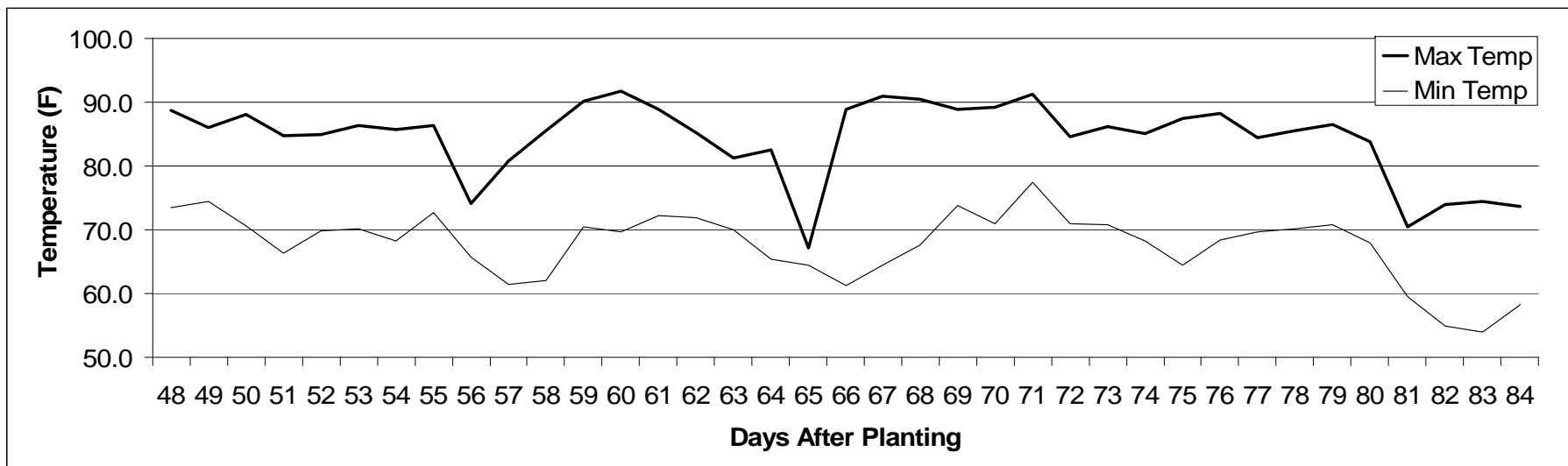
<sup>3</sup> Concentrated Fordhook

**Table 2. Days to Flowering for Entries in the 2009 Lima Bean Variety Trial**

Variety (ordered by yield)	Days After Planting (Flowering was evaluated on starred days.)																														
	*	50	*	55	*	60	*	65	*	70	*	75	*	80	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
DE0505002A																															
DE0407911																															
DE0401711																															
DE0402701																															
184-85																															
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DE0505002B																															
G200394																															
G418267																															
G200430																															
DE0407906																															
GBL 24-04																															
CFH*																															

\*Concentrated Fordhook  
 =no flowering   
 =first flowers   
 =increasing flower   
 =increasing/full flower   
 =full/decreasing flowers   
 =decreasing flowers

**Chart 1. Max and Min Temperatures During the Flowering Period for the 2009 Lima Variety Trial**



**Appendix A: Weather Data for 2009 Lima Variety Trial  
June 11<sup>th</sup> (planting) to September 16<sup>th</sup> (final harvest)**

<b>DAP</b>	<b>Date</b>	<b>Max Temp °F</b>	<b>Min Temp °F</b>	<b>Rainfall (in.)</b>
0	11-Jun	81.7	64.0	0.00
1	12-Jun	84.9	71.4	0.09
2	13-Jun	73.5	67.8	0.00
3	14-Jun	76.4	61.8	0.13
4	15-Jun	76.6	60.9	0.00
5	16-Jun	70.7	59.2	0.00
6	17-Jun	69.0	58.0	0.00
7	18-Jun	75.0	64.2	2.34
8	19-Jun	80.2	65.3	0.01
9	20-Jun	85.8	65.2	0.36
10	21-Jun	77.9	68.8	0.00
11	22-Jun	81.0	65.5	0.21
12	23-Jun	78.3	64.4	0.00
13	24-Jun	81.1	67.1	0.08
14	25-Jun	83.7	65.9	0.00
15	26-Jun	87.7	65.7	0.00
16	27-Jun	83.3	67.9	0.00
17	28-Jun	81.8	63.2	0.00
18	29-Jun	84.1	64.0	0.00
19	30-Jun	86.2	64.1	0.00
20	1-Jul	86.7	66.2	0.33
21	2-Jul	81.8	67.0	0.04
22	3-Jul	79.0	62.4	0.12
23	4-Jul	81.7	63.4	0.00
24	5-Jul	75.6	64.9	0.00
25	6-Jul	83.1	63.5	0.00
26	7-Jul	84.5	62.7	0.00
27	8-Jul	80.0	60.6	0.00
28	9-Jul	75.8	57.3	0.00
29	10-Jul	77.1	55.1	0.00
30	11-Jul	81.0	55.9	0.00
31	12-Jul	88.1	70.0	0.00
32	13-Jul	83.1	65.6	0.00
33	14-Jul	81.6	61.3	0.00
34	15-Jul	84.3	56.7	0.00
35	16-Jul	90.1	67.5	0.00
36	17-Jul	87.9	72.3	0.00
37	18-Jul	83.2	64.3	0.00
38	19-Jul	83.8	60.6	0.00
39	20-Jul	81.2	62.3	0.00
40	21-Jul	82.6	69.0	0.29
41	22-Jul	86.0	66.1	0.01
42	23-Jul	78.4	69.2	0.21
43	24-Jul	84.2	67.3	0.11
44	25-Jul	88.6	65.6	0.03
45	26-Jul	90.3	70.6	0.05
46	27-Jul	84.3	68.8	0.47



<b>DAP</b>	<b>Date</b>	<b>Max Temp °F</b>	<b>Min Temp °F</b>	<b>Rainfall (in.)</b>
47	28-Jul	88.7	68.1	0.00
48	29-Jul	88.7	73.5	0.22
49	30-Jul	86.0	74.4	0.01
50	31-Jul	88.1	70.6	0.50
51	1-Aug	84.7	66.4	0.01
52	2-Aug	85.0	69.8	0.35
53	3-Aug	86.4	70.1	0.01
54	4-Aug	85.7	68.3	0.00
55	5-Aug	86.3	72.7	0.00
56	6-Aug	74.2	65.7	0.67
57	7-Aug	80.8	61.4	0.01
58	8-Aug	85.6	62.0	0.00
59	9-Aug	90.1	70.5	0.00
60	10-Aug	91.7	69.7	0.00
61	11-Aug	88.9	72.2	0.06
62	12-Aug	85.3	71.9	0.04
63	13-Aug	81.2	70.0	0.14
64	14-Aug	82.6	65.4	0.00
65	15-Aug	67.2	64.4	0.00
66	16-Aug	88.9	61.2	0.00
67	17-Aug	90.9	64.5	0.00
68	18-Aug	90.5	67.6	0.01
69	19-Aug	88.9	73.8	0.02
70	20-Aug	89.2	70.9	0.00
71	21-Aug	91.2	77.4	0.00
72	22-Aug	84.6	71.0	2.17
73	23-Aug	86.2	70.8	0.42
74	24-Aug	85.1	68.2	0.64
75	25-Aug	87.4	64.5	0.00
76	26-Aug	88.3	68.4	0.00
77	27-Aug	84.4	69.7	0.00
78	28-Aug	85.5	70.1	0.98
79	29-Aug	86.5	70.8	0.05
80	30-Aug	83.8	67.9	1.06
81	31-Aug	70.5	59.6	0.00
82	1-Sep	74.0	55.0	0.00
83	2-Sep	74.5	54.0	0.00
84	3-Sep	73.6	58.2	0.00
85	4-Sep	80.2	64.2	0.00
86	5-Sep	84.1	58.9	0.00
87	6-Sep	80.7	55.9	0.00
88	7-Sep	76.1	67.3	0.00
89	8-Sep	71.6	62.9	0.02
90	9-Sep	70.4	62.2	0.12
91	10-Sep	68.3	61.1	0.93
92	11-Sep	64.1	59.7	1.90
93	12-Sep	69.6	61.5	0.00
94	13-Sep	78.6	59.8	0.00
95	14-Sep	80.7	56.5	0.00
96	15-Sep	82.4	63.3	0.00
97	16-Sep	75.9	66.2	0.00

**Appendix B: Weather Conditions During 2009 Lima Variety Trial June 11<sup>th</sup> (planting) to September 16<sup>th</sup> (final harvest)**

