UNIVERSITY OF DELAWARE

LIMA BEAN

VARIETY TRIAL RESULTS

2012

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2012 UNIVERSITY OF DELAWARE GREEN BABY LIMA BEAN AND FORDHOOK LIMA BEAN VARIETY TRIALS

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2012 Baby Lima Bean Variety Trials

In 2012 two trials of green baby lima varieties were planted at the University of Delaware Research Farm in Georgetown, Delaware. A third trial was planted with a grower cooperator near Milton, Delaware.

June 7 Planted Green Baby Lima Bean Variety Trial at Georgetown

The June 7 planted Green Baby Lima Bean Variety Trial included a total of 28 lines. The purpose of this trial was to evaluate advanced breeding material from the UD Lima Bean Breeding Program that had been selected under dryland conditions. This trial was irrigated but was planted in early June expose the entries to heat stress during flowering. Trial entries were evaluated for yield and days to harvest.

Trial Location:
Field 19A at the University of Delaware Research and Education Center Farm, Georgetown, DE

Plot Setup and Cultural Practices:
The trial was planted on June 7, 2012 with a Jang TD1 Precision Seeder into rows marked with a Monosem planter. Some of the seed was treated, and some was not, as indicated in the results section. Varieties were planted in one-row plots with 30 inch between row spacing and 3 inch in-row spacing. Plots were 15 feet in length. The variety "Cypress" was planted in every other row as a border between experimental plots. Generally, plots were arranged in a randomized complete block design with four replications, because of limited seed availability, only three replications, or only one replication was planted for some lines as indicated in the following list of entries. The field was fertilized according to soil test results. Pre-emergence herbicides (0.6 oz/A Sandea + 1.0 pint/A Dual II Magnum) were applied on June 8 as well as 40 lbs/A nitrogen in the form of 30% UAN. Plots were cultivated on July 16 and sidressed with 40 lbs/A nitrogen in the form of 30% UAN. Additional hand weeding was done as necessary. Weed control in the trial was excellent. Plots were irrigated, when necessary, with a traveling, linear system. No applications were made for disease or insect control.

Harvest:
Harvest decisions were made based on visual evaluation of the individual plot. Plots were harvested to maximize the number of full (as opposed to dry or flat) pods. Not all replications for a variety were harvested on the same day. Harvest began on August 24 (78 DAP) and ended on September 5 (90 DAP).

A 10-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 with a fan and a screen, and the cleaned beans were weighed to determine yield. A random sample of 100 succulent beans was weighed to determine 100 bean weight as a means of bean size comparison.

Lines Evaluated in the June 7, 2012 Planted Baby Lima Bean Trial

Line	# Replications	Description
DE0801502A	1	UD dryland selection
DE0801602A	1	UD dryland selection
DE0801702B	1	UD dryland selection
DE0802102B	1	UD dryland selection
DE0802503A	1	UD dryland selection
DE0802703C	1	UD dryland selection
DE0802705B	1	UD dryland selection
DE0802102C	3	UD dryland selection
DE0802701B	3	UD dryland selection
DE0802702A	3	UD dryland selection
DE10013	4	UD irrigated selection
DE0801802B	4	UD dryland selection
DE0802101A	4	UD dryland selection
DE0802102A	4	UD dryland selection
DE0802502A	4	UD dryland selection
DE0802502B	4	UD dryland selection
DE0802702C	4	UD dryland selection
DE0802705A	4	UD dryland selection
DE0802705D	4	UD dryland selection
Cypress	4	Standard variety
C-elite Select	4	Standard variety
DE0505002A	4	UD irrigated selection
DE0407907	4	UD irrigated selection
Bush FL Butter	1	Stress tolerant variety
Jackson Wonder	1	Stress tolerant variety
PI 534918	1	Stress tolerant landrace
1102-6	1	Landrace from Haiti
1102-10	1	Landrace from Haiti

June 14 Planted Green Baby Lima Bean Variety Trial at Georgetown

The June 14 planted Green Baby Lima Bean Variety Trial included a total of 40 lines. Ten of the lines were entered by the two participating seed companies: ADM Seedwest and Ben Fish & Son. Twenty-six 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 green baby lima bean varieties for yield, maturity, and quality under Delaware growing conditions.

Entries in the June 14, 2012 Planted Delaware Green Baby Lima Bean Variety Trial

Variety Name	Source
G200381	ADM
G200382	ADM
G9002033	ADM
G0023023	ADM
G0026023	ADM
G0029023	ADM
G700801	ADM
Meadow	ADM (standard variety)
Cypress	ADM (standard variety)
GBL 21-04-DA	Ben Fish
GBL 24-04-DA	Ben Fish
GBL 26-04-DA	Ben Fish
GBL 184-85	Ben Fish (standard variety)
Celite Select	Ben Fish (standard variety)
DE0801502A	University of Delaware
DE0801602A	University of Delaware
DE0801702B	University of Delaware
DE0802102B	University of Delaware
DE0802503A	University of Delaware
DE0802703C	University of Delaware

Variety Name	Source
DE0802701B	University of Delaware
DE0802702A	University of Delaware
DE10013	University of Delaware
DE0801802B	University of Delaware
DE0802101A	University of Delaware
DE0802102A	University of Delaware
DE0802502A	University of Delaware
DE0802502B	University of Delaware
DE0802702C	University of Delaware
DE0802705A	University of Delaware
DE0802705D	University of Delaware
DE0505002A	University of Delaware
DE0407907	University of Delaware
DE0407905	University of Delaware
DE0501801A	University of Delaware
DE0501805A	University of Delaware
DE0802401C	University of Delaware
DE0802703B	University of Delaware
DE0802705B	University of Delaware
DE0802102C	University of Delaware

Location:
Field 19B at the University of Delaware Research and Education Center Farm, Georgetown, DE

Cultural Practices:
The trial was planted on June 14, 2012 with a Monosem planter. Some of the seed was treated, and some was not, as indicated in the results section. 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. The variety "Cypress" was planted in every other row as a border between experimental plots. Plots were arranged in a randomized complete block design with four replications, because of limited seed availability for some of the UD lines, only three replications, or only one replication was planted, as indicated in the results section. The field was fertilized according to soil test results. Pre-emergence herbicides (0.6 oz/A Sandea + 1.0 pint/A Dual II Magnum + 1.0 qt/A Honcho) were applied on June 18, 2012 as well as 40 lbs/A nitrogen in the form of 30% UAN. Plots were cultivated on August 1, 2012 and sidressed with 40 lbs/A nitrogen in the form of 30% UAN. Additional hand weeding was done as necessary. Weed control in the trial was excellent. Plots were irrigated, when necessary, with a traveling, linear system. Warrior II at 2.0 oz/A + bifenthrin at 6 oz/A was applied for insect control on August 20. No applications were made for disease control.

Harvest:
Harvest decisions were made based on visual evaluation of the individual plot. Plots were harvested to maximize the number of full (as opposed to dry or flat) pods. Not all replications

for a variety were harvested on the same day. Harvest began on August 31 (78 DAP) and ended on September 17 (95 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 with a fan and a screen, and the cleaned beans were weighed to determine yield. A random sample of 100 succulent beans was weighed to determine 100 bean weight as a means of bean size comparison.

Quality Evaluation of Blanched and Frozen Samples of Baby Lima Lines

The processing quality of advanced UD breeding material was evaluated by representatives of the regional processors at a meeting on December 11, 2012. Samples of thirteen UD breeding lines, and the four standard cultivars in the trial (Meadow, Cypress, C-elite Select and GBL 184-85) were evaluated. Samples of harvested beans were washed and rotten, sprouted and split beans and plant debris were removed. Light colored beans were not graded out. The cleaned samples were blanched for three minutes in boiling water, and then cooled immediately in ice water. Cooled beans were drained using a salad spinner then packed in Ziploc plastic bags and frozen at -10°F. Three commercially frozen baby lima samples that were purchased at local grocery stores were included in the evaluation as controls. On the day of the evaluation the samples were thawed briefly in warm water, drained in a colander and a one cup sample was displayed in a white Styrofoam bowl. Samples were randomized and identified only by a number. The group of eight evaluators was comprised of fieldmen, and processing and preprocessing quality experts from the four regional lima bean processors. Evaluators rated the samples for size, shape, uniformity of shape, color, uniformity of color and overall acceptability.

Results and Discussion of Baby Lima Trials at Georgetown

Weather, Pod Set and Maturity

Weather conditions were hotter and drier than average this season, with 2012 being the third warmest summer on record for Delaware (2010 and 2011 were the warmest and second warmest summers, respectively). Despite very warm conditions from late June through July, temperatures cooled more quickly in August than they did in 2010, allowing plants to begin setting pods earlier than they did in that year. Harvest of standard varieties in the early June planted trial was slightly delayed compared to the 2006-2009 average, but not as severe as what was observed in 2010 and 2011. A comparison days to harvest for two of the standard varieties for this year versus the historical average is as follows:

Variety	**Average DTH for 2006, 2007, 2008 & 2009 Trials**	**DTH for 2010 Trial** Planted June 6	**DTH for 2011 Trial** Planted June 6	**DTH for 2012 Trial** Planted June 7
Cypress	77	91	97	81
C-elite Select	84	96	98	87
184-85	86	95	99	--

Split sets were not a problem in either of the baby lima trials this year.

Yield and Maturity in the June 7 Planted Baby Lima Trial

The purpose of the June 7 planted baby lima trial was to evaluate some of the advanced breeding material from the University of Delaware that had been selected in dryland conditions in irrigated but heat stressed growing conditions. There were significant differences in yield between some of the varieties in this trial, however none of them had significantly higher yield than C-elite Select (Table 1). Two varieties, DE0802101A and DE0802702C, did have significantly higher yield than Cypress. DE0802101A was the highest yielding replicated variety in this trial and was also the highest yielding variety in the June 14 planted trial. The two lines with the highest yield in this trial, 1102-10 and 1102-6, were not replicated, so they cannot be statistically separated from the other varieties for yield. These two lines are determinate landraces from Haiti, which are being used in the breeding program. Bush Florida Butter was the earliest maturing variety in this trial, possibly because this variety has some heat tolerance and was able to set pods earlier.

Yield and Maturity in the June 14 Planted Baby Lima Trial

The purpose of the June 14 planted baby lima trial was to evaluated advanced breeding material from the University of Delaware, as well as new varieties available from the two companies supplying lima seed in Delaware. There were significant differences in yield between the varieties in this trial (Table 2). The two highest yielding varieties were DE0802101A and DE0505002A. DE0802101A was also the highest yielding replicated variety in the June 7 planted trial. DE0505002A was the highest yielding variety in the baby lima trials in 2009, 2010 and 2011. Neither DE0802101A nor DE0505002A is green seeded.

Other varieties with high yields in this trial (but with significantly lower yields than the top two varieties) included G700801, DE0802702C, G0026023, DE0802102A, DE10013, G9002033, DE0802102C, DE0802702A, DE0801802B, G200382, Meadow, DE0501801A, G200381, DE0802701B, and DE0407905. Of the six ADM varieties in this group, three (G9002033, G200382, and G200381) were tested in the 2011 trial and performed well in that year. Two of the Delaware lines in this group have been tested in past trials. DE0501801A was tested in 2011, and was the third highest yielding variety in that trial. DE0407905 has been in all trials since 2008 and has been among the highest yielding varieties each year.

One characteristic desirable in a variety is uniform maturity across the field. The rate of maturity of some varieties is more affected by variations in field conditions (i.e. soil type, drainage, variable stand) than others. Standard deviation is a statistic used to describe the average difference between several individual observations and their mean (or average). The standard deviation of days to harvest for the replicated varieties in trial is given in Table 3. Varieties with the lowest standard deviation of days to harvest are those matured most uniformly across the field. Most varieties had a standard deviation of two days or less. For varieties with higher standard deviation of days to harvest it may be more difficult to determine when to harvest the field for maximum yield and quality.

Quality Characteristics of Baby Limas Evaluated at Georgetown

The weight of 100 succulent seeds per plot for all of the baby limas in the two Georgetown trials was determined as a way of quantifying seed size (Table 4). Most of the varieties in the trials had seed size that was not significantly different than that of Cypress. DE0802101A and

DE08027023 may have larger seed than size that what is desirable for a baby lima. The varieties from Ben Fish had smaller seed than most of the other varieties in the trial.

UD breeding lines with green or light green seed were evaluated for freezing quality by a panel of eight fieldmen, and processing and preprocessing quality experts from the four regional lima bean processors. The results of this evaluation are given in Tables 4 & 5. The three commercially frozen samples that were included in the evaluation as controls were rated as average or worse compared to the experimentally frozen samples, indicating that the blanching and freezing techniques used for the experimental lines did not produce an inferior product compared to commercial practices. Only Cypress received an acceptable rating from all evaluators for all categories. DE0407905, DE0501801A, and Meadow were rated as overall acceptable by all evaluators. C-elite Select, DE0802701B, DE10013, DE0802705A, DE0407907, and Commercial Sample A were rated as overall acceptable by 87.5 % of the evaluators. The most commonly cited defect for these lines was color.

Table 1. Days to Harvest, Yield, Maturity at Harvest, Pods per Plant, Plant Weight, and Percent Stand at Harvest for the Baby Lima Bean Variety Trial Planted June 7, 2012

Variety	Days to Harvest	Yield (Lbs/A)	% Full Pods	% Flat Pods	% Dry Pods	# Pods/Plant	Plant Weight (Lbs/10 ft)	% Stand**
1102-10*	88.0	6050	80.9	3.3	15.8	85	21.9	
1102-6*	83.0	5416	49.2	21.5	29.2	32	21.3	
DE0802101A	79.5 g	4439 a	91.8 a	4.8 d	3.8 a	27 bc	15.8 cd	66 bc
DE0802702C	81.5 c-g	4410 a	88.8 ab	9.8 cd	1.5 a	30 a-c	18.0 bc	75 ab
DE0802702A	80.9 d-g	4153 ab	92.3 a	4.5 d	2.8 a	35 ab	17.1 bcd	68 bc
DE10013	86.3 ab	4064 ab	77.0 b	16.0 cd	6.8 a	31 a-c	20.7 a	70 bc
DE0505002A	84.3 bc	3980 ab	74.5 b	21.8 c	4.0 a	28 bc	21.1 a	72 bc
DE0801802B	87.8 a	3955 ab	80.3 ab	14.5 cd	5.3 a	35 ab	19.1 ab	61 cd
C-elite Select	87.3 a	3886 ab	80.3 ab	13.5 cd	6.3 a	34 ab	19.8 ab	77 ab
DE0802102C	82.9 c-f	3826 ab	86.3 ab	8.5 d	4.8 a	33 ab	17.4 bcd	69 bc
Jackson Wonder*	88.0	3788	84.7	7.4	7.9	32	19.0	73
DE0802102A	80.8 e-g	3757 ab	84.5 ab	9.8 cd	6.3 a	33 ab	17.5 bc	66 bc
DE0802703C*	90.0	3749	86.3	7.5	6.2	28	18.3	55
PI534918*	82.0	3741	85.5	13.8	0.7	24	18.0	85
Bush FL Butter*	78.0	3734	84.4	9.1	6.5	39	15.1	55
DE0407907	87.8 a	3728 ab	73.8 b	14.5 cd	11.8 a	27 bc	21.0 a	71 bc
DE0801602A*	90.0	3511	69.2	14.6	16.2	26	16.0	65
DE0802502A	82.5 c-f	3435 b	77.8 b	17.8 cd	4.5 a	38 a	21.2 a	53 d
DE0802705B*	81.0	3426	84.3	14.2	1.5	34	15.2	53
DE0802701B	79.5 fg	3418 b	84.6 ab	12.8 cd	2.5 a	30 a-c	15.7 cd	73 abc
Cypress	80.5 e-g	3358 b	74.0 b	19.8 cd	6.0 a	24 c	18.2 bc	86 a
DE0802102B*	81.0	3242	90.0	5.3	4.7	27	16.9	78
DE0802503A*	85.0	3196	71.3	23.6	5.1	45	20.0	48
DE0801702B*	88.0	2743	88.6	7.7	3.7	53	16.5	50
DE0801502A*	88.0	2474	76.5	20.0	3.5	44	20.3	63
DE0802705A	83.3 c-e	2433 c	60.3 c	35.8 b	4.0 a	19 c	14.9 d	65 bcd
DE0802705D	83.8 b-d	2414 c	72.8 b	18.8 cd	8.8 a	27 bc	16.4 cd	77 ab
DE0802502B	82.5 c-f	1283 d	46.8 d	51.5 a	1.5 a	19 c	21.3 a	66 bc
p-value	***<0.0001***	***<0.0001***	***<0.0001***	***<0.0001***	***0.6262***	***0.0012***	***<0.0001***	***0.0059***

*Variety was not replicated in trial because of insufficient seed.

**Percent stand is highlighted for varieties for which treated seed was planted.

Table 2. Days to Harvest, Yield, Maturity at Harvest, Pods per Plant, Plant Weight, and Percent Stand at Harvest for the Baby Lima Bean Variety Trial Planted June 14, 2012

Variety	Days to Harvest	Yield (Lbs/A)	% Full Pods	% Flat Pods	% Dry Pods	# Pods/Plant	Plant Weight (Lbs/15 ft)	% Stand**
DE0802101A	82.0 l	6016 a	94.0 a	0.8 gh	5.3 a	32 a-f	33.2 bc	107 a-c
DE0505002A	86.5 e-j	5948 a	92.3 a	2.8 e-h	5.0 a	31 a-f	39.6 a	111 a
G700801	85.3 h-l	5103 b	72.8 a	6.5 c-h	20.8 a	24 ef	31.1 b-g	112 a
DE0802702C	82.8 l	5071 b	87.8 a	1.0 gh	11.5 a	28 c-f	32.4 b-d	110 ab
DE0802102B*	85.0	4999	71.6	6.0	22.4	19	32.0	113
G0026023	79.0 m	4938 bc	89.5 a	6.3 c-h	4.0 a	29 b-f	29.3 b-h	109 ab
DE0802102A	85.3 h-l	4884 b-d	83.5 a	0.5 h	16.0 a	28 c-f	28.7 c-h	103 a-e
DE10013	89.3 b-e	4867 b-d	80.0 a	10.3 b-d	10.3 a	23 f	34.2 b	104 a-d
G9002033	85.8 g-k	4835 b-d	81.8 a	2.3 gh	16.0 a	26 d-f	30.5 b-g	105 a-c
DE0802102C	82.8 k	4769 b-e	83.6 a	4.4 c-h	12.0 a	26 c-f	27.8 c-h	98 a-g
DE0802702A	86.1 f-j	4730 b-e	87.6 a	3.4 d-h	9.3 a	25 d-f	30.9 b-g	102 a-f
DE0801802B	92.3 a	4625 b-f	89.3 a	4.5 c-h	6.3 a	38 a	31.9 b-e	91 e-h
G200382	82.0 l	4530 b-g	84.8 a	6.0 c-h	9.3 a	30 a-f	30.3 b-h	104 a-d
Meadow	82.3 l	4480 b-h	84.0 a	4.8 c-h	11.3 a	24 ef	30.7 b-g	109 ab
DE0501801A	87.8 d-h	4361 b-i	83.0 a	11.3 a-c	5.8 a	24 ef	33.3 bc	103 a-f
G200381	81.0 lm	4350 b-j	83.5 a	10.5 b-d	5.8 a	30 a-f	30.8 b-g	100 a-f
DE0802701B	82.4 l	4341 b-j	87.2 a	3.4 d-h	9.0 a	30 a-f	27.4 d-h	102 a-f
DE0407905	86.8 e-j	4313 b-j	89.8 a	2.8 e-h	7.5 a	27 c-f	33.1 bc	106 a-c
GBL 184-85	88.3 c-g	4245 c-k	81.0 a	11.3 a-c	7.8 a	28 c-f	32.6 b-d	82 h
GBL 21-04-DA	89.0 b-f	4101 d-k	86.0 a	3.5 d-h	10.5 a	28 c-f	27.6 d-h	90 f-h
DE0802502A	91.5 ab	4096 d-k	76.3 a	11.3 a-c	12.5 a	34 a-d	29.8 b-h	98 b-g
Cypress	82.3 l	3981 e-k	85.3 a	10.0 b-d	4.5 a	29 b-f	31.7 b-f	105 a-c
DE0407907	89.8 a-d	3963 e-l	77.8 a	7.8 b-g	14.5 a	22 f	29.9 b-h	110 ab
C-elite Select	89.3 b-e	3841 f-m	88.5 a	2.5 f-h	9.0 a	26 d-f	28.5 c-h	100 a-f
GBL 24-04-DA	88.3 c-g	3821 g-m	83.3 a	3.8 d-h	12.8 a	32 a-e	28.4 c-h	86 gh
G0029023	80.0 lm	3800 g-m	81.5 a	14.0 ab	4.3 a	24 ef	30.9 b-g	109 ab
G0023023	80.0 lm	3721 h-m	90.0 a	3.8 d-h	6.8 a	27 c-f	25.2 h	101 a-f
DE0802401C	85.5 g-l	3661 i-m	85.8 a	10.5 b-d	3.8 a	29 b-f	26.4 gh	92 d-h
DE0802502B	90.8 a-c	3647 i-m	77.8 a	7.0 b-h	15.3 a	27 c-f	27.2 e-h	87 gh
DE0801702B*	85.0	3621	89.7	5.2	5.2	28	34.7	95
DE0501805A	87.5 d-i	3587 i-m	85.5 a	5.8 c-h	8.5 a	37 ab	29.1 c-h	107 a-c
GBL 26-04-DA	87.3 d-i	3555 j-m	79.0 a	17.8 a	3.3 a	29 b-f	26.8 f-h	85 gh
DE0802503A*	89.0	3483	62.4	11.8	25.8	34	26.1	58
DE0802705D	84.8 i-l	3463 k-m	73.3 a	9.8 b-e	17.3 a	26 d-f	29.6 b-h	91 e-h
DE0802705B*	82.0	3237	94.1	2.2	3.8	35	28.4	95
DE0802705A	84.3 j-l	3177 lm	78.8 a	9.5 b-f	12.0 a	27 c-f	25.3 h	95 c-g
DE0802703B	87.3 d-i	3157 m	82.8 a	13.8 ab	3.0 a	35 a-c	28.7 c-h	96 c-g
DE0801602A*	83.0	3140	76.9	15.6	7.5	27	26.5	102
DE0802703C*	88.0	2622	87.7	5.7	6.6	21	24.6	105
DE0801502A*	92.0	2218	78.8	19.7	1.5	21	35.7	92
p-value	***<0.0001***	***<0.0001***	***0.0646***	***<0.0001***	***0.0624***	***0.0493***	***0.0003***	***<0.0001***

*Variety was not replicated in trial because of insufficient seed.

**Percent stand is highlighted for varieties for which treated seed was planted.

Table 3. Average Days to Harvest and Standard Deviation of Days to Harvest for the Baby Lima Bean Variety Trial Planted June 14, 2012

Variety	Average Days to Harvest	Standard Deviation of Days to Harvest*
DE0802101A	82.0	0.00
G200382	82.0	0.00
Cypress	82.3	0.50
GBL 24-04-DA	88.3	0.50
GBL 184-85	88.3	0.50
Meadow	82.3	0.50
DE0802102C	82.7	0.58
DE0802701B	82.3	0.58
DE10013	89.3	1.26
DE0802502B	90.8	1.26
C-elite Select	89.3	1.26
GBL 21-04-DA	89.0	1.41
DE0802702C	82.8	1.50
DE0407907	89.8	1.50
DE0802702A	86.0	1.73
DE0505002A	86.5	1.73
DE0801802B	92.3	1.89
DE0501801A	87.8	1.89
G200381	81.0	2.00
G0026023	79.0	2.00
DE0802102A	85.3	2.06
DE0407905	86.8	2.06
G0023023	80.0	2.31
G0029023	80.0	2.31
DE0802705D	84.8	2.36
DE0802705A	84.3	2.50
DE0802502A	91.5	2.52
GBL 26-04-DA	87.3	2.87
G9002033	85.8	2.87
DE0802703B	87.3	2.87
G700801	85.3	3.20
DE0802401C	85.5	3.51
DE0501805A	87.5	4.12

*Standard deviation of days to harvest describes the average number of days between harvest of an individual plot of a variety and the overall average days to harvest for all of the plots of that variety. Varieties with low standard deviation of days to harvest, reached maturity at the same time. Varieties with high standard deviation of days to harvest did not mature uniformly.

Table 4. Yield, 100 Seed Weight, Color and Acceptability to Processor Evaluators for Varieties in the 2012 Baby Lima Variety Trials

Variety	Yield in Jun 14 Trial (lbs/A)[1]	Weight of 100 Succulent Seeds (g)		Color & Pattern	Percent Acceptable Rating[2]			
		June 14 Trial	June 7 Trial		Size	Shape	Color	Overall
DE0802101A	6016 a	80.37 a	80.19 a	speckled				
DE0802702C	5071 b	81.75 a	78.65 ab	burgundy				
Bush FL Butter	3734		78.14	buff w/ colored hilum				
DE0801502A	2218	64.31	79.78	green	85.7	85.7	28.6	37.5
DE0802102C	4769 b-e	70.72 bc	72.37 a-d	light green	85.7	71.4	14.3	12.5
DE0802702A	4730 b-e	66.70 b-f	75.44 a-c	burgundy				
DE0802701B	4341 b-j	71.29 b	70.19 c-e	light green	100.0	100.0	87.5	87.5
DE0802705B	3237	66.71	72.8	burgundy				
Jackson Wonder	3788		69.71	speckled				
PI534918	3741		69.11	white				
DE0505002A	5948 a	65.97 b-g	72.14 b-c	light green	87.5	85.7	71.4	75.0
DE10013	4867 b-d	66.46 b-f	70.35 c-e	light green	100.0	100.0	87.5	87.5
DE0802102B	4999	64.42	72.23	light green	66.7	33.3	0.0	12.5
G0023023	3721 h-m	67.97 b-d		green				
DE0802102A	4884 b-d	65.32 b-g	69.44 c-e	light green				
DE0802401C	3661 i-m	66.94 b-e		green				
Meadow	4480 b-h	66.76 b-f		green	100.0	100.0	100.0	100.0
G200382	4530 b-g	66.73 b-f		green				
DE0801602A	3140	66.54	65.73	light green				
G0029023	3800 g-m	65.99 b-g		green				
DE0802705A	3177 lm	64.94 b-h	65.48 d-f	green	100.0	100.0	87.5	87.5
DE0802703C	2622	57.16	73.15	green	100.0	100.0	75.0	75.0
G9002033	4835 b-d	64.90 b-h		green				
Cypress	3981 e-k	64.46 c-i	65.28 d-f	green	100.0	100.0	100.0	100.0
DE0407907	3963 e-l	63.81 d-i	65.51 d-f	green	100.0	100.0	87.5	87.5
G0026023	4938 bc	64.50 c-i		green				
DE0802502A	4096 d-k	61.82 d-k	66.95 c-f	speckled				
DE0802503A	3483	63.91	63.67	yellowish white				
G200381	4350 b-j	63.79 d-i		green				
DE0407905	4313 b-j	63.10 d-j		green	100.0	100.0	100.0	100.0
G700801	5103 b	62.53 d-k		green				
DE0802703B	3157 m	62.35 d-k		green				
DE0802705D	3463 k-m	60.53 f-k	63.72 ef	green	100.0	100.0	71.4	62.5
DE0801802B	4625 b-f	59.79 g-l	64.37 d-f	white				
DE0501801A	4361 b-i	61.62 e-k		green	100.0	100.0	100.0	100.0
DE0801702B	3621	57.66	64.38	speckled				
DE0802502B	3647 i-m	62.00 d-k	59.97 f	light green				
C-elite Select	3841 f-m	57.30 j-m	63.01 ef	green	75.0	75.0	100.0	87.5
GBL 184-85	4245 c-k	58.91 h-l		green	100.0	100.0	85.7	75.0
GBL 21-04-DA	4101 d-k	58.60 i-l		green				
1102-10	6050		57.04	buff w/ colored hilum				
GBL 26-04-DA	3555 j-m	56.28 k-m		green				
GBL 24-04-DA	3821 g-m	54.22 lm		green				
DE0501805A	3587 i-m	51.98 m		green	87.5	75.0	75.0	75.0
1102-6	5416		49.04	buff w/ colored hilum				
p-value	***<0.0001***	***<0.0001***	***<0.0001***					

[1] Highlighted cells indicate yield reported is from the June 7 planted trial

[2] Percent of evaluators who rated blanched and frozen sample as acceptable or better.

Table 5. Processor Evaluator Ratings of Blanched and Frozen Samples of Succulent Baby Limas from the Georgetown Variety Trials

Variety	Percent of Evaluators Rating as Acceptable or Better					
	Size	Shape	Uniformity of Shape	Color	Uniformity of Color	Overall
Cypress	100.0	100.0	100.0	100.0	100.0	100.0
DE0407905	100.0	100.0	87.5	100.0	100.0	100.0
DE0501801A	100.0	100.0	87.5	100.0	100.0	100.0
Meadow	100.0	100.0	87.5	100.0	100.0	100.0
C-elite Select	75.0	75.0	62.5	100.0	87.5	87.5
DE0802701B	100.0	100.0	100.0	87.5	75.0	87.5
DE10013	100.0	100.0	100.0	87.5	87.5	87.5
DE0802705A	100.0	100.0	100.0	87.5	87.5	87.5
DE0407907	100.0	100.0	100.0	87.5	62.5	87.5
Commercial Sample A*	100.0	100.0	100.0	85.7	85.7	87.5
GBL 184-85	100.0	100.0	85.7	85.7	85.7	75.0
DE0802703C	100.0	100.0	87.5	75.0	62.5	75.0
DE0501805A	87.5	75.0	87.5	75.0	75.0	75.0
DE0505002A	87.5	85.7	85.7	71.4	42.9	75.0
DE0802705D	100.0	100.0	85.7	71.4	57.1	62.5
DE0801502A	85.7	85.7	71.4	28.6	14.3	37.5
DE0802102C	85.7	71.4	71.4	14.3	14.3	12.5
DE0802102B	66.7	33.3	50.0	0.0	0.0	12.5
Commercial Sample B*	85.7	85.7	71.4	0.0	0.0	12.5
Commercial Sample C*	83.3	83.3	83.3	0.0	0.0	0.0

*Commercially frozen green baby lima beans purchased at local grocery stores

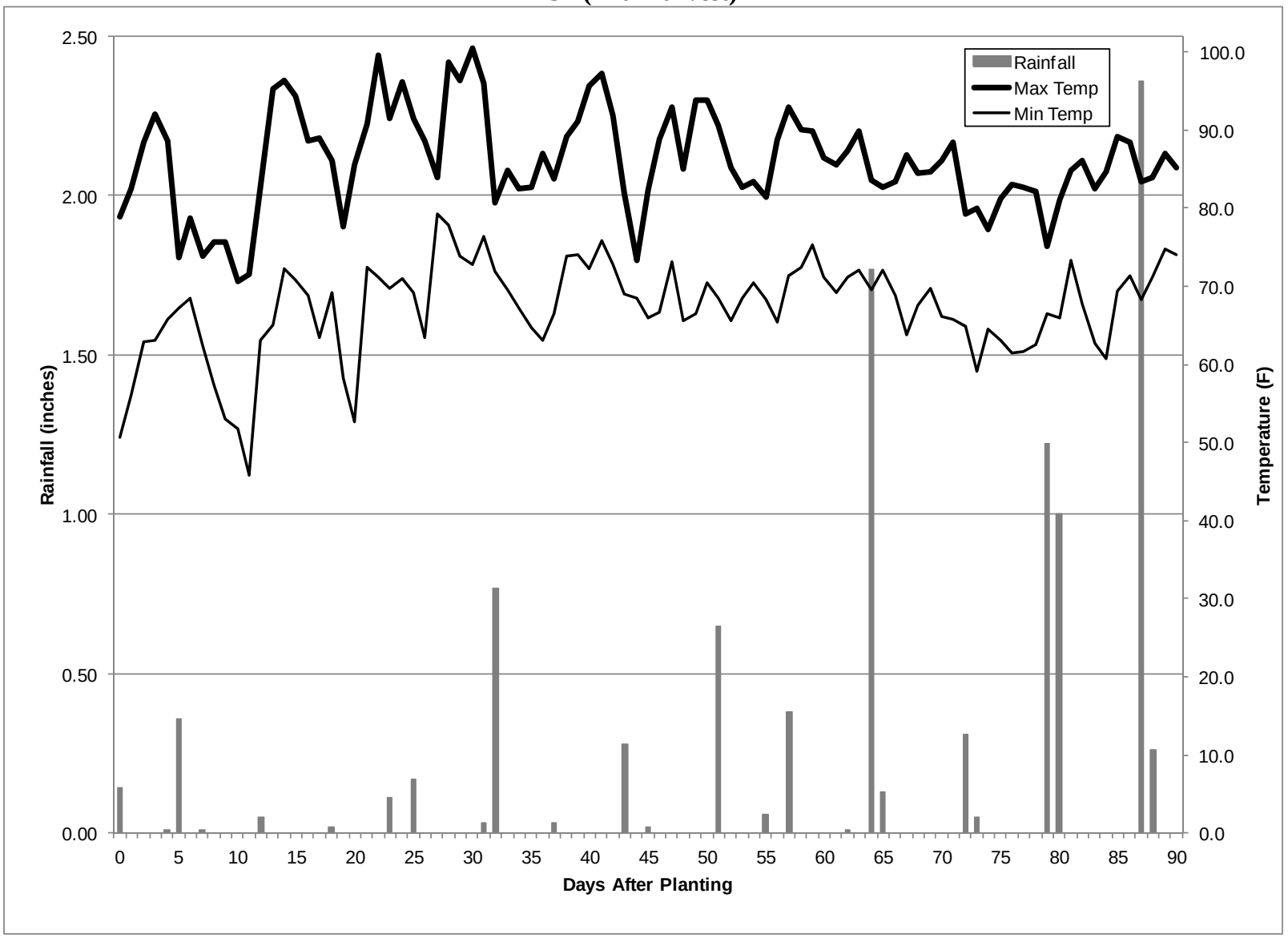
Appendix A: Weather Data for 2012 Baby Lima Variety Trials at Georgetown
June 7th (first planting) to September 17th (final harvest)

Data from DEOS weather station @ Georgetown, DE-REC: www.deos.udel.edu

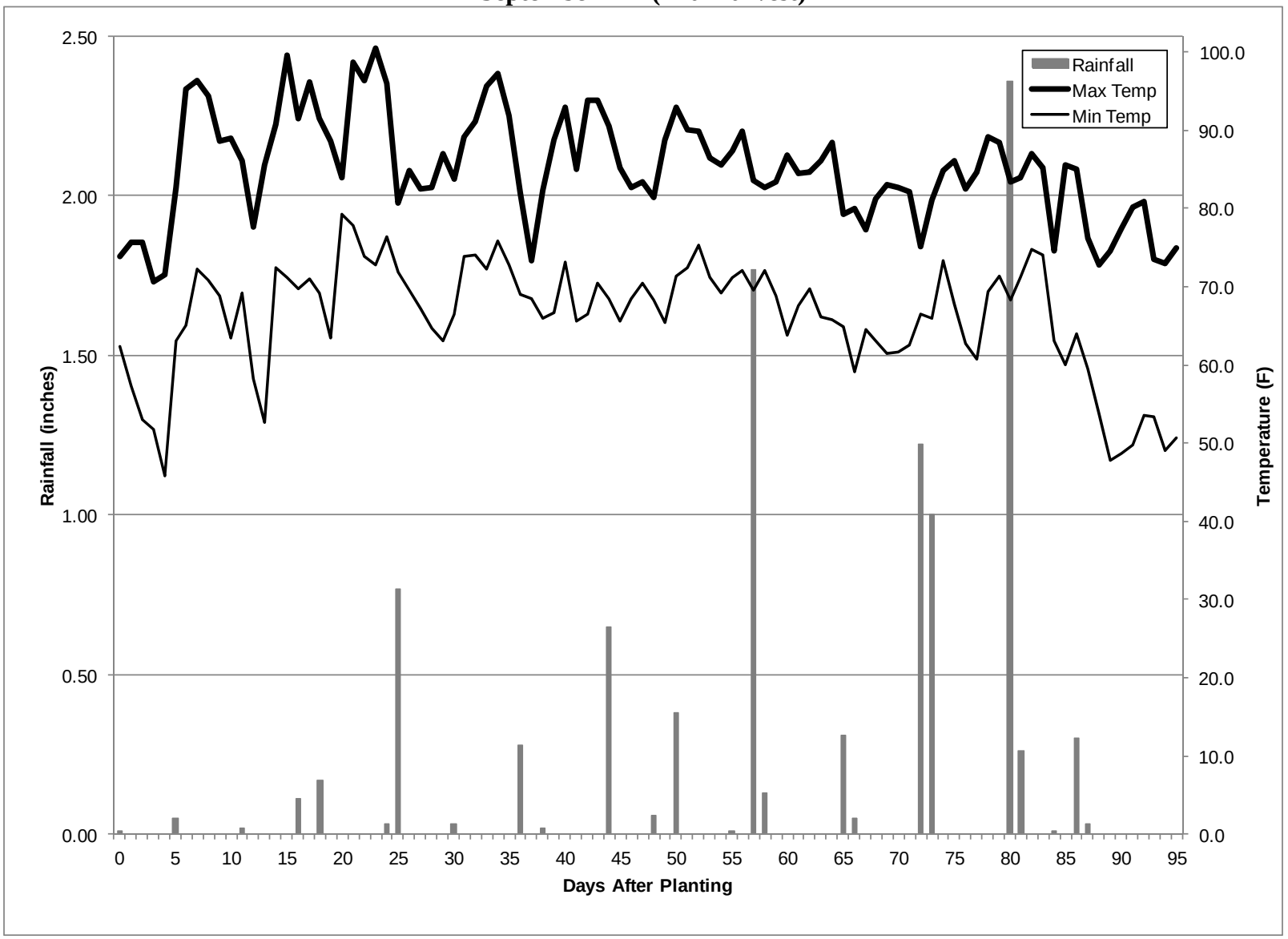
Days After Planting		Date	Max Temp °F	Min Temp °F	Rainfall (in.)
June 7 Planted Trial	June 14 Planted Trial				
0		7-Jun	78.9	50.7	0.14
1		8-Jun	82.4	56.0	0
2		9-Jun	88.4	62.9	0
3		10-Jun	92.1	63.1	0
4		11-Jun	88.6	65.7	0.01
5		12-Jun	73.6	67.2	0.36
6		13-Jun	78.7	68.5	0
7	0	14-Jun	73.9	62.3	0.01
8	1	15-Jun	75.6	57.3	0
9	2	16-Jun	75.6	53.0	0
10	3	17-Jun	70.7	51.7	0
11	4	18-Jun	71.6	45.8	0
12	5	19-Jun	82.6	63.0	0.05
13	6	20-Jun	95.3	65.0	0
14	7	21-Jun	96.4	72.2	0
15	8	22-Jun	94.4	70.8	0
16	9	23-Jun	88.6	68.8	0
17	10	24-Jun	89.0	63.4	0
18	11	25-Jun	86.0	69.2	0.02
19	12	26-Jun	77.6	58.2	0
20	13	27-Jun	85.6	52.6	0
21	14	28-Jun	90.7	72.4	0
22	15	29-Jun	99.6	71.1	0
23	16	30-Jun	91.5	69.8	0.11
24	17	1-Jul	96.2	71.0	0
25	18	2-Jul	91.4	69.1	0.17
26	19	3-Jul	88.6	63.5	0
27	20	4-Jul	83.9	79.2	0
28	21	5-Jul	98.6	77.9	0
29	22	6-Jul	96.3	73.9	0
30	23	7-Jul	100.5	72.8	0
31	24	8-Jul	95.9	76.4	0.03
32	25	9-Jul	80.6	71.9	0.77
33	26	10-Jul	84.9	69.6	0
34	27	11-Jul	82.5	67.2	0
35	28	12-Jul	82.6	64.7	0
36	29	13-Jul	86.9	63.1	0
37	30	14-Jul	83.7	66.4	0.03
38	31	15-Jul	89.1	73.8	0
39	32	16-Jul	91.1	74.1	0
40	33	17-Jul	95.7	72.3	0
41	34	18-Jul	97.3	75.9	0
42	35	19-Jul	91.9	72.7	0
43	36	20-Jul	82.0	69.0	0.28
44	37	21-Jul	73.4	68.5	0
45	38	22-Jul	82.3	66.0	0.02
46	39	23-Jul	88.7	66.7	0
47	40	24-Jul	93.0	73.1	0
48	41	25-Jul	85.0	65.6	0
49	42	26-Jul	93.9	66.4	0

Days After Planting		Date	Max Temp °F	Min Temp °F	Rainfall (in.)
June 7 Planted Trial	June 14 Planted Trial				
50	**43**	**27-Jul**	93.9	70.4	0
51	**44**	**28-Jul**	90.6	68.4	0.65
52	**45**	**29-Jul**	85.2	65.6	0
53	**46**	**30-Jul**	82.7	68.5	0
54	**47**	**31-Jul**	83.4	70.4	0
55	**48**	**1-Aug**	81.4	68.3	0.06
56	**49**	**2-Aug**	88.8	65.4	0
57	**50**	**3-Aug**	92.9	71.3	0.38
58	**51**	**4-Aug**	90.0	72.5	0
59	**52**	**5-Aug**	89.9	75.3	0
60	**53**	**6-Aug**	86.4	71.1	0
61	**54**	**7-Aug**	85.5	69.1	0
62	**55**	**8-Aug**	87.4	71.1	0.01
63	**56**	**9-Aug**	89.9	72.0	0
64	**57**	**10-Aug**	83.5	69.5	1.77
65	**58**	**11-Aug**	82.6	72.0	0.13
66	**59**	**12-Aug**	83.4	68.9	0
67	**60**	**13-Aug**	86.8	63.7	0
68	**61**	**14-Aug**	84.5	67.5	0
69	**62**	**15-Aug**	84.6	69.8	0
70	**63**	**16-Aug**	86.0	66.2	0
71	**64**	**17-Aug**	88.4	65.7	0
72	**65**	**18-Aug**	79.2	64.9	0.31
73	**66**	**19-Aug**	79.9	59.1	0.05
74	**67**	**20-Aug**	77.3	64.5	0
75	**68**	**21-Aug**	81.3	63.0	0
76	**69**	**22-Aug**	83.1	61.4	0
77	**70**	**23-Aug**	82.7	61.6	0
78	**71**	**24-Aug**	82.1	62.6	0
79	**72**	**25-Aug**	75.2	66.4	1.22
80	**73**	**26-Aug**	81.0	65.9	1
81	**74**	**27-Aug**	84.8	73.3	0
82	**75**	**28-Aug**	86.0	67.7	0
83	**76**	**29-Aug**	82.4	62.7	0
84	**77**	**30-Aug**	84.6	60.7	0
85	**78**	**31-Aug**	89.2	69.4	0
86	**79**	**1-Sep**	88.5	71.4	0
87	**80**	**2-Sep**	83.3	68.2	2.36
88	**81**	**3-Sep**	84.0	71.1	0.26
89	**82**	**4-Sep**	86.9	74.7	0
90	**83**	**5-Sep**	85.1	74.1	0
	84	**6-Sep**	74.6	63.0	0.01
	85	**7-Sep**	85.5	60.0	0
	86	**8-Sep**	85.0	64.0	0.3
	87	**9-Sep**	76.2	59.4	0.03
	88	**10-Sep**	72.7	53.7	0
	89	**11-Sep**	74.6	47.7	0
	90	**12-Sep**	77.5	48.6	0
	91	**13-Sep**	80.1	49.8	0
	92	**14-Sep**	80.8	53.5	0
	93	**15-Sep**	73.5	53.3	0
	94	**16-Sep**	73.0	49.0	0
	95	**17-Sep**	74.9	50.6	0

Appendix B: Weather Conditions During the June 7, 2012 Planted Baby Lima Variety Trial June 7th (planting) to September 5th (final harvest)



Appendix C: Weather Conditions During the June 14, 2012 Planted Baby Lima Variety Trial June 14th (planting) to September 17th (final harvest)



Commercially Harvested Green Baby Lima Bean Variety Trial

In 2012 eight advanced breeding lines from the University of Delaware lima bean breeding program were tested in a commercially field in cooperation with a grower. The lines and check variety included in the trial are listed below. The purpose of this trial was to evaluate the experimental lima bean varieties for yield under commercial production conditions

Varieties Evaluated in 2012 Grower Field Trial

Variety Name	Description
C-elite Select	Check variety
DE0402701	UD Breeding Line
DE0407906	UD Breeding Line
DE0505002B	UD Breeding Line
DE0407911	UD Breeding Line
DE0407907	UD Breeding Line
DE0505002A	UD Breeding Line
DE0501805A	UD Breeding Line
DE0407905	UD Breeding Line

Location:

The trial was located near Milton, Delaware at 30°50'10.8.32"N 75°19'27.54"W.
Soil types in the trial area were Fort Mott loamy sand, 0 to 2 percent slopes and Rosedale loamy sand, 0 to 2 percent slopes.

Cultural Practices:

The trial was planted on June 29, 2012. Plots were four rows wide and approximately 1200 ft long. Varieties were replicated three times and the plot layout is illustrated to the right. This trial was located in a field irrigated by a center pivot system. Fertility, applications for pest and disease problems, and irrigation were managed by the cooperating grower.

Layout of Plots in 2012 Grower Field Trial

3 - C-elite Select
2 - DE0407906
1 - DE0402701
1 - DE0402701
2 - DE0407906
3 - C-elite Select
3 - C-elite Select
2 - DE0407906
1 - DE0402701
5 - DE0407911
6 - DE0407907
4 - DE0505002B
4 - DE0505002B
6 - DE0407907
5 - DE0407911
5 - DE0407911
6 - DE0407907
4 - DE0505002B
9 - DE0407905
7 - DE0505002A
8 - DE0501805A
8 - DE0501805A
7 - DE0505002A
9 - DE0407905
9 - DE0407905
7 - DE0505002A
8 - DE0501805A

Harvest:

The trial was harvested using commercial harvesters on September 25, 2012, 88 days after planting. Yield from each plot was weighed individually by offloading into plastic totes, maneuvered into place using a forklift. Filled totes were weighed using portable truck scales.

Harvest loss was estimated by counting full pods left on the plants or on the ground in a 10 ft x 2.5 ft section of row. Four randomly selected sections were sampled in each plot.

Results and Discussion of Commercially Harvested Green Baby Lima Trial

The conditions of this field were generally good, however one section of the field was affected by low stands that may have been caused by root knot nematode. This area then became infested with weeds, particularly pigweed. Average yields for some of the varieties in the trial were disproportionately affected by this, as noted in Table 6. Nonetheless, there were significant differences in yield between some of the varieties in the trial. DE0505002A, C-elite Select, DE0505002B, DE0402701, and DE0407905 were the highest yielding varieties in the trial.

We also observed difference in harvest loss between the varieties. DE0407907, DE0505002B and DE0407911 had the least harvest loss of the varieties in the trial. DE0501805A, C-elite Select and DE0407905 had the greatest harvest loss.

DE0505002B is a green-seeded sister line to the perennially high yielding DE0505002A. DE0505002B performed well in the 2010 trial at Georgetown, but was below average in the 2009 and 2011 trials. The cooperating grower noted that DE0505002B set pods high on the plant and theorized that it might be well suited to mechanical harvest, and indeed the harvest loss for this variety was the second lowest of the varieties in the trial.

Table 6. Yield of Varieties in 2012 Green Baby Lima Commercial Field Trial – Planted June 29

Variety	Yield (Lbs/A)		Notes
DE0505002A	3024	a	
C-elite Select	2985	ab	
DE0505002B	2858	abc	one rep in the area with bad stand; good reps averaged **3284** lbs/A
DE0402701	2734	abc	
DE0407905	2537	abc	one rep in the area with bad stand; good reps averaged **2550** lbs/A
DE0407907	2439	bcd	one rep in the area with bad stand; good reps averaged **2636** lbs/A
DE0501805A	2431	bcd	
DE0407906	2325	cd	
DE0407911	1964	d	one rep in the area with bad stand; good reps averaged **2241** lbs/A
p-value	***0.0204***		
LSD	**569**		

Table 7. Comparison of Harvest Loss of Varieties in 2012 Green Baby Lima Commercial Field Trial

	Number of Full Pods Left in a 10 x 2.5 ft Row Section					
Variety	**On Plants**		**On Ground**		**Total**	
DE0407907	1.4	d	5.4	d	6.8	d
DE0505002B	1.8	d	9.8	bcd	11.5	cd
DE0407911	3.5	abcd	8.3	cd	11.8	cd
DE0402701	1.9	cd	11.2	abc	13.1	bc
DE0407906	1.8	d	11.3	abc	13.2	bc
DE0505002A	2.4	bcd	11.5	abc	13.9	bc
DE0407905	4.5	abc	13.8	ab	18.3	ab
C-elite Select	5.0	ab	14.6	a	19.6	a
DE0501805A	5.6	a	15.3	a	20.9	a
p-value	***0.0072***		***0.0016***		***<0.0001***	
LSD	**2.64**		**4.76**		**5.62**	

Appendix D: Weather Data for 2012 Green Baby Lima Commercial Field Trial June 29 – September 25

Data from DEOS weather station @ Ellendale, DE: www.deos.udel.edu

DAP	Date	Max Temp °F	Min Temp °F	Rainfall (in.)
0	**29-Jun**	99.8	73.7	0
1	**30-Jun**	94.5	66.2	0.14
2	**1-Jul**	96.9	67.9	0
3	**2-Jul**	92.2	67.4	0.02
4	**3-Jul**	90.4	62.4	0
5	**4-Jul**	86.8	80.2	0
6	**5-Jul**	98.7	70.7	0.39
7	**6-Jul**	93.5	68.4	0
8	**7-Jul**	102.1	70.8	0
9	**8-Jul**	93.4	76.2	0
10	**9-Jul**	80.3	68.2	1.31
11	**10-Jul**	86.7	65.3	0
12	**11-Jul**	83.4	63.0	0
13	**12-Jul**	83.6	62.0	0
14	**13-Jul**	89.3	59.7	0
15	**14-Jul**	86.2	68.4	0.01
16	**15-Jul**	89.7	70.0	0.41
17	**16-Jul**	92.5	67.9	0.01
18	**17-Jul**	96.7	68.8	0
19	**18-Jul**	98.0	70.1	0.24
20	**19-Jul**	91.3	68.2	0.25
21	**20-Jul**	76.4	64.7	0.37
22	**21-Jul**	73.5	63.6	0
23	**22-Jul**	85.4	63.9	0
24	**23-Jul**	89.9	65.6	0
25	**24-Jul**	94.1	70.5	0
26	**25-Jul**	87.6	65.5	0
27	**26-Jul**	95.2	67.1	0
28	**27-Jul**	96.4	68.6	0
29	**28-Jul**	93.4	67.0	0.27
30	**29-Jul**	85.7	62.5	0.01
31	**30-Jul**	83.4	65.0	0
32	**31-Jul**	84.0	66.1	0
33	**1-Aug**	81.2	64.3	0.11
34	**2-Aug**	91.5	61.1	0
35	**3-Aug**	95.6	68.2	0
36	**4-Aug**	94.0	69.4	0
37	**5-Aug**	93.7	72.0	0
38	**6-Aug**	91.6	69.9	0
39	**7-Aug**	86.8	65.7	0
40	**8-Aug**	88.1	66.2	0
41	**9-Aug**	90.4	67.1	0
42	**10-Aug**	85.3	65.7	0.67
43	**11-Aug**	85.0	68.2	0.09
44	**12-Aug**	86.6	64.7	0
45	**13-Aug**	88.6	60.3	0
46	**14-Aug**	87.2	63.0	0.48
47	**15-Aug**	86.5	64.5	0.01
48	**16-Aug**	88.4	62.0	0
49	**17-Aug**	90.9	63.1	0

DAP	Date	Max Temp °F	Min Temp °F	Rainfall (in.)
50	**18-Aug**	80.8	62.2	0.76
51	**19-Aug**	79.7	56.6	0
52	**20-Aug**	79.5	61.8	0
53	**21-Aug**	83.6	60.0	0
54	**22-Aug**	85.2	57.8	0
55	**23-Aug**	85.5	58.2	0
56	**24-Aug**	84.3	59.1	0
57	**25-Aug**	75.9	63.4	1.25
58	**26-Aug**	79.0	63.3	0.16
59	**27-Aug**	85.7	66.6	0.11
60	**28-Aug**	88.6	65.1	0
61	**29-Aug**	83.7	58.4	0
62	**30-Aug**	88.8	57.5	0
63	**31-Aug**	91.9	64.7	0
64	**1-Sep**	91.0	67.1	0
65	**2-Sep**	83.2	64.6	0.37
66	**3-Sep**	80.9	66.4	0.16
67	**4-Sep**	85.7	67.8	0
68	**5-Sep**	86.8	71.0	0.08
69	**6-Sep**	72.0	58.6	1.67
70	**7-Sep**	87.0	56.3	0
71	**8-Sep**	85.5	60.8	0.13
72	**9-Sep**	79.4	55.8	0.06
73	**10-Sep**	75.7	53.3	0.01
74	**11-Sep**	78.1	45.5	0
75	**12-Sep**	80.0	47.9	0
76	**13-Sep**	80.3	47.4	0
77	**14-Sep**	81.9	49.9	0
78	**15-Sep**	77.6	52.2	0
79	**16-Sep**	77.4	46.9	0
80	**17-Sep**	76.4	47.3	0
81	**18-Sep**	80.4	63.4	0.73
82	**19-Sep**	72.6	49.9	0.01
83	**20-Sep**	73.8	45.3	0
84	**21-Sep**	78.0	46.3	0
85	**22-Sep**	83.1	56.9	0.35
86	**23-Sep**	71.7	45.9	0.01
87	**24-Sep**	70.7	41.7	0
88	**25-Sep**	75.0	45.0	0

2012 Fordhook Lima Bean Variety Trial

The 2012 Fordhook Lima Bean Variety Trial included a total of 25 lines. Nineteen of the lines were from the University of Delaware lima bean breeding program. One variety was entered by Ben Fish. Concentrated Fordhook and Fordhook 242 were included in the trial as check varieties. Two green-seeded USDA released varieties, 90-1 and FH 1072, and a green-seeded ADM variety trialed in Delaware in the past, Sussex, were also included in the trial. The purpose of this trial is to evaluate advanced Fordhook breeding lines and other available varieties for yield, maturity, and quality under Delaware growing conditions.

Varieties Entered in the 2012 Delaware Fordhook Lima Bean Variety Trial

Variety Name	Description
DE0600101D	UD Breeding Line
DE0600102B	UD Breeding Line
DE0600601D	UD Breeding Line
DE0600602B	UD Breeding Line
DE0600605C	UD Breeding Line
DE0700904	UD Breeding Line
DE0701101	UD Breeding Line
DE0701102A	UD Breeding Line
DE0701301A	UD Breeding Line
DE0701303B	UD Breeding Line
DE0701502A	UD Breeding Line
DE0803801A	UD Breeding Line
DE0803801B	UD Breeding Line
DE0803801C	UD Breeding Line
DE0804101A	UD Breeding Line
DE0804401C	UD Breeding Line
DE0804404A	UD Breeding Line
DE0804404C	UD Breeding Line
DE0804404D	UD Breeding Line
GSFH 1-10-DA	Ben Fish Entry
90-1	USDA Release
Concentrated Fordhook	Standard Variety
FH 1072	USDA Release
FH 242	Standard Variety
Sussex	ADM Variety

Location:

Field 19A at the University of Delaware Research and Education Center Farm, Georgetown, DE

Cultural Practices:

The trial was hand planted on June 27, 2012 into rows marked with a Monosem planter. Only the Concentrated Fordhook and Fordhook 242 seed was treated. Varieties were planted in one-row plots with 30 inch between row spacing and 6 inch in-row spacing. Plots were 10 feet in length. Plots were arranged in a randomized complete block design with three replications. The field was fertilized according to soil test results. Pre-emergence herbicides (0.6 oz/A Sandea + 1.5 pint/A Dual II Magnum) were applied on June 29, 2012 as well as 40 lbs/A nitrogen in the form of 30% UAN. Plots were cultivated on August 4, 2012 and sidressed with 40 lbs/A

nitrogen in the form of 30% UAN. Additional hand weeding was done as necessary. Weed control in the trial was excellent. Plots were irrigated, when necessary, with a traveling, linear system. Warrior II at 2 oz/A + bifenthrin at 6 oz/A was applied for insect control on August 20. No applications were made for disease control.

Harvest:
As harvest approached, plants were visually evaluated for maturity and plots were harvested when the majority of the pods were filled. Not all replications for a variety were harvested on the same day. Harvest began on September 17 (82 DAP) and ended on October 1 (96 DAP).

An 8 foot section from each plot was harvested. The plants were cut off at soil level and weighed. Pods were stripped from the harvested plants from each plot and counted as full, flat or dry. The pulled pods were shelled in a Model 520 "TaMaCo" huller from Taylor Manufacturing Co., Inc., Moultrie, GA. Any remaining trash was removed from the shelled beans by hand and the cleaned beans were weighed to determine yield.

Quality Evaluation of Blanched and Frozen Samples of Fordhook Lima Varieties
The processing quality of all of the varieties in the Fordhook variety trial was evaluated by representatives of the regional processors at a meeting on December 11, 2012. Samples of beans harvested from the trial were washed and rotten, sprouted and split beans and plant debris were removed. Light colored beans were not graded out, and the samples were not graded for size. The cleaned samples were blanched for three minutes in boiling water, and then cooled immediately in ice water. Cooled beans were drained using a salad spinner then packed in Ziploc plastic bags and frozen at -10°F. Two commercially frozen Fordhook lima bean samples that were purchased at local grocery stores were included in the evaluation as controls. On the day of the evaluation the samples were thawed briefly in warm water, drained in a colander and a one cup sample was displayed in a white Styrofoam bowl. Samples were randomized and identified only by a number. The group of eight evaluators was comprised of fieldmen, and processing and preprocessing quality experts from the four regional lima bean processors. Evaluators rated the samples for size, shape, uniformity of shape, color, uniformity of color and overall acceptability.

Results and Discussion
Seedling emergence in this trial was variable. Although there were significant differences between the varieties for % stand at harvest, there does not seem to be a correlation between the observed stand loss and yield loss (Table 8).

This trial was planted in late June and experienced excellent conditions for pod set in mid-August. Consequently, varieties matured earlier than in the 2011 and 2010 trials. Yields in this trial were not as high as in the 2011 trial, possibly because part of this year's trial was located in a low wet spot in the field. This also resulted in more yield variability within the varieties and fewer statistically distinguishable differences in yield. Three lines in this trial had significantly higher yields than FH 242 and four had significantly higher yields than Concentrated Fordhook. These four highest yielding lines were DE0803801A, DE0600605C, DE0803801B, and DE0700904. DE0600605C was the highest yielding variety in the 2010 trial and the second highest yielding variety in the 2011 trial. In both of those trials it also had significantly higher

yield than Concentrated Fordhook. DE0700904 was also trialed in 2011, where it had a significantly higher yield than Concentrated Fordhook.

All of the varieties in the Fordhook trial were evaluated for freezing quality by a panel of eight fieldmen, and processing and preprocessing quality experts from the four regional lima bean processors. The results of this evaluation are given in Table 9. The two commercially frozen samples that were included in the evaluation as controls were rated as average or worse compared to the experimentally frozen samples, indicating that the blanching and freezing techniques used for the experimental lines did not produce an inferior product compared to commercial practices. Three of the lines received an acceptable rating from all evaluators for all categories: DE0804404C, DE0701301A and GSFH 1-10-DA. An additional four lines were rated as overall acceptable by all of the evaluators: DE0804404A, DE0804101A, Sussex and 90-1. Several of the lines with high quality ratings were also high yielding in this trial; however the highest yielding varieties did not have commercially acceptable seed quality.

Table 8. Days to Harvest, Yield, Maturity at Harvest, Number of Pods per Plant, Plant Weight, and Percent Stand at Harvest, for Entries in the 2012 Fordhook Lima Bean Variety Trial

Variety	Days to Harvest	Yield (Lbs/A)	% Full Pods	% Flat Pods	% Dry Pods	# Pods/Plant	Plant Weight (lbs/8 ft)	% Stand*
DE0803801A	88.7 abcdefg	4367 a	80.5 abc	13.8 defg	5.7 a	16.8 a	13.4 a	90.0 abcd
DE0600605C	86.3 cdefgh	4111 ab	87.0 a	8.5 fg	4.6 a	12.7 a	11.2 a	90.0 abcd
DE0803801B	88.7 abcdefg	3960 ab	77.2 abcde	16.5 defg	6.3 a	13.4 a	12.8 a	93.3 abc
DE0700904	91.0 abc	3763 abc	80.2 abc	14.0 defg	5.8 a	15.0 a	13.3 a	95.0 ab
DE0804404C	88.0 abcdefg	3685 abcd	77.6 abcde	18.7 bcdef	3.6 a	18.2 a	12.1 a	58.3 gh
DE0804404A	92.3 ab	3399 abcde	71.2 cdefg	22.0 abcde	6.8 a	20.1 a	9.8 a	51.7 h
DE0701101	84.3 gh	3371 abcde	85.9 a	12.7 efg	1.5 a	12.0 a	12.0 a	88.3 abcd
DE0803801C	84.7 fgh	3309 abcde	80.5 abc	15.0 defg	4.5 a	13.3 a	9.1 a	85.0 abcde
DE0600602B	87.7 bcdefg	3136 abcdef	79.2 abcd	13.1 efg	7.7 a	12.2 a	9.8 a	91.7 abc
DE0804401C	86.7 cdefgh	2977 bcdef	66.9 efg	24.9 abcd	8.2 a	11.6 a	9.3 a	75.0 cdefg
DE0701301A	85.0 efgh	2908 bcdef	80.2 abc	15.2 defg	4.5 a	10.9 a	8.7 a	98.3 a
DE0701303B	87.3 cdefgh	2892 bcdef	76.4 abcde	18.2 bcdefg	5.4 a	11.9 a	9.6 a	83.3 abcde
DE0804404D	84.3 gh	2710 cdef	74.1 cdef	23.3 abcde	2.6 a	15.3 a	9.0 a	66.7 efgh
DE0701102A	86.3 cdefgh	2612 cdef	85.6 ab	7.0 g	7.4 a	8.7 a	9.2 a	95.0 ab
DE0600601D	88.7 abcdefg	2582 cdef	74.2 bcdef	19.0 bcdef	6.8 a	10.2 a	11.2 a	81.7 abcde
DE0804101A	85.0 efgh	2573 cdef	69.5 cdefg	22.0 abcde	8.6 a	8.5 a	10.6 a	95.0 ab
FH 242	89.3 abcdef	2536 cdef	80.2 abc	15.8 defg	4.0 a	12.8 a	9.3 a	71.7 defg
Concentrated Fordhook	89.7 abcde	2518 def	73.2 cdefg	17.7 cdefg	9.0 a	9.3 a	11.9 a	78.3 bcdef
DE0600101D	82.7 h	2489 def	77.5 abcde	16.7 defg	5.8 a	11.0 a	7.8 a	96.7 ab
DE0701502A	86.0 defgh	2438 ef	71.2 cdefg	21.5 abcde	7.3 a	8.8 a	9.7 a	90.0 abcd
GSFH 1-10-DA	88.0 abcdefg	2350 ef	64.5 fg	28.9 abc	6.7 a	10.1 a	10.3 a	78.3 bcdef
DE0600102B	87.3 cdefgh	2336 ef	66.7 efg	29.5 ab	3.8 a	11.0 a	12.6 a	80.0 abcde
Sussex	88.3 abcdefg	2269 ef	68.0 defg	28.3 abc	3.7 a	8.8 a	8.6 a	91.7 abc
90-1	90.3 abcd	2008 f	73.6 cdef	18.4 bcdefg	8.0 a	10.7 a	8.8 a	60.0 fgh
FH 1072	92.7 a	1986 f	61.9 g	32.3 a	5.8 a	10.0 a	10.2 a	75.0 cdefg
p-value	***0.0063***	***0.0075***	***0.0011***	***0.0035***	***0.6566***	***0.0692***	***0.1747***	***<0.0001***
LSD	**4.71**	**1240**	**11.35**	**22.24**	**NA**	**NA**	**NA**	**18.69**

*Percent stand is highlighted for varieties for which treated seed was planted

Table 9. Processor Evaluator Ratings of Blanched and Frozen Samples of Succulent Fordhook Limas from the 2012 Georgetown Variety Trial

Variety	Days to Harvest	Yield (lbs/A)	Percent of Evaluators Rating as Acceptable or Better					
			Size	Shape	Uniformity of Shape	Color	Uniformity of Color	Overall
DE0803801A	88.7 abcdefg	4367 a	33	50	17	17	0	0
DE0600605C	86.3 cdefgh	4111 ab	100	100	100	17	17	13
DE0803801B	88.7 abcdefg	3960 ab	83	67	17	0	0	0
DE0700904	91.0 abc	3763 abc	100	83	67	33	17	13
DE0804404C	88.0 abcdefg	3685 abcd	100	100	100	100	100	100
DE0804404A	92.3 ab	3399 abcde	100	100	100	88	88	100
DE0701101	84.3 gh	3371 abcde	50	17	0	0	0	0
DE0803801C	84.7 fgh	3309 abcde	33	17	0	0	0	0
DE0600602B	87.7 bcdefg	3136 abcdef	83	100	50	33	17	25
DE0804401C	86.7 cdefgh	2977 bcdef	100	86	57	57	43	38
DE0701301A	85.0 efgh	2908 bcdef	100	100	100	100	100	100
DE0701303B	87.3 cdefgh	2892 bcdef	88	88	88	100	100	88
DE0804404D	84.3 gh	2710 cdef	100	100	86	86	86	75
DE0701102A	86.3 cdefgh	2612 cdef	100	100	67	17	17	13
DE0600601D	88.7 abcdefg	2582 cdef	86	86	43	29	14	38
DE0804101A	85.0 efgh	2573 cdef	100	100	75	100	75	100
FH 242	89.3 abcdef	2536 cdef	83	83	33	17	0	13
Concentrated Fordhook	89.7 abcde	2518 def	100	100	67	67	17	38
DE0600101D	82.7 h	2489 def	67	83	17	0	0	13
DE0701502A	86.0 defgh	2438 ef	100	100	86	71	86	63
GSFH 1-10-DA	88.0 abcdefg	2350 ef	100	100	100	100	100	100
DE0600102B	87.3 cdefgh	2336 ef	100	100	67	33	0	25
Sussex	88.3 abcdefg	2269 ef	100	100	88	100	100	100
90-1	90.3 abcd	2008 f	100	88	88	100	100	100
FH 1072	92.7 a	1986 f	86	86	86	100	71	88
Commercial Sample D*			71	83	67	100	67	38
Commercial Sample E*			100	100	67	17	0	13
p-value	***0.0063***	***0.0075***						
LSD	**4.71**	**1240**						

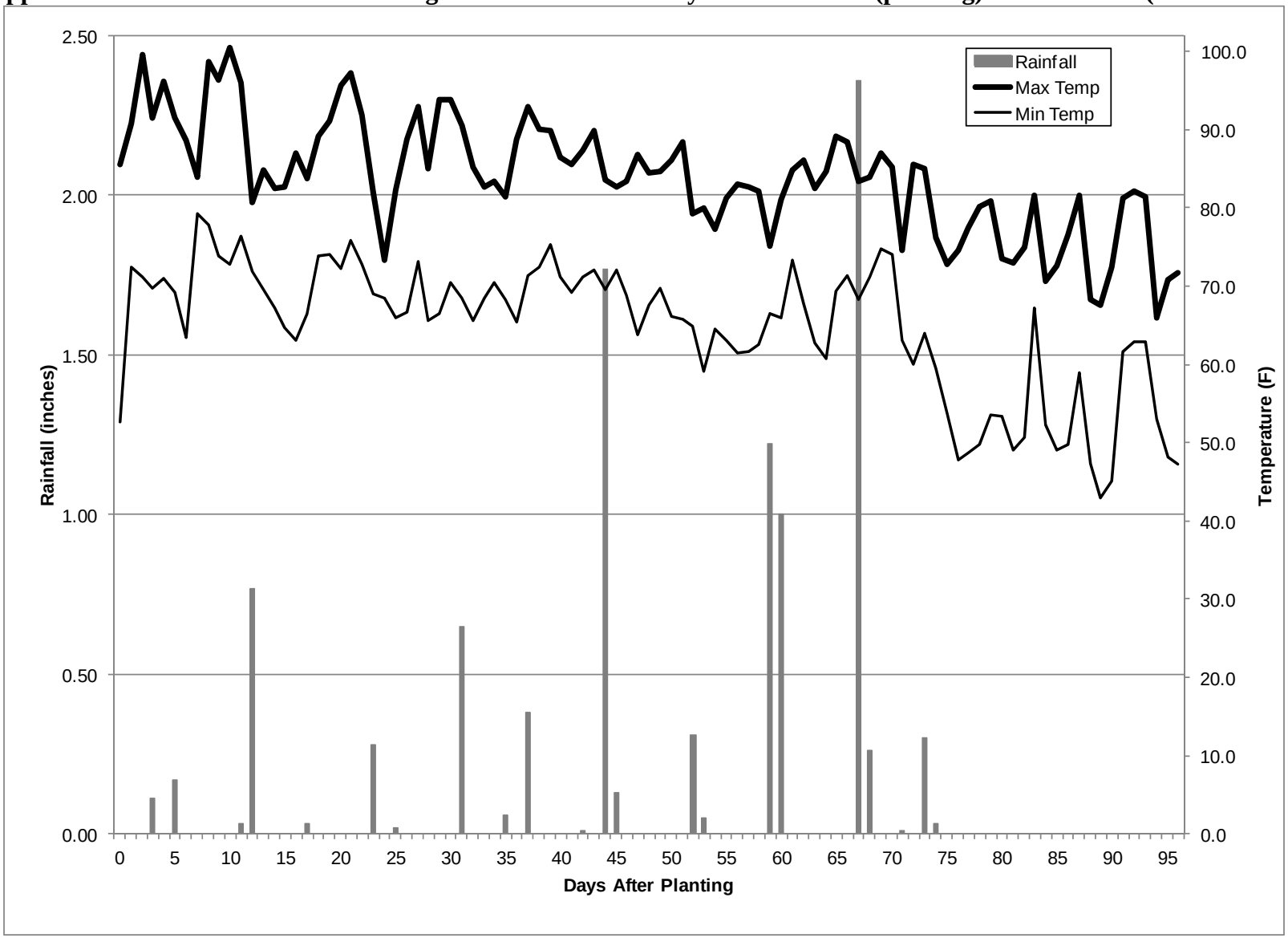
*Commercially frozen Fordhook lima beans purchased at local grocery stores

Appendix E: Weather Data for 2012 Fordhook Lima Variety Trial June 27th (planting) to October 1st (final harvest)

DAP	Date	Max Temp °F	Min Temp °F	Rainfall (in.)
0	27-Jun	85.6	52.6	0
1	28-Jun	90.7	72.4	0
2	29-Jun	99.6	71.1	0
3	30-Jun	91.5	69.8	0.11
4	1-Jul	96.2	71.0	0
5	2-Jul	91.4	69.1	0.17
6	3-Jul	88.6	63.5	0
7	4-Jul	83.9	79.2	0
8	5-Jul	98.6	77.9	0
9	6-Jul	96.3	73.9	0
10	7-Jul	100.5	72.8	0
11	8-Jul	95.9	76.4	0.03
12	9-Jul	80.6	71.9	0.77
13	10-Jul	84.9	69.6	0
14	11-Jul	82.5	67.2	0
15	12-Jul	82.6	64.7	0
16	13-Jul	86.9	63.1	0
17	14-Jul	83.7	66.4	0.03
18	15-Jul	89.1	73.8	0
19	16-Jul	91.1	74.1	0
20	17-Jul	95.7	72.3	0
21	18-Jul	97.3	75.9	0
22	19-Jul	91.9	72.7	0
23	20-Jul	82.0	69.0	0.28
24	21-Jul	73.4	68.5	0
25	22-Jul	82.3	66.0	0.02
26	23-Jul	88.7	66.7	0
27	24-Jul	93.0	73.1	0
28	25-Jul	85.0	65.6	0
29	26-Jul	93.9	66.4	0
30	27-Jul	93.9	70.4	0
31	28-Jul	90.6	68.4	0.65
32	29-Jul	85.2	65.6	0
33	30-Jul	82.7	68.5	0
34	31-Jul	83.4	70.4	0
35	1-Aug	81.4	68.3	0.06
36	2-Aug	88.8	65.4	0
37	3-Aug	92.9	71.3	0.38
38	4-Aug	90.0	72.5	0
39	5-Aug	89.9	75.3	0
40	6-Aug	86.4	71.1	0
41	7-Aug	85.5	69.1	0
42	8-Aug	87.4	71.1	0.01
43	9-Aug	89.9	72.0	0
44	10-Aug	83.5	69.5	1.77
45	11-Aug	82.6	72.0	0.13
46	12-Aug	83.4	68.9	0
47	13-Aug	86.8	63.7	0

DAP	Date	Max Temp °F	Min Temp °F	Rainfall (in.)
48	**14-Aug**	84.5	67.5	0
49	**15-Aug**	84.6	69.8	0
50	**16-Aug**	86.0	66.2	0
51	**17-Aug**	88.4	65.7	0
52	**18-Aug**	79.2	64.9	0.31
53	**19-Aug**	79.9	59.1	0.05
54	**20-Aug**	77.3	64.5	0
55	**21-Aug**	81.3	63.0	0
56	**22-Aug**	83.1	61.4	0
57	**23-Aug**	82.7	61.6	0
58	**24-Aug**	82.1	62.6	0
59	**25-Aug**	75.2	66.4	1.22
60	**26-Aug**	81.0	65.9	1
61	**27-Aug**	84.8	73.3	0
62	**28-Aug**	86.0	67.7	0
63	**29-Aug**	82.4	62.7	0
64	**30-Aug**	84.6	60.7	0
65	**31-Aug**	89.2	69.4	0
66	**1-Sep**	88.5	71.4	0
67	**2-Sep**	83.3	68.2	2.36
68	**3-Sep**	84.0	71.1	0.26
69	**4-Sep**	86.9	74.7	0
70	**5-Sep**	85.1	74.1	0
71	**6-Sep**	74.6	63.0	0.01
72	**7-Sep**	85.5	60.0	0
73	**8-Sep**	85.0	64.0	0.3
74	**9-Sep**	76.2	59.4	0.03
75	**10-Sep**	72.7	53.7	0
76	**11-Sep**	74.6	47.7	0
77	**12-Sep**	77.5	48.6	0
78	**13-Sep**	80.1	49.8	0
79	**14-Sep**	80.8	53.5	0
80	**15-Sep**	73.5	53.3	0
81	**16-Sep**	73.0	49.0	0
82	**17-Sep**	74.9	50.6	0
83	**18-Sep**	81.5	67.2	0
84	**19-Sep**	70.7	52.3	0
85	**20-Sep**	72.6	49	0
86	**21-Sep**	76.5	49.8	0
87	**22-Sep**	81.5	59	0
88	**23-Sep**	68.2	47.2	0
89	**24-Sep**	67.5	42.9	0
90	**25-Sep**	72.4	45	0
91	**26-Sep**	81.2	61.6	0
92	**27-Sep**	82.2	62.8	0
93	**28-Sep**	81.4	62.8	0
94	**29-Sep**	66	53	0
95	**30-Sep**	70.8	48.1	0
96	**1-Oct**	71.7	47.3	0

Appendix F: Weather Conditions During 2012 Fordhook Variety Trial June 27th (planting) to October 1st (final harvest)



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