

2018 University of Delaware Snap Bean Variety Trials

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Introduction

The 2018 Snap Bean Variety Trials included twenty-three varieties from five participating companies. Varieties in the trial are listed below. Early and mid-season trials were planted. The purpose of the trials was to evaluate snap bean varieties for yield, quality characteristics, and heat tolerance in a once-over harvest situation.

Name	Entering Company	Name	Entering Company
BA1001	Seminis	Annihilator	Pure Line Seed
SV3231GG	Seminis	Greenfield	Pure Line Seed
Affirmed	Seminis	587	Pure Line Seed
Sybaris	Seminis	Camaro	Crites Seed, Inc/Pop Vriend Seeds
SVGG2053	Seminis	PV 857	Crites Seed, Inc/Pop Vriend Seeds
SV1286GW	Seminis	PV 905	Crites Seed, Inc/Pop Vriend Seeds
BEX034(BSC26)	Brotherton	PV 888	Crites Seed, Inc/Pop Vriend Seeds
Dinasty	Brotherton	Rimember	Crites Seed, Inc/Pop Vriend Seeds
BSC897	Brotherton	Caprice (<i>check</i>)	HM Clause
BEX138 (Echo)	Brotherton	Colter	HM Clause
F-19	Pure Line Seed	Lasalle	HM Clause
Dominator	Pure Line Seed		

Materials and Methods

Location

Field 2D (May-planted) and field 2C (June-planted) at the University of Delaware Research and Education Center Farm, Georgetown, DE.

Cultural Practices

May 8-Planted Trial

The early trial was planted on May 8, 2018. Varieties were planted in single-row plots arranged in a randomized complete block design with four replications. Plots were 28 feet long. Border rows of the standard variety ‘Caprice’ were planted on the outside of the plot. The seeding rate was 8 seeds/foot, for an in-row spacing of 1.5 inches. Between row spacing was 30 inches.

The field was fertilized with potassium (0-0-63-29S-7B) before planting according to soil test results. An application of 1.5 pt/A Dual II Magnum for weed control as well as 20 gpa N SUL 33 (27-0-0-6S) was made pre-emergence. Plots were cultivated and sidedressed with 10 gpa 30% UAN. Additional hand weeding was done as necessary. Weed control in the trial was excellent.

June 26-Planted Trial

The mid-season trial was planted on June 28, 2018. Varieties were planted in single-row plots arranged in a randomized complete block design with four replications. Plots were 28 feet long. Border rows of the

standard variety 'Caprice' were planted on the outside of the plot. The seeding rate was 8 seeds/foot, for an in-row spacing of 1.5 inches. Between row spacing was 30 inches.

The field was fertilized with potassium (0-0-63-29S-7B) before planting according to soil test results. An application of 1.5 pt/A Dual II Magnum for weed control as well as 20 gpa N SUL 33 (27-0-0-6S) was made pre-emergence. Plots were cultivated and sidedressed with 10 gpa 30% UAN. Additional hand weeding was done as necessary. Weed control in the trial was excellent.

The plot was overhead irrigated as necessary with a traveling linear system.

Harvest

Harvest of the May 8-planted trial was completed on July 6, 2018 (59 DAP). Although emergence and stands were good, the plants in this trial were severely stunted due to stress during the growing season, namely waterlogged soil from 17 inches of rain during the May 8 to July 6 time-period. For three of the four replications, plants were pulled from a 5-foot section of each 28 foot plot and all pods were removed by hand. All pods were weighed to determine yield and then a 100 g sub-sample of pods was evaluated for quality based on the USDA standard and graded as U.S. Fancy, U.S. No. 1 or Cull. Additional data was collected from the June 26-planted trial, where yields were much more typical.

Harvest of the June 26-planted trial began on August 13 (48 DAP) and was completed on August 17 (52 DAP). Plants were pulled from a 5-foot section of each 28 foot plot and all pods were removed by hand. All pods were weighed to determine yield and then a 200 g sub-sample of pods was evaluated for quality based on the USDA standard and graded as U.S. Fancy, U.S. No. 1 or Cull. Fancy and No. 1 grade beans were considered marketable and were further graded by diameter sieve size. The beans in each quality and size grade were weighed. Pod length and seed length was recorded for 10 pods from marketable sieve size 3 pods except for four varieties where some sieve size 4 pods were also used for pod and seed length measurements. These varieties (F-19, 587, Camaro and SV3231GG) had too few size 3 pods in some reps.

Results

Yields from the May 8-planted trial are reported in Table 1. Yields from the June 26-planted trial are reported in tables 2, 3, and 4. These tables show days to harvest, total yield, marketable yield (Fancy and No. 1 grades), U.S. Fancy grade yield, U.S. No. 1 grade yield and seed length for grade 3 pods. Yields in Table 2 are reported in pounds per acre. Tables 3 and 4 include the same information as Table 2 but with yields converted to tons per acre (Table 3) or crates per acre, (Table 4) assuming 30 lbs/crate.

Table 5 reports the percent of yield in each quality grade for each variety in the May 8-planted trial and Table 6 includes the same information for the June 26-planted trial. Table 7 reports the percent of marketable pods in each sieve size by variety for the June 26-planted trial. Table 8 reports the pod length for each variety for the June 26-planted trial. Table 9 reports the seed length of marketable grade 3 or grade 3 & 4 pods.

Discussion

Yields in the May 8-planted trial were extremely low. Although emergence and stands were good, the plants in this trial were severely stunted due to stress during the growing season, namely waterlogged soil from 17 inches of rain during the May 8 to July 6 time-period. Nighttime temperatures during flowering were moderate, for this trial. Good performance in this trial would be indicative of tolerance of poor soil conditions and waterlogging. PV 888 produced the highest marketable yield in this trial, but 13 other varieties were not significantly different from PV 888 in terms of marketable yield. Six varieties produced marketable yields that were significantly different than that of Caprice: PV 888, Sybaris, BEX138 (Echo), BA1001, SVGG2053 and Annihilator.

The June 26-planted trial emerged well with excellent stands. The plants grew well and filled the row middles (Figure 1). This trial experienced sustained high nighttime temperatures (daily lows >65°F) during flowering and pod development (Appendix A). The varieties that produced the highest marketable yields in this trial were PV 857, Colter and Annihilator. In addition to these three varieties, four others produced significantly higher yields than Caprice: Dominator, BSC897, BEX138 (Echo) and PV 888. These varieties may have better ability to produce marketable quality pods under heat stress conditions. These varieties also tended to produce a high percentage of marketable pods (Table 6).

The varieties differed in the diameter and length of their pods, as reported in tables 7 and 8. Photos of a sample of pods from each variety is in Figure 2.

Appendix A contains temperature and rainfall data from the Georgetown REC weather station corresponding to the period from planting to final harvest of both of the trials, and graphs of this data.

Appendix B is a table reporting Marketable Yields from all varieties in the 2017 and 2018 snap bean trials. Both 2017 trials experienced some heat stress during flowering and pod formation. There are Seventeen varieties that were in both years trials. In this table the varieties are ordered by the average of their performance relative to Caprice. Of the varieties in all trials, PV 857 was produced the highest marketable yield. Other varieties with notable ability to yield under heat stress yields are Annihilator, Dominator, SVGG2050 and F19. Colter performed well in the 2018 trial, but not as well in the two 2017 trials.

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Table 1. May 8 Planted Trial: Days to Harvest; Total, Marketable, Fancy, No.1 and Cull Yield in Pounds Per Acre

Variety	Days to Harvest	Total Yield (lbs/A)	Marketable Yield (lbs/A)	Fancy Yield (lbs/A)	No. 1 Yield (lbs/A)	Culls (lbs/A)
PV 888	59	5445 a	4175 a	1484 abcde	2692 ab	1269 ab
Sybaris	59	4656 a	4069 ab	1869 ab	2200 abc	587 cde
BEX138 (Echo)	59	4850 a	4066 ab	2279 a	1786 abcdef	785 bcde
BA1001	59	4730 a	3989 ab	815 bcdefg	3174 a	740 bcde
SVGG2053	59	4991 a	3717 abc	1948 ab	1769 abcdef	1274 ab
Annihilator	59	4223 a	3678 abc	1535 abcde	2143 abcd	545 cde
Dominator	59	3962 a	3278 abcd	1764 abc	1514 bcdef	683 bcde
PV 905	59	3974 a	3037 abcde	1644 abcde	1392 bcdef	938 abcde
BSC897	59	4097 a	2794 abcdef	1132 abcdefg	1661 bcdef	1304 ab
Lasalle	59	3946 a	2789 abcdef	868 bcdefg	1921 abcde	1158 abc
PV 857	59	3491 a	2739 abcdef	1686 abcd	1052 cdef	752 bcde
F-19	59	3053 a	2567 abcdef	1034 bcdefg	1534 bcdef	485 de
Affirmed	59	3493 a	2325 abcdef	1371 abcdef	954 cdef	1168 abc
Colter	59	3237 a	2311 abcdef	896 bcdefg	1415 bcdef	926 abcde
Camaro	59	2481 a	1966 bcdef	1106 abcdefg	860 cdef	516 cde
SV3231GG	59	1890 a	1602 cdef	809 bcdefg	793 cdef	288 e
SV1286GW	59	2991 a	1434 def	498 defg	935 cdef	1558 a
Caprice	59	2425 a	1421 def	530 cdefg	891 cdef	1004 abcd
BEX034(BSC26)	59	2487 a	1399 def	488 defg	911 cdef	1088 abcd
Greenfield	59	2261 a	1107 def	572 cdefg	535 ef	1154 abcd
Rimember	59	2100 a	1040 ef	435 efg	604 ef	1060 abcd
587	59	1723 a	844 ef	85 g	759 def	879 bcde
Dinasty	59	1429 a	664 f	214 fg	450 f	765 bcde
<i>p-value</i>		<i>0.052</i>	<i>0.0127</i>	<i>0.0307</i>	<i>0.0269</i>	<i>0.0495</i>
Fisher's LSD¹		NA	2195	1239	1436	672
Coefficient of Variation		44.2	53.8	69.1	62.8	44.9

Table 2. June 26-Planted Trial: Days to Harvest; Total, Marketable, Fancy, No.1 and Cull Yield in Pounds Per Acre; Average Seed Size for Size 3 or Size 3 & 4 Pods

Variety	Days to Harvest	Total Yield (lbs/A)	Marketable Yield (lbs/A)	Fancy Yield (lbs/A)	No. 1 Yield (lbs/A)	Culls (lbs/A)	Grade Measured	Average Seed Length (mm)
PV 857	48	14,027 a	13,042 a	8,433 a	4,609 ab	985 e	3	8.14 bcd
Colter	48	13,948 a	11,702 ab	6,817 ab	4,886 a	2,246 abcd	3	8.09 bcd
Annihilator	48	12,054 ab	10,971 abc	6,014 bc	4,956 a	1,084 e	3	7.55 defg
Dominator	48	11,956 ab	10,690 bcd	7,894 a	2,796 defghi	1,266 cde	3	7.53 defg
BSC897	52	10,983 bc	9,214 cde	5,705 bc	3,509 bcde	1,769 bcde	3	7.76 cdef
BEX138 (Echo)	48	10,677 bcde	9,121 cde	5,351 bcde	3,769 abcd	1,557 cde	3	6.83 ijk
PV 888	48	10,942 bcd	8,684 def	5,820 bc	2,864 cdefghi	2,258 abcd	3	6.86 hij
SV3231GG	52	9,114 cdef	7,993 efg	4,629 cdefg	3,364 bcdef	1,121 e	3 & 4	8.83 a
PV 905	48	8,960 cdef	7,985 efg	5,793 bc	2,192 fghi	976 e	3	7.32 efghi
Affirmed	48	9,352 cdef	7,801 efg	4,863 cdef	2,938 cdefghi	1,551 cde	3	5.59 n
BA1001	48	8,987 cdef	7,738 efg	5,621 bcd	2,117 fghi	1,249 de	3	6.22 klm
SVGG2053	52	9,275 cdef	7,467 efgh	3,365 fghij	4,103 abc	1,808 bcde	3	7.21 fghij
Sybaris	48	8,628 defg	7,364 efgh	4,500 cdefg	2,865 cdefghi	1,264 de	3	7.17 fghij
Dinasty	48	8,386 efg	7,318 efgh	4,257 cdefg	3,061 cdefgh	1,068 e	3	5.77 mn
Lasalle	48	9,002 cdef	6,717 fghi	3,595 efghi	3,122 cdefg	2,286 abc	3	6.09 lmn
F-19	52	8,338 efg	6,616 fghi	3,927 defgh	2,689 defghi	1,722 bcde	3 & 4	8.51 ab
Caprice	48	8,568 efg	5,924 ghij	2,412 hij	3,512 bcde	2,644 ab	3	6.23 klm
Rimember	52	7,666 fgh	5,408 hijk	2,193 hij	3,215 cdef	2,258 abcd	3	6.64 jkl
587	52	7,222 fghi	5,287 hijk	2,142 ij	3,146 cdef	1,934 bcde	3 & 4	7.04 ghij
Camaro	52	7,921 fgh	4,886 ijk	3,015 ghij	1,871 ghi	3,035 a	3 & 4	7.85 cde
BEX034 (BSC26)	52	6,553 ghi	4,598 ijk	2,260 hij	2,338 efghi	1,956 bcde	3	8.25 abc
SV1286GW	52	5,787 hi	4,083 jk	2,339 hij	1,745 i	1,704 bcde	3	6.11 lmn
Greenfield	52	5,155 i	3,448 k	1,615 j	1,833 hi	1,707 bcde	3	7.47 efgh
<i>p-value</i>		<i><0.0001</i>	<i><0.0001</i>	<i><0.0001</i>	<i><0.0001</i>	<i>0.0037</i>		<i><0.0001</i>
Fisher's LSD¹		2347	2190	1757	1266	1022		0.62
Coefficient of Variation		17.9	20.5	27.9	28.9	42.2		19.8

¹Means followed by the same letter are not significantly different according to Fisher's LSD.

Table 3. June 26-Planted Trial: Days to Harvest; Total, Marketable, Fancy, No.1 and Cull Yield in Tons Per Acre; Average Seed Size for Size 3 or Size 3 & 4 Pods

Variety	Days to Harvest	Total Yield (lbs/A)	Marketable Yield (lbs/A)	Fancy Yield (lbs/A)	No. 1 Yield (lbs/A)	Culls (lbs/A)	Grade Measured	Average Seed Length (mm)
PV 857	48	7.01 a	6.52 a	4.22 a	2.30 ab	0.49 e	3	8.14 bcd
Colter	48	6.97 a	5.85 ab	3.41 ab	2.44 a	1.12 abcd	3	8.09 bcd
Annihilator	48	6.03 ab	5.49 abc	3.01 bc	2.48 a	0.54 e	3	7.55 defg
Dominator	48	5.98 ab	5.35 bcd	3.95 a	1.40 defghi	0.63 cde	3	7.53 defg
BSC897	52	5.49 bc	4.61 cde	2.85 bc	1.75 bcde	0.88 bcde	3	7.76 cdef
BEX138 (Echo)	48	5.34 bcde	4.56 cde	2.68 bcde	1.88 abcd	0.78 cde	3	6.83 ijk
PV 888	48	5.47 bcd	4.34 def	2.91 bc	1.43 cdefghi	1.13 abcd	3	6.86 hij
SV3231GG	52	4.56 cdef	4.00 efg	2.31 cdefg	1.68 bcdef	0.56 e	3 & 4	8.83 a
PV 905	48	4.48 cdef	3.99 efg	2.90 bc	1.10 fghi	0.49 e	3	7.32 efghi
Affirmed	48	4.68 cdef	3.90 efg	2.43 cdef	1.47 cdefghi	0.78 cde	3	5.59 n
BA1001	48	4.49 cdef	3.87 efg	2.81 bcd	1.06 fghi	0.62 de	3	6.22 klm
SVGG2053	52	4.64 cdef	3.73 efgh	1.68 fghij	2.05 abc	0.90 bcde	3	7.21 fghij
Sybaris	48	4.31 defg	3.68 efgh	2.25 cdefg	1.43 cdefghi	0.63 de	3	7.17 fghij
Dinasty	48	4.19 efg	3.66 efgh	2.13 cdefg	1.53 cdefgh	0.53 e	3	5.77 mn
Lasalle	48	4.50 cdef	3.36 fghi	1.80 efghi	1.56 cdefg	1.14 abc	3	6.09 lmn
F-19	52	4.17 efg	3.31 fghi	1.96 defgh	1.34 defghi	0.86 bcde	3 & 4	8.51 ab
Caprice	48	4.28 efg	2.96 ghij	1.21 hij	1.76 bcde	1.32 ab	3	6.23 klm
Rimember	52	3.83 fgh	2.70 hijk	1.10 hij	1.61 cdef	1.13 abcd	3	6.64 jkl
587	52	3.61 fghi	2.64 hijk	1.07 ij	1.57 cdef	0.97 bcde	3 & 4	7.04 ghij
Camaro	52	3.96 fgh	2.44 ijk	1.51 ghij	0.94 ghi	1.52 a	3 & 4	7.85 cde
BEX034 (BSC26)	52	3.28 ghi	2.30 ijk	1.13 hij	1.17 efghi	0.98 bcde	3	8.25 abc
SV1286GW	52	2.89 hi	2.04 jk	1.17 hij	0.87 i	0.85 bcde	3	6.11 lmn
Greenfield	52	2.58 i	1.72 k	0.81 j	0.92 hi	0.85 bcde	3	7.47 efgh
<i>p-value</i>		<0.0001	<0.0001	<0.0001	<0.0001	0.0037		<0.0001
Fisher's LSD¹		1.173	1.095	0.879	0.633	0.511		0.62
Coefficient of Variation		17.9	20.5	27.9	28.9	42.2		19.8

¹Means followed by the same letter are not significantly different according to Fisher's LSD.

Table 4. June 26-Planted Trial: Days to Harvest; Total, Marketable, Fancy, No.1 and Cull Yield in Crates (30 lbs) Per Acre; Average Seed Size for Size 3 or Size 3 & 4 Pods

Variety	Days to Harvest	Total Yield (lbs/A)	Marketable Yield (lbs/A)	Fancy Yield (lbs/A)	No. 1 Yield (lbs/A)	Culls (lbs/A)	Grade Measured	Average Seed Length (mm)
PV 857	48	468 a	435 a	281 a	154 ab	33 e	3	8.14 bcd
Colter	48	465 a	390 ab	227 ab	163 a	75 abcd	3	8.09 bcd
Annihilator	48	402 ab	366 abc	200 bc	165 a	36 e	3	7.55 defg
Dominator	48	399 ab	356 bcd	263 a	93 defghi	42 cde	3	7.53 defg
BSC897	52	366 bc	307 cde	190 bc	117 bcde	59 bcde	3	7.76 cdef
BEX138 (Echo)	48	356 bcde	304 cde	178 bcde	126 abcd	52 cde	3	6.83 ijk
PV 888	48	365 bcd	289 def	194 bc	95 cdefghi	75 abcd	3	6.86 hij
SV3231GG	52	304 cdef	266 efg	154 cdefg	112 bcdef	37 e	3 & 4	8.83 a
PV 905	48	299 cdef	266 efg	193 bc	73 fghi	33 e	3	7.32 efghi
Affirmed	48	312 cdef	260 efg	162 cdef	98 cdefghi	52 cde	3	5.59 n
BA1001	48	300 cdef	258 efg	187 bcd	71 fghi	42 de	3	6.22 klm
SVGG2053	52	309 cdef	249 efgh	112 fghij	137 abc	60 bcde	3	7.21 fghij
Sybaris	48	288 defg	245 efgh	150 cdefg	95 cdefghi	42 de	3	7.17 fghij
Dinasty	48	280 efg	244 efgh	142 cdefg	102 cdefgh	36 e	3	5.77 mn
Lasalle	48	300 cdef	224 fghi	120 efghi	104 cdefg	76 abc	3	6.09 lmn
F-19	52	278 efg	221 fghi	131 defgh	90 defghi	57 bcde	3 & 4	8.51 ab
Caprice	48	286 efg	197 ghij	80 hij	117 bcde	88 ab	3	6.23 klm
Rimember	52	256 fgh	180 hijk	73 hij	107 cdef	75 abcd	3	6.64 jkl
587	52	241 fghi	176 hijk	71 ij	105 cdef	64 bcde	3 & 4	7.04 ghij
Camaro	52	264 fgh	163 ijk	101 ghij	62 ghi	101 a	3 & 4	7.85 cde
BEX034 (BSC26)	52	218 ghi	153 ijk	75 hij	78 efghi	65 bcde	3	8.25 abc
SV1286GW	52	193 hi	136 jk	78 hij	58 i	57 bcde	3	6.11 lmn
Greenfield	52	172 i	115 k	54 j	61 hi	57 bcde	3	7.47 efgh
<i>p-value</i>		<i><0.0001</i>	<i><0.0001</i>	<i><0.0001</i>	<i><0.0001</i>	<i>0.0037</i>		<i><0.0001</i>
Fisher's LSD¹		78	73	59	42	34		0.62
Coefficient of Variation		17.9	20.5	27.9	28.9	42.2		19.8

¹Means followed by the same letter are not significantly different according to Fisher's LSD.

Table 5. May 8 Planted Trial Percent of Yield in Each Quality Grade

Variety	% Marketable	% Fancy	% No. 1
Sybaris	87 a	39 ab	48 abc
Annihilator	85 ab	37 ab	48 abc
BA1001	83 abc	17 cde	66 a
F-19	81 abcd	32 abc	49 ab
BEX138 (Echo)	80 abcd	43 a	37 bcd
Camaro	79 abcd	40 a	39 bcd
SV3231GG	79 abcd	40 ab	40 bcd
Dominator	78 abcd	44 a	34 bcd
PV 905	78 abcd	42 a	36 bcd
SVGG2053	74 abcde	39 ab	35 bcd
PV 888	72 abcdef	29 abcd	42 bc
PV 857	69 abcdef	37 ab	31 bcd
BSC897	68 bcdef	27 abcd	41 bc
Colter	66 cdef	22 bcde	43 bc
Lasalle	63 defg	19 cde	43 bc
BEX034(BSC26)	58 efgh	19 cde	39 bcd
Affirmed	57 efghi	28 abcd	30 cd
Caprice	53 fghij	19 cde	35 bcd
SV1286GW	46 ghij	16 cde	30 cd
Dinasty	46 ghij	15 cde	31 bcd
587	42 hij	4 e	38 bcd
Greenfield	39 ij	17 cde	22 d
Rimember	35 j	13 de	21 d
<i>p-value</i>	<i><0.0001</i>	<i>0.0002</i>	<i>0.0174</i>
Fisher's LSD¹	18.7	17.8	18.6
Coefficient of Variation	17.3	38.7	29.6

¹Means followed by the same letter are not significantly different according to Fisher's LSD.

Table 6. June 26-Planted Trial Percent of Yield in Each Quality Grade

Variety	% Marketable	% Fancy	% No. 1
PV 857	93 a	60 abc	33 bcdefg
Annihilator	91 ab	50 cde	41 abc
Dominator	89 abc	66 a	23 fg
PV 905	89 abc	66 ab	23 g
SV3231GG	88 abc	51 bcde	37 abc
Dinasty	87 abc	51 abcde	36 abcd
BA1001	86 abcd	62 abc	24 efg
BEX138 (Echo)	85 abcd	50 cde	35 abcde
Colter	84 abcd	49 cdef	35 abcde
BSC897	84 abcde	51 abcde	33 bcdefg
Sybaris	84 abcde	51 abcde	32 bcdefg
Affirmed	82 bcde	50 cde	32 bcdefg
SVGG2053	80 cdef	34 gh	46 a
PV 888	80 cdef	54 abcd	26 defg
F-19	79 cdef	47 cdefg	32 bcdefg
Lasalle	76 defg	42 defgh	35 abcde
587	74 efg	29 h	45 a
BEX034(BSC26)	70 fgh	35 fgh	36 abcd
Rimember	70 fgh	28 h	42 ab
Caprice	69 gh	29 h	40 abc
SV1286GW	69 gh	39 efgh	30 cdefg
Greenfield	67 gh	33 gh	34 abcdef
Camaro	62 h	40 defgh	22 g
<i>p-value</i>	<i><0.0001</i>	<i><0.0001</i>	<i>0.0005</i>
Fisher's LSD¹	10.1	14.9	11.1
Coefficient of Variation	8.9	22.7	23.3

¹Means followed by the same letter are not significantly different according to Fisher's LSD.

Table 7. Varieties by Percent of Marketable Pods in Each Diameter Size Grade

Variety	% Grade 2		% Grade 3		% Grade 4		% Grade 5		%Grade 6		Grade 3 Average Seed Length (mm)¹
SV1286GW	17.6	a	74.7	abc	7.8	h	0.0	g	0.0	a	6.11 lmn
Dinasty	15.5	ab	52.6	defg	26.9	efg	5.0	fg	0.0	a	5.77 mn
587	15.0	abc	56.2	cdef	28.8	ef	0.0	g	0.0	a	7.04 ghij*
BEX034(BSC26)	13.3	abcd	78.6	ab	8.1	h	0.0	g	0.0	a	8.25 abc
BEX138 (Echo)	11.7	abcde	57.5	bcde	16.8	fgh	13.9	defg	0.0	a	6.83 ijk
Greenfield	11.6	abcde	74.7	abc	9.6	gh	4.1	fg	0.0	a	7.47 efgh
Lasalle	7.9	bcdef	37.9	efgh	38.7	bcde	15.5	cdefg	0.0	a	6.09 lmn
Rimember	7.5	bcdef	81.8	a	10.7	gh	0.0	g	0.0	a	6.64 jkl
SVGG2053	7.5	bcdef	68.9	abcd	23.7	efgh	0.0	g	0.0	a	7.21 fghij
PV 905	7.1	cdef	52.7	defg	29.8	def	10.4	efg	0.0	a	7.32 efghi
BA1001	5.9	def	37.5	efgh	31.8	cdef	24.7	bcde	0.0	a	6.22 klm
BSC897	5.8	def	49.7	defg	39.5	bcde	5.0	fg	0.0	a	7.76 cdef
PV 888	5.1	ef	26.8	hi	38.3	bcde	29.8	bc	0.0	a	6.86 hij
F-19	4.8	ef	24.5	hi	47.4	abcd	23.3	bcde	0.0	a	8.51 ab*
Sybaris	4.2	ef	33.0	ghi	60.7	a	2.1	fg	0.0	a	7.17 fghij
Camaro	3.5	f	27.0	hi	52.4	ab	17.1	cdef	0.0	a	7.85 cde*
Caprice	3.1	f	35.1	fghi	48.8	abc	13.0	defg	0.0	a	6.23 klm
Affirmed	2.7	f	33.9	ghi	48.2	abc	15.3	cdefg	0.0	a	5.59 n
SV3231GG	2.1	f	20.2	hi	55.5	ab	22.3	bcde	0.0	a	8.83 a*
Annihilator	2.1	f	20.7	hi	40.0	bcde	34.0	b	3.2	a	7.55 defg
Dominator	1.8	f	15.8	i	28.4	ef	51.0	a	3.0	a	7.53 defg
PV 857	1.7	f	16.7	hi	53.9	ab	27.7	bcd	0.0	a	8.14 bcd
Colter	0.4	f	16.9	hi	60.4	a	22.3	bcde	0.0	a	8.09 bcd
<i>p-value</i>	0.0003		<0.0001		<0.0001		<0.0001		0.1412		<0.0001
Fisher's LSD²	8.07		21.20		17.61		15.65		NA		0.62
C.V.	83.4		34.8		35.6		75.8		NA		19.8

¹asterisk indicates that grade 3 & 4 pods were measured; ²Means followed by the same letter are not significantly different according to Fisher's LSD.

Table 8. Pod Length in Centimeters of Marketable Grade 3 or Grade 3 & 4 Pods

Variety	Grade Measured	Average Pod Length (cm)
F-19	3 & 4	13.9 a
Greenfield	3	13.1 b
BA1001	3	12.9 bc
Sybaris	3	12.9 bc
PV 905	3	12.9 bc
BEX034(BSC26)	3	12.7 bcd
Affirmed	3	12.7 bcd
PV 857	3	12.7 bcd
Colter	3	12.5 cde
SV3231GG	3 & 4	12.3 def
BSC897	3	12.3 efg
Annihilator	3	12.2 efg
PV 888	3	12.1 efg
Camaro	3 & 4	12.1 efg
SVGG2053	3	12.1 efg
Dinasty	3	11.9 fg
BEX138 (Echo)	3	11.8 fg
Caprice	3	11.8 fg
Dominator	3	11.8 fg
587	3 & 4	11.6 g
Lasalle	3	11.6 g
Rimember	3	11.0 h
SV1286GW	3	10.7 h
<i>p-value</i>		<i><0.0001</i>
Fisher's LSD¹		0.54
Coefficient of Variation		10.0

¹Means followed by the same letter are not significantly different according to Fisher's LSD.

Table 9. Seed Length in Millimeters of Marketable Grade 3 or Grade 3 & 4 Pods

Variety	Grade Measured	Average Seed Length (mm)
SV3231GG	3 & 4	8.83 a
F-19	3 & 4	8.51 ab
BEX034(BSC26)	3	8.25 abc
PV 857	3	8.14 bcd
Colter	3	8.09 bcd
Camaro	3 & 4	7.85 cde
BSC897	3	7.76 cdef
Annihilator	3	7.55 defg
Dominator	3	7.53 defg
Greenfield	3	7.47 efgh
PV 905	3	7.32 efghi
SVGG2053	3	7.21 fghij
Sybaris	3	7.17 fghij
587	3 & 4	7.04 ghij
PV 888	3	6.86 hij
BEX138 (Echo)	3	6.83 ijk
Rimember	3	6.64 jkl
Caprice	3	6.23 klm
BA1001	3	6.22 klm
SV1286GW	3	6.11 lmn
Lasalle	3	6.09 lmn
Dinasty	3	5.77 mn
Affirmed	3	5.59 n
<i>p-value</i>		<i><0.0001</i>
Fisher's LSD¹		0.62
Coefficient of Variation		19.8

¹Means followed by the same letter are not significantly different according to Fisher's LSD.

Figure 1. June 26-planted snap bean trial, phot taken on August 13, 2018, the first day of harvest.



Figure 2. Pod samples from varieties in the 2018 snap bean trials.

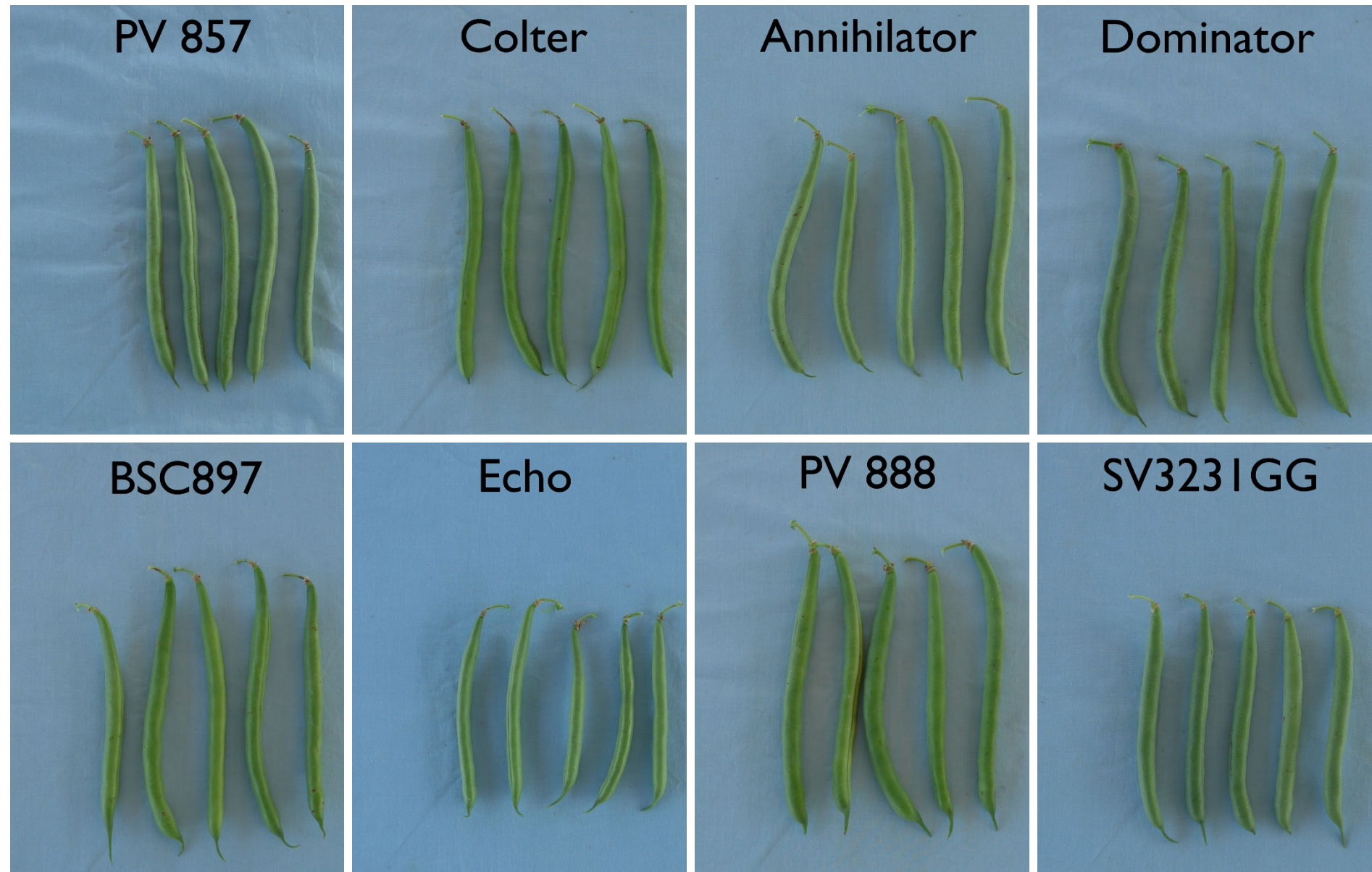


Figure 2 continued. Pod samples from varieties in the 2018 snap bean trials.

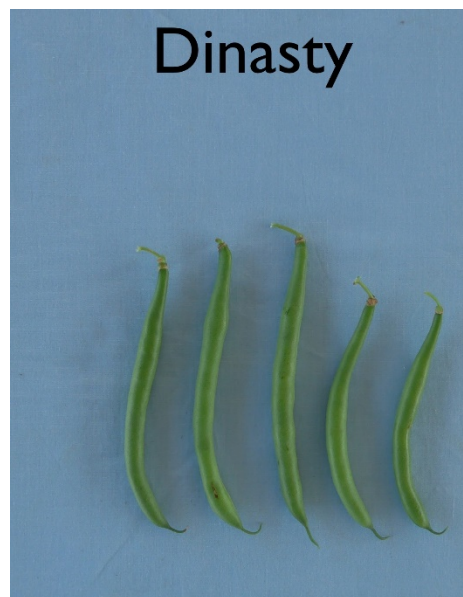
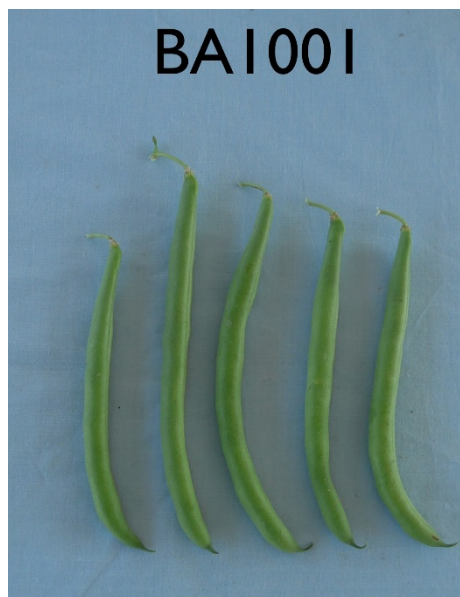
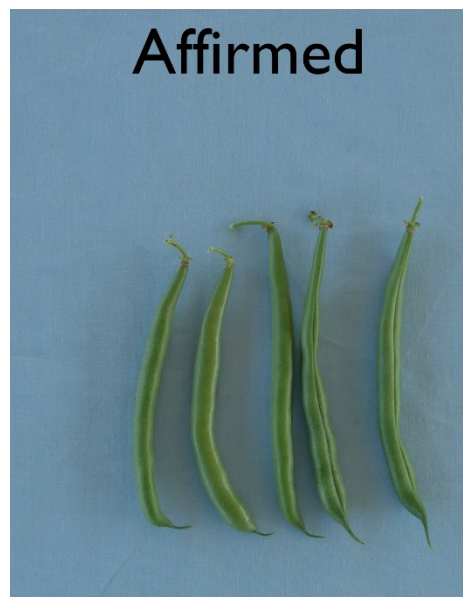
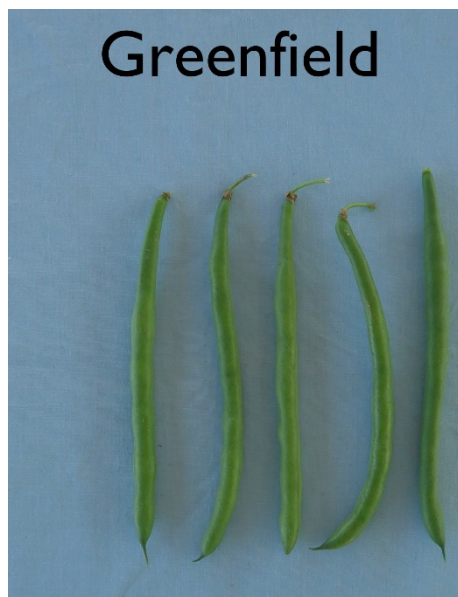
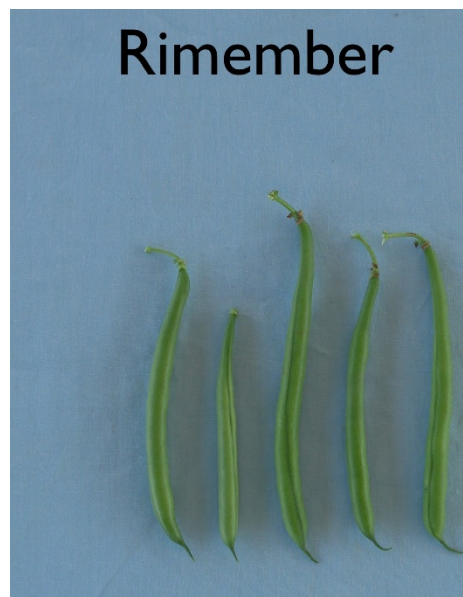


Figure 2 continued. Pod samples from varieties in the 2018 snap bean trials.

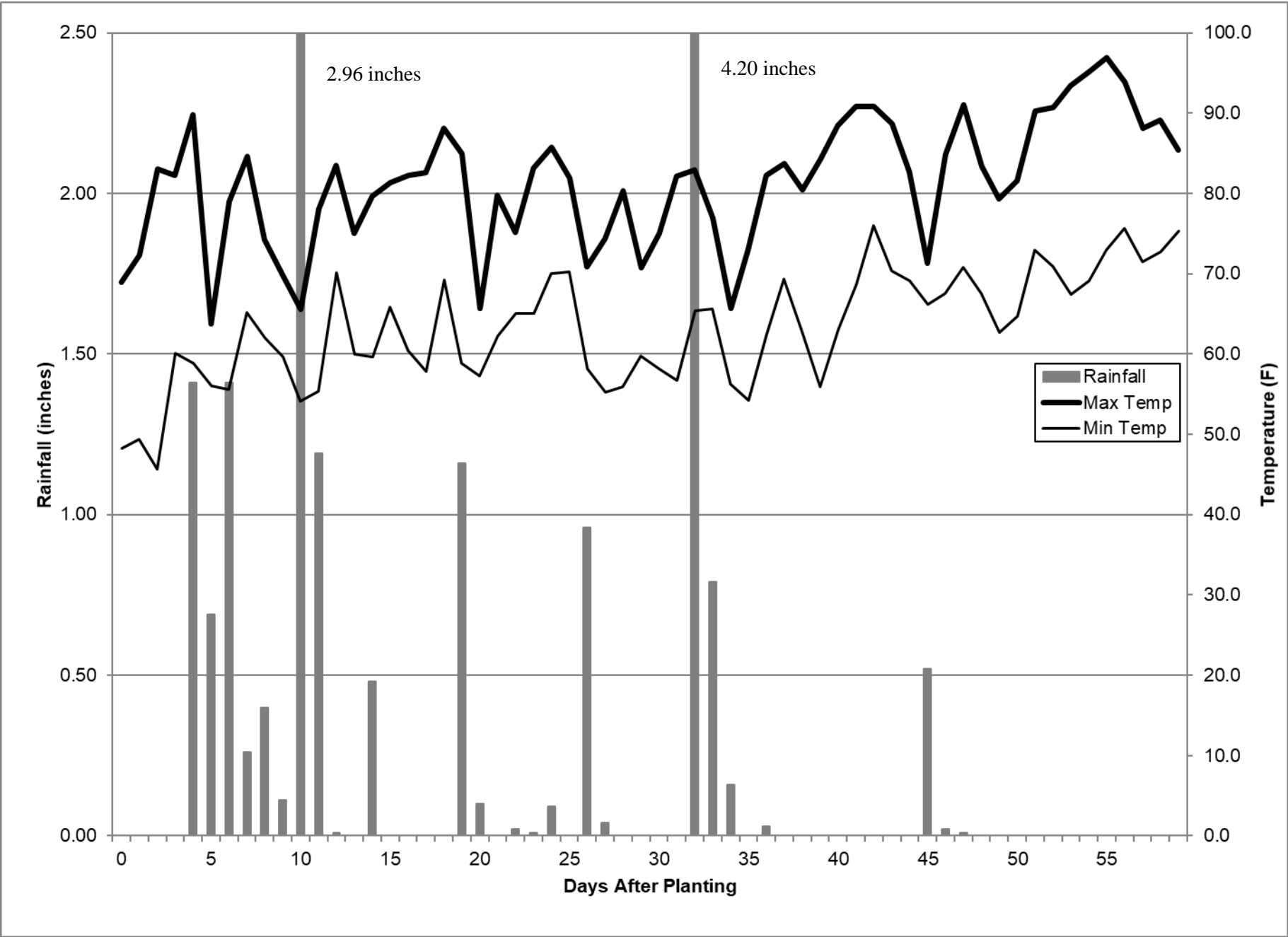


Appendix A: Daily Maximum and Minimum Temperatures and Rainfall for Period of May 8, 2018 (first planting) to August 17, 2018 (final harvest) for Snap Bean Trials at Georgetown, Delaware

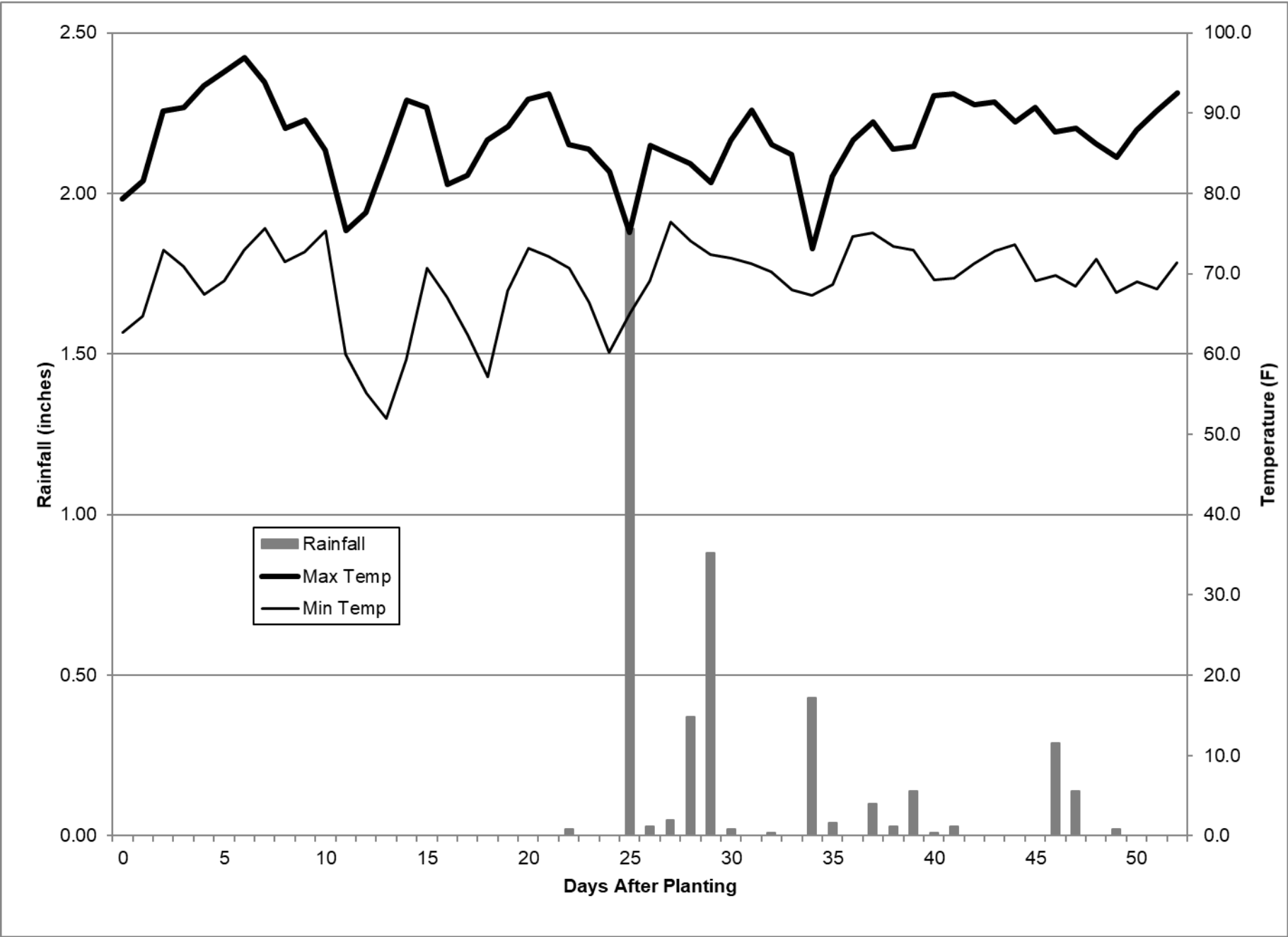
Date	Days After Planting		Max Temp (F)	Min Temp (F)	Rainfall (in)
	May 18	June 26			
8-May	0		68.9	48.2	0
9-May	1		72.3	49.4	0
10-May	2		83.0	45.7	0
11-May	3		82.2	60.1	0
12-May	4		89.8	58.8	1.41
13-May	5		63.7	56.0	0.69
14-May	6		79.0	55.6	1.41
15-May	7		84.6	65.2	0.26
16-May	8		74.2	62.0	0.4
17-May	9		69.9	59.6	0.11
18-May	10		65.6	54.1	2.96
19-May	11		78.1	55.4	1.19
20-May	12		83.5	70.1	0.01
21-May	13		75.0	60.0	0
22-May	14		79.6	59.6	0.48
23-May	15		81.3	65.8	0
24-May	16		82.2	60.4	0
25-May	17		82.6	57.8	0
26-May	18		88.1	69.2	0
27-May	19		85.0	58.8	1.16
28-May	20		65.7	57.3	0.1
29-May	21		79.8	62.2	0
30-May	22		75.1	65.0	0.02
31-May	23		83.2	65.1	0.01
1-Jun	24		85.7	70.0	0.09
2-Jun	25		81.9	70.2	0
3-Jun	26		70.9	58.2	0.96
4-Jun	27		74.4	55.2	0.04
5-Jun	28		80.3	55.9	0
6-Jun	29		70.7	59.8	0
7-Jun	30		75.0	58.2	0
8-Jun	31		82.1	56.7	0
9-Jun	32		82.9	65.4	4.2
10-Jun	33		76.9	65.6	0.79
11-Jun	34		65.7	56.3	0.16
12-Jun	35		73.0	54.2	0
13-Jun	36		82.2	62.5	0.03
14-Jun	37		83.7	69.3	0
15-Jun	38		80.4	62.8	0
16-Jun	39		84.3	55.9	0
17-Jun	40		88.4	63.0	0
18-Jun	41		90.8	68.7	0
19-Jun	42		90.8	76.0	0
20-Jun	43		88.7	70.4	0
21-Jun	44		82.7	69.1	0
22-Jun	45		71.3	66.2	0.52
23-Jun	46		84.8	67.5	0.02
24-Jun	47		91.0	70.8	0.01
25-Jun	48		83.4	67.5	0
26-Jun	49	1	79.3	62.7	0
27-Jun	50	2	81.6	64.7	0
28-Jun	51	3	90.3	73.0	0
29-Jun	52	4	90.7	70.9	0
30-Jun	53	5	93.4	67.4	0
1-Jul	54	6	95.1	69.1	0
2-Jul	55	7	96.9	72.9	0
3-Jul	56	8	93.9	75.6	0
4-Jul	57	9	88.1	71.5	0
5-Jul	58	10	89.1	72.7	0
6-Jul	59	11	85.4	75.3	0
7-Jul		12	75.4	60.0	0

Date	Days After Planting		Max Temp (F)	Min Temp (F)	Rainfall (in)
	May 18	June 26			
8-Jul		13	77.6	55.1	0
9-Jul		14	84.6	52.0	0
10-Jul		15	91.6	59.3	0
11-Jul		16	90.7	70.7	0
12-Jul		17	81.1	67.1	0
13-Jul		18	82.3	62.4	0
14-Jul		19	86.6	57.2	0
15-Jul		20	88.3	67.9	0
16-Jul		21	91.7	73.2	0
17-Jul		22	92.4	72.2	0
18-Jul		23	86.1	70.7	0.02
19-Jul		24	85.5	66.4	0
20-Jul		25	82.7	60.2	0
21-Jul		26	75.1	65.1	1.89
22-Jul		27	86.0	69.1	0.03
23-Jul		28	84.8	76.4	0.05
24-Jul		29	83.7	74.1	0.37
25-Jul		30	81.3	72.4	0.88
26-Jul		31	86.7	71.9	0.02
27-Jul		32	90.4	71.2	0
28-Jul		33	86.1	70.2	0.01
29-Jul		34	84.8	68.0	0
30-Jul		35	73.1	67.3	0.43
31-Jul		36	82.1	68.7	0.04
1-Aug		37	86.7	74.6	0
2-Aug		38	88.9	75.1	0.1
3-Aug		39	85.5	73.4	0.03
4-Aug		40	85.9	72.9	0.14
5-Aug		41	92.2	69.2	0.01
6-Aug		42	92.4	69.5	0.03
7-Aug		43	91.0	71.3	0
8-Aug		44	91.4	72.8	0
9-Aug		45	88.9	73.6	0
10-Aug		46	90.7	69.1	0
11-Aug		47	87.7	69.8	0.29
12-Aug		48	88.1	68.4	0.14
13-Aug		49	86.2	71.8	0
14-Aug		50	84.5	67.6	0.02
15-Aug		51	87.9	69.0	0
16-Aug		52	90.3	68.1	0
17-Aug		53	92.5	71.4	0

Temperature and Rainfall for the May 8 Planted Snap Bean Trial from May 8 (planting) July 6 (final harvest)



Temperature and Rainfall for the June 26 Planted Snap Bean Trial from June 26 (planting) August 17 (final harvest)



Appendix B: Marketable Yields from 2017 and 2018 Trials, Ordered by Average Yield as a Percent of Caprice

	Marketable Yield in Lbs/A					
Cultivar	May 2017		June 2017		June 2018	
SVGG2050	5440	ab	8324	ab		
Annihilator					10971	abc
PV 857	4898	abc	6438	abcd	13042	a
Dominator					10690	bcd
F19	5789	a	8436	a	6616	fghi
SVGG2053	4406	abcd	8597	a	7467	efgh
BA1001	4671	abcd	7756	ab	7738	efg
SV3231GG	3503	cdef	8282	ab	7993	efg
Antigua	3146	defg	6288	abcd		
PV 905	5436	ab	4083	cde	7985	efg
Colter	3592	cde	4179	cde	11702	ab
PV 888	4037	bcde	5586	abcde	8684	def
Dinasty	3941	bcde	6707	abcd	7318	efgh
BSC897	4349	abcd	3335	de	9214	cde
Camaro	3834	cde	7180	abc	4886	ijk
BEX138	4176	bcd	2403	e	9121	cde
Beau	1944	fg	8046	ab		
BEX034	4145	bcd	5332	abcde	4598	ijk
Lasalle					6717	fghi
Sybaris	3154	defg	3513	de	7364	efgh
Affirmed	2562	efg	3346	de	7801	efg
Caprice	2532	efg	4836	bcde	5924	ghij
Elba	1744	g	5916	abcde		
Rimember					5408	hijk
587					5287	hijk
SV1286GW	1637	g	3999	cde	4083	jk
Greenfield					3448	k
p-value	<0.0001		0.0033		<0.0001	
LSD	1574		3542		2190	
CV	29.6		42.9		20.5	