2020 University of Delaware Round Podded Snap Bean Variety Trials

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Introduction

The 2020 Snap Bean Variety Trials included twenty-one varieties from four 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
Asya (flat pod)	Brotherton Seed Company	HMX 017-5756	HM Clause
BEX175 (flat pod)	Brotherton Seed Company	Affirmed	Seminis
Jackson	Brotherton Seed Company	SV1286GW	Seminis
Word Cup	Brotherton Seed Company	SVGF2074	Seminis
Bridger	HM Clause	SVGF2091	Seminis
Caprice	HM Clause	SVGG2106	Seminis
Colter	HM Clause	Sybaris	Seminis
HM 5101	HM Clause	PV 857	Crites Seed, Inc.
HMC 017711	HM Clause	PV 946	Crites Seed, Inc.
HMX 016-4423	HM Clause	Silverado	Crites Seed, Inc.
HMX 017-5722	HM Clause		

Materials and Methods

Location

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

Cultural Practices

June 9-Planted Trial

The first trial was planted on June 9, 2020. Varieties were planted in single-row plots arranged in a randomized complete block design with four replications. Plots were 20 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. The variety 'Asya' was planted at 6 seeds per foot. Between row spacing was 30 inches.

The field was fertilized with potassium before planting according to soil test results. An application of 1.25 pt/A Dual Magnum + 2 pt/A Gramoxone + 1pt/A Ridomil Gold as well as 15 gpa N SUL 33 (27-0-0-6S) was made pre-emergence on June 10. Plots were cultivated and sidedressed with 15 gpa N-SUL 33 (43.5 lb/A of N). Additional hand weeding was done as necessary. Weed control in the trial was excellent. Warrior at 2 oz/A was applied on July 2 and July 6 and Hero at 4 oz/A on July 21 to control potato leafhopper, lygus and stinkbug.

July 15-Planted Trial

The second trial was planted on July 15, 2020. Varieties were planted in single-row plots arranged in a randomized complete block design with four replications. Plots were 20 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. The variety 'Asya' was planted at 6 seeds per foot. Between row spacing was 30 inches.

The field was fertilized with potassium before planting according to soil test results. An application of 1.25 pt/A Dual Magnum for weed control as well as 20 gpa N SUL 33 (27-0-0-6S) was made preemergence. Plots were cultivated and sidedressed with 15 gpa N SUL 33 on August 12. Additional hand weeding was done as necessary. Weed control in the trial was excellent.

Both trials were overhead irrigated as necessary with a traveling linear system.

Harvest

Harvest of the June 9-planted trial began on July 27 (48 DAP) and was completed on August 3 (55 DAP). Emergence and stands were excellent. This experienced sustained high night temperatures from flowering through harvest; in the month of July, only four days had a minimum temperature less than 68 °F. Nighttime temperatures above this level have been shown to reduce bean seed yields in sensitive types. At harvest, plants were pulled from a 10-foot section of each 20-foot plot and all pods were removed by hand. All pods were weighed to determine yield and then a 300 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 grade.

Harvest of the July 15-planted trial began on September 3 (50 DAP) and was completed on September 15 (62 DAP). This trial was not exposed to heat stress during flowering and pod fill and yields were much higher. Harvest procedures were the same as for the June 9-planted trial.

Results

Yields from the two trials are reported separately in Tables 1 and 2. Figure 3 shows marketable and cull yields from both trials. The percent of yield in each quality grade is reported in Tables 3 and 4. Tables 5 and 6 report the percent of marketable pods in each sieve size. Table 7 reports the pod length for each variety for both trials. Table 8 reports the seed length of marketable grade 3 pods for both trials. Table 9 reports plant height and width for both trials.

Figure 1 is a photo of the June 9 planted trial on the first day of harvest.

Figure 2 includes photos of a 300 g sample of pods from each variety that has been graded into Fancy, No. 1 and cull categories. In all cases, the sample is from block 4 of the June 9-planted trial, which was exposed to heat stress. These photos are ordered by marketable yield in the heat stressed June 9 trial.

Figure 3 is a chart showing marketable and cull yields for the varieties for both trials.

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.

Discussion

Both trials had good emergence and stand establishment. Weed control was excellent and plants were adequately irrigated. Potato leafhoppers were well managed in both trials. Plants in the June 9 trial were

smaller than in the July 15 trial (Table 9, Fig. 1) and did not completely fill the row middles. Most varieties in the July 15 trial filled the row middles.

The June 9 trial experienced significant heat stress during the bud formation and flowering stage which resulted in many varieties with reduced yields and higher incidence of culls. Full flower for most varieties occurred around July 13 (34 DAP). Buds are the most susceptible to heat stress damage, so the 10 days before full flower a period when snap beans are particularly susceptible to damage from high night temperatures. The average night temperature for the 10 days preceding July 13 was 71 °F and only one of the nights was below 68 °F, which is considered the threshold for damage to pollen and anther development. The July 15 trial reached full flower around August 24 (40 DAP). The average night temperature for the 10 days preceding this was 66 °F and five nights were below 68 °F.

Yields were lower in the June 9 trial than the July 15 trial (Tables 1 and 2, Fig. 3). Some varieties produced virtually no yield in the June 9 trial, despite having robust, healthy plants. PV 857 and Bridger produced the highest marketable yields in the June 9 trial and their yields were statistically significantly different than all the other varieties in the trial (Table 1). PV 857 has performed well under heat stress in past trials and is considered heat tolerant. Bridger has not been tested in past years.

Silverado produced the highest marketable yield in the July 15 trial (Table 2). Nine Varieties produced marketable yields that were not significantly different than Silverado: SVGF2091, PV 946, Affirmed, BEX175 (flat pod), HM 5101, PV 857, SVGG2106, Bridger and Sybaris. Five varieties produced yields that were significantly higher than Caprice (the standard variety): Silverado, SVGF2091, PV 946, Affirmed and BEX175. PV 946, the only yellow bean in the trial, performed well in the July 15 trial but is not heat tolerant.

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Variety	Days	Total Yield	Marketable	Fancy Yield	No. 1 Yield	Culls	Grade	Average
	to	(lbs/A)	Yield	(lbs/A)	(lbs/A)	(lbs/A)	Measured	Seed Length
	Harvest		(lbs/A)					(mm)
PV 857	48	6,226 a	5,124 a	2,335 a	2,789 a	1,102 defg	3	6.97 d
Bridger	48	6,223 a	4,675 a	1,775 b	2,900 a	1,548 abcd	3	7.26 d
HMX 017-5722	48	5,445 ab	3,504 b	706 cde	2,799 a	1,941 a	3	5.80 efg
HM 5101	48	4,311 bc	2,982 bc	986 c	1,996 b	1,329 bcde	3	5.75 efg
Silverado	49	3,019 defg	2,388 cd	923 cd	1,465 bcdef	631 ghi	3	5.27 g
HMX 016-4423	50	4,173 cd	2,251 cde	336 fgh	1,915 b	1,922 a	3	5.97 ef
Colter	48	3,558 cd	2,181 cde	627 def	1,554 bcd	1,378 bcde	3	6.05 ef
Sybaris	49	3,276 cde	2,076 cde	559 ef	1,518 bcde	1,200 cdef	3	5.80 efg
BEX175 (flat pod)	51	3,647 cd	2,036 cde	310 fgh	1,726 bc	1,611 abc	NA	7.51 cd
HMX 017-5756	49	3,353 cd	2,010 de	786 cde	1,225 bcdef	1,343 bcde	3	6.11 ef
SVGF2074	49	3,212 cdef	1,757 def	532 efg	1,225 bcdef	1,456 abcd	3	6.35 e
SVGF2091	50	1,808 hij	1,432 defg	561 ef	871 defgh	376 hi	3	6.21 ef
Affirmed	50	3,184 cdef	1,371 efgh	305 fgh	1,066 cdefg	1,812 ab	3	5.81 efg
Jackson	49	2,123 efgh	1,024 fghi	209 gh	816 defgh	1,099 defg	3	5.76 efg
Asya (flat pod)	55	1,766 hij	935 fghij	217 gh	718 efghi	832 fghi	NA	10.28 a
HMC 017711	51	2,067 fgh	854 fgij	186 h	668 fghi	1,213 cdef	3	7.98 c
Caprice	50	1,825 ghij	773 ghij	100 h	674 fghi	1,052 efg	3	5.94 ef
SVGG2106	51	1,901 ghi	705 ghij	110 h	596 fghi	1,196 cdef	3	8.04 c
PV 946	51	772 ijk	448 hij	93 h	355 ghi	325 i	3	5.62 fg
Word Cup	55	655 jk	148 ij	16 h	132 hi	507 hi	3	9.18 b
SV1286GW	55	244 k	47 j	12 h	35 i	197 i	3	7.98 c
p-value		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		<0.0001
Fisher's LSD ¹		1195.8	969.3	338.8	774.6	489.7		0.609
Coefficient of Varia	ation	28.3	37.2	43.1	42.5	30.2		20.5

Table 1. June 9 Planted Trial: Days to Harvest; Total, Marketable, Fancy, No.1 and Cull Yield in Pounds Per Acre; Average Seed Size for Size 3 Pods

Variety	Days	Total	Yield	Marke	etable	Fancy	y Yield	No. 1	Yield	Cu	lls	Grade	Ave	rage
	to	(lbs	/A)	Yie	eld (A)	(lb:	s/A)	(lb	s/A)	(lbs	/A)	Measured	Se	ed
	Harvest			(IDS	/A)								Len	igtn m)
Silverado	56	13.089	a	11.943	a	7.553	а	4.389	bcd	1.650	cd	3	7.04	eføh
SVGF2091	58	12,169	ab	10,777	ab	6.653	ab	4.124	bcd	1,198	def	3	8.41	h
PV 946	62	13.178	a	10,449	abc	3.784	cdefg	6.665	a	1,487	cde	3	7.98	bc
Affirmed	56	11,589	abc	10,185	abc	5,922	abc	4,263	bcd	1,334	cde	3	6.94	efgh
BEX175 (flat pod)	58	11,639	abc	9,989	abc	4,718	bcdef	5,272	ab	1,409	cde	NA	9.21	a
HM 5101	54	10,725	abcd	9,454	abcd	4,659	bcdefg	4,795	bc	1,995	bc	3	7.47	cde
PV 857	50	9,804	bcdef	9,399	abcd	5,976	abc	3,424	cde	1,601	cd	3	6.44	h
SVGG2106	58	10,488	abcd	9,290	abcd	4,011	cdefg	5,279	ab	1,159	def	3	7.86	bc
Bridger	50	10,376	abcd	9,041	abcde	4,686	bcdef	4,355	bcd	1,147	def	3	7.70	cd
Sybaris	58	10,372	abcd	8,906	abcde	4,182	cdefg	4,724	bc	1,168	def	3	7.38	def
HMX 017-5722	54	10,269	abcde	8,860	bcde	5,350	abcd	3,510	cde	405	g	3	7.10	defg
SVGF2074	56	10,520	abcd	8,172	bcdef	3,851	cdefg	4,321	bcd	1,271	def	3	7.51	cde
HMX 017-5756	54	8,619	cdef	7,959	bcdef	5,224	bcde	2,736	de	929	efg	3	7.04	efgh
Asya (flat pod)	56	9,529	bcdef	7,929	bcdef	2,941	efg	4,988	bc	1,405	cde	NA	9.08	a
Word Cup	55	9,825	bcdef	7,829	bcdef	3,933	cdefg	3,896	bcd	1,444	cde	3	6.94	efgh
HMC 017711	56	9,124	bcdef	7,637	cdef	4,212	cdefg	3,426	cde	660	fg	3	7.72	cd
HMX 016-4423	54	7,669	def	6,739	def	2,942	efg	3,798	bcd	876	efg	3	7.51	cde
Jackson	62	8,013	def	6,569	def	2,389	g	4,180	bcd	1,466	cde	3	6.83	fgh
Caprice	54	7,705	def	6,546	def	2,570	fg	3,976	bcd	2,728	а	3	7.16	def
Colter	51	7,097	ef	6,221	ef	3,337	defg	2,884	de	2,348	ab	3	7.06	efgh
SV1286GW	58	6,707	f	5,539	f	3,545	defg	1,995	e	1,392	cde	3	6.51	gh
p-value		0.0026		0.0055		0.0012		0.0006		<0.000	01		<0.00	01
Fisher's LSD ¹		3253.2		3060.5		2283.0		1656.4		667.7			0.632	
Coefficient of Varia	ation	23.2		25.3		36.7		28.3		34.1			19.3	

Table 2. July 15 Planted Trial: Days to Harvest; Total, Marketable, Fancy, No.1 and Cull Yield in Pounds Per Acre; Average Seed Size for Size 3 Pods

Variety	% Marketable	% Fancy	% No. 1
PV 857	82.5 a	38.3 a	44.3 abcd
SVGF2091	77.3 ab	30.8 b	46.3 abc
Silverado	77.0 ab	29.5 bc	47.8 ab
Bridger	75.0 abc	28.3 bc	47.0 ab
HM 5101	68.8 bcd	22.8 cde	46.3 abc
HMX 017-5722	63.0 cde	13.0 fgh	50.0 a
Colter	61.3 de	18.0 def	43.8 abcd
Sybaris	61.3 de	15.8 efg	45.5 abce
HMX 017-5756	59.0 de	23.5 cd	35.8 bcdef
PV 946	58.3 de	12.5 fgh	46.3 abc
SVGF2074	54.5 ef	17.0 def	37.5 bcdef
HMX 016-4423	54.0 efg	8.3 hij	46.0 abc
BEX175 (flat pod)	53.8 efg	8.8 ghij	45.0 abcd
Asya (flat pod)	52.8 efgh	11.8 fghi	41.0 abcde
Affirmed	43.5 fghi	9.8 ghi	33.8 def
Jackson	41.0 ghi	8.0 hij	33.5 def
Caprice	40.0 hi	5.3 ij	34.8 cdef
HMC 017711	37.8 i	6.8 hij	31.0 efg
SVGG2106	33.5 ij	5.0 ij	28.8 fg
Word Cup	22.0 jk	2.3 j	19.8 gh
SV1286GW	13.5 k	1.8 j	11.8 h
p-value	<0.0001	<0.0001	<0.0001
Fisher's LSD ¹	13.4	7.1	12.2
Coefficient of Variation	17.6	33.2	22.3

Table 3. June 9 Planted Trial: Percent of Yield in Each Quality Grade

Variety	% Mar	ketable	% F	ancy	% N	No. 1
PV 857	96.3	а	61.5	а	34.8	efg
Silverado	90.8	ab	56.5	ab	34.3	efg
HMX 017-5756	90.8	ab	57.8	ab	33.3	fg
SVGF2091	88.5	bc	54.8	ab	34.0	efg
SVGG2106	88.5	bc	37.3	efgh	51.3	abc
HM 5101	88.3	bc	43.8	cdefg	44.8	abcdef
Bridger	87.3	bcd	45.3	bcdefg	41.8	abcdefg
HMX 016-4423	87.3	bcd	37.8	efgh	49.5	abcd
Colter	87.0	bcd	47.0	bcdef	39.8	cdef
Affirmed	86.8	bcd	49.5	abcde	37.5	efg
HMX 017-5722	86.5	bcd	51.8	abcd	34.0	efg
Sybaris	85.5	bcde	39.8	defgh	45.3	abcde
BEX175 (flat pod)	84.3	bcdef	40.0	defgh	43.8	abcdef
Caprice	84.0	bcdef	33.0	gh	51.0	abc
HMC 017711	83.5	cdef	45.8	bcdef	38.3	defg
Asya (flat pod)	83.0	cdefg	30.0	h	53.0	а
Jackson	81.8	cdefg	29.0	h	52.8	ab
SV1286GW	80.5	defg	49.3	abcde	31.5	g
PV 946	79.5	efg	27.8	h	51.8	ab
Word Cup	78.3	fg	36.3	fgh	42.3	abcdefg
SVGF2074	76.5	g	35.8	fgh	41.3	bcdefg
p-value	<0.0001		<0.0001		0.0003	
Fisher's LSD ¹	6.8		12.5		11.5	
Coefficient of Variation	5.7		20.4		19.3	

 Table 4. July 15 Planted Trial: Percent of Yield in Each Quality Grade

Variety	% Grade 2	% Grade 3	% Grade 4	% Grade 5	Grade 3 Average Seed Length (mm)
SV1286GW	11.7 a	88.3 a	0.0 h	0.0 g	8.0 c
PV 857	0.8 b	54.3 b	43.8 fg	1.3 fg	7.0 d
SVGF2074	0.0 b	48.5 bc	50.8 efg	0.8 g	6.4 e
HMX 017-5722	0.8 b	43.5 bcd	51.3 efg	4.5 efg	5.8 efg
SVGG2106	0.5 b	41.0 bcde	58.5 cdef	0.0 g	8.0 c
Jackson	0.3 b	37.8 cdef	54.5 def	7.3 cdefg	5.8 efg
Colter	3.0 b	36.8 cdef	57.0 cdef	3.8 fg	6.0 ef
Silverado	2.3 b	35.8 cdef	46.3 fg	15.5 cde	5.3 g
Sybaris	0.5 b	35.8 cdef	57.8 cdef	6.0 defg	5.8 efg
HM 5101	2.5 b	33.3 def	47.0 fg	17.8 c	5.7 efg
Affirmed	0.0 b	28.5 efg	65.5 bcde	6.0 defg	5.8 efg
SVGF2091	0.3 b	28.3 efg	71.0 abcd	0.5 g	6.2 ef
Caprice	0.0 b	26.0 fgh	70.3 abcd	4.0 fg	5.9 ef
HMX 016-4423	0.3 b	23.0 fgh	73.3 abc	3.0 fg	6.0 ef
HMX 017-5756	0.0 b	17.8 ghi	64.8 bcde	17.0 cd	6.1 ef
PV 946	0.0 b	12.8 hij	82.5 a	4.8 efg	5.6 fg
Bridger	0.5 b	12.3 hij	36.8 g	50.5 b	7.3 d
HMC 017711	0.0 b	7.8 ij	80.0 ab	12.3 cdef	8.0 c
Word Cup	0.0 b	0.0 j	11.8 h	88.3 a	9.2 b
p-value	0.0038	<0.0001	<0.0001	<0.0001	<0.0001
Fisher's LSD ¹	4.27	14.78	16.55	11.24	0.61
C.V.	276.1	32.9	21.2	60.6	20.5

 Table 5. June 9 Planted Trial: 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)
SV1286GW	44.3 a	49.5 defgh	6.3 g	0.0 e	0.0 a	6.51 gh
SVGG2106	5.8 bc	81.8 a	13.0 fg	0.0 e	0.0 a	7.86 bc
Jackson	1.0 cd	75.8 ab	22.0 efg	1.5 de	0.0 a	6.83 fgh
Affirmed	1.0 cd	75.8 ab	23.5 def	0.0 e	0.0 a	6.94 efgh
HMC 017711	2.8 bcd	72.5 ab	23.3 def	1.5 de	0.0 a	7.72 cd
PV 946	2.0 bcd	71.8 abc	22.8 defg	3.8 cde	0.0 a	7.98 bc
Silverado	3.0 bcd	65.3 abcd	30.0 cde	1.8 de	0.0 a	7.04 efgh
HM 5101	2.3 bcd	63.5 bcde	23.3 def	11.3 bcd	0.0 a	7.47 cde
HMX 016-4423	3.0 bcd	63.0 bcde	33.3 abcde	0.8 e	0.0 a	7.51 cde
SVGF2074	1.0 cd	60.8 bcde	38.5 abcde	0.0 e	0.0 a	7.51 cde
SVGF2091	0.0 d	60.0 bcdef	39.3 abcd	0.8 e	0.0 a	8.41 b
Caprice	2.3 bcd	59.8 bcdefg	36.8 abcde	1.3 de	0.0 a	7.16 def
HMX 017-5722	1.0 cd	55.3 cdefgh	30.5 cde	13.5 bc	0.0 a	7.10 defg
Colter	1.0 cd	48.5 defgh	44.8 abc	6.3 bcde	0.0 a	7.06 efgh
Word Cup	6.5 b	48.0 efgh	40.8 abc	4.8 bcde	0.0 a	6.94 efgh
PV 857	1.8 bcd	43.3 fgh	48.5 a	6.3 bcde	0.0 a	6.44 h
Sybaris	1.0 cd	43.0 gh	47.8 ab	8.3 bcde	0.0 a	7.38 def
HMX 017-5756	1.5 bcd	42.3 hi	42.3 abc	14.0 b	0.0 a	7.04 efgh
Bridger	4.0 bcd	26.0 i	31.3 bcde	33.8 a	4.8 a	7.70 cd
p-value	<0.0001	<0.0001	<0.0001	<0.0001	0.109	<0.0001
Fisher's LSD ¹	5.46	16762.00	16.94	10.22	NA	0.63
C.V.	86.1	20.3	38.0	125.4	700.4	19.3

Table 6. July 15 Planted Trial: Varieties by Percent of Marketable Pods in Each Diameter Size Grade

Variety	Jun 9 Trial Pod	Jul 15 Trial Pod	Overall Average
	Length (cm)	Length (cm)	Pod Length (cm)
BEX175 (flat pod)	12.6 a	14.9 a	13.8
Asya (flat pod)	11.4 b	13.3 bc	12.3
Bridger	10.5 cd	13.3 bc	11.9
Silverado	10.0 efgh	13.7 b	11.8
HMX 017-5722	10.6 c	12.5 de	11.6
Jackson	9.9 fgh	13.2 c	11.6
SVGF2091	10.2 defg	12.7 d	11.4
PV 946	9.9 fgh	12.7 d	11.3
Sybaris	10.4 cde	12.1 fg	11.2
PV 857	10.3 cdef	12.2 ef	11.2
SVGF2074	10.2 cdefg	12.1 ef	11.2
Affirmed	9.9 fgh	12.1 fg	11.0
HMX 017-5756	10.0 defgh	11.6 hi	10.8
Word Cup	9.7 hij	11.7 ghi	10.7
HMX 016-4423	9.8 ghi	11.5 i	10.7
HM 5101	9.2 k	12.0 fgh	10.6
Caprice	9.4 ijk	11.8 fghi	10.6
HMC 017711	9.3 jk	11.8 fghi	10.5
Colter	9.6 hijk	11.4 ij	10.5
SVGG2106	9.2 k	11.1 j	10.1
p-value	<0.0001	<0.0001	
Fisher's LSD ¹	0.118	0.432	
C.V.	10.1	8.0	

 Table 7. Pod Length in Centimeters of Marketable Grade 3 Pods for Both Trials and Overall Average

Variety	Jun 9 Trial Seed	Jul 15 Trial Seed	Overall Average
	Length (mm)	Length (mm)	Seed Length (mm)
Asya (flat pod)	10.28 a	9.08 a	9.68
BEX175 (flat pod)	7.51 cd	9.21 a	8.36
Word Cup	9.18 b	6.94 efgh	8.06
SVGG2106	8.04 c	7.86 bc	7.95
HMC 017711	7.98 c	7.72 cd	7.85
Bridger	7.26 d	7.70 cd	7.48
SVGF2091	6.21 ef	8.41 b	7.31
SV1286GW	7.98 c	6.51 gh	7.24
SVGF2074	6.35 e	7.51 cde	6.93
PV 946	5.62 fg	7.98 bc	6.80
HMX 016-4423	5.97 ef	7.51 cde	6.74
PV 857	6.97 d	6.44 h	6.71
HM 5101	5.75 efg	7.47 cde	6.61
Sybaris	5.80 efg	7.38 def	6.59
HMX 017-5756	6.11 ef	7.04 efgh	6.57
Colter	6.05 ef	7.06 efgh	6.55
Caprice	5.94 ef	7.16 def	6.55
HMX 017-5722	5.80 efg	7.10 defg	6.45
Affirmed	5.81 efg	6.94 efgh	6.38
Jackson	5.76 efg	6.83 fgh	6.29
p-value	<0.0001	<0.0001	
Fisher's LSD ¹	0.609	0.632	
C.V.	20.5	19.3	

 Table 8. Seed Length in Millimeters from Marketable Grade 3 Pods for Both Trials and

 Overall Average

	Jun 9	Trial	Jul 15	Trial	Overall	
	Height (cm)	Width (cm)	Height (cm)	Width (cm)	Height	Width
HMX 016-4423	50.5 a	49.0 a	49.0 bcd	49.3 a	49.8	49.1
Silverado	40.8 bcd	42.5 a	51.8 ab	55.5 a	46.3	49.0
SVGG2106	41.3 bc	40.3 a	57.5 a	49.0 a	49.4	44.6
Word Cup	41.0 bc	39.8 a	50.0 bcd	54.3 a	45.5	47.0
BEX175 (flat pod)	43.5 b	43.5 a	46.0 bcde	50.8 a	44.8	47.1
Asya (flat pod)	38.8 bcd	41.3 a	45.3 cde	58.8 a	42.0	50.0
HMX 017-5722	40.8 bcd	44.5 a	47.5 bcde	50.0 a	44.1	47.3
PV 857	37.5 cd	40.3 a	47.8 bcde	57.5 a	42.6	48.9
Sybaris	39.5 bcd	42.8 a	45.0 de	54.3 a	42.3	48.5
Caprice	41.0 bc	36.5 a	49.3 bcd	53.5 a	45.1	45.0
Bridger	39.3 bcd	42.3 a	47.3 bcde	50.8 a	43.3	46.5
SVGF2091	40.0 bcd	40.0 a	44.3 de	55.3 a	42.1	47.6
HMX 017-5756	41.1 bc	36.5 a	51.3 bc	48.8 a	46.2	42.6
Colter	40.8 bcd	39.0 a	46.5 bcde	50.5 a	43.6	44.8
Affirmed	39.0 bcd	41.0 a	45.5 cde	49.3 a	42.3	45.1
PV 946	37.3 cd	43.0 a	42.0 e	52.8 a	39.6	47.9
SVGF2074	38.3 bcd	35.5 a	47.0 bcde	53.0 a	42.6	44.3
HM 5101	37.3 cd	39.3 a	45.5 cde	50.3 a	41.4	44.8
HMC 017711	39.8 bcd	39.5 a	44.3 de	47.0 a	42.0	43.3
SV1286GW	35.5 d	34.0 a	44.3 de	44.3 a	39.9	39.1
Jackson	36.0 cd	36.0 a	42.5 e	42.5 a	39.3	39.3
p-value	0.0015	0.0896	0.0026	0.5890		
Fisher's LSD ¹	5.33	NA	6.24	NA		
C.V.	9.4	13.7	9.4	16.6		

 Table 9. Plant Height and Width in Centimeters for Both Trials and Overall Average

Figure 1. June 9-planted snap bean trial, photo taken on July 27, 2020, the first day of harvest.



Figure 2. June 9 Planted Trial: 300 g Sample from Block 4 of Each Variety Graded into Fancy, No. 1 and Cull Categories



Figure 2 continued. June 9 Planted Trial: 300 g Sample from Block 4 of Each Variety Graded into Fancy, No. 1 and Cull Categories



HMX 017 5756



SVGF2074















Figure 2 continued. June 9 Planted Trial: 300 g Sample from Block 4 of Each Variety Graded into Fancy, No. 1 and Cull Categories







Appendix A: Daily Maximum and Minimum Temperatures and Rainfall for Period of June 9, 2020 (first planting) to September 15 (final harvest) for Snap Bean Trials at Georgetown, Delaware

Date	Days Afte	er Planting	Max Temp	Min Temp	Rainfall
	June 9	July 15	(F)	(F)	(in)
9-Jun	0		89.6	54.7	0
10-Jun	1		91.6	72.3	0
11-Jun	2		82.6	70.4	1.48
12-Jun	3		85.3	67.2	0.01
13-Jun	4		78.2	59.5	0
14-Jun	5		72.4	55.6	0
15-Jun	6		71.3	58.5	0
16-Jun	7		71.4	60.4	0
17-Jun	8		66.1	60.4	0.25
18-Jun	9		81.9	64.9	0.02
19-Jun	10		83.7	61.8	0
20-Jun	11		84.3	65.1	0
21-Jun	12		83.4	66.4	0.7
22-Jun	13		87.6	66.0	0.01
23-Jun	14		91.0	68.0	0
24-Jun	15		84.2	68.2	0.01
25-Jun	16		80.1	67.9	0.05
26-Jun	17		86.3	62.7	0
27-Jun	18		90.4	71.9	0
28-Jun	19		89.8	72.3	0
29-Jun	20		89.1	70.6	0
30-Jun	21		88.8	67.8	0
1-Jul	22		80.0	68.8	0.24
2-Jul	23		88.5	65.4	0
3-Jul	24		94.9	70.9	0
4-Jul	25		86.6	70.5	0
5-Jul	26		90.9	66.8	0
6-Jul	27		91.5	68.8	0.86
7-Jul	28		83.9	69.0	0.88
8-Jul	29		87.0	71.6	0
9-Jul	30		85.7	72.6	0
10-Jul	31		82.6	72.4	3.08
11-Jul	32		88.2	74.6	0
12-Jul	33		89.3	68.0	0
13-Jul	34		86.3	71.0	0
14-Jul	35		86.3	70.0	0
15-Jul	36	0	86.6	64.5	0
16-Jul	37	1	80.4	67.8	0
17-Jul	38	2	88.9	68.1	0
18-Jul	39	3	93.6	74.9	0
19-Jul	40	4	92.8	72.8	0
20-Jul	41	5	95.4	79.0	0
21-Jul	42	6	94.6	75.1	0
22-Jul	43	7	92.2	73.2	0.01
23-Jul	44	8	91.9	72.0	0
24-Jul	45	9	85.3	74.3	0.02
25-Jul	46	10	88.8	70.7	0
26-Jul	47	11	94.1	73.6	0
27-Jul	48	12	93.6	73.8	0
28-Jul	49	13	94.2	74.6	0.07
29-Jul	50	14	91.9	74.1	0.01

Date	Days Afte	er Planting	Max Temp	Min Temp	Rainfall
	June 9	July 15	(F)	(F)	(in)
30-Jul	51	15	92.3	71.1	0.06
31-Jul	52	16	77.9	72.8	0.55
1-Aug	53	17	87.5	71.7	0
2-Aug	54	18	90.9	74.7	0
3-Aug	55	19	89.3	75.0	0.08
4-Aug		20	83.9	71.4	0.71
5-Aug		21	88.1	71.7	0
6-Aug		22	81.2	70.4	0.05
7-Aug		23	85.5	70.8	0.03
8-Aug		24	85.8	69.6	0.14
9-Aug		25	88.5	66.2	0
10-Aug		26	90.2	71.1	0
11-Aug		27	88.7	72.6	0
12-Aug		28	91.2	72.4	0.24
13-Aug		29	83.0	72.4	0.85
14-Aug		30	82.9	69.2	0.8
15-Aug		31	77.1	67.7	0
16-Aug		32	73.6	68.3	0.48
17-Aug		33	82.1	63.9	0.10
18-Aug		34	84.6	65.0	0
19-Aug		35	80.9	65.6	0.68
20-Aug		36	80.3	63.1	0.00
20 Aug		37	83.0	60.8	0.01
27-Aug		38	82.4	70.4	0.08
22-Aug		30	87.7	69.0	0.00
20-Aug		40	88.5	7/ 1	0
25-Aug		40	88.5	73.2	0
26-Aug		42	82.8	66.1	0
20-Aug		42	02.0	71 /	0
28-Aug		43	91.0	73.5	0.23
20-Aug		44	84.2	73.5	1 10
29-Aug		45	70.4	62.3	1.19
21 Aug		40	79.4	50.2	0
1 Son		47	00.2	09.3 60.2	0
1-Sep		40	03.0	09.3 60.9	0
2-Sep		49	07.2	09.0	0 60
3-Sep		50	90.3	72.3	0.09
4-Sep		51	07.9	72.4	0.37
5-Sep		52	/ 0.0	60.5 50.5	0
o-Sep		53	82.2	50.5	0
/-Sep		54	80.8	55.9	0
ö-Sep		55	83.4	01.8	0
9-Sep		56	81.0	69.8	0.03
10-Sep		57	84.0	73.9	0.3
11-Sep		58	/9./	/1.4	0.02
12-Sep		59	/3.8	62.5	0
13-Sep		60	79.5	62.3	0
14-Sep		61	76.8	60.9	0
15-Sep		62	69.0	51.3	0



Temperature and Rainfall for the June 9 Planted Snap Bean Trial from June 9 (planting) August 3 (final harvest)



Temperature and Rainfall for the July 15 Planted Snap Bean Trial from July 15 (planting) September 15 (final harvest)