

## 2017 University of Delaware Spring Broccoli Variety Trial

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A spring broccoli variety trial was conducted in 2017 at the University of Delaware research farm near Georgetown, DE.

### Varieties evaluated and participating companies:

Variety	Source
Burney	Bejo
Destiny	Sakata
Diplomat	Sakata
Durapak 16	Syngenta
Eastern Crown	Sakata
Emerald Crown	Sakata
Emerald Jewel	Sakata
Emerald Star	Sakata
Everest	Syngenta
Green Gold	Sakata
Green Magic	Sakata
Gypsy	Sakata
Imperial	Sakata
Iron Man	Seminis
Lieutenant	Seminis
Luna	HM Clause
Millennium	Sakata
Sakata 3563	Sakata
Sakata 6316	Sakata
Sakata 6317	Sakata

### Materials and Methods

There were 22 varieties in the 2 spring trials. Seeds of each variety were planted in 72 cell trays in the greenhouse on February 22 and March 8, 2017. Plants were transplanted to the field on April 3 for planting 1 and April 17 for planting 2. The soil was a Hammonton loamy sand. Plots were 7' long with 4 rows wide with 1' between rows and 1' between plants (28 plants). The experimental design was a randomized complete block with 4 replications. Herbicides applied were: Roundup 1 qt/A, Prefar 6 qt/A, Goal 1 pt/A. Fertilizer applied preplant included 80 lbs N and 60 lbs K20 per acre. Additional N was applied at a rate of 50 lbs N per acre 3 and 6 weeks after planting. Insecticides were applied 6, first application was Radiant followed by 5 weekly

applications of Dipel. Fungicide was applied two times and consisted of azoxystrobin (Quadris). Irrigation was provided by overhead sprinklers. Plots were hand weeded. Plots were harvested from the May 31 to June 19 in planting 1 and June 8 to June 26 in planting 2. Plots were harvested as crown cuts. Target head size was 4 inches in diameter and heads were cut 1 inch below the lowest floret attachment. Data collected included marketable and cull head number and weight, crown diameter, crown height, head uniformity ratings, head evenness ratings, hollow stem incidence, and brown bead ratings. Descriptive characteristics included color and dome shape.

## **Results**

Yield results are presented in Tables 1 and 2. In the April 3 planting, Eastern Crown had the highest marketable yield with 467 boxes per acre and 9 % cull. Both Luna and Sakata 6316 also yielded over 400 boxes per acre (452 and 429 respectively). Yields of other varieties tested were below 400 boxes per acre in trial 1. In the April 17 planting, Millenium significantly outyielded all varieties with 641 boxes per acre and 0 percent culls. Other varieties yielding over 400 boxes per acre were Eastern Crown, Emerald Crown, and Sakata 6316 (488, 423, and 406 respectively).

Head and crown characteristics are shown in Table 3. Average head weights ranged from 0.36 to 0.53 lbs, average crown diameters ranged from 3.31 to 4.31 inches, and average crown height ranged from 1.95 to 2.42 inches. Gypsy and Iron Man had the most uniform marketable heads. Color, dome shape, brown bead severity, hollow stem severity and head evenness ratings are presented in Table 4. Gypsy and Sakata 6316 had the lowest dome shape. Destiny, Eastern Crown, Green Gold, and Sakata 3563 had the highest ratings for brown bead. Diplomat, Gypsy, and Imperial had significant hollow stem. Iron Man, Gypsy, Everest, Emerald Jewel, Emerald Crown, and Diplomat had the highest ratings for head evenness.

Table 1. Broccoli marketable yields and cull percent, UD-REC, Georgetown, Spring 2017, April 3 planting.

Variety	Marketable Yield		Cull
	lbs/acre	boxes/acre	%
<b>Eastern Crown</b>	10742	467	9
<b>Luna</b>	10390	452	16
<b>Sakata 6316</b>	9866	429	39
<b>Sakata 6317</b>	9097	396	30
<b>Emerald Crown</b>	8680	377	16
<b>Gypsy</b>	8340	363	15
<b>Sakata 3563</b>	8232	358	15
<b>Green Gold</b>	7475	325	22
<b>Lieutenant</b>	7095	308	21
<b>Everest</b>	6983	304	23
<b>Millennium</b>	6618	288	6
<b>Imperial</b>	6278	273	5
<b>Emerald Star</b>	6274	273	14
<b>Green Magic</b>	6098	265	32
<b>Durapak 16</b>	5818	253	10
<b>Iron Man</b>	5589	243	9
<b>Burney</b>	5461	237	34
<b>Emerald Jewel</b>	5261	229	8
<b>Diplomat</b>	5137	223	20
<b>Destiny</b>	4921	214	42
<b>p 0.05</b>	0.014		
<b>LSD</b>	1891		

Table 2. Broccoli marketable yields and cull percent, UD-REC, Georgetown, Spring 2017, April 17 planting.

Variety	Marketable Yield		Cull
	lbs/acre	boxes/acre	%
<b>Millennium</b>	14735	641	0
<b>Eastern Crown</b>	11214	488	3
<b>Emerald Crown</b>	9732	423	9
<b>Sakata 6316</b>	9342	406	16
<b>Gypsy</b>	9033	393	7
<b>Green Gold</b>	8433	367	6
<b>Sakata 3563</b>	8324	362	10
<b>Luna</b>	8255	359	10
<b>Green Magic</b>	7745	337	10
<b>Durapak 16</b>	7574	329	9
<b>Everest</b>	6812	296	24
<b>Emerald Star</b>	6726	292	0
<b>Imperial</b>	6681	290	3
<b>Lieutenant</b>	6595	287	19
<b>Diplomat</b>	5530	240	6
<b>Burney</b>	5043	219	17
<b>Sakata 6317</b>	3778	164	41
<b>Iron Man</b>	3526	153	3
<b>Destiny</b>	3509	153	45
<b>Emerald Jewel</b>	2988	130	6
<b>p 0.05</b>	0.001		
<b>LSD</b>	2219		

**Eastern Crown**



**Millennium**



Table 3. Broccoli head and crown characteristics, UD-REC, Georgetown, Spring 2017

Variety	Head Weight	Crown		Head Uniformity
		Diameter	Height	
	(lbs)	(inches)	(inches)	(1 low – 5 high)
<b>Burney</b>	0.47	4.09	2.18	3.57
<b>Destiny</b>	0.46	4.01	2.31	3.80
<b>Diplomat</b>	0.42	4.28	2.28	3.91
<b>Durapak 16</b>	0.43	3.77	2.04	3.27
<b>Eastern Crown</b>	0.49	3.67	2.34	3.06
<b>Emerald Crown</b>	0.48	4.13	2.42	3.79
<b>Emerald Jewel</b>	0.43	3.87	2.17	3.97
<b>Emerald Star</b>	0.53	4.09	2.28	3.15
<b>Everest</b>	0.36	3.34	2.12	3.62
<b>Green Gold</b>	0.53	3.94	2.30	3.28
<b>Green Magic</b>	0.46	3.99	2.27	3.55
<b>Gypsy</b>	0.45	3.68	2.10	4.09
<b>Imperial</b>	0.48	3.85	2.26	3.57
<b>Iron Man</b>	0.49	4.31	2.16	4.25
<b>Lieutenant</b>	0.40	3.78	1.95	3.27
<b>Luna</b>	0.48	3.52	2.09	3.50
<b>Millennium</b>	0.46	3.31	2.37	2.74
<b>Sakata 3563</b>	0.50	3.82	2.31	3.20
<b>Sakata 6316</b>	0.45	3.66	2.36	3.41
<b>Sakata 6317</b>	0.44	4.12	2.33	3.44

Table 4. Broccoli variety comments and characteristics, UD-REC, Georgetown, Spring, 2017.

Variety	Color	Brown Bead <sup>1</sup>	Dome Shape	Hollow Stem	Head Evenness <sup>2</sup>
		0-10			1-5
<b>Burney</b>	Green	0	Semi Dome	Minor	3.8
<b>Destiny</b>	Blue Green	3	Semi Dome	None	3.4
<b>Diplomat</b>	Blue Green	0	Semi Dome	> 50%	4.0
<b>Durapak 16</b>	Blue Green	0	Semi Dome	Minor	3.5
<b>Eastern Crown</b>	Blue Green	3	Full Dome	None	3.3
<b>Emerald Crown</b>	Green	2	Full Dome	None	4.3
<b>Emerald Jewel</b>	Blue Green	0	Semi Dome	None	4.5
<b>Emerald Star</b>	Blue Green	1	Full Dome	None	3.3
<b>Everest</b>	Green	2	Semi Dome	None	4.1
<b>Green Gold</b>	Green	3	Full Dome	Minor	3.4
<b>Green Magic</b>	Blue Green	2	Semi Dome	Minor	3.5
<b>Gypsy</b>	Blue Green	1	Low Dome	>50%	4.1
<b>Imperial</b>	Blue Green	0	Semi Dome	25%	3.6
<b>Iron Man</b>	Blue Green	0	Semi Dome	None	4.6
<b>Lieutenant</b>	Green	1	Semi Dome	Minor	3.4
<b>Luna</b>	Blue Green	0	Semi Dome	None	3.6
<b>Millennium</b>	Green	1	Full Dome	None	2.5
<b>Sakata 3563</b>	Green	3	Semi Dome	None	3.4
<b>Sakata 6316</b>	Green	1	Low Dome	None	3.7
<b>Sakata 6317</b>	Green	1	Semi Dome	None	2.5

<sup>1</sup>Brown bead severity 0 = None to 10 = present on all heads

<sup>2</sup>Head evenness rating 1 = very uneven to 5 = very even

Appendix B1. Weather data for the Georgetown REC site April 2017.

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>G</b>	<b>H</b>	<b>I</b>	<b>J</b>	<b>K</b>	<b>L</b>	<b>M</b>	<b>N</b>	<b>O</b>
1	49.8	54.8	44.5	0	76.7	95.7	64.2	10.5	11.9	0.01	0.08	53.3	54.5	52.1
2	51	61.4	41.4	1.4	57.9	78.2	33.1	23.6	6.7	0	0.15	53.6	58.8	49.5
3	55.4	68.5	42.7	5.6	61.1	93.7	26.8	18.9	9.5	0.17	0.18	54.1	57.6	50.5
4	68.5	78.7	57.4	18	69.1	93.2	42	20	11.8	0.01	0.21	58.8	63.2	55.1
5	60.4	73.6	51.4	12.5	61.4	91.3	35.8	20.7	6.8	0	0.17	59.4	64	55.5
6	58.6	68.6	52.1	10.3	79.3	94.6	47.8	9.2	11.8	0.83	0.13	58.3	59.7	57.1
7	48.1	56.7	43.4	0	52.3	61.2	44	9.8	15.7	0	0.15	54.3	57.4	51.6
8	48.4	59.8	38.1	0	42.1	68.4	23.1	24.5	10.8	0	0.18	52	55.8	48.4
9	52.4	68.6	33	0.8	50.6	91.7	20.4	25.3	4.1	0	0.16	53.7	60	48.1
10	62.6	77.4	44.8	11.1	51.4	83.6	28.1	24.4	10.3	0	0.24	56.4	61.1	52
11	67.9	80.5	58.7	19.6	61.8	77.6	38.3	24.1	9.7	0	0.24	59.8	64.7	55.9
12	67.8	77.8	53.5	15.6	62.7	87.5	37.8	21.3	7.6	0	0.2	62.1	66.1	58.8
13	56.9	68.8	44.3	6.6	55.9	87	27	23.2	4.5	0	0.16	60.7	65	56.7
14	54.4	68.9	42.9	5.9	64.2	93.5	35.4	20.4	3.5	0	0.14	60.2	64.7	56.6
15	60.9	73.7	45.8	9.7	72.5	86.7	55.3	14.8	7.7	0	0.14	59.8	63	57.2
16	74.7	85.6	63.7	24.7	56.7	89.6	31.4	23.4	12.1	0	0.28	63.7	68	60.5
17	66.7	75.5	50.4	13	69.1	96.1	49.9	13.3	7.4	0	0.14	64.1	66.1	62.3
18	55.7	64	47	5.5	63.7	97.7	35.4	25.9	6.3	0	0.16	62.2	66.8	58.5
19	53.5	60	43.6	1.8	77	94.9	58.1	11.9	5.7	0	0.09	59.9	61.8	57.6
20	66.8	80.9	59.6	20.2	72	89.4	42.2	20	6.3	0	0.19	63.2	68.7	59.5
21	62.3	81.6	54.8	18.2	84	98.7	51.2	17.8	4.7	0	0.15	65.6	70.2	62.5
22	54	56.2	51.9	4.1	95.1	98.6	90.5	3	5.6	0.34	0.03	62.3	65.3	60.3
23	52.2	58.9	46.8	2.8	79	96.3	59.4	15.8	5.5	0	0.1	60.8	64.1	58
24	52.8	56.7	49.8	3.3	87	96.6	74.5	7	8.5	0.46	0.06	59.4	60.9	58.4
25	57.6	61.2	54	7.6	96.7	98.7	91.2	4.6	9.5	1.38	0.04	59	60.4	57.9
26	59.9	64.4	56	10.2	94.4	98.9	83.5	6.3	4.6	0.01	0.05	60.9	62.6	59.5
27	68.2	82.9	54.5	18.7	79	98.9	38.3	22.2	7.2	0	0.21	64.3	69.4	60.2
28	75	85.4	66.8	26.1	67.1	91.3	40.1	25	6.8	0	0.23	68.8	74.6	64.5
29	79.8	89.3	71	30.1	74.2	92.7	39.8	21.1	10.5	0	0.26	71.5	75.3	68.6
30	72.4	83.6	58.1	20.9	79.8	97.2	54.8	21.9	5.6	0	0.18	73.1	77.4	69.7
31	49.8	54.8	44.5	0	76.7	95.7	64.2	10.5	11.9	0.01	0.08	53.3	54.5	52.1
A	Day													
B	Avg Temp			(°F)				I	Avg Solar			(MJ.m <sup>-2</sup> .day <sup>-1</sup> )		
C	Max Temp			(°F)				J	Avg Wind Speed			(mph)		
D	Min Temp			(°F)				K	Rainfall			(in)		
E	GDD			(base 50 °F)				L	Ref ET			(in day <sup>-1</sup> )		
F	Avg RH			(%)				M	Avg Soil Temp			(°F)		
G	Max RH			(%)				N	Max Soil Temp			(°F)		
H	Min RH			(%)				O	Min Soil Temp			(°F)		



Appendix B2. Weather data for the Georgetown REC site May 2017.

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>G</b>	<b>H</b>	<b>I</b>	<b>J</b>	<b>K</b>	<b>L</b>	<b>M</b>	<b>N</b>	<b>O</b>	
1	72.8	84.3	57.5	20.9	72.2	98.2	45.7	22.1	13.8	0	0.24	71.8	75	69	
2	71.6	77.1	57.1	17.1	59.9	91.9	23.1	26.1	14.5	0.17	0.28	71.6	74.7	69.3	
3	59.6	67.1	49.2	8.2	58.3	91.9	32.7	27.9	7.9	0	0.19	68.4	72.6	64.8	
4	56	63.5	46.7	5.1	65.9	89.5	44.7	23.5	7.4	0	0.15	66.6	71.2	62.4	
5	62.7	68.5	58.3	13.4	89.8	96.2	81.6	3	8.4	1.43	0.05	65.5	66.9	64.9	
6	59.5	67.4	51.3	9.3	76	90.2	62.3	10.6	11.7	0.01	0.12	65	66.4	62.8	
7	53.9	61.9	46.4	4.1	66.2	93.8	38.2	20.8	8.8	0.12	0.15	62.3	65.1	59.6	
8	52.3	60.3	44	2.1	53.7	96.6	26.3	29.2	7.8	0.01	0.18	62.4	67.2	58.3	
9	54.5	64.4	43.8	4.1	55.7	94	19.9	28.4	4.7	0	0.18	63.4	69.4	58.3	
10	58.9	72.4	44.2	8.3	67.5	96.7	31	23.9	3.5	0	0.17	65.1	71	59.6	
11	54.2	58.2	50.2	4.2	83.7	93	68.6	4.9	4.6	0.3	0.06	63.9	66.7	62	
12	52.4	56.4	49	2.7	80.3	94.9	65.5	10.8	5.5	0.3	0.08	62.2	64.3	60.3	
13	53.4	56.7	50.3	3.5	93.2	97.2	87.3	7.2	9.7	0.85	0.05	60.5	61.9	59.3	
14	61.9	76.3	46.5	11.4	65.6	97.6	30.2	26.2	8.7	0	0.23	62.7	68.9	57.6	
15	61.5	72.2	51.5	11.9	49.5	86.7	29	29.3	11	0	0.24	64.1	68.9	59.6	
16	64.8	78.9	47.3	13.1	59.8	93.8	30.3	28.9	4.1	0	0.21	66.1	73	60	
17	76.6	92.4	58.3	25.4	64.3	94.9	39.5	27.4	6.6	0	0.27	70.4	77.9	63.8	
18	80.2	89.6	72.4	31	58.1	71.2	44.3	27.1	10.9	0	0.31	73.8	79	69.4	
19	81.3	91.3	72.1	31.7	61.4	80.2	38.7	27	9.5	0	0.31	76.2	82	71.3	
20	64	74.7	52.2	13.5	63.8	84.3	46.7	26.8	8.7	0	0.21	74.7	77.7	71.7	
21	57.9	64.9	47.7	6.3	70.2	91.6	52.4	18.7	5.8	0	0.13	70	73.3	66.6	
22	64.4	69.5	58.9	14.2	93.5	98.6	83.1	4.7	2.7	0.59	0.05	68.9	70.4	67.6	
23	61.2	65	55.9	10.4	86.7	98.8	64.3	6.8	5.2	0.16	0.07	67.9	69.2	66.1	
24	59.4	65.2	55.7	10.4	87.5	96.9	66.2	11.4	6.4	0.15	0.09	66.5	69.7	64.4	
25	65.5	78.4	55.1	16.8	82	97.7	48.8	18.9	8.7	0.76	0.18	67.6	72.9	63.5	
26	67.4	75.5	58.9	17.2	71.2	93.2	52.7	21.3	10.7	0	0.19	68.4	71.7	64.9	
27	67.7	77.9	60.5	19.2	69.3	85.7	50.7	17.3	3.2	0	0.15	69.6	73.9	65.5	
28	65.1	75	59.6	17.3	83.3	96.8	59.7	15	4.5	0.38	0.13	70.1	73.3	67.3	
29	62.2	67.9	58.1	13	92.3	98.5	81.3	9.5	5.2	0.09	0.07	69.1	71.8	67.3	
30	61.9	67.8	57.2	12.5	93.5	98.1	86.8	5.5	5	0.2	0.05	67.4	68.7	66.3	
31	68.8	78.9	62	20.4	85.5	99	62.4	17.4	4.1	0.01	0.14	70.4	75.5	66.6	
A	Day														
B	Avg Temp			(°F)			I			Avg Solar			(MJ.m <sup>-2</sup> .day <sup>-1</sup> )		
C	Max Temp			(°F)			J			Avg Wind Speed			(mph)		
D	Min Temp			(°F)			K			Rainfall			(in)		
E	GDD			(base 50 °F)			L			Ref ET			(in day <sup>-1</sup> )		
F	Avg RH			(%)			M			Avg Soil Temp			(°F)		
G	Max RH			(%)			N			Max Soil Temp			(°F)		
H	Min RH			(%)			O			Min Soil Temp			(°F)		

Appendix B3. Weather data for the Georgetown REC site June 2017.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	72.7	82.8	63.1	23	66.6	98	29.3	27.2	5.9	0	0.24	73	78	68.8
2	70.7	82	57.6	19.8	56.9	94.8	25.7	27.3	5.5	0	0.24	73.1	77.9	68.4
3	67.1	77.9	53.5	15.7	61.5	90.9	36.4	21.2	5.4	0	0.19	71.2	75.7	67.2
4	71.2	86	53.1	19.6	63.7	97.2	30.1	27.3	6.8	0	0.26	72	78	66.4
5	70	74.4	63.7	19	88.1	96.6	73.9	5.7	7.2	0.3	0.08	71.9	73.7	70.4
6	66.2	74.7	59.7	17.2	89.2	98.3	64.8	17	4.2	0.01	0.13	71.8	76.2	68.3
7	59.3	65.3	52.3	8.8	78.7	94.8	57.3	18.8	5.9	0	0.13	70.4	72.7	68.2
8	57.4	65.8	49.1	7.5	78.3	95.9	53.5	15.9	4.3	0	0.12	67.1	69.5	64.5
9	67.1	81.8	47.8	14.8	63.8	97.3	33.5	29	6.4	0.02	0.24	68.6	75.1	62.9
10	75	86.6	60.3	23.5	62.1	96.2	30.6	28	7.5	0	0.27	72.5	78.1	67.4
11	79.9	92.9	66	29.5	60.9	91.2	32.2	28.7	6.4	0	0.29	75.7	82.1	70.3
12	81.9	93.2	71.3	32.3	61.6	88	35.5	27.9	5.6	0	0.28	78.6	84.5	73.7
13	82.8	94.2	72.9	33.5	67	91.7	39.4	26.5	7.1	0	0.28	79.8	84.6	75.5
14	76.6	84.5	65.4	25	72.2	93.5	50	26.3	7	0	0.23	80.1	83.9	77
15	69.1	77.9	60.8	19.4	78.2	94	56.7	21.2	5	0	0.17	77.3	80.7	74
16	74.7	87.4	67.2	27.3	81.8	97.6	46.5	23.9	3.1	0	0.2	79.2	84.9	74.9
17	78.7	89.6	70.9	30.2	79.2	96.9	50.3	24.1	8	0	0.24	80.6	84.3	77.4
18	80.7	88.6	73.9	31.2	78.2	95.9	58.8	21.8	11.1	0	0.22	80.4	83.6	77.7
19	80.6	90.6	70.7	30.7	76.7	96.4	53.9	21.6	13.5	1.23	0.25	80.1	83.7	77.9
20	75.8	82.2	70.1	26.2	77.7	96.4	43.3	19.5	7.6	0.03	0.2	78.5	81.4	76
21	76.1	83.9	69.8	26.8	79.1	96.1	54.7	23.2	8.4	0.2	0.21	78	82.1	74.7
22	79.2	87.2	71.2	29.2	80.7	97.7	55.9	20.6	3.7	0	0.18	79.7	83.9	75.6
23	79.7	86.6	71.9	29.3	81.1	95.3	67.2	18.1	11.2	0.17	0.18	79.2	81.6	77.1
24	80.7	86.6	68.7	27.7	67	91.5	42.7	26.6	11.3	0.1	0.28	80	83.4	77.4
25	76	85.6	64.3	24.9	67.2	97.2	36.7	25.6	3.6	0	0.22	79.2	83.9	74.6
26	73.4	82.1	62.3	22.2	54.9	87.4	29.3	29.6	4.9	0	0.25	79.4	83.8	74.9
27	70.8	81.1	62.7	21.9	63.9	91.2	33	23.6	5.1	0.02	0.21	78.3	82.4	74.5
28	68.8	79.5	54.8	17.2	57.5	92.2	27.7	29.5	5.3	0	0.24	77.3	82.1	72.8
29	73.8	85.7	61.5	23.6	64.1	85	40.8	26.9	9.8	0	0.27	77.2	81.2	73.4
30	78.3	87.5	68.9	28.2	73.2	93.8	51.8	27.9	10.8	0	0.26	78.6	82.8	75
A	Day													
B	Avg Temp			(°F)				I	Avg Solar			(MJ.m <sup>-2</sup> .day <sup>-1</sup> )		
C	Max Temp			(°F)				J	Avg Wind Speed			(mph)		
D	Min Temp			(°F)				K	Rainfall			(in)		
E	GDD			(base 50 °F)				L	Ref ET			(in day <sup>-1</sup> )		
F	Avg RH			(%)				M	Avg Soil Temp			(°F)		
G	Max RH			(%)				N	Max Soil Temp			(°F)		
H	Min RH			(%)				O	Min Soil Temp			(°F)		

