

**Small Plot Pickling Cucumber Variety Trial and  
Pickling Cucumber Evaluations for Traits Affecting Mechanical Harvest  
University of Delaware - 2010**

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## **Introduction**

A small plot pickling cucumber variety trial was conducted in 2010 to evaluate a wide range of commercially available and experimental pickling cucumber varieties for yield and traits that would affect mechanical harvest. It is a long range goal to develop a mechanical pickle harvester head that would be able to harvest off of plastic mulch, cover crop residue in no-till plantings, as well bare ground. This system would not bring any root material into the separating unit thus limiting the amount of soil carried. As a result, there would be reduced abrasion and less soil to wash and improved quality of harvested fruit would therefore be another potential benefit. As a part of this harvester head development project, there was a need to indentify characteristics of pickling cucumbers that would interact significantly with mechanical harvest and header design.

## **Materials and Methods**

A total of 23 commercial pickle varieties and experimental lines (Table 1) were evaluated in this study (not all are reported on due to confidentiality agreements). Plots were established in field 9 at the University of Delaware Research and Education Center near Georgetown, DE. The soil was Hurlock loamy sand. The area was tilled with a field cultivator prior to planting. Fertilizer consisted of 80 lbs. of nitrogen/acre incorporated preplant as UAN solution and 40 lbs of N sidedressed at 40 lbs/a. Soil phosphorus (P) and potassium (K) levels were optimum or above optimum so no additional P or K fertilizer was added. Herbicides consisted of Sandea (0.5 oz./A), Prefar (5 qts./a), and Curbit (1 pint per acre) applied preemergence and Select (10 oz/A) post emergence for additional grass control. Plots were also hand weeded for escaped weeds (mostly morningglory). Fungicide and insecticide applications consisted of chlorothalonil (1.5 pt /A) and Previcur Flex (1.2 pt/A) or chlorothalonil (1.5 pt /A) and Ranman (2.75 fl. oz./A) alternated for two applications each plus an insecticide lambda-cyhalothrin (Lamda Star 4 oz/A) sprayed 1 times. Irrigation was provided as needed.

Plots were laid out and planted on June 3, 2010. For gynococious varieties, appropriate pollenizer varieties at the recommended ratio were included with each entry. Each plot consisted of a single row of one of the 23 test varieties, 20 feet in length, bordered on either side by guard rows (Vlaspik). There were 30 inches between rows. The experiment design was a randomized complete block with 4 blocks. Three blocks were harvested. Each plot was seeded with a push planter at approximately 6 seeds per

foot. Each plot was then hand thinned 2 weeks after planting. One half of the each plot (10') was thinned to 35 plants. This was used for collecting yield data. The other half was thinned so that some plants remained at higher density (6 plants per foot), others at standard density (3-4 plants per foot), and some a low density (1-2 plants per foot). Plots were harvested from 41-43 days after planting. In gynoecious entries, only gynoecious plants were harvested for plant characteristics. At harvest, two plants were taken from each plot and the following data was taken: density grown at, uproot force, position of fruit set (node), main stem or branch set, internode length to fruit position, branch number, main stem length, and leaf number. Two 3A size pickles were then selected from plants and the following information was collected: force of detachment, stem end puncture, length, diameter, length:diameter ratio (L:D), and pedicel length. The 10 foot section for yield was harvested by hand and fruit numbers and weights were recorded by grade. A full grade was not taken due to the small plot size. Pickle fruits were sorted into 3, 2, oversize, and cull grades (there were few if any 1 grades). Marketable bushels were calculated from this information.

## Results and Discussion

Leaf number, main stem length, side branch number, and uproot force results by variety are presented in Table 2. Varieties varied from 14 to 45 leaves. Those varieties with the most side branches and longest stems had the most leaves. Varieties 2, 3, 4, 12, 15, 16, 18, and 22 had significantly fewer leaves than varieties 8, 9, 10, 14, 19, 21, and 23. Mean main stem length varied from 86 to 153 cm between varieties. Short vine varieties included 2, 3, 4, 15, 16, and 22. Long vine varieties included 8, 10, 17, 19, and 20. Heaviest branching varieties were 8 and 23 with over 5 branches per plant. Varieties with 2 or less branches were 12 and 13. Varieties with highest uproot force were 9, 12, 13, 14, 17, 19, and 20. Varieties with significantly lower uproot force were 2, 15, 18, and 22. Over all varieties, leaf number and side branch number increased significantly as plant densities decreased (Table 3). This was particularly evident in varieties 8, 14, and 21. Uproot force increased with increasing density in variety 1 but decreased with increasing density in varieties 8 and 14.

Fruit traits by variety are presented in Table 4. There were significant differences between varieties in fruit length, width, L:D ratio, pedicel length, force of detachment, and stem end penetration force. Varieties with L:D ratios 3.0 or above included 1, 2, 6, 14, 15, 18 and 19. Lowest L:D ratios were with varieties 4, 11, 20, and 22. Varieties 1, 6, 18, 19, 20, and 22 had significantly longer pedicels compared to 4, 9, 10, and 15 with shorter pedicels. Force of detachment was highest with varieties 3, 4, 6, 12, 15, and 22 (over 600 g) and lowest in varieties 13, and 17 (under 400 g). Stem end penetration force, a measure of potential for damage during detachment, was significantly higher in varieties 6, 12, 13, 15, and 20 (over 900 g) than in 3, 14, 17, 19, and 23 (under 720 g). There was a significant variety by density interaction with pedicel length and force of detachment. Pedicel length was greatest at high densities in variety 8, and 12 and lowest in variety 18. Force of detachment was greatest at high density in varieties 3 and 4 and lowest in variety 2.

Lengths of the first six internodes are shown in Table 6. The first internode was similar in all varieties. Longest second internodes were in varieties 12, 13, 15, 18, 20, and 22 (over 40 mm) and shortest second internodes were in varieties 1, 4, 6, 8, and 23 (30 mm or less). Varieties with third internodes greater than 40 mm include 11, 12, 13, 17, 18, 20, and 22 and varieties with third internodes 30 mm or less were 1, 2, 4, 6, 8, and 23. The longest fourth internodes were found in varieties 12, 18, and 22 (50 mm or more) and the shortest were found in varieties 4 and 23 (less than 30 mm). Varieties with fifth and sixth internodes 60 mm or greater included 2, 6, 11, 12, 15, 19, 20, and 22 and those with fifth or sixth internodes less than 40 mm included 8, 21, and 23. By internode 5, the varieties with overall shortest internode length were 1, 4, 6, 8, 14, 21, and 23 (under 200 mm) and the varieties with overall longest internode length (over 200 mm) were 9, 10, 12, 15, 17, 18, 19, 20, 22 (Figure 1).

Frequency distributions of pickle fruits by nodes on main stems are presented in Tables 7a and 7b. Those varieties that produced 20 percent or more fruits on nodes 1 and 2 combined were 1, 4, 8, 9, 16, and 20 and those varieties that produced 10 percent or less on nodes 1 and 2 combined were 10, 11, 13, 17, 18, 19, 21, and 23. Those varieties that produced 50 percent or more fruit at node 5 or greater were 8, 12, 14, 15, 17, and 21. Those varieties with 10 percent or more pickle set on nodes 7 or greater include 8, 10, 12, 15, 17, 21, and 23. The majority of fruit on most varieties were set on nodes 3 and 4 and those varieties with 50 percent or greater set on these nodes included 3, 6, 10, 11, 13, 16, 18, 20, and 22. The number of fruits set on main stems compared to branches is shown in Table 7c. Those varieties with 20 percent or more set on branches included 8, 10, 12, and 23. In Figure 2, frequency distributions are presented in bar chart form. Varieties 6, 20, and 22 were relatively evenly distributed over nodes 2 through 5. Varieties 11, 10, and 17 had no set on the first two nodes. Varieties 4 and 9 had relatively high set on nodes 1 and 2. Nodes where side branches bearing fruit were attached are shown in Table 8. Varieties 23 and 10 had fruit bearing branches relatively evenly distributed across nodes whereas varieties 4, 6, 8, and 21 had bearing branches concentrated at nodes 2, 3, and 4.

Mean location of fruits by distance from plant base are shown in Tables 9 and 10 for main stem and branch set pickles respectively. For the main stem set, varieties with first pickle set 70 mm or less from the plant base included 4, 6, 16, and 23 and those with first pickle set greater than 120 mm from the plant base included 12, 17, and 22. Varieties with second pickle set under 150 mm were 1, 2, 3, 4, 6, 8, 15, 16, 21, and 23 and those with set over 200 mm were 10, 11, 12, and 17. Varieties 11 and 12 did not have any plants setting more than 2 harvestable pickles. Variety 22 set at even distances for up to 8 pickles per plant on the main stem. Variety 23 had even set of pickles on branch stems (up to 6 pickles on branches). Most branch set occurred greater than 120 mm from the plant base. However, in varieties 4, 6, and 9, some branch set occurred less than 90 mm from the plant base.

While this study was not primarily designed as a yield trial, yield and grade information was taken and is shown in Table 11. Marketable yield greater than 300 bu/A was obtained with varieties 8 and 23. Varieties with less than 200 marketable bu/A were 6,

9, 10, 11, 12, and 14. Varieties 10, 11, and 14 had high percentages of culls. All other varieties had yields in the 200-300 bu/A range. Our standard varieties for this region, Expedition, Vlaspiik, Sassy, and Lafayette yielded 248, 154, 224, and 260 bu/A respectively.

The model pickling cucumber plant for improved harvest using a combing-oscillating-lifting cutterbar type head adapted to plasticulture, no-till, and bare ground culture would have the following characteristics:

- 1) First pickle set as far away from the plant base as possible without affecting days to harvest (to allow for pickup without fruit damage),
- 2) Internode lengths as long as possible in lower nodes (again to get increased distance for first pickle set),
- 3) High percentage of fruit set away from lower nodes without affecting days to harvest,
- 4) High uproot force (to limit uprooting during cutting),
- 5) Balanced main vine length, branch lengths, and foliage that would allow for ease of pickup but with adequate feeding into separation unit to limit damage,
- 6) High force of detachment and high puncture force for pickle fruits,
- 7) Balanced stem thickness at lower nodes to allow for ease of cut but that will not allow for stem breakage during combing and cutting,

Of course, varieties would need to have good yield potential, acceptable L:D ratio, and color.

In this trial, the variety seen as best fit for this style of harvester header is no. 17, Treasure (HMX5406).



Combing-oscillating-lifting cutter bar type header

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**Table 1.** Pickling cucumber variety number designations used in this report, UD REC, Georgetown, 2010.

<b>Designation</b>	<b>Variety</b>	<b>Source</b>
<b>1</b>	Journey	Seminis
<b>2</b>	Expedition	Seminis
<b>3</b>	Excursion	Seminis
<b>4</b>	Palomino	Seminis
<b>6</b>	Vlaspik	Seminis
<b>8</b>	Alibi	Bejo
<b>9</b>	Allianz	Bejo
<b>10</b>	Advance	Bejo
<b>11</b>	Atlantis	Bejo
<b>12</b>	Atomic	Bejo
<b>13</b>	Ardia	Bejo
<b>14</b>	Nun 5331 PU	Nunhems
<b>15</b>	Wainright Supreme	Nunhems
<b>16</b>	Lafayette Classic	Nunhems
<b>17</b>	Treasure (HMX5406)	Harris Moran
<b>18</b>	Sassy	Harris Moran
<b>19</b>	Fiesty	Harris Moran
<b>20</b>	HMX9447	Harris Moran
<b>21</b>	Wealthy	Harris Moran
<b>22</b>	HMX0472	Harris Moran
<b>23</b>	12-104 RZ	Rijk Zwaan

**Table 2.** Pickling cucumber plant traits (means) by variety, UD REC, Georgetown, 2010

Variety	Leaves (no.)	Main Stem (cm)	Side Branches (no.)	Uproot Force (kg)
1	23	115	4.4	3.1
2	19	110	3.3	2.6
3	17	86	3.3	3.4
4	18	110	3.1	4.2
6	28	119	4.0	3.3
8	45	146	6.0	3.5
9	30	122	4.6	5.2
10	32	148	3.2	3.0
11	23	120	4.0	3.0
12	14	128	1.5	4.9
13	19	129	2.0	4.5
14	33	131	3.6	4.7
15	17	106	3.3	2.8
16	17	107	2.3	3.6
17	27	153	4.0	4.7
18	18	123	2.3	2.1
19	36	141	4.5	4.8
20	21	142	2.3	5.3
21	32	124	4.2	4.3
22	15	107	2.8	2.9
23	40	130	5.5	4.0
<b>LSD<sub>0.05</sub></b>	10	24	2.1	1.5
<i>p</i> -value	0.0028	0.0010	0.0072	0.0002

**Table 3.** Pickling cucumber plant traits (means) by density and variety, UD REC, Georgetown, 2010

Variety	Leaf Number (no./plant)			Main Stem Length (cm)			Side Branch Number (no./plant)			Uproot Force (kg)		
	HD <sup>1</sup>	ID	LD	HD	ID	LD	HD	ID	LD	HD	ID	LD
<b>1</b>	16.0	18.5	30.0	140	94	125	4.00	5.50	3.50	6.80	1.36	2.86
<b>2</b>	17.0	.	23.0	109	.	111	2.67	.	5.00	2.93	.	1.60
<b>3</b>	10.5	19.0	23.0	79	90	89	2.00	4.67	2.00	4.00	3.40	2.20
<b>4</b>	15.0	18.8	.	90	113	.	5.00	2.83	.	4.40	4.18	.
<b>6</b>	27.0	21.0	30.0	126	124	114	3.50	5.00	4.00	4.20	3.80	2.47
<b>8</b>	.	22.0	49.8	.	165	142	.	2.00	6.80	.	0.46	4.12
<b>9</b>	14.0	25.5	37.6	114	132	115	2.00	3.75	5.80	5.00	5.00	5.32
<b>10</b>	21.0	40.5	35.0	134	166	145	0.50	7.00	2.00	2.50	2.30	4.05
<b>11</b>	.	22.6	27.0	.	116	136	.	3.80	5.00	.	3.24	2.00
<b>12</b>	12.0	15.5	12.0	110	140	122	1.00	1.50	2.00	6.60	3.00	6.80
<b>13</b>	16.0	18.2	23.5	115	132	130	1.00	1.80	3.00	4.20	4.70	4.20
<b>14</b>	.	14.3	47.5	.	108	149	.	0.67	5.75	.	3.67	5.50
<b>15</b>	.	19.0	14.5	.	104	109	.	4.50	2.00	.	2.10	3.40
<b>16</b>	27.0	14.8	.	111	107	.	3.00	2.20	.	3.20	3.68	.
<b>17</b>	.	24.3	29.0	.	151	155	.	3.33	4.67	.	3.66	5.73
<b>18</b>	13.0	20.5	.	108	130	.	0.50	3.25	.	2.10	2.06	.
<b>19</b>	26.0	20.0	41.8	120	149	144	5.00	4.00	4.50	4.80	5.80	4.60
<b>20</b>	12.0	15.0	24.5	132	140	144	0.00	2.00	3.00	6.40	6.20	4.85
<b>21</b>	.	26.3	44.5	.	117	139	.	3.25	6.00	.	4.10	4.60
<b>22</b>	16.0	14.8	.	118	102	.	2.50	3.00	.	3.30	2.70	.
<b>23</b>	.	42.3	37.0	.	129	131	.	4.67	6.33	.	4.87	3.07
<b>VxD<sup>2</sup></b>												
<i>p-value</i>		0.1333			0.7777			0.0427			0.0167	
<b>Overall</b>	17 a <sup>3</sup>	21 b	35 c	109	119	133	2.2 a	3.3 b	4.6 c	3.7	3.6	4.2
<i>p-value</i>		<0.0001			0.2314			0.0015			0.3221	

<sup>1</sup>HD, ID, LD High density, intermediate density, and low density respectively.

<sup>2</sup>VxD Variety by density interaction. Shaded areas have significant differences between densities within a variety.

<sup>3</sup>Numbers followed by different letters are significantly different at the 0.05 level.



**Table 4.** Pickling cucumber fruit traits (means) by variety, UD REC, Georgetown, 2010

Variety	Length	Diameter	L:D Ratio	Pedicel Length	Force of Detachment	Stem End Penetration Force
	mm	mm	ratio	mm	g	g
1	109	36	3.03	30	522	876
2	124	39	3.19	26	522	876
3	124	42	2.92	27	622	636
4	104	44	2.40	22	672	758
6	119	39	3.06	34	686	944
8	94	34	2.76	29	504	758
9	107	42	2.57	23	563	858
10	117	39	2.96	22	527	826
11	105	43	2.45	26	459	899
12	111	39	2.85	29	617	972
13	119	44	2.70	29	345	949
14	138	43	3.19	27	508	704
15	120	40	3.03	23	654	1012
16	114	42	2.76	27	531	781
17	113	39	2.90	28	277	690
18	139	45	3.09	33	581	876
19	124	41	3.04	33	477	699
20	104	42	2.48	31	536	922
21	103	41	2.52	28	558	790
22	93	40	2.35	32	631	867
23	106	42	2.51	25	486	717
<b>LSD<sub>0.05</sub></b>	24	7	0.74	5	212	182
<i>p-value</i>	0.0465	0.0047	0.0285	<0.0001	0.0105	0.0033

**Table 5.** Pickling cucumber fruit traits (means) by variety and density, UD REC, Georgetown, 2010

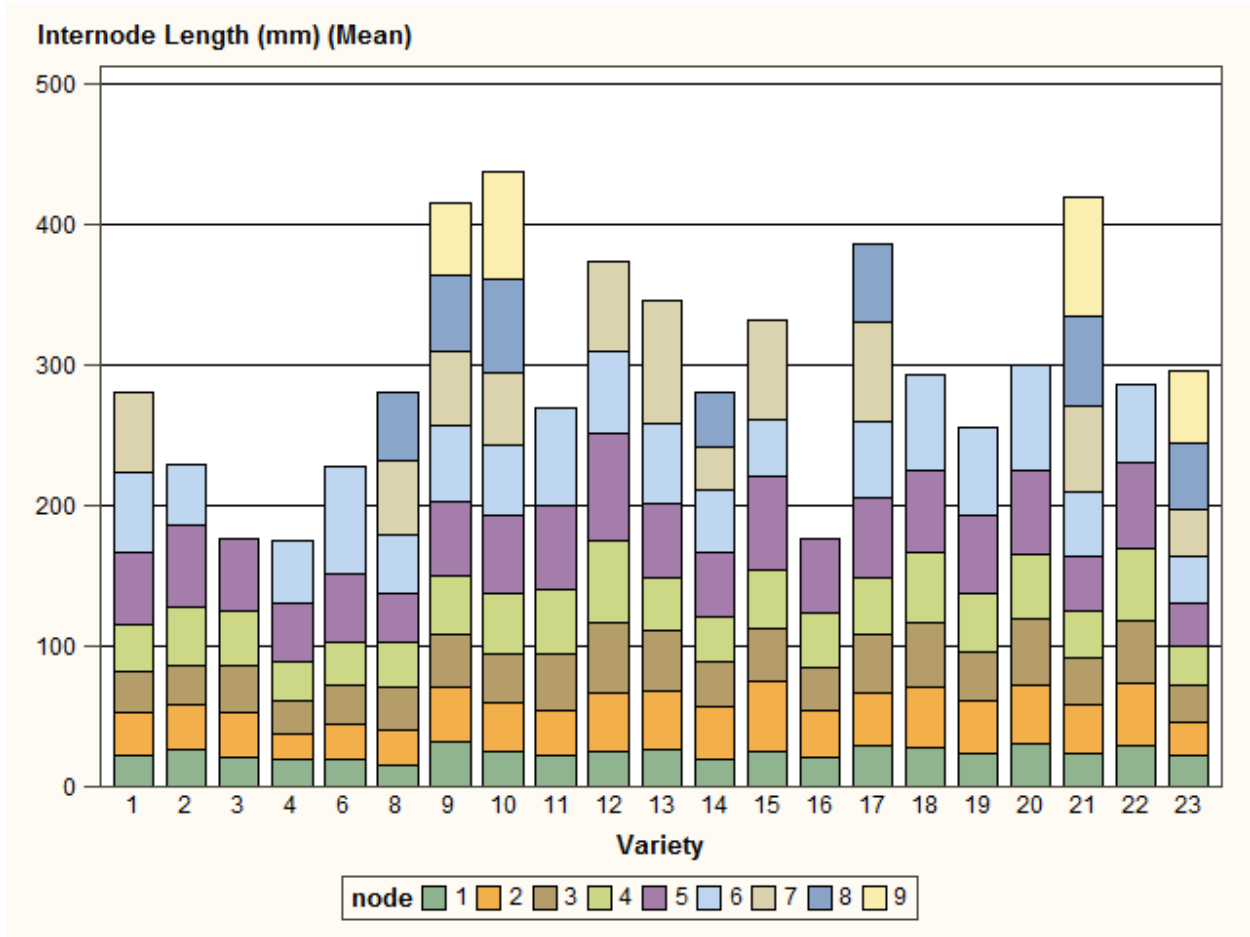
Variety	Pedicel Length			Force of Detachment		
	HD	ID	LD	HD	ID	LD
1	29	31	31	545	490	524
2	25	.	29	365	.	1385
3	26	27	31	969	480	654
4	21	22	.	985	501	.
6	34	42	31	436	624	644
8	.	40	27	.	393	595
9	20	22	24	645	598	446
10	20	20	27	471	600	257
11	.	26	28	.	642	479
12	37	23	32	188	323	552
13	24	29	32	568	514	465
14	.	27	27	.	515	745
15	.	26	20	.	522	539
16	27	27	.	213	288	.
17	.	30	27	.	524	654
18	27	36	.	443	493	.
19	34	38	32	579	520	531
20	24	25	34	568	697	523
21	.	26	31	.	574	749
22	28	33	.	409	522	.
23	.	24	27	.	827	651
VxD <sup>1</sup>						
<i>p-value</i>		0.0474			0.0023	

**Table 6.** Pickling cucumber internode lengths for the first six nodes by variety, UD REC, Georgetown, 2010.

Variety	Internode					
	1 <sup>a</sup>	2	3	4	5	6
Internode length (mm)						
1	22	30	29	34	52	57
2	26	33	28	41	60	42
3	20	33	33	39	51	.
4	19	19	23	28	41	44
6	20	25	27	31	48	77
8	15	25	30	32	35	42
9	32	39	37	42	53	55
10	25	34	35	43	56	50
11	22	33	40	45	60	71
12	24	42	50	59	77	59
13	26	42	42	39	53	56
14	20	37	32	32	47	44
15	24	51	37	42	66	41
16	21	33	31	39	53	.
17	29	38	42	40	57	55
18	27	44	45	50	59	67
19	23	38	34	42	56	62
20	30	41	47	46	60	75
21	23	35	33	33	39	47
22	30	44	45	51	61	55
23	22	24	26	28	31	33
<b>LSD<sub>0.05</sub></b>	NS	12	9	10	12	18
<i>p-value</i>	0.0536	0.0003	<0.0001	<0.0001	<0.0001	0.0007

<sup>a</sup>1 Distance from soil line to first node after cotyledon node.

**Figure 1.** Pickling cucumber internode lengths by variety, UD REC, Georgetown, 2010



**Table 7a.** Frequency distribution of pickling cucumber fruits by variety and node on main stems, UD REC, Georgetown, 2010.

Variety	Node									Total	Plant No.
	1 <sup>a</sup>	2	3	4	5	6	7	8	9		
number of fruits by node											
1	0	3	2	4	3	2	1	0	0	15	5
2	1	1	2	2	3	2	0	0	0	11	4
3	0	2	3	4	3	1	0	0	0	13	6
4	1	7	4	3	5	3	0	0	0	23	7
6	0	3	3	5	4	1	0	0	0	16	6
8	0	5	0	5	4	2	2	1	0	19	6
9	2	5	3	7	3	5	0	0	0	25	10
10	0	0	4	6	3	1	2	0	1	17	6
11	0	0	3	4	2	3	0	0	0	12	6
12	0	1	1	2	1	2	1	0	0	8	4
13	0	2	7	6	6	3	2	0	0	26	8
14	0	3	2	2	7	4	0	1	0	19	7
15	0	2	4	2	4	2	2	1	0	17	4
16	2	1	5	5	2	0	0	0	0	15	6
17	0	0	3	2	6	3	4	1	0	19	6
18	0	1	4	6	6	2	0	0	0	19	6
19	0	2	5	4	5	4	0	0	0	20	6
20	0	3	4	4	3	1	0	0	0	15	6
21	0	2	4	6	5	4	3	2	1	27	6
22	0	3	4	4	3	2	0	0	0	16	6
23	0	3	6	8	6	4	3	0	1	31	6

<sup>a</sup>1 Distance from soil line to first node after cotyledon node.

**Table 7b.** Percentage distribution of pickling cucumber fruits by variety and node on main stems, UD REC, Georgetown, 2010.

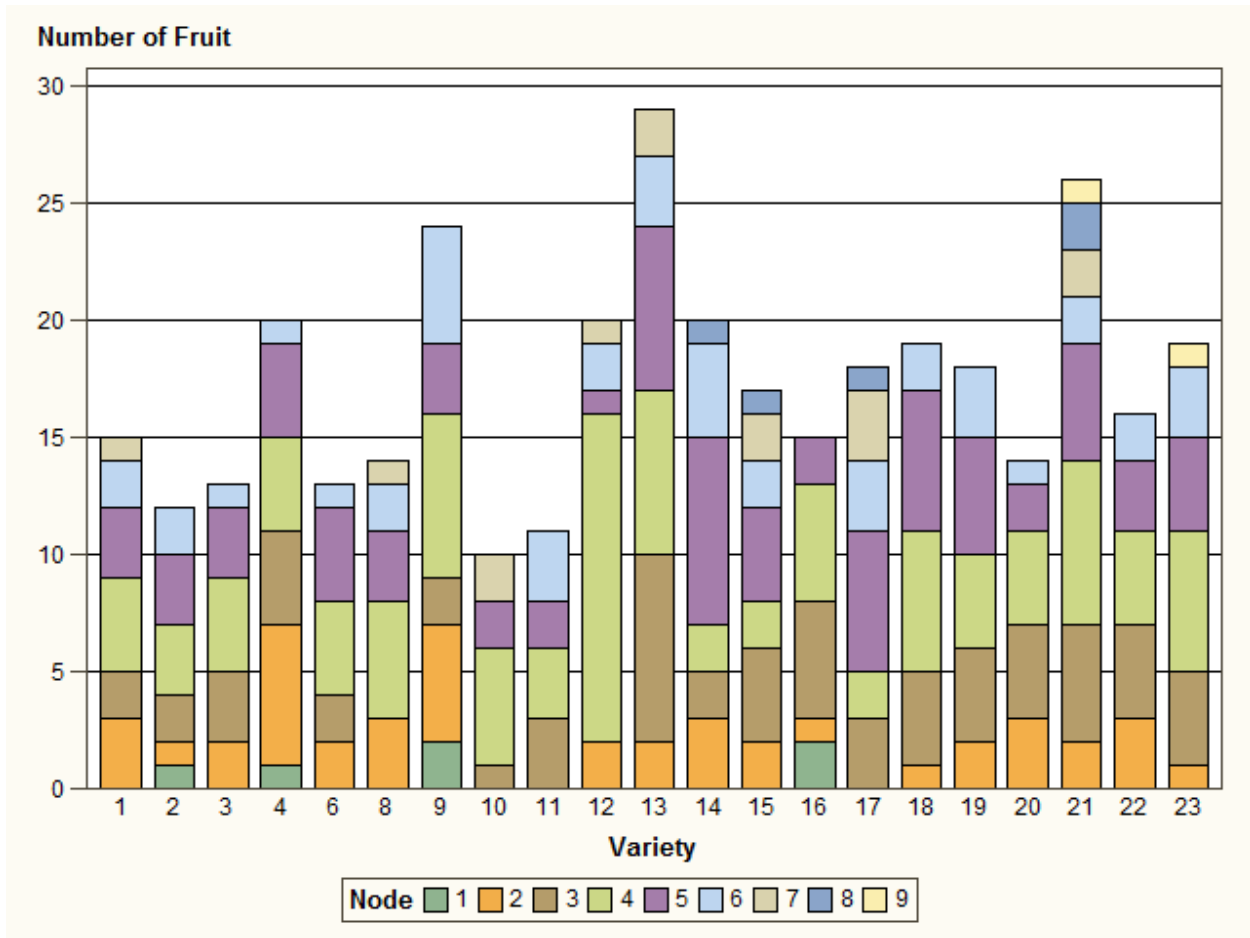
Variety	Node								
	1	2	3	4	5	6	7	8	9
percentage of fruits by node									
1	0	20	13	27	20	13	7	0	0
2	9	9	18	18	27	18	0	0	0
3	0	15	23	31	23	8	0	0	0
4	4	30	17	13	22	13	0	0	0
6	0	19	19	31	25	6	0	0	0
8	0	26	0	26	21	11	11	5	0
9	8	20	12	28	12	20	0	0	0
10	0	0	24	35	18	6	12	0	6
11	0	0	25	33	17	25	0	0	0
12	0	13	13	25	13	25	13	0	0
13	0	8	27	23	23	12	8	0	0
14	0	16	11	11	37	21	0	5	0
15	0	12	24	12	24	12	12	6	0
16	13	7	33	33	13	0	0	0	0
17	0	0	16	11	32	16	21	5	0
18	0	5	21	32	32	11	0	0	0
19	0	10	25	20	25	20	0	0	0
20	0	20	27	27	20	7	0	0	0
21	0	7	15	22	19	15	11	7	4
22	0	19	25	25	19	13	0	0	0
23	0	10	19	26	19	13	10	0	3

<sup>a</sup>1 Distance from soil line to first node after cotyledon node.

**Table 7c.** Number and percentage of pickling cucumber fruits on main stems compared to branches by variety, UD REC, Georgetown, 2010.

Variety	Main Stem	Branch	Total	Main Stem	Branch
	no. of fruits	no. of fruits	no. of fruits	% of fruits	% of fruits
1	15	0	15	100	0
2	11	0	11	100	0
3	13	0	13	100	0
4	23	5	28	82	18
6	16	3	19	84	16
8	19	5	24	79	21
9	25	0	25	100	0
10	17	8	25	68	32
11	12	0	12	100	0
12	8	2	10	80	20
13	26	0	26	100	0
14	19	0	19	100	0
15	17	0	17	100	0
16	15	0	15	100	0
17	19	1	20	95	5
18	19	0	19	100	0
19	20	2	22	91	9
20	15	1	16	94	6
21	27	3	30	90	10
22	16	0	16	100	0
23	31	12	43	72	28

**Figure 2.** Frequency of fruiting in pickling cucumber by variety and node on main stems, UD REC, Georgetown, 2010





**Table 8.** Frequency distribution of pickling cucumber fruits on side branches by variety, UD REC, Georgetown, 2010.

Variety	Node Side Branch Attached							
	2	3	4	5	6	7	9	All
number of fruits by node								
4	2	2	1	0	0	0	0	5
6	1	1	1	0	0	0	0	3
8	4	0	1	0	0	0	0	5
10	0	3	3	1	0	1	0	8
12	0	1	1	0	0	0	0	2
17	0	0	0	1	0	0	0	1
19	0	1	1	0	0	0	0	2
20	1	0	0	0	0	0	0	1
21	1	2	0	0	0	0	0	3
23	2	2	3	3	1	0	1	12

**Table 9.** Location of pickling cucumber fruit by variety and distance from plant base on main stems, UD REC, Georgetown, 2010.

Variety	Fruit Number in Order from Plant Base							
	1	2	3	4	5	6	7	8
fruit location by distance from plant base (mm)								
1	94	135	149	214	.	.	.	.
2	78	137	175	138	.	.	.	.
3	86	145	185	.	.	.	.	.
4	53	96	143	139	.	.	.	.
6	65	137	167	111	.	.	.	.
8	82	145	146	177	.	114	.	.
9	91	163	210	215	.	.	.	.
10	109	215	161	.	288	.	.	.
11	118	243	.	.	.	.	.	.
12	160	297	.	.	.	.	.	.
13	112	155	193	222	320	.	.	.
14	94	166	194	235	.	.	.	.
15	91	142	210	267	333	.	.	.
16	65	113	134	194	.	.	.	.
17	146	240	267	327	.	.	.	.
18	118	173	241	308	.	.	.	.
19	109	171	161	215	276	.	.	.
20	120	188	159	214	.	.	.	.
21	106	142	211	230	321	315	385	470
22	122	172	219	342	.	.	.	.
23	66	98	139	239	192	.	252	.
<b>LSD<sub>0.05</sub></b>	51	65	NS	NS				
<i>p-value</i>	0.009	0.0003	0.1032	0.2877				

**Table 10.** Location of pickling cucumber fruit by variety and distance from plant base on side stems, UD REC, Georgetown, 2010.

Variety	Fruit Number in Order from Plant Base					
	1	2	3	4	5	6
	side stem fruit location by distance from plant base (mm)					
4	34	.	146	141	187	.
6	134	58	78	.	.	.
8	330	127	263	213	76	.
9	.	.	88	.	.	.
10	193	158	336	296	.	.
11	.	131	.	.	.	.
12	202	.	.	.	.	.
17	.	.	329	.	.	.
19	.	241	165	.	.	.
20	.	210	.	.	.	.
21	.	.	189	.	.	.
23	133	174	184	181	178	226

**Table 11.** Yield and grade of pickling cucumbers by variety, UD REC, Georgetown, 2010.

Variety	Oversize <sup>a</sup>	Size 3 <sup>b</sup>	Size 2 <sup>c</sup>	Cull <sup>d</sup>	Marketable Yield
	-----percent-----				bu/a
1	2.8	77.5	17.5	2.3	221
2	0.0	70.3	18.7	11.0	248
3	0.0	81.3	11.4	7.4	231
4	8.9	59.7	4.6	26.8	214
6	0.0	50.7	36.8	12.5	154
8	8.7	84.7	6.6	0.0	313
9	3.7	54.0	36.5	5.8	154
10	5.8	55.8	16.6	21.8	165
11	0.0	62.9	11.1	26.0	178
12	5.2	69.9	17.3	7.6	173
13	0.0	73.4	18.7	7.9	266
14	17.9	42.4	9.2	30.5	150
15	0.0	79.6	9.4	11.0	226
16	4.7	75.5	7.2	12.6	260
17	8.7	81.9	6.5	3.0	281
18	11.9	76.5	1.5	10.1	224
19	3.4	79.1	16.2	1.3	230
20	3.7	88.5	5.8	2.1	228
21	0.0	88.4	11.6	0.0	256
22	9.7	77.6	4.3	8.3	281
23	0.0	79.3	12.8	8.0	361
<b>LSD 0.05</b>	NS	26.9	NS	NS	120
<i>p</i> -value	0.196	0.049	0.061	0.167	0.0197

<sup>a</sup>Oversize >2.00 inches in diameter

<sup>b</sup>Combined 3A and 3B size grades 1.50 to 2.00 inches in diameter

<sup>c</sup>Combined 2A and 2B size grades 1.06 to 1.50 inches in diameter

<sup>d</sup>Cull fruit consisting of crooks, nubs, and damaged

Appendix A. Weather data for the Georgetown REC site June 2010.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	75.8	85.5	69.8	27.6	77.9	94.2	57.8	18.8	8.7	0	0.19	78.3	86	74.2
2	77.9	89.3	68.2	28.7	73.2	97.4	36.2	26.3	3.9	0	0.23	80.3	91.7	71.8
3	77.2	88.4	69.3	28.9	78.7	96.9	52.5	23.7	5.8	0	0.22	82	93.4	74.5
4	78.9	89.8	68.1	29	73.8	96.9	47.2	25.6	3.7	0	0.22	83.3	95	74
5	82.1	90.5	75.3	32.9	70.3	92.7	47.6	23.6	6.4	0	0.24	85	95.3	78.2
6	79.9	90.3	67	28.7	73	90.5	51.5	20.7	8.7	0	0.23	84.4	94.6	78.2
7	67	76.1	58.9	17.5	58.4	88.6	34.6	27	5	0	0.21	80.3	93.7	70.4
8	66.2	76.5	55.7	16.1	56.7	94.7	22.7	29.5	4.9	0	0.23	79.5	93.6	68.4
9	66.7	72.3	57.3	14.8	75.4	92.6	50.7	6.5	5.5	0	0.1	73.5	76.1	71.3
10	78	87.2	68.8	28	61.9	94.2	32.9	25.9	5.3	0	0.25	80.5	93.4	70.6
11	71.2	80.3	60.2	20.3	66	92.3	45.1	28.3	3.9	0	0.21	83	97.8	71
12	74.2	86.6	61.9	24.3	73.7	96.6	50.8	24.5	6.2	0	0.22	83.5	97.3	73.1
13	80.9	92.4	73.8	33.1	75.9	95.3	51.2	24.5	5.5	0	0.24	86.8	100	78
14	76.7	87.3	68	27.6	79.9	97.2	49.6	21.9	4	0	0.2	84.2	95.2	76.1
15	72.3	78.6	67.7	23.1	79.9	94.1	62.8	17.7	4	0	0.15	81.7	92.4	74.9
16	74.6	83.3	66.7	25	81.6	94.8	66.5	16.6	4	0	0.15	81.3	90.5	73.6
17	78.4	85.5	66.5	26	64.3	94.6	40.4	28.1	7.3	0	0.26	85.4	98.3	75.6
18	70.3	82.9	57.9	20.4	67.8	89.9	43	23.4	2.9	0	0.19	82.7	95.1	71
19	75.4	88.1	61.2	24.6	72.8	92.6	45.2	25.4	5.1	0	0.23	84.2	98.3	71.7
20	81.8	93.7	72	32.8	67	95.7	34.8	25.7	5.5	0	0.27	88.2	102	77.7
21	78.6	90.5	66.6	28.6	66.6	93.1	39.4	22.9	2.4	0	0.2	87.8	99.4	76.9
22	79.9	92.8	66.3	29.6	71.2	96.5	39.9	24	4.2	0	0.23	88.6	102	76.6
23	80.9	91.9	68.5	30.2	71.8	96.3	40.9	27.1	3.8	0	0.24	84.8	96.9	74.9
24	83.2	94.7	74.1	34.4	74.7	95.7	41.6	23.9	5.7	0	0.25	86.5	98.3	78.5
25	77.7	87.3	71	29.1	74.8	96.7	48.2	26.4	3.2	0	0.22	84.7	96.9	76.2
26	78.7	89.1	67.4	28.3	75.3	97.2	46.4	23.2	3.8	0	0.21	84.6	96.1	74.8
27	84	94.3	73	33.7	69.7	96.7	41.5	26	3.9	0	0.25	88.7	101	77.4
28	84.5	94.9	76.8	35.8	72.6	92.6	47.7	24.7	7	0.23	0.26	89.4	102	81.7
29	81.1	88.6	76.3	32.5	69.2	92.8	37.2	19.1	4.7	0.05	0.21	84.5	91.1	79.7
30	71.6	79.7	58.9	19.3	59.6	92	35.7	24	4.6	0	0.2	82.7	94.4	74.7
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 B. Weather data for the Georgetown REC site July 2010.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	67.7	77.4	57.3	17.3	58.9	95.7	30.5	29.1	4.8	0	0.22	81.2	94.4	70.5
2	67.3	78.8	53.7	16.2	59.3	88.7	32.5	28.7	4.1	0	0.22	81.1	93.2	70.2
3	71.4	85.1	55.4	20.2	60.2	94.2	31.7	28.7	3.3	0	0.23	82.9	97.8	70.1
4	77.1	90.7	63	26.8	58.3	91.7	26.9	29	4.3	0	0.26	85.2	99.6	72.4
5	80.8	96	68	32	63.5	90.7	30.2	26.2	3	0	0.24	87.3	101	75.4
6	84.4	101	68.9	34.7	62.2	94.4	26.5	25.7	2	0	0.23	89.9	104	77.8
7	83.8	95.5	72.8	34.1	66.3	91	42.4	26.1	3.5	0	0.25	91	104	80.3
8	77.3	84.3	73.4	28.9	83.1	95.2	50	13.9	2.6	0	0.14	86.2	92.9	82.5
9	77.9	87.4	71.8	29.6	82.6	96.1	59.1	21.1	3.6	0.02	0.19	86.1	97.4	79.1
10	72.7	76.9	70.3	23.6	94.2	97.5	88.5	4.7	2.7	1.15	0.05	79.5	83.5	75.8
11	76.8	86.9	68.5	27.7	76.1	97.2	36.2	21.4	3.8	0.01	0.2	80.8	91.5	72.5
12	77.6	88.1	67.5	27.8	80.2	96.3	51.5	17.2	4.2	0	0.17	81.4	91.2	72.6
13	79.7	86.8	73.5	30.2	84.4	96	66.2	16.5	5	0.31	0.16	82.8	90.9	77.5
14	76.2	81.3	72.5	26.9	86.8	95.3	71.8	13.7	5.9	0.03	0.13	80.6	86	77.1
15	78.9	88.1	71.3	29.7	80.8	95.4	58.9	22.4	2.4	0	0.19	83.8	94.9	74.5
16	83.4	93.4	73.2	33.3	74.6	96.6	46	23.5	3.5	0	0.22	86.7	97	77.7
17	82.9	91.1	75.1	33.1	70.5	91.6	46.5	22.6	1.3	0	0.19	88.2	98.3	80.4
18	82.9	92.3	72.8	32.6	69.6	90.3	47.5	25	3.5	0	0.23	88.8	99.9	79.3
19	81.4	88.6	74.9	31.8	76.6	90.1	63	18.1	6	0	0.18	87.6	94.2	81.3
20	82.8	92.2	73.4	32.8	70	92.1	45.2	21.1	2.8	0	0.2	90	101	79.6
21	82.4	90.7	73.6	32.2	75	93.6	55.4	16.8	1.7	0	0.15	90.1	101	81.7
22	82.2	91.2	72.1	31.7	66.2	90.9	39.5	22.2	2.9	0	0.21	91	104	80.2
23	84.3	94.8	72.1	33.4	72.3	94.5	46.8	21.5	4.2	0	0.22	92.4	106	81.3
24	88.6	97.9	79.7	38.8	65.9	90.3	43	22.1	4.8	0	0.24	95.5	109	85
25	83.9	97.9	72.2	35.1	71.7	94.9	40.4	19.1	3.8	0.09	0.21	93.7	109	83.7
26	75.7	84.7	66.9	25.8	67.8	94.9	38.9	26	1.8	0	0.2	87.8	102	77.4
27	76.5	88.3	61.5	24.9	64.8	93.9	37.2	20.4	0.6	0	0.15	87.2	101	74.5
28	80.4	89.8	72.9	31.4	71.2	83.8	55.3	20	4.8	0	0.2	89.9	102	80.7
29	81.1	90.8	74.4	32.6	79.3	91.7	57.7	15.4	4.2	0.78	0.16	86.9	99.3	81.1
30	74.7	81.9	65.1	23.5	63.6	94.3	42.5	23.1	4	0	0.19	81.4	93.1	72.2
31	78.8	91.3	63.2	27.3	68.3	96.1	34.5	27	6	0	0.27	78.7	88.3	70
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)	