# High Tunnel Pepper Variety Trial, 2011

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## Introduction

Peppers offer a viable option to tomatoes for commercial production in high tunnel greenhouses. In 2011 the Cornell Vegetable Program partnered with Harris Seed, Inc. to evaluate five varieties in a cooperating grower's unheated high tunnel.

## **Materials and Methods**

Pepper varieties Alliance, Gordo, Sandpiper, Vanguard and Yellow Crest were seeded in a heated greenhouse on March 1, 2011, into seedling trays and then 50 count trays at cotyledon stage. These were transplanted into the high tunnel soil, a Lima Silt Loam, on May 6, at the four true-leaf stage. The high tunnel, fabricated on farm, is a 30 by 120 foot galvanized steel structure, covered with Tuff Lite IV 6 mil polyethylene. No supplemental heat was used in growing the crop post-transplant. The trial was arranged as a randomized in-row block design with four replications. Each replicate consisted of four plants, transplanted into black plastic mulch with a 24-inch double staggered row with a single drip irrigation tape per bed. The grower cooperator maintained the trial site for fertilization, irrigation and weed control to their standards (see appendix 1). Plants were trellised with twine and stakes to prevent lodging. Peppers were harvested from June 25 to October 25. The weight and number of marketable fruit was recorded at each harvest date. Mean yield (lbs) per plant, mean fruit per plant and mean fruit weight were calculated (table 1). Data was analyzed using statistical software Analysis of Variance (ANOVA) procedure, and treatment means were separated using Fishers Protected Least Significant Difference Test (p<0.05). One replicate of Gordo was removed from statistical analysis due to Tobacco Mosaic Virus infection.

## Results

Yield, as measured by pounds of fruit per plant, was not significantly different among the five varieties. Sandpiper was the highest yielding as measured by pounds per plant, although there were not statistical differences amongst the other varieties (table 1). However there were significant statistical differences in number of fruit per plant. Yellow Crest was by far the highest yielding with 35.44 fruit per plant. Significant differences were detected in fruit weight, with Yellow Crest the lightest and Gordo the heaviest. These numbers are inversely correlated with fruit number per plant. These findings are consistent with the results of a single grouping of mean pounds yield per plan without differences.

## **Discussion and Conclusions**

The peppers evaluated in 2011 performed very similar in total yield per plant as measured by pounds. When we look at fruit size and weight we do find differences that can help growers make choices in variety. When selling by the piece, in a retail setting, varieties such as Yellow Crest would work well. For wholesale accounts varieties such as Gordo will fill bushel boxes faster. Sandpiper, a slightly smaller fruit than the other bell peppers is this trial, gave very good yields and offers a nice color spectrum (Figure 3). High tunnels are a great tool for vegetable growers to increase quality and color of bell peppers. Total economic performance per square foot is much less than tomatoes. However, labor inputs are also lower. Although not a perfect rotational crop with tomatoes, peppers are not a host for Fulvia Leaf Mold, and are less likely to harbor Two Spotted Spider Mites. We encourage growers to consider peppers in high tunnels for increased quality and yield.

The Cornell Vegetable Program and cooperating grower express gratitude to Harris Seed, Inc. for their collaboration in this project.

Pepper Variety	Average Fruit Weight (lbs)*	Average No. Fruit per Plant	Average Yield per Plant (lbs)
Alliance	0.49 b	15.88 c	7.86
Gordo	0.56 a	13.12 c	7.26
Sandpiper	0.33 c	26.29 b	8.70
Yellow Crest	0.24 d	35.44 a	8.45
Vanguard	0.52 b	15.71 c	8.10
LSD	0.0000	0.0000	NS

## Table 1. Yield data: Standard Fertility

\*Means with different letters (groupings) are significantly difference with a p test value  $\leq 0.05$ .

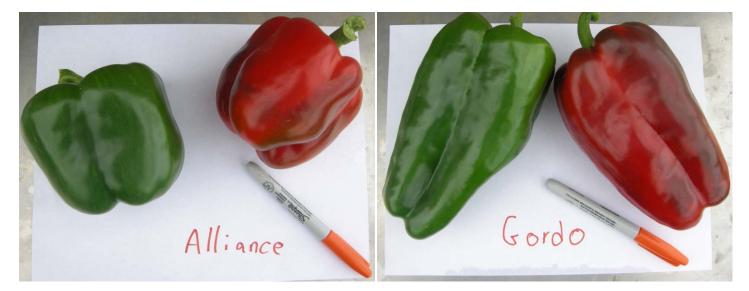


Figure 1. Alliance at Harvest

Figure 2. Gordo at Harvest

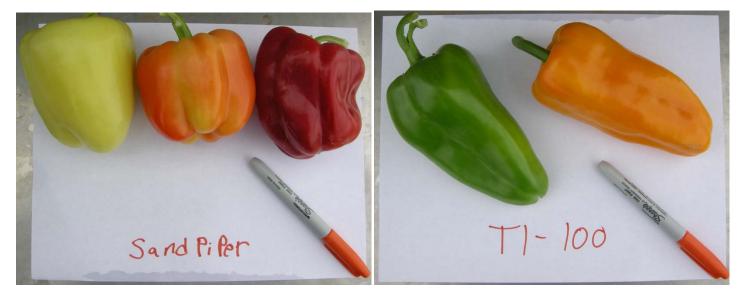


Figure 3. Sandpiper at Harvest



Figure 5. Vanguard at Harvest

Figure 4. Yellow Crest at Harvest



Figure 6. Alliance, Gordo, Sandpiper, Yellow Crest, and Vanguard (pictured left to right).



Figure 7. Pepper trail in High Tunnel with Cucumbers and Tomatoes.

Appendix 1.	Fertilizer	schedule	for	2011	high	tunnel	peppers.	
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21-May   20-20-20   0.30     25-May   20-20-20   0.31     1-Jun   20-20-20   0.36     1-Jun   20-20-20   0.36     15-Jun   plus 0.02 fluid oz. 66% sulfuric acid     15-Jun   9-15-30   0.24     15-Jun   9-15-30   0.42     21-Jun   9-15-30   0.42     21-Jun   9-15-30   0.42     21-Jun   9-15-30   0.42     21-Jun   9-15-30   0.42     25-Jun   Epsom salt (magnesium sulfate)   0.06     27-Jun   9-15-30   0.45     28-Jun   9-15-30   0.21     30-Jun   Epsom salt (magnesium sulfate)   0.30     1-Juil   9-15-30   0.21     30-Jun   Epsom salt (magnesium sulfate)   0.30     1-Juil   9-15-30   0.24     1-Juil   9-15-30   0.24     1-Juil   9-15-30   0.21     30-Jun   Epsom salt (magnesium sulfate)   0.18     1-Juil   9-15-30   0.21     1-Juil   9-15-30   0.21 <th>10-May 20-20-20 *</th> <th>0.19</th> <th></th>	10-May 20-20-20 *	0.19	
30-May     20-20-20     0.30       1-Jun     20-20-20     0.31       4-Jun     20-20-20     0.36       15-Jun     Epsom salt (magnesium sulfate)     0.24       16-Jun     9-15-30     0.42       17-Jun     9-15-30     0.42       21-Jun     9-15-30     0.42       24-Jun     9-15-30     0.45       28-Jun     9-15-30     0.21       30-Jun     Epsom salt (magnesium sulfate)     0.30       1-Jul     9-15-30     0.24       1-Jul     9-15-30     0.24       7-Jul     9-15-30     0.24       7-Jul     9-15-30     0.24       7-Jul     9-15-30     0.24       9-10     9-15-30     0.24       12-Jul     9-15-30     0.24       14-Jul     9-15-30     0.24       12-	21-May 20-20-20	0.30	
1-Jun     20-20-20     0.31       4-Jun     20-20-20     0.36     plus 0.02 fluid oz. 66% sulfuric acid       15-Jun     Epsom salt (magnesium sulfate)     0.24     0.27       17-Jun     9-15-30     0.42     0.24       21-Jun     9-15-30     0.42     0.24       21-Jun     9-15-30     0.42     0.24       24-Jun     9-15-30     0.42     0.05       25-Jun     Epsom salt (magnesium sulfate)     0.06     0.21       30-Jun     Epsom salt (magnesium sulfate)     0.30     0.30       1-Jul     9-15-30     0.30     0.30       1-Jul     9-15-30     0.30     0.30       1-Jul     9-15-30     0.30     0.30       1-Jul     9-15-30     0.39     0.31       1-Jul     9-15-30     0.24     0.31       9-Jul     9-15-30     0.39     0.31       12-Jul     9-15-30     0.24     0.31       13-Jul     Epsom salt (magnesium sulfate)     0.15     0.14       14-Jul <t< td=""><td>25-May 20-20-20</td><td>0.31</td><td></td></t<>	25-May 20-20-20	0.31	
4-Jun     20-20     0.36     plus 0.02 fluid oz. 66% sulfuric acid       15-Jun     Epsom salt (magnesium sulfate)     0.24     16-Jun 9-15-30     0.42       16-Jun 9-15-30     0.42     10-Jun 9-15-30     0.42       21-Jun 9-15-30     0.42     10-Jun 9-15-30     0.42       24-Jun 9-15-30     0.42     10-Jun 9-15-30     0.42       25-Jun Epsom salt (magnesium sulfate)     0.06     10-Jun 19-Jun 9-15-30     0.45       28-Jun 9-15-30     0.45     10-Jun 19-Jun 9-Jun 19-Jun 19-	30-May 20-20-20	0.30	
15-Jun   Epsom salt (magnesium sulfate)   0.24     16-Jun   9-15-30   0.27     17-Jun   9-15-30   0.42     21-Jun   9-15-30   0.42     24-Jun   9-15-30   0.42     25-Jun   Epsom salt (magnesium sulfate)   0.06     27-Jun   9-15-30   0.45     28-Jun   9-15-30   0.21     30-Jun   Epsom salt (magnesium sulfate)   0.30     1-Jul   9-15-30   0.18     6-Jul   9-15-30   0.18     9-Jul   9-15-30   0.18     9-Jul   9-15-30   0.18     12-Jul   9-15-30   0.21     13-Jul   Epsom salt (magnesium sulfate)   0.15     14-Jul   9-15-30   0.24     19-Jul   9-15-30   0.24     19-Jul   9-15-30   0.24     19-Jul   9-15-30   0.24 <td< td=""><td>1-Jun 20-20-20</td><td>0.31</td><td></td></td<>	1-Jun 20-20-20	0.31	
16-Jun   9-15-30   0.27     17-Jun   9-15-30   0.42     21-Jun   9-15-30   0.42     24-Jun   9-15-30   0.42     25-Jun   Epsom salt (magnesium sulfate)   0.06     27-Jun   9-15-30   0.45     28-Jun   9-15-30   0.45     30-Jun   Epsom salt (magnesium sulfate)   0.30     1-Jul   9-15-30   0.30     5-Jul   Epsom salt (magnesium sulfate)   0.18     6-Jul   9-15-30   0.24     7-Jul   9-15-30   0.24     7-Jul   9-15-30   0.24     7-Jul   9-15-30   0.18     9-Jul   9-15-30   0.21     14-Jul   9-15-30   0.21     14-Jul   9-15-30   0.24     12-Jul   9-15-30   0.24     13-Jul   Epsom salt (magnesium sulfate)   0.15     14-Jul   9-15-30   0.24     19-Jul   9-15-30   0.24     19-Jul   9-15-30   0.36     22-Jul   20-20-20   0.36     <	4-Jun 20-20-20	0.36	plus 0.02 fluid oz. 66% sulfuric acid
17-Jun   9-15-30   0.42     21-Jun   9-15-30   0.42     24-Jun   9-15-30   0.42     25-Jun Epsom salt (magnesium sulfate)   0.06     27-Jun   9-15-30   0.45     28-Jun   9-15-30   0.21     30-Jun Epsom salt (magnesium sulfate)   0.30     1-Jul   9-15-30   0.30     5-Jul Epsom salt (magnesium sulfate)   0.30     5-Jul Epsom salt (magnesium sulfate)   0.30     5-Jul Epsom salt (magnesium sulfate)   0.18     9-Jul 9-15-30   0.24     7-Jul 9-15-30   0.18     9-Jul 9-15-30   0.39     12-Jul 9-15-30   0.51     13-Jul Epsom salt (magnesium sulfate)   0.15     14-Jul 9-15-30   0.24     19-Jul 9-15-30   0.21     16-Jul 9-15-30   0.24     19-Jul 9-15-30   0.24     19-Jul 9-15-30   0.24     19-Jul 9-15-30   0.24     19-Jul 9-15-30   0.15     21-Jul 20-20-20   0.42     22-Jul 20-20-20   0.36     23-Jul 20-20-20   0.36     <	15-Jun Epsom salt (magnesium sulfate)	0.24	
21-Jun   9-15-30   0.42   plus 0.03 fluid oz. 66% sulfuric acid     25-Jun   Epsom salt (magnesium sulfate)   0.06     27-Jun   9-15-30   0.45     28-Jun   9-15-30   0.45     30-Jun   Epsom salt (magnesium sulfate)   0.30     1-Jul   9-15-30   0.30     5-Jul   Epsom salt (magnesium sulfate)   0.18     6-Jul   9-15-30   0.24     7-Jul   9-15-30   0.24     7-Jul   9-15-30   0.24     7-Jul   9-15-30   0.24     7-Jul   9-15-30   0.21     13-Jul   Fpsom salt (magnesium sulfate)   0.18     9-Jul   9-15-30   0.24     14-Jul   9-15-30   0.21     14-Jul   9-15-30   0.21     16-Jul   9-15-30   0.24     19-Jul   9-15-30   0.24     19-Jul   9-15-30   0.24     19-Jul   9-15-30   0.15     21-Jul   20-20-20   0.42     22-Jul   20-20-20   0.42     22-Jul   20-20-	16-Jun 9-15-30	0.27	
24-Jun     9-15-30     0.42     plus 0.03 fluid oz. 66% sulfuric acid       25-Jun     Epsom salt (magnesium sulfate)     0.06	17-Jun 9-15-30	0.42	
25-Jun     Epsom salt (magnesium sulfate)     0.06       27-Jun     9-15-30     0.45       28-Jun     9-15-30     0.21       30-Jun     Epsom salt (magnesium sulfate)     0.30       1-Jul     9-15-30     0.30       5-Jul     Epsom salt (magnesium sulfate)     0.18       6-Jul     9-15-30     0.24       7-Jul     9-15-30     0.18       9-Jul     9-15-30     0.39       12-Jul     9-15-30 to 4 tunnels     0.51       13-Jul     Epsom salt (magnesium sulfate)     0.15       14-Jul     9-15-30     0.24       19-Jul     9-15-30     0.21       16-Jul     9-15-30     0.21       16-Jul     9-15-30     0.24       19-Jul     9-15-30     0.24       19-Jul     9-15-30     0.24       19-Jul     9-15-30     0.24       19-Jul     9-20-20     0.42       22-Jul     20-202     0.36       23-Jul     20-202     0.30       28-Jul     9-15-30 <td>21-Jun 9-15-30</td> <td>0.42</td> <td></td>	21-Jun 9-15-30	0.42	
27-Jun   9-15-30   0.45     28-Jun   9-15-30   0.30     1-Jul   9-15-30   0.30     5-Jul Epsom salt (magnesium sulfate)   0.18     6-Jul 9-15-30   0.24     7-Jul 9-15-30   0.18     9-Jul 9-15-30 to 4 tunnels   0.51     13-Jul Epsom salt (magnesium sulfate)   0.15     14-Jul 9-15-30   0.24     19-Jul 9-15-30   0.21     16-Jul 9-15-30   0.21     19-Jul 9-15-30   0.21     19-Jul 9-15-30   0.24     19-Jul 9-15-30   0.15     20-Jul 9-15-30   0.15     21-Jul 20-20-20   0.42     22-Jul 20-20-20   0.36     23-Jul 20-20-20   0.12     26-Jul 9-15-30   0.30     28-Jul 9-15-30   0.37     30-Jul 9-15-30   0.37     30-Jul 9-15-30   0.37     30-Jul 9-15-30   0.37     31-Aug 9-15-30   0.37	24-Jun 9-15-30	0.42	plus 0.03 fluid oz. 66% sulfuric acid
28-Jun     9-15-30     0.21       30-Jun     Epsom salt (magnesium sulfate)     0.30       1-Jul     9-15-30     0.30       5-Jul     Epsom salt (magnesium sulfate)     0.18       6-Jul     9-15-30     0.24       7-Jul     9-15-30     0.18       9-Jul     9-15-30     0.39       12-Jul     9-15-30 to 4 tunnels     0.51       13-Jul     Epsom salt (magnesium sulfate)     0.15       14-Jul     9-15-30 to 4 tunnels     0.21       14-Jul     9-15-30     0.21       14-Jul     9-15-30     0.21       14-Jul     9-15-30     0.21       14-Jul     9-15-30     0.24       19-Jul     9-15-30     0.24       19-Jul     9-15-30     0.24       19-Jul     9-15-30     0.09       21-Jul     20-20-20     0.42       22-Jul     20-20-20     0.36       23-Jul     20-20-20     0.24       24-Jul     9-15-30     0.30       28-Jul     9-15-30	25-Jun Epsom salt (magnesium sulfate)	0.06	
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1-Jul   9-15-30   0.30     5-Jul   Epsom salt (magnesium sulfate)   0.18     6-Jul   9-15-30   0.24     7-Jul   9.15-30   0.18     9-Jul   9.15-30   0.39     12-Jul   9.15-30 to 4 tunnels   0.51     13-Jul   Epsom salt (magnesium sulfate)   0.15     14-Jul   9-15-30   0.24     14-Jul   9-15-30   0.21     14-Jul   9-15-30   0.24     19-Jul   9-15-30   0.24     19-Jul   9-15-30   0.24     20-Jul   9-15-30   0.24     21-Jul   20-20-20   0.42     22-Jul   20-20-20   0.42     22-Jul   20-20-20   0.12     26-Jul   9-15-30   0.30     28-Jul   9-15-30   0.30     28-Jul   9-15-30   0.30     28-Jul   9-15-30   0.30     28-Jul   9-15-30   0.37     30-Jul   9-15-30   0.37     30-Jul   9-15-30   0.37     31-Aug   9-15	28-Jun 9-15-30	0.21	
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20-Jul   9-15-30   0.09     21-Jul   20-20-20   0.42     22-Jul   20-20-20   0.36     23-Jul   20-20-20   0.12     26-Jul   9-15-30   0.30     28-Jul   9-15-30   0.24     29-Jul   9-15-30   0.37     30-Jul   9-15-30   0.30     5-Aug   20-20-20   0.24     8-Aug   9-15-30   0.37     11-Aug   9-15-30   0.37     13-Aug   9-15-30   0.22	16-Jul 9-15-30	0.24	
21-Jul   20-20-20   0.42     22-Jul   20-20-20   0.36     23-Jul   20-20-20   0.12     26-Jul   9-15-30   0.30     28-Jul   9-15-30   0.24     29-Jul   9-15-30   0.37     30-Jul   9-15-30   0.30     5-Aug   20-20-20   0.24     8-Aug   9-15-30   0.37     11-Aug   9-15-30   0.37     13-Aug   9-15-30   0.12	19-Jul 9-15-30	0.15	
22-Jul   20-20-20   0.36     23-Jul   20-20-20   0.12     26-Jul   9-15-30   0.30     28-Jul   9-15-30   0.24     29-Jul   9-15-30   0.37     30-Jul   9-15-30   0.30     5-Aug   20-20-20   0.24     8-Aug   9-15-30   0.37     11-Aug   9-15-30   0.22     13-Aug   9-15-30   0.15	20-Jul 9-15-30	0.09	
23-Jul   20-20-20   0.12     26-Jul   9-15-30   0.30     28-Jul   9-15-30   0.24     29-Jul   9-15-30   0.37     30-Jul   9-15-30   0.30     5-Aug   20-20-20   0.24     8-Aug   9-15-30   0.37     11-Aug   9-15-30   0.22     13-Aug   9-15-30   0.15	21-Jul 20-20-20	0.42	
26-Jul   9-15-30   0.30     28-Jul   9-15-30   0.24     29-Jul   9-15-30   0.37     30-Jul   9-15-30   0.30     5-Aug   20-20-20   0.24     8-Aug   9-15-30   0.37     11-Aug   9-15-30   0.22     13-Aug   9-15-30   0.15	22-Jul 20-20-20	0.36	
28-Jul   9-15-30   0.24     29-Jul   9-15-30   0.37     30-Jul   9-15-30   0.30     5-Aug   20-20-20   0.24     8-Aug   9-15-30   0.37     11-Aug   9-15-30   0.22     13-Aug   9-15-30   0.15	23-Jul 20-20-20	0.12	
29-Jul   9-15-30   0.37     30-Jul   9-15-30   0.30     5-Aug   20-20-20   0.24     8-Aug   9-15-30   0.37     11-Aug   9-15-30   0.22     13-Aug   9-15-30   0.15	26-Jul 9-15-30	0.30	
30-Jul   9-15-30   0.30     5-Aug   20-20-20   0.24     8-Aug   9-15-30   0.37     11-Aug   9-15-30   0.22     13-Aug   9-15-30   0.15	28-Jul 9-15-30	0.24	
30-Jul   9-15-30   0.30     5-Aug   20-20-20   0.24     8-Aug   9-15-30   0.37     11-Aug   9-15-30   0.22     13-Aug   9-15-30   0.15	29-Jul 9-15-30	0.37	
5-Aug     20-20-20     0.24       8-Aug     9-15-30     0.37       11-Aug     9-15-30     0.22       13-Aug     9-15-30     0.15		0.30	
8-Aug     9-15-30     0.37       11-Aug     9-15-30     0.22       13-Aug     9-15-30     0.15		0.24	
11-Aug 9-15-30 0.22   13-Aug 9-15-30 0.15		0.37	
13-Aug 9-15-30 0.15		0.22	
	· · · · · · · · · · · · · · · · · · ·		
	27-Aug 9-15-30	0.18	
*Miller's Greenhouse Grade 20-20-20 (N-P-K) plus micronutrients In irrigation water sufficient to moisten the rootzo	**Miller's Greenhouse Grade 9-15-30 (N-	P-K) plus micronutrie	nts In irrigation water sufficient to moisten the rootzo