

High Tunnel Variety Trial of English Cucumbers, 2006

Judson Reid

Cornell Vegetable Program

Funded by the New York Farm Viability Institute's Agriculture Initiative Center.

Introduction

High tunnels are passively heated, manually vented greenhouses. There are many commercial and farmer-created design variations. Common characteristics include roll-up sides, a single layer of polyethylene covering and soil based crop culture. High tunnels are growing in popularity with horticultural growers in the Northeast due to growing degree-day accumulation and weather exclusion. Tomatoes are the most popular high tunnel crop and in previous research have provided the greatest economic return. Alternative crops to tomatoes are being explored for rotation and product line expansion.

Parthenocarpic (or English) cucumbers are a successful greenhouse crop in Europe and North America. They were selected for evaluation as a high tunnel crop due to their high retail value, vertical space utilization and relatively quick yield.

Materials and Methods

A variety trial was established in Penn Yan, NY in a cooperating grower's 20 by 120-ft high tunnel to evaluate yield and disease resistance of 10 English cucumber varieties. On May 8, 40 plants at first flower stage of 10 varieties were transplanted into a Lima silt loam soil (pH 6.6) at an in-row spacing of 16-in. with 42-in between rows. The treatments were arranged in a randomized complete block design with four replications with 10 plants per replication. Black plastic mulch and drip tape were laid prior to transplanting. The crop was fertilized with 25 dry oz of 9-15-30 in 300 gallons of water on June 26; and July 4, 20, 27 through a 1:100 injector system via irrigation drip tape. 40 dry oz of 20-20-20 was applied July 18 in the same delivery system. A fungicide application at label rate of chlorothalonil (Bravo), tank mixed with bifenthrin insecticide (Capture EC) was made with a hand pressurized 2.5 gallon back-pack sprayer on June 21. A bifenthrin-only application was made on June 29. Bifenazate miticide (Acramite WS) was applied at label rate on July 4 with a backpack mist blower. 4000 *Phytoseiulus persimilis* predatory mites were released on June 9. A mixture containing 6000 predatory mites of the species *P. persimilis*, *Neoseiulus californicus* and *Mesoseiulus longipes* was introduced on July 9. Varieties were pruned to a single leader and vertically trellised weekly. Cucumber fruit harvest and yield data collection began on June 3 and ended August 9, with 2 to 3 harvests per week. Number of fruit per block and total weight per block was recorded at each harvest. Percent foliage infested with *Podosphaera xanthii* Powdery Mildew was determined on July 19. Fruit length of 4 fruit per block was recorded on July 11. Varieties Ivanhoe and Corona were removed from the trial July 17 due to disease pressure. The trial was terminated on August 8. Data were analyzed using statistical software Analysis of Variance (ANOVA) procedure, and treatment means were separated using Fisher's Least Significant Difference.

Results

Ilias yielded significantly more fruit than all other varieties (Table 1.). Ilias also yielded the highest mean weight per block, at 108.2 pounds (10 plant blocks) but, varieties Manar, Alladin and Discover did not statistically differ. Corona and Ivanhoe were grouped as the lowest yields, as measured by both mean fruit per block and mean weight per block in pounds. Powdery mildew infection ratings were measured on a 0-9 scale, with 0 representing 0% foliage infected and 9 representing plant death due to complete foliar infection. Discover had the lowest powdery mildew rating at 0.3, which was statistically similar to Manar, Niagara, Curtiz, Murgis. Nearly complete foliar infection was recorded for Corona and Ivanhoe, both with a mean of 8.3. Ivanhoe and Murgis had the longest mean fruit length of 15.5 inches. Alladin, Discover and Camaro were also in the same statistical group. Ilias and Manar were ranked in the lowest group for length.

Table 1. Weight in pounds, fruit number, mildew severity and length of 10 varieties.

Variety	Mean Fruit per Block (10 plants in a block)	Mean Weight per Block (10 plants in a block)	Mean Powdery Mildew Rating per Block	Mean Fruit Length in Inches
Ilias	307 a*	108.2 a	3.8 b	8.4 e
Manar	226.5 b	84.6 ab	0.5 e	7.6 e
Alladin	146.5 c	88.8 ab	2 cd	15 ab
Discover	128.8 cd	84.4 ab	0.3 e	14.7 ab
Curtiz	123.3 cd	76.8 b	1 de	14.5 bc
Murgis	118.8 cd	78.4 b	1 de	15.5 a
Camaro	111.3 cd	73.6 b	3.3 bc	14.7 ab
Niagara	110.3 cd	67.9 b	0.8 de	13.5 d
Corona	77.3 de	38.6 c	8.3 a	13.7 cd
Ivanhoe	51.5 e	31.1 c	8.3 a	15.5 a
LSD	51.9	25.5	1.3	0.9

*Means with different letters (grouping) differ significantly according to Fisher's Protected LSD (P<0.05)

Discussion

Great yield differences were observable between varieties. If the high tunnel were planted solely to highest yielding variety, Ilias, the equivalent would be nearly 4000 pounds, approximately 80 bushels from 2400 square feet. This was from a harvest period of only 3 months and could be acceptable to growers if the yield could be maintained throughout the high tunnel growing season, or double cropped. However pest and disease pressure from Two Spotted Spider Mite (*Tetranychus urticae*), Powdery Mildew, Bacterial Wilt (*Erwinia tracheiphila*) and Aphids (*Aphis* and *Myzus* spp.) was too great to continue the trial beyond the month of August. Manar showed excellent powdery mildew resistance and its yield in weight was also ranked in the highest statistical grouping. The varieties 'Ilias and Manar' are 'beit-alpha' types, much smaller than the other 'English' varieties. Bees must be kept away from English cucumbers, or fruit malformation occurs. The exclusion of bees, and other pollinators, is difficult with the roll-up sides common to high tunnels. This highlights another advantage of the smaller varieties, as they are less likely to exhibit the curling of fruit, common to the longer varieties when visited by pollinators. Price data collected during the trial indicates English cucumbers will likely not bring a price differential when field cucumbers are at wholesale auction.

Yet, there are some potential benefits to high tunnel production of English cucumbers. They provided a harvestable yield quicker than tomatoes planted earlier in an adjacent high tunnel. During a separate fall trial we avoided a devastating blight of Downy Mildew (*Pseudoperonospora cubensis*), which severely impacted field cucumbers in the region by late August. This is of particular interest to organic cucumber growers.

By planting the highest yielding varieties, timing the crop cycle to hit early or late markets and with intensive pest management, English cucumbers could be profitable for Northeast vegetable farmers. However, further research is needed in several areas:

- Pest Management. Precise guidelines are needed for both biological and chemical control.
- Variety Evaluation. Production in the colder 'shoulder' seasons when prices are higher would increase profitability, but many varieties are highly cold sensitive.
- Crop rotation. English cucumbers could be double-cropped themselves or with other short season crops, such as snap beans, greens or other cucurbits. Feasibility and profitability of these systems must be evaluated.
- Pollination. Breeding efforts are producing cultivars that are closer to 100% gynoecious (many current varieties will produce a small percentage of male flowers). Pollinator exclusion must be compared to monoecious hybrids and/or beit alpha types.

This project was funded by a grant from the New York Farm Viability Institute's Agriculture Initiative Center.

Table 2. Photographs of 10 varieties of English cucumber grown in a high tunnel.

	
<p>ALLADIN. Good yields with moderate powdery mildew resistance. Long fruit with some curling and tapering.</p>	<p>CAMARO. Moderate yields with good powdery mildew resistance. Long fruit, some curling.</p>
	
<p>CORONA. Very powdery mildew susceptible. Fruit prone to curling. Yield was low in trial because variety was removed early (disease).</p>	<p>CURTIZ. Good yields and good powdery mildew resistance. Medium fruit length.</p>
	
<p>DISCOVER. High yielding, excellent powdery mildew resistance. Fruit was long and straight.</p>	<p>ILIAS. High yielding, short 'beit-alpha' type. Powdery mildew susceptible. Uniform, straight fruit.</p>



IVANHOE. Very powdery mildew susceptible. Longest fruit in trial, prone to curling. Yield was low in trial because variety was removed early (disease).



MANAR. High yielding, short 'beit-alpha' type. Excellent powdery mildew resistance. Uniform, straight fruit. Later yielding, but thicker than Ilias.



MURGIS. Good yields and moderate powdery mildew resistance. Longest fruit with some curls.



NIAGARA. High yielding with good powdery mildew resistance. Fruit was not uniform and showed some curling.



Vertical trellising of English cucumbers in a Penn Yan high tunnel.



Harvested high tunnel cucumbers (and tomatoes) ready to be packed for market.