

The Penn State High Tunnel Research and Education Facility

2006 Crop Review



The Penn State *Cellar Market*

Lisianthus

Spring Cut Flowers

Fall Cut Flowers

Sunflowers

Garlic

Eggplant

Colored Bell Peppers

Strawberries

Bitter Melon & Okra

Specialty & Other Crops

Weather Review

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Penn State High Tunnel Research and Education Facility
~2006 Crop Review~

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Every year, the data collected at the Penn State High Tunnel Research and Education Facility (HTREF) is compiled into the *Annual Crop Review*. This crop review is merely a summery of the ongoing research. Further information may be available on any of the crops listed above, please feel free to contact us with comments or questions.

Special thanks to Tricia Blackstock, Cara Eisley and Shaina Dulburg!

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The Penn State Cellar Market

Beginning in the summer of 2004 the Penn State Cellar Market opened on the University Park campus. The long-term goal of the Cellar Market is for an intensive summer course to be built around the many facets of farming and marketing and the integral relationship between the two. This course will prove to be very valuable in the ever increasingly competitive work environment. Students will grow and market the produce as well as calculate the farm and market budget and set produce prices accordingly. As the course is in its development stages, the market has been open for three full growing seasons now. We have been able to glean much information about customer preference and quality of the produce in this time. Included in each section below comments about specific varieties will be reported as well as overall trends in customer preference. If you happen to be on the University Park Campus, please feel free to stop by and visit. The Cellar Market is located on Eisenhower Road just beneath the greenhouses of the Tyson Building.

In addition to last year's 'face lift', the Cellar Market is undergoing further improvements. This year a green roof is being built atop the old vegetable cellar. The Cellar Market will now be a destination point of interest on the expanding Penn State University Park Campus. We are excited to offer such an interesting learning experience for students as well as the general public.

A few marketing tips learned from the Cellar Market:

~Know your customer base – On the University Pak campus there is a wide diversity of age and ethnicity. However, this ia a transient community, therefore the trends may change from year to year.

~Ask your customers what they would like to buy, grow it if you can – There have been a few crops, like collard greens and okra, that would not have necessarily been grown, but was at customer request. They have proved to be very successful crops at the market with a wide variety of customers.

~Offer tips on how to prepare produce, especially for new or unfamiliar produce. Have recipes that might include many other items that are for sale.

~Learn the names of regular customer. The little things really go a long way in customer retention.

~Label produce clearly – Pretty simple, but it seems that if people are confused about the price or are not sure what the item is, they are not likely to buy it.



Lisianthus

Varieties: ‘Balboa Yellow’, ‘Avila Deep Rose’, ‘Ventura Peach’, ‘Laguna Green’, ‘Echo Lavender’

Study Period: All sown from seed in Hort Farm greenhouse in early November 2005
Planted: 24 April 2005 / Final harvest: 10 October 2005

Tunnel: 3A (17’x36’)

Study Design: 2 rows of blue plastic mulch, 2 rows of black plastic mulch, all with drip irrigation. Each variety planted on both blue and black mulch. Balboa, Laguna and Ventura 30 plants each; *Avila and Echo have 45 plants each *Yield reflects these differences. Beneficial plants were planted around the perimeter of the high tunnel.

Spacing: 8”, single row

Parameters Evaluated: (1) Yield (2) Average Stem Length (3) Effect of plastic colored mulch

Pest Control: None; aphid parasitizers and green lacewings (native and/or via releases in other tunnels in previous years) established and controlled aphid populations by late summer/early fall.

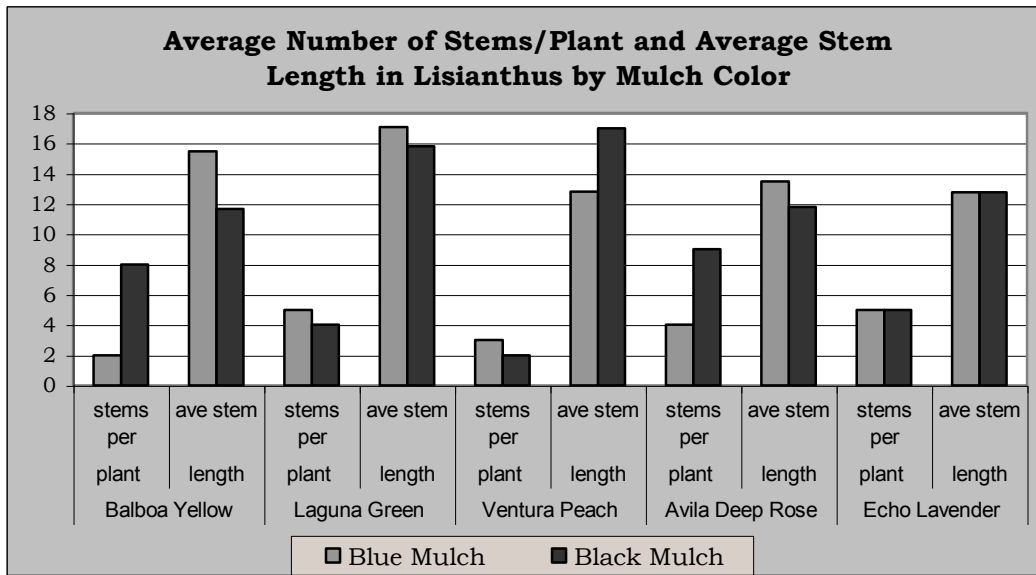
Fertility: Two applications of Liquid Compost Factor and one application of 20-10-20

Quality: Excellent

Seed Source: Ball Seed

(1) *Yield (2) Average Stem Length & (3) Effect of Colored Mulch

	Balboa Yellow	Laguna Green	Ventura Peach	*Avila Deep Rose	*Echo Lavender
Blue Mulch	125	136	56	179	304
Black Mulch	80	174	131	210	130



First Harvest Quantity Relating to Earliness of Varieties:

10-July 2005	Balboa Yellow	Laguna Green	Ventura Peach	Avila Deep Rose	Echo Lavender
Blue	2	0	0	33	0
Black	0	0	2	22	0

Harvest guidelines – cut at plant base when one or more flowers are fully open.

Notes: Lisianthus is a very high dollar cut flower. Keeping wind and rain off of the delicate petals proves to be a major advantage for this flower, as well as all other crops grown in high tunnels. Harvesting can also occur regardless of the weather. In previous years, Lisianthus was also grown in the field, which produced significantly shorter stems and inferior flower quality. Field trials are no longer conducted, only high tunnel trials. Avila and Ventura are not recommended for high temperature/high light production but their performance was tested in high tunnel conditions to see if they would come on earlier than Balboa, Laguna and Echo, which are recommended for high temp/high light environments. Avila and Ventura are recommended for cooler temperatures as well as shorter day length. With an early spring planting in April, the days are still relatively short and the evenings are cool. Avila was earlier than all of the other varieties, including Ventura. Avila was also much shorter in stem length than the rest of the varieties. This earliness may not be significant enough to warrant growing these varieties in the high tunnel environment, at least not for this climate. ‘Laguna Peach’ and ‘Ventura Peach’ are single varieties, the others are doubles. Empirical data suggests that the singles do not hold up as well as the doubles in post harvest handling. Lisianthus is a standard in the mixed bouquets sold at the Cellar Market. They are also sold as single stems. Customers have grown to recognize and love the elegance of this beautiful flower.



Spring Cut Flowers

Varieties: Calendula ‘Alpha’ and ‘Antares Flashback’, Snapdragon ‘Rocket Mix’, Zinnia ‘Benery’s Giant Mix’, Eucalyptus ‘Silver Drop’, China Aster ‘Unium Mix’, Heliotrope ‘Marine’, Talinum ‘Kingswood Gold’ and Bupleurum ‘Green Gold’

Study Period: Planted: 4 April 2005 / Final harvest: 8 November 2005

Tunnel: 7A (17’x36’)

Study Design: Five (5) permanent raised beds with drip irrigation. Each variety was planted in 15’ rows; *Snapdragon, Zinnia planted in 2, 15’ rows (totaling 30’ ; data reflects increased number of plants).*

Spacing: 6”, single row

Parameters Evaluated: (1) Yield (2) Average Stem Length

Pest Control:

13 April: Rove beetles

21 April: N. cucumeris

9 June: Green Lacewing Eggs, Adult Labybird Beetles, Encarsia Formosa, Longi/Cali Mix and N. cucumeris

Fertility: Two applications of Liquid Compost Factor and one application of 20-10-20

Quality: Excellent

Seed Source: Ball Seed – Bupleurum, Snapdragons; Johnny’s Selected Seeds – all others.

(1) Yield (2) Average Stem Length

	Yield	Ave Stem Length (in)
Calendula	240	13.7
Snapdragons*	1880	20.9
Zinnia*	896	16.3
Eucalyptus	483	16.7
Aster	571	14.4
Heliotrope	220	11.4
Talinum	653	18.6
Bupleurum	190	16.4

Notes: Calendula is grown to sell as an edible flower. Although it is labeled as a cut flower, it does not last long in a vase. There is also a slightly off odor and are sticky to handle. Calendula sold better at market as edible flower than as cut flower. Snapdragons and Zinnias are grown every year and are both very reliable. Zinnias often get powdery mildew towards the end of the season. Eucalyptus, Aster, Heliotrope and Talinum were new this year. Eucalyptus is a very slow grower and was not really harvestable until mid-late season and is great for fresh or dried flower arranging. Aster was a nice addition; it added great texture to the arrangements. However, it needs to be sow two or three times for continuous blooms. Heliotrope is a beautiful flower with small velvety blue flowers, but seems to be too cold sensitive for the coolers at 40-45° F. By the time the flower was used in an arrangement the flowers would shatter and looked brownish and damaged. Talinum is a great new filler trialed this year. It is very whimsical and also adds great texture to arrangements – the only downfall is that it seems to be the first to drop it's little berries in a mixed bouquet (around day four in vase). Multiple sowings of Bupleurum are needed to ensure continuous harvest all season of the beautiful filler flower. Of these flowers listed above, Bupleurum seems to be the first attacked by thrips.



Fall Cut Flowers

Varieties: Snapdragon 'Rocket Mix', Scabiosa 'Black Knight', Celosia 'Pampas Plume', 'Lime Light Spray' Millet, Statice 'Sunset Mix', Ornamental Grass 'Ruby Silk'.

Study Period: Planted: 5 June 2005 / Final harvest: 9 October 2005

Tunnel: 5C (17'x36')

Study Design: Four (4) raised beds with black plastic mulch, all with drip irrigation. Each variety was planted in 15' rows

Spacing: 6", single row

Parameters Evaluated: (1) Yield (2) Average Stem Length

Pest Control:

13 April: Rove beetles

21 April: Cucumeris

Adult Lady Bird Beetles

Fertility: One application each of Liquid Compost Factor (LCF) and 20-10-20

Quality: Excellent / Good

Seed Source: Ball Seed – Snapdragon 'Rocket Mix', Johnny's Selected Seeds – all others

(1) Yield & (2) Average Stem Length

	Yield	Ave Stem Length (in)
Snapdragons	437	20.3
Celosia	507	18.9
Millet	152	16.7
Statice	30	24.0
Scabiosa	371	14.2
Ruby Silk	1555	26.1

Notes: A second planting of flowers introduces a new batch of flowers into the mix, keeping customers interested in your product. Choose deeper or more muted colors and grasses for a great 'fall look' to the arrangements. Also keep an eye out for seed pods as they add to the fall look. Consider growing a few varieties that dry well, so that when a hard frost hits and kills the live flowers, dry flowers can be introduced (harvest and hang to dry throughout the season). Bouquets of orange/yellow statice sold very well around Halloween at the Cellar Market. Snapdragons were grown again to ensure sufficient supply. Celosia and Statice are standard fall cuts and are grown every year. Scabiosa was grown in 2005 and was given a second chance in 2006. Although the deep purple/black color is fabulous, the thin wiry stem is not. This will not be grown again. Ruby Silk was new this year and proved to be a great addition, however it is more labor to harvest the very thin (yet sturdy) stems – adds a wonderful 'bounce' to flower arrangements.



Sunflowers

Varieties: ‘Procut Yellow Lite’, ‘Sunrich Orange’, ‘Procut Lemon’, ‘Sunbright Supreme’

Study Period: Planted: 10 May, 2 June, 23 June 2006

Study Design: Four raised beds with black plastic mulch and drip irrigation

Spacing: 4”, single row

Parameters Evaluated: (1) Average Stem Length per planting date (2) Average Disk Diameter per planting date

Pest Control: Powdery mildew was noted by the end of the crop cycle.

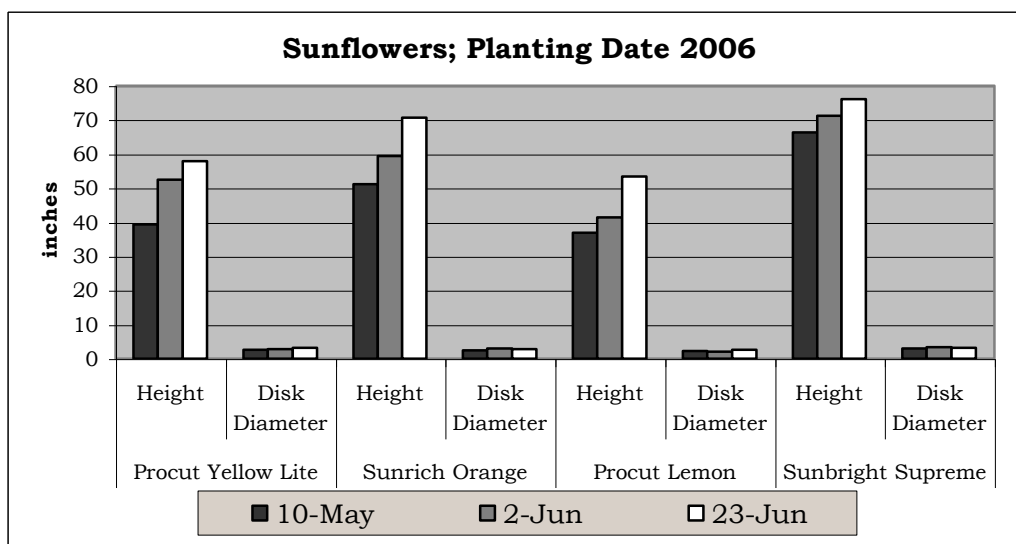
Aphids were noted on some plants but beneficial insects (both released in other tunnels and those present on the farm) handled the aphid population and no other intervention as taken.

Fertility: One application each of Liquid Compost Factor (LCF) and 20-10-20

Quality: Excellent

Seed Source: Johnny’s Selected Seeds

(1) & (2) Average Stem Length and Average Disk Diameter per planting date



Notes: All four of these varieties are industry standards and performed very well. The data suggests that the stems get longer with warmer weather and longer days.



Garlic

Varieties: Xian, Medidzhuari, Inchelium Red, German Extra Hardy, German White

Study Period: Planted: November 2005 Harvest: June/July 2006

Tunnel: 4C, 6C (17'x36')

Study Design: All: top-dressed with compost with drip irrigation, no plastic mulch.

4C: Seven (7) rows raised beds (hand raked)

6C: Five (5) Permanent raised beds (PRB)

Spacing: 4C - 6" double row, 6C - 6" triple row

Parameters Evaluated: (1) Yield (2) Cull (3) Garlic growth in PRB vs. Raised Beds

Pest Control:

3 April – Spintor

13 April – ScanMask and Rove Beetles

21 April – Cucumeris

Fertility: Two applications of Liquid Compost Factor and one application of 20-10-20

Quality: Mixed; Excellent, Good, Poor

Seed Source: HTREF Seed stock

(1) Yield (In fresh and dry weights) (2) Cull (3) Garlic growth in PRB vs. Raised Beds

	Yield (lbs)				Cull	
	4C		6C		4C	6C
	Fresh Harvest	Dry Weight	Fresh Harvest	Dry Weight		
German White	27/25.6	22.6/21.6	38.2	27.2	1.2/2.2	0.4
Medidhizuari	22/19.2	17.2/17	27.4	19.8	2/1.4	0
Inchelium Red	25.4	13.8	29.2	11	1.4	1.4
Xian	21.2	15			1.2	
German Extra Hardy	7	6.2			0.8	

Notes: Due to continuous studies over the years, it has been determined that garlic grows best with only one layer of plastic; either plastic mulch in the fields or plastic over-head as with a high tunnel. This year the flat culture trial was eliminated and only raised beds and permanent raised beds were used. Overall, garlic grows extremely well in the high tunnel environment. It is also a nice use for the transition from fall to spring to maximize the potential profit of the high tunnel investment. Cull contributors are size of bulb too small, improper

growth or other damage, and human error at time of harvest, all causing the bulb to be unmarketable.



Eggplant

Varieties: ‘Zebra’, ‘Nadia’, ‘Orient Charm’ and ‘Orient Express’

Study Period: (A) Planted: 18 April 2006 / Final harvest: 9 October 2006

(B) Planted: 23 May 2006 / Final harvest: 9 October 2006

Tunnels: 2A (17’x36’)

Study Design: Four rows of raised beds with black plastic mulch, and drip irrigation. Each variety was planted in a 15’ long, half row. The tunnel was managed with the use of biological controls whereby it received bio-releases of beneficial insects. Beneficial plants were planted around the inside perimeter of the high tunnel to aid in the retention of released insects as well as the attraction of local beneficial insects.

Spacing: 16”, single row

Parameters Evaluated: (1) Yield, (2) Cull (3) Crop-specific weight

Pest Control:

21 April: N cucumeris

9 June: Encarsia Formosa, Longi/Cali Mix, N cucumeis, Adult Ladybird Beetles and Green Lacewing Eggs

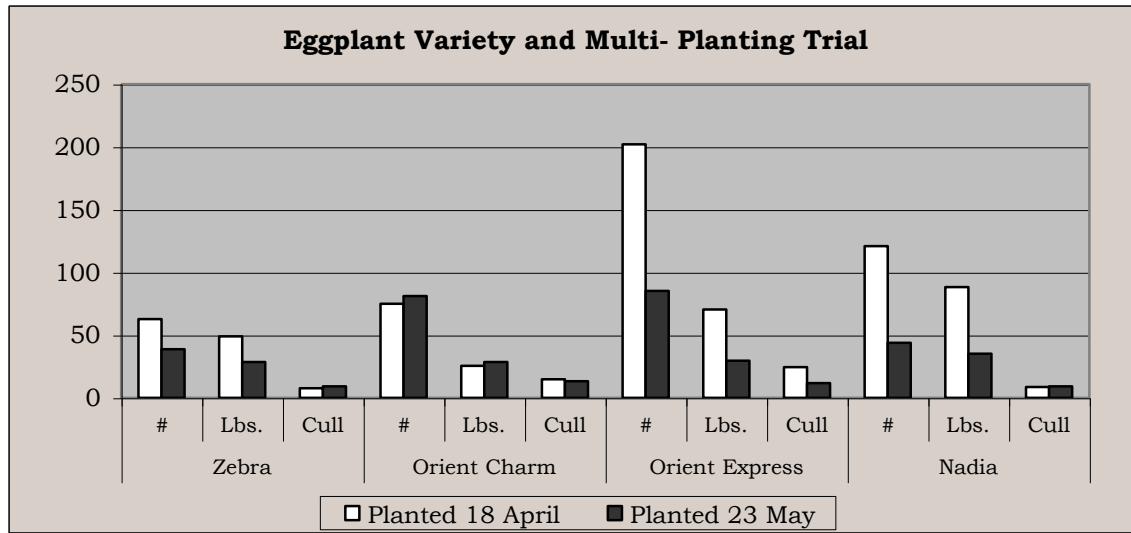
Fertility: Tunnel received 2 applications of Liquid Compost Factor (LCF) and one application of 20-10-20.

Quality: excellent/good

Seed Sources: Johnny’s Selected Seeds for all eggplant; Territorial Seed for Beneficial Bug Mix and Richters Herbs for additional beneficial plants.

(1) Yield & (2) Cull 3) Average Eggplant Variety Weight in lbs.

	1st Planting					2nd Planting				
	Yield	Lbs.	Cull	Ave lb/fruit	% Cull	Yield	Lbs.	Cull	Ave lb/fruit	% Cull
Zebra	63	49.2	7.6	0.78	13.4	39	28.8	9.2	0.74	24.2
Orient Charm	75	25.3	14.8	0.34	36.9	81	28.8	13.4	0.36	31.8
Orient Express	202	70.6	24.6	0.35	25.8	85	29.6	11.6	0.35	28.2



Notes: All three varieties proved to be very reliable this season. ‘Zebra’ replaced Neon this year and was a decent replacement. ‘Zebra’ is not as prolific as ‘Neon’, but it is a very nice fruit and it sold well at the Cellar Market. ‘Nadia’ is the traditional dark purple Italian-type eggplant, both ‘Orient Express’ (dark purple) and ‘Orient Charm’ (pink/ purple) are long slender Asian-type eggplant which also sold very well. All varieties grow very well in high tunnel production. The data suggests that getting the eggplant in early in the season results in a much higher crop yield throughout the season. Pests on these plants included western flower thrips, two spotted spider mites, flea beetles and Colorado potato beetles (CPB) and where present on all varieties. In high tunnels, manual removal of large beetles such as CPB’s is possible, thus managing the population without pesticide use. Beneficial insects where released to manage the other aforementioned pests.



Bell Peppers

Varieties: ‘3XR Red Knight’ (large red bell), ‘Gourmet’ (orange bell), ‘Labrador’ (yellow bell), ‘Blue Jay’ (blue/purple to red bell)

Study Period: (A) Planted: 18 April 2006 / Final harvest: 9 October 2006

(B) Planted: 23 May 2006 / Final harvest: 9 October 2006

Study Design: The tunnels was managed with the use of biological controls whereby it receives bio-releases of beneficial insects. Beneficial plants were planted around the inside perimeter of the high tunnel to aid in the retention of released insects as well as the attraction of local beneficial insects.

Spacing: 12”, single row; 16 plants per variety therefore 64 total pepper plants

Parameters Evaluated: (1) Yield, (2) Cull (3) Crop-specific weight

Pest Control:

9 June: N cucumeris, Adult Ladybird Beetles

Fertility: Tunnel received 2 applications of Liquid Compost Factor (LCF) and one of 20-10-20.

Quality: excellent/good

Seed Sources: Johnny’s Selected Seeds for all eggplant; Territorial Seed for Beneficial Bug Mix and Richters Herbs for additional beneficial plants.

(1) Yield & (2) Cull (all in lbs.)

	Jumbo	Fancy	Standard	Total Yield	Cull	% Cull
Red Knight	71.6	54.9	7.4	133.9	17.8	11.7
Gourmet	3.2	69.3	33.4	105.9	16.9	13.8
Early Sunstation	29	89.2	14.2	132.4	17.2	11.5
Blue Jay	0.6	44	46	90.6	32.2	26.2

(3) Average Pepper Variety Weight (lbs).

	Jumbo	Fancy	Standard
Red Knight	0.80	0.61	0.46
Gourmet	0.64	0.56	0.43
Early Sunsation	0.78	0.59	0.44
Blue Jay	0.60	0.48	0.37

Variety Notes:

Red Knight: Very large, thick skin and flesh; very flavorful; overall attractive; mostly Jumbo sized fruit

Gourmet: good color, mild sweet flavor; reliable orange pepper; keeps well post harvest; mostly Fancy sized fruit

Labrador: Reliable yellow pepper; good color and mild flavor; does not keep as well as other post harvest; mostly Fancy sized fruit

Blue Jay: Beautiful color when immature and changes nicely to red, with mottled yellow and orange in between; not as productive as others; mostly standard sized fruit

Notes:

All varieties of bell peppers were harvested showing at least 40-50% color. Overall, pest damage was minimal and well controlled by beneficial insects. Labrador and Gourmet are grown every year and we will likely grow Red Knight again as well.



Strawberries

Variety: 'Chandler'

Study Period: Planted: 14 October 2005 Harvest: June/July 2006

Tunnel: 6B (17'x36')

Study Design: Four rows, drip irrigation and black plastic mulch.

Spacing: 10"x10", staggered the drip tape

Parameters Evaluated: (1) Yield (2) Cull (3) 50 Berry weight

Pest Control:

9 June: Longi/Cali Mix

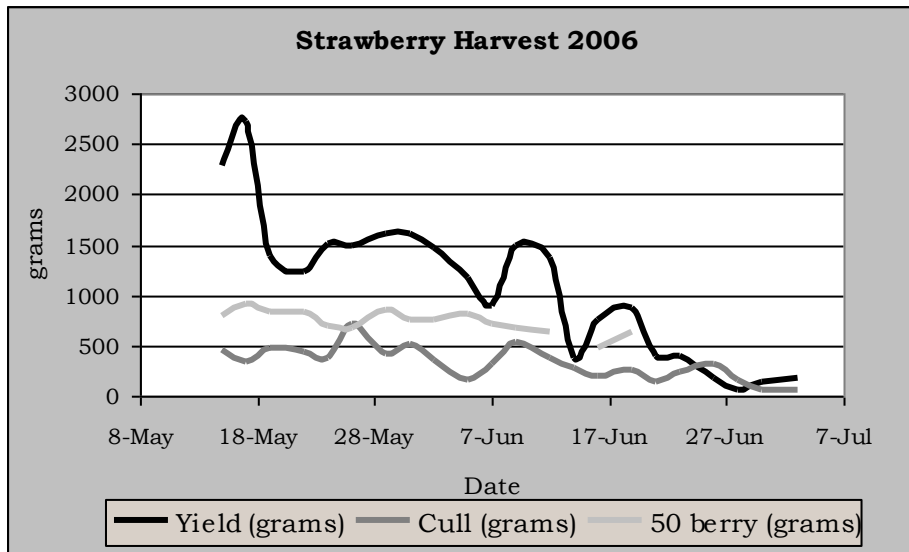
Fertility: 1/2" Compost tilled into soil

Quality: Excellent

Seed Source: Shady Hollow Nursery

(1) Yield (2) Cull (3) 50 Berry weight

<u>'Chandler' Harvest Summary (all in grams)</u>	
Yield	23,592.9
Cull	7,211.1
50 berry (ave)	738.1



Notes: Strawberries are a high value crop and grow very well in high tunnels. Keeping the rain off of the ripening fruit yields beautiful berries. When planted in the fall, the plants will flower earlier in the tunnel than would in the field. Therefore care must be taken to properly pollinate the flowers. Opening the tunnel on warm days/ or purchasing bees are some options. Due to the high market demand for strawberries, a large area needs to be planted. One 17'x36' high tunnel produced about 24 quarts a week at maximum production, which only is at most a week or two.



Bitter Melon & Okra

Varieties: (A) Bitter Melon, ‘Kiew Yoke’ (B) Okra, ‘Clemson Spineless’ and ‘Red Burgundy’

Study Period: Planted: (A) 2 June 2006 (B) / Last Harvest: (A) & (B) 25 September 2006

Tunnel: 4A (17’x36’)

Study Design:

Spacing: (A) one half, 18” single row (B) one, 6” single row

Parameters Evaluated: (1) Yield

Pest Control: None

Fertility: One application of Liquid Compost Factor and one application of 20-10-20

Quality: Excellent

Seed Source: (A) Johnny’s Select Seeds (B) Heirloom Seeds

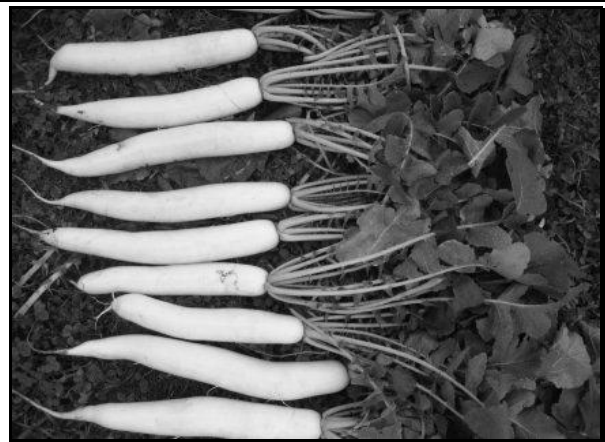
(1) Yield

	Bitter Melon		Okra	
	Yield	Lbs.	Yield	Lbs.
Total	72	25	729	19.4

Notes:

Bitter Melon: Again, at a customer's request, a few bitter melon plants were grown as an initial trial. Surprisingly, this crop sold extremely well. A great deal more bitter melon will be grown in 2007. Only 9 bitter melon plants were planted and over the entire growing season, only ~8 fruits were harvested per plant. Therefore, to make this crop economically feasible, a large number of plants will need to be planted. Bitter melon is a cold sensitive crop and was easily damaged by cool nights in late September. A much larger quantity will be trialed in 2007 as well as two new varieties; 'Kiew Yoke' was not available, therefore 'Palee' and 'Comet' will be grown.

Okra: A highly demanding crop, okra needs to be harvested at least every other day. Both varieties performed very well. 'Red Burgundy' seems to grow longer and thinner than 'Clemson Spineless' does, thereby making more of the crop marketable. Please note that the okra data presented above did not separate the two varieties. Overall, okra performs very well in the high tunnel environment.



Specialty Crops

The cropping potential in high tunnels is relatively limitless. Due to time and labor constraints, not all of the crops grown at the High Tunnel Research and Education Facility have complete data taken on them. However, the crops mentioned below performed very well and should be included as worthwhile for growing in the protected environment of the high tunnel.

Culinary and Medicinal Herbs: Fresh cut herbs for culinary use are a summer standard. Herbs tend to grow very well in high tunnels, with the exception of cilantro in the summer. Cilantro (even 'Santo', the slow bolt variety) is difficult to grow in the heat of the summer, however, if left in the tunnel till winter, cilantro thrives. All of the other herbs grown in the high tunnels do very well; rosemary, thyme, parsley, basil, dill, oregano etc. Data has been taken in them in the past, and will be again in the future. The market for medicinal herbs is growing as more consumers are realizing the benefits of them. All of the aforementioned herbs have medicinal qualities, but there are many other herbs that could be trialed in high tunnels for the increasing market demand of high quality fresh medicinal herbs.

Daikon Radish: This root turned out to be another crop in very high demand at the market. These radishes were grown in permanent raised beds (PRBs) where the soil was composted and tilled with a Mantis tiller prior to direct seeding. This soil prep work had a noticeable difference in the quality of the radish; the fall crop yielded beautiful straight white radishes whereas the spring crop produced forked and irregular radishes in hand-tilled PRBs (pictured above right).

Edamame: Edible soybeans are another crop that is on the rise in consumer demand. As Asian restaurants are becoming more popular, more people are being turned onto the tasty, easy to eat and healthy soybean. 'Sayamusume' from Territorial Seed grown with great success both in crop production and consumer approval. This is a great crop to rotate in too for its soil building properties. If left on the plant, the dried soybeans can still be harvested and sold as bulk soybeans (pictured bottom).

Mini Bell Peppers: Another Territorial Seed find, these mini bell peppers were great! They were easy to grow, easy to harvest and turned red much earlier than large bell peppers therefore getting to market early. Customers seemed to like them as well, despite the slightly higher price (specialty crop + labor + red bell pepper). This too will be grown again in coming years.

Spring New Potatoes: Planted in late March under black plastic mulch with row covers on top, new potatoes can be harvested by mid June. Fresh-dug new potatoes are very popular at the market and sell at a reasonably high price. This also opens up the high tunnel for a fall crop.

Sweet Potatoes: 'Jewel' was trialed two years ago 'Georgia Jet' and in 2006 both with varied success. In 2005 the sweet potatoes were under black plastic, over watered and over fertilized resulting in long stringy sweet potatoes. In '06, 'Georgia Jet' was grown in raised beds with no plastic and did a little better, however many of the fruits were too big to sell. 2007 may be the last year sweet potatoes are trialed in high tunnels; 'Beauregard' is the variety that will be tested (pictured top left).

Tomatoes: Of course! A great deal of research has been conducted on tomatoes on high tunnels. In fact, tomatoes are likely the number one crop grown in high tunnels. They perform very well, and there is a large financial incentive to having the first tomato of the season. Of all the crops mentioned, this is one of the surest bets!

New for 2007:

Edible Gourds:

~Luffa Sponge Gourds, edible when 6", if left to mature and dry on plant, can be harvested

as 'Loofa' cleaning sponge.

~'Rama' Gourd

~'Comet' and 'Palee' Bitter Gourds

Radish:

~Asian; 'Miyashige' and 'Discovery'

~French; 'D'Avignon'

Papaya



Weather Review

The day's weather is recorded manually at the High Tunnel Research and Education Facility. The chart below represents the average ambient temperatures for each month of 2006, as well as the highest and lowest temperature recorded for that month. The rainfall measurements do not include snow or other frozen precipitation.

2006	Average Minimum	Average Maximum	Absolute Minimum	Absolute Maximum	Rainfall (mm)	Rainfall (inches)
January	27.8	44.1	10	59	47.6	1.9
February	22.0	36.4	8	63	26.8	1.1
March	26.7	45.8	14	74	27.2	1.1

April	37.3	62.9	20	80	68.6	2.7
May	44.8	68.3	28	90	54.0	2.1
June	53.7	76.5	38	88	139.8	5.5
July	61.3	81.2	42	90	94.6	3.7
August	57.4	81.0	40	90	77.4	3.0
September	51.0	63.7	36	78	99.5	3.9
October	39.2	58.0	22	78	169.3	6.7
November	35.8	50.6	18	68	79.2	3.1
December	27.4	47.9	16	66	47.3	1.9
Total					931.3	36.7
