High Tunnel Cantaloupe and Specialty Melon Cultivar Evaluation

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Introduction:

High tunnels are unheated, plastic-covered greenhouses which provide many benefits to vegetable producers:

1. High tunnels lengthen the growing season of many high value vegetable crops such as melons and tomatoes.
2. High tunnels protect the growing crop from extremes in temperature, strong winds, driving rain and destructive hail.
3. High tunnels protect the growing crop from many harmful insects and diseases that can lower marketable yield.
4. High tunnels can be used to intercrop many vegetable species. On a small plot of land, high tunnels permit intensive production of food crops.

Cantaloupes (*Cucumis melo* L.) and specialty melons may be a viable cash crop for high tunnel production in the Midwest. There is a strong demand for early-season melons, and many specialty melons are becoming increasingly popular with consumers. Specialty melons include heirlooms (e.g., *Charentais*), ananas-types casaba melons, Canary melons, crenshaw melons, honeydews and Galia melons. Galia melons are light-green-fleshed cantaloupes with no sutures (Figure 1). Galia melons are adapted to warm, dry climates that make them particularly suitable to high tunnel production.

Figure 1. High tunnels may be well-suited for commercial production of Galia melons.

Methodology:

Three (20 ft. wide x 34 ft. long) high tunnels (Stuppy Greenhouse Mfg., Kansas City, MO) located at the University of Missouri Bradford Research and Education Center was used as experimental units for this cultivar evaluation. Each high tunnel had a single layer of 6 mil plastic with 38 inch-high sidewalls that were rolled-up (or down) to manage temperature and humidity.

Seven cantaloupe cultivars were chosen for this evaluation. Each cultivar was seeded into 50 cell trays filled with Promix media (Premiere Horticulture, Inc., Red Hill, PA) on 17 February, 2005 and placed in a heated (75°F) greenhouse for transplant growth. The transplants were allowed to grow for approximately 42 days before transplanting within the high tunnels on 30 March 2005. Each week, the transplants were fertilized with 600 ppm nitrogen. The transplants were conditioned (i.e., hardened) one week prior to transplanting by reducing fertilization and water application.

Each melon transplant was spaced 24 inches apart on raised beds covered with 1 mil embossed, black plastic mulch. A starter fertilizer (20N-20P-20K) was applied to each transplant. Each raised beds was 48 inches apart on center, and a single drip line was placed under the plastic (medium flow; 12 inch dripper spacing) to deliver water and fertilizer to the growing melon plants.

Prior to laying plastic 40% of the total seasonal nitrogen (1 lb/1000ft^2), 100% of the required phosphorus, and 66% of the required potassium (based on a soil test) were applied as a granular fertilizer and tilled into each raised bed. The soil pH (salt) was 6.6 with 3% organic matter. The remaining nitrogen was fertigated via calcium nitrate each week through the growing season. Additional potassium was applied through the drip irrigation commencing at harvest.

Immediately after transplanting, the melons were covered with a medium weight row cover which was used to increase the average minimum temperature around the plants. Row covers remained on the plants for approximately 3 weeks. Four weeks after transplanting the plants were trellised using a 72 inch-high plastic mesh trellis supported with tensile wire and 72 inch metal posts. The vines were secured to the trellis using ¾ inch vine clips. Vines were not pruned for this evaluation.

Cantaloupes, like all cucurbits require movement of pollen from male flowers to female flowers. Female flowers appeared on the vines 25 April. Vents were open almost continually during the day after 25 April to encourage bee pollinators to enter the high tunnels.

Fruit were harvested when the netting or rind changed from green to bright yellow and the fruit were able to be easily detached from the vines. Harvest commenced on 12 June and continued through July. During harvest, random samples of fruit were measured for sugar (total soluble solids) using a hand-held refractometer.

Table 1. Melon cultivars evaluated within a high tunnel.

Cultivar	Fruit characteristics	Seed vendor
Athena	Orange flesh; light sutures	Rupp Seeds
Savor	*Charentais* melon; Orange flesh; small; no netting; Does not slip from the vine	Johnny's Seeds
Crescent Moon	Orange flesh; coarse net; deep sutures	Rupp Seeds/Seedway
Elario	Light green flesh; Galia type	Hazera Seeds
Galileo	Light green flesh; Galia type	Seedway
Galia 152	Light green flesh; Galia type	Hazera Seeds
Passport	White/green flesh; (honeydew x Galia type) light net	Johnny's Seeds

Results:

Table 2. Marketable yield of high tunnel melons.

Cultivar	Marketable yield[y]			
	lbs/plant	lbs/high tunnel[z]	Melons/plant	Melons/high tunnel[z]
Galia 152	10.1^{ab}	3044^{ab}	3.1^{ab}	938^{a}
Athena	7.6^{b}	2270^{b}	2.0^{b}	600^{b}
Crescent Moon	12.1^{a}	3638^{a}	2.2^{b}	675^{b}
Elario	9.7^{b}	2917^{b}	2.5^{b}	725^{b}
Savor	7.6^{b}	2273^{b}	3.3^{a}	975^{a}
Passport	10.2^{ab}	3055^{ab}	2.3^{b}	675^{b}
Galileo	8.3^{b}	2473^{b}	2.6^{b}	775^{b}
LSD (0.05)	*4.6*	*1377*	*1.1*	*346*

[z]Assumes a commercial high tunnel 20 ft. x 96 ft. with 300 melon plants.
[y]Means with the same letter superscript are not significantly different according to Duncan's MRT P=0.05.

Cantaloupe fruit with a weight greater than 3 lbs were considered marketable. 'Galia 152', 'Crescent Moon' and 'Passport' produced the highest marketable yields (Table 2; Figure 2). 'Galia 152' had excellent external appearance, high sugar content, a tight seed cavity and a very floral smell. The flesh was light green. The TSS (Total Soluble Solids) or sugar content averaged 14% (Figure 3)

'Passport' had relatively good yield of marketable fruit. However, 'Passport' did not seem to possess the uniformity in size and shape characteristic of 'Galia 152'. In addition, the external fruit appearance was not as attractive as either 'Galia 152' or 'Elario'. 'The sugar content of 'Passport' was equal to 'Galia 152'.

Charentais melons ('Savor') are actually true cantaloupes. The mature fruit lacks netting and do not slip from the vine when mature. Fruit is mature when the leaf closest to the fruit becomes pale. Fruit size is relatively small (2 lb./fruit), but quality is excellent. Some fruit had a tendency to split at the blossom end if left on the vine too long. The vine was very vigorous and should be pruned. *Charentais* melons and 'Passport' did not possess good tolerance to powdery mildew (*Sphaerotheca fuliginea*) relative to 'Galia 152'. The dry, dense plant climate within a high tunnel is an excellent environment for powdery mildew.

'Athena' and 'Crescent Moon' are excellent orange flesh cantaloupes (muskmelons). 'Athena' produced a uniform size and quality fruit with excellent shelf life and disease tolerance. 'Crescent Moon' produced a very large Eastern-type fruit (≥ 6lbs.) which requires support if the vine is trellised.

'Galileo' produced a uniform Galia-type melon with a tight seed cavity, light-green flesh, good powdery mildew tolerance and sugar content. The fruit did not require any support on the trellis.

When growing high tunnel melons, special attention must be paid to pollination. Vents may not be open during flowering if weather is cool. Since melon flowers are open for one day, pollination is essential. Bumble bees may be purchased and placed in each tunnel. Also 'attractant" crops like mustard (*Brassica* sp.) can be planted along the perimeter (inside or out) of the high tunnel to encourage entry of native bee species. Hand pollination may be feasible for a small number of plants.

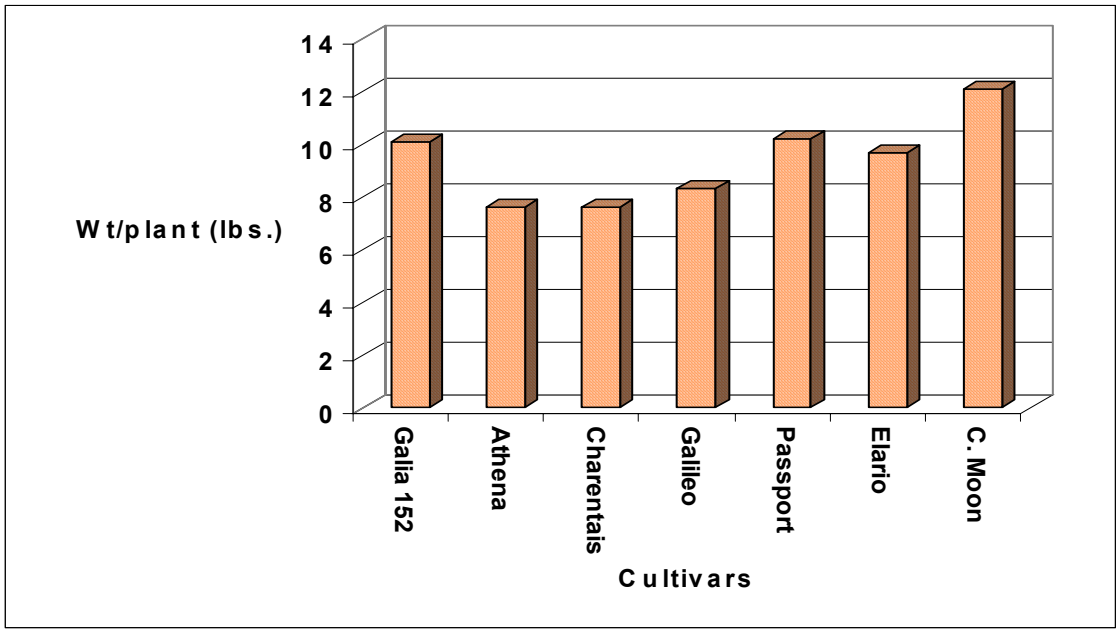

Figure 2. Marketable yield of melon cultivars grown within a high tunnel.

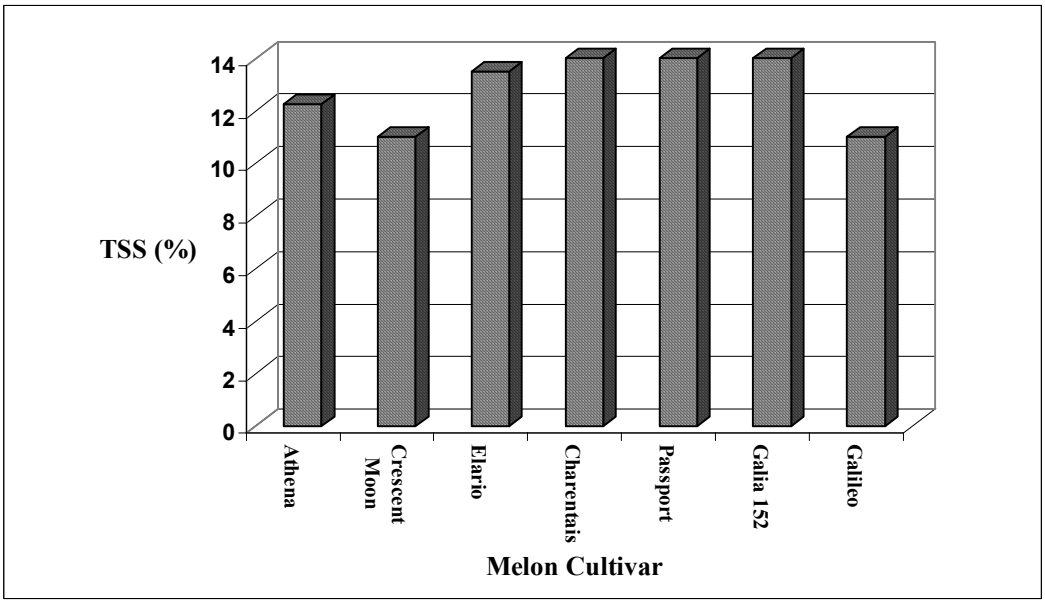

Figure 3. Total soluble solids of melon cultivars grown within a high tunnel.

Conclusions:

High tunnels permit early harvest of frost sensitive crop like melons. In the central Midwest, melons can be planted in early spring and harvested before mid-June when local supplies are low and prices are high. Melons are an excellent rotation crop with solanaceous vegetables such as tomatoes and peppers since they are botanically unrelated and do not share the same spectra of diseases and insects.

Galia melons can be successfully grown using a high tunnel. The warm, dry environment within a high tunnel creates the ideal microenvironment for growth and development. Galia melons often sell for $2-4/melon making them very profitable (Rodriguez, et al., 2002[1]). However, all cantaloupes evaluated performed very well within the high tunnel. Trellising is optional, but supporting the vines on a trellis makes harvest easier and reduces vine damage during harvest. Also, trellising improves light interception by the melon plants. Careful attention should be paid to pollination of the crop. Also, growers should evaluate the market potential of these melons in their area before planting.

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[1]Rodriguez, J. C., N. Shaw, and D. Cantliffe. 2002. Production of galia-type muskmelon using a passive ventilated greenhouse and soilless culture. pp 365-372. Cucurbitacea 2002 (D. Maynard, ed.).