HYDROPONICALLY PRODUCED 'GALIA' MUSKMELON—WHAT'S THE SECRET?

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Abstract. **'Galia' muskmelon (*Cucumis melo* L. Reticulatus group) is a green-fleshed specialty melon with a yellow-netted rind, bold aroma, and sweet flavor that is highly desirable in the European market. Twelve 'Galia' or 'Galia-type' muskmelon cultivars were grown in a passive-ventilated greenhouse over three seasons in Gainesville, Florida to identify cultivars with the best characteristics, such as fruit yield and quality, as well as potential for year-round production in a Florida protected structure. Seedlings were transplanted into perlite-filled polyethylene bags on 31 Mar. 1999, 14 Oct. 1999, and 1 Mar. 2000. Environmental growing conditions varied among seasons and influenced fruit yield and quality. In spring 1999, yields were not different among cultivars with 2.2 to 3.6 fruit produced per plant. In fall 1999, all cultivars produced 2.3 to 3.8 fruit per plant, except 'Galia-H' and 'Golan', which produced significantly lower yields than all other cultivars (less than 2 fruit per plant). 'Revigal' and 'Omega' produced 5 fruit per plant in spring 2000, but their yields were not significantly different from those of 'Gal-152', 'Gal-52', 'Galia-H', 'Galia-Z', 'Galor', 'Golan', and 'Jalisco'. Total fruit weight was less than 2.3 kg per plant in fall 1999 when temperatures were below 20°C, between 3.1 and 4.8 kg per plant in spring 1999, and between 3.0 and 4.4 kg per plant in spring 2000 when temperatures were greater than 20°C. Average fruit weight was greater than 1.20 kg when plants were not pruned in spring 1999 and less than 0.80 kg when temperatures were below 20°C in fall 1999. Average fruit weights in spring 2000 were between 0.70 kg and 0.90 kg per fruit depending on cultivar. Soluble solids readings varied among seasons and cultivars. Soluble solids for 'Galia-H' and 'Galia-Z' were greater than 10° Brix in spring 1999, but not different from those of 'Arava-Z', 'Gal-52', 'Jalisco', and 'Revigal'. In fall 1999, 'Omega' had the greatest soluble solids at 11.1° Brix, but was not significantly different from 'Arava-Z', 'Gal-152', and 'Golan'. In spring 2000, 'Gal-52', 'Galia-H', 'Galia-Z', 'Galor', and 'Revigal' cultivars had the sweetest fruit with soluble solids averaging greater than 11.3° Brix. The secrets to hydroponically produced 'Galia' melon include: planting for warm season fruit production, use of vigorous transplants, proper pruning and training, proper irrigation and fertigation, effective use of pollinator insects, and adequate pest and disease control.**

Greenhouse vegetable production has increased in Florida to over 40 ha (Tyson et al., 2001). The major crops produced are pepper (*Capsicum annuum* L.), tomato (*Lycopersicon esculentum* Mill.), lettuce (*Lactuca sativa* L.), and herbs. While the market for hydroponic vegetables is strong throughout the U.S., it is a unique market that continues to increase with diversification of commodities grown. Currently being introduced at local grocery stores is the middle-eastern or Beit Alpha cucumber (*Cucumis sativus* L.; see *http://www.hos.ufl.edu/protectedag*), and in the near future, 'Galia' muskmelon (*Cucumis melo* L. Reticulatus group) could become another hydroponic crop favorite. Both crops are quite common in Europe and were developed in Israel for field cultivation (Karchi, 2000). With advancements in agricultural technology and consumers' demands for better quality produce, both crops are being produced economically in greenhouses or protected-agriculture structures such as walk-in tunnels.

The 'Galia' melon is a green-fleshed muskmelon with a golden-yellow netted rind at maturity. 'Galia' fruit have a unique aroma and sweet flavor, and show promise as a specialty melon (Simon et al., 1993). Grown hydroponically in a protected-ag structure, 'Galia' fruit quality surpasses the quality of field-grown orange muskmelons because of its bold aroma and high sugar content, leading to higher market value.

The Florida vegetable industry is facing many challenges, including the loss of the soil fumigant methyl bromide in 2005; increased regulations on water, fertilizer, and pesticide use; increased urbanization and loss of production land in southern Florida; challenges from weather, including freezes, wind, and rain; and increased regional and global market competition (Cantliffe et al., 2001). Not only are alternative growing methods needed, including protected agriculture in non-traditional growing regions of Florida, but also new specialty commodities (Simon et al., 1993), such as 'Galia' melon, may be what Florida growers need to stay competitive.

The value of hydroponic crops produced in Florida totals about $14 million (Woods, 2000). Israeli growers are faced with some of the same challenges as Florida growers and have been the forerunners in developing protected ag technology under high temperatures (Blank, 1999). Israel's greenhouse vegetable industry is nearly 3,800 ha. Israel currently exports $121 million of fresh vegetables each year (Israel Export Institute, 2001). In 1999, nearly 240,000 tons of melons [including watermelon, *Citrullus lanatus* (Thunb.) Matsum. & Nak.] were produced under 208 ha of protected structure (greenhouse and tunnel) (State of Israel, 2001). In Europe, 'Galia' melons are in high demand and well known for their superior quality and high soluble solids (Hochmuth et al., 1992), furthermore, 'Galia' has become an identifiable trade name (Karchi and Govers, 1977). The cultivar is especially adapted to strict irrigation and fertilization and yields up to 50 metric tons/ha of high-quality fruit with 13-15% Brix are commonly achieved (Karchi, 2000; Karchi and Ayalon, 1977).

While 'Galia' melon is well accepted in European markets, one of its drawbacks is that the fruit must be picked at vine-ripe stage for peak flavor (Karchi, 1979), thus potentially limiting long distant shipment to market. In 2000, outdoor muskmelon production in the U.S. exceeded 15,390 ha; the primary states exporting the fruit are Arizona, California, Georgia, and Texas (USDA, 2000). Based on production statistics from Israel, Florida growers could break into this lucrative market by producing 'Galia' melon and targeting niche markets within the southeastern U.S. and exporting to the eastern seaboard.

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The present research was conducted to evaluate fruit yield and quality of 12 green-fleshed 'Galia' and 'Galia-type' muskmelon cultivars; to compare 'Galia-type' muskmelon cultivars to the original F_1 hybrid 'Galia'; and to determine the potential for year-round production.

Materials and Methods

The research was conducted at the Protected Ag Project located at the Horticultural Research Unit, Gainesville, Florida. The 0.20-ha greenhouse structure (Top Greenhouses Ltd., Rosh Ha'ayin 48101, Israel) was covered in double layer polyethylene with passive ventilation. The sidewalls were 3.6-m high with a 1-m roof vent at 8 m. Both the sidewalls and roof vent were covered with 0.6 mm insect screen (Polysack Plastic Industries LTD, Nir Yitzhak D. N. Hanegev 85455, Israel) to prevent the movement of insects into or out of the greenhouse. Temperatures were measured every 15 min at various locations in the greenhouse using thermocouples and were recorded by a datalogger (CR-10 Campbell Scientific, Inc., N. Logan, Utah) to have a complete history of temperature fluctuations (Jovicich, 2001). There were no additional heating or cooling units installed in the greenhouse. On several occasions during the fall 1999 growing season, night temperatures in the greenhouse dropped to 5°C with temperatures outside the greenhouse below 0°C. To prevent loss of the crop due to frost, plants were covered with polyester-spun floating row covers (Hummert International, Earth City, Mo.) commonly used for field crops.

Transplants were grown for 3 weeks in an evaporative pad-cooled greenhouse at temperatures of 28°C day and 22°C night. Transplant medium was a 60%-40% (v:v) mixture of peat and vermiculite. Once the cotyledons were fully expanded, transplants were fertilized twice a week using a solution of 100 ppm each of N-P-K with micronutrients made from Peters Professional All Purpose Plant Food (Spectrum Group, St. Louis, Mo.). Eight melon cultivars in spring 1999 and 12 melon cultivars in fall 1999 and spring 2000 were transplanted into 1 m long × 0.32 m wide white-polyethylene bags (Agrodynamics, East Brunswick, N.J.) filled with coarse perlite (Airlite Processing Corp. of Florida, Vero Beach, Fla.) on 31 Mar. 1999, 14 Oct. 1999, and 3 Mar. 2000. Melon cultivars were 'Arava-H', 'Gal-152', 'Gal-52', 'Galia-H', 'Galor', 'Jalisco', and 'Revigal' from Hazera Genetics (Burim, D. N. Shikmim, Israel 79837); 'Arava-Z', 'Galia-Z', and 'Golan' from Zeraim Gedera (Gedera, Israel 70750) and 'Capri' and 'Omega' distributed by Sunseeds (Morgan Hill, Calif.). Since different seed companies sell cultivars with the same name, the first letter of the company was added to 'Arava' and 'Galia' for discussion purposes. 'Capri', 'Gal-152', 'Galor', and 'Omega' were not grown in spring 1999 because seeds were unavailable at the time of planting.

The experiment was a randomized-complete-block design with three replications. Plant spacing was 30 cm between plants with three plants in each bag. Each plot consisted of two bags or six plants. Single rows were spaced 1.8 m apart (equivalent to 1.85 plants m^{-2} or 18,500 plants ha^{-1}). Plants were pruned to a single stem and woven through a nylon net trellis (Tenax Corp., Baltimore, Md.) for support. The 2-m wide net was 1000-m long and cut to hang vertically above the bags for the complete length of each row (28 m). The net openings measured 15.2 cm × 15.2 cm.

Hydroponic greenhouse production of muskmelon requires intense pruning beginning within 1 week after transplanting. 'Galia' fruit develop on the first node of the lateral; therefore, all laterals and female flowers were removed up to the 8th node and each subsequent lateral was pruned at the second node after pollination (Zvi Karchi, pers. comm.). Bumble bees (*Bombus impatiens*, Natupol, Koppert Biological Systems, Inc., Romulus, Mich.) were introduced into the crop 3 weeks after planting to pollinate flowers. Plants were not pruned properly in spring 1999 because information regarding production practices of 'Galia' melon was limited. Consequently, plants were excessively vegetative, resulting in fewer fruit but greater weight of fruit.

Irrigation water, along with a complete nutrient solution, was delivered through WPCJ pressure-compensating emitters (Netafim USA, Fresno, Calif.) at a flow rate of 33 $ml \cdot min^{-1}$. Irrigation scheduling was based on plant need to achieve 10-20% leachate from the bag. A programmable timer, Sterling 12 (Superior Controls Co., Inc., Valencia, Calif.) was used for irrigation. Total volume of irrigation delivered each day depended on the stage of plant growth, temperature, and solar radiation. From transplant to first female flower, approximately the first 4 weeks after transplant, plants received 300 to 600 ml of nutrient solution each day, the next 4 weeks during fruit set, plants received 800 to 1,200 ml each day, during fruit maturation, plants received 1,600 to 2,400 ml each day. When the first flush of fruit was harvested, plant water needs decreased and daily irrigation was reduced to 1,600 to 1,800 ml each day. Irrigation scheduling for each season was adjusted to specific environmental conditions by either increasing or decreasing the frequency of irrigation or length of each irrigation to provide more or less water to each plant.

Essential nutrients were delivered with each irrigation. Stock solutions were mixed to deliver nutrient concentrations as follows: Nitrogen (N) varied during plant growth, N = 160 ppm from transplant until first female flower, N = 200 ppm during fruit set, N = 100 to 120 ppm during fruit maturation, N = 160 ppm after first flush was harvested (Zvi Karchi, pers. comm.). All other nutrients remained constant during plant growth in accordance with University of Florida recommendations for hydroponic vegetable production in perlite (Hochmuth and Hochmuth, 1998). Potassium (K) = 150 ppm, P = 50 ppm, Ca = 120 ppm, Mg = 50 ppm, S = 65 ppm, Fe = 3 ppm, Cu = 0.2 ppm, Mn = 0.8 ppm, Zn = 0.3 ppm, B = 0.7 ppm, and Mo = 0.06 ppm. The pH of the nutrient solution was maintained between 5.5 and 6.5.

Due to the presence of bumblebees as pollinators, use of chemical fungicides and insecticides was limited and biological control measures were implemented whenever possible. Preventative fungicides were used for powdery mildew (*Sphaerotheca fuliginea*) and gummy stem blight (*Didymella bryoniae*) in all three seasons. In spring and fall 1999, weekly applications of either Dithane (mancozeb, Rohm & Haas Co., Philadelphia, Pa.) or Bravo 500 (chlorothalonil, Zeneca Agricultural Products, Wilmington, Del.) were made. In spring 2000, Quadris (azoxystrobin, Zeneca) fungicide was applied twice after planting and rotated with Bravo. Thereafter, a biological fungicide, AQ 10 (*Ampelomyces quisqualis*, Ecogen, Inc., Langhorne, Pa.) was used for powdery mildew control.

Insect pests were monitored using yellow sticky cards (Whitmire Micro-Gen, Research Laboratories, Inc., St. Louis, Mo.) and daily scouting. In spring and fall 1999, weekly applications (rotated) of the insecticides M-pede (fatty acid soap, Mycogen Corporation, San Diego, Calif.), Dipel (*Bacillus thuringiensis*, subsp. *kurstaki*, Abbott Laboratories, Inc., North Chicago, Ill.), or XenTari (*Bacillus thuringiensis*, subsp. *aizawai*, Abbott) were made. The miticide Agri-mek (abemectin, Novartis Crop Protection, Greensboro, N.C.) was rotated with

Results and Discussion

There were 13 harvests in spring 1999 beginning 65 days after planting (dap), 9 harvests in fall 1999 beginning 90 dap, and 17 harvests in spring 2000 beginning 73 dap. Total numbers of harvests were different between each season because

Table 1. Total marketable fruit number and weight per plant of 'Galia' and 'Galia-type' muskmelon cultivars for three seasons. Gainesville, Florida. Spring 1999, Fall 1999, Spring 2000.

	Marketable fruit no. per plant[z]			Marketable fruit wt. per plant (kg)		
Cultivar	Spring[x,y] 1999	Fall 1999	Spring 2000	Spring[x,y] 1999	Fall 1999	Spring 2000
Arava-H	2.2	3.5 a	3.1 b	3.1	2.2 a	3.0 e
Arava-Z	2.5	2.8 abc	3.4 b	3.3	19. ab	33. cde
Capri	—	3.2 ab	2.9 b	—	2.0 ab	3.5 cde
Gal-152	—	3.3 ab	4.7 a	—	2.3 a	4.3 ab
Gal-52	3.2	3.2 ab	4.9 a	4.8	2.1 ab	4.4 a
Galia-H	2.7	1.8 c	4.4 a	4.0	1.1c	3.5 bcde
Galia-Z	2.9	3.1 ab	4.7 a	4.3	1.9 ab	3.7 bcde
Galor	—	2.3 bc	4.6 a	—	1.5 bc	3.9 abcd
Golan	2.8	1.8 c	4.7 a	3.4	1.0 c	3.2 de
Jalisco	3.6	3.3 ab	4.8 a	4.7	2.1 ab	4.1 abc
Omega	—	3.8 a	5.0 a	—	2.2 a	3.6 bcde
Revigal	3.5	3.2 ab	5.0 a	4.1	2.1 ab	3.8 abcde
Signif.	ns	0.0053	.0001	ns	0.0013	0.0108
R-square	0.38	0.64	0.77	0.45	0.70	0.64

[z]Total marketable fruit number and total marketable fruit weight per plant is the added total of extra small (0.5-0.69 kg), small (0.7-0.99 kg), medium (1.0-1.19 kg), large (1.2-1.49 kg) and extra large (>1.50 kg) size fruit. Means separation within each column using Duncan's multiple range test, $P \leq 0.05$.
[y]Spring 1999 was 31 Mar.-16 July 1999 with 13 harvests. Fall 1999 was 14 Oct. 1999-11 Feb. 2000 with 9 harvests. Spring 2000 was 3 Mar.- 28 July 2000 with 17 harvests.
[x]'Capri', 'Gal-152', 'Galor', and 'Omega' were not grown in spring 1999.

muskmelon to weigh more than 1.40 kg (Maynard and Olson, 2000).

The interaction between season and cultivar for cull number and weight per plant was not significant (Table 3). There were no differences among cultivars for cull number or weight per plant for each season. More culls were produced in fall 1999 than either spring 1999 or 2000. Averaged over cultivars, 0.69 fruit per plant in fall were culled, while 0.19 and 0.22 fruit per plant were culled in spring 1999 and 2000, respectively. Cull number and weight per plant were considered very low compared with percent culls reported by Waldo (1999) in which 55% or 75% of fruit produced from 'Galia' in walk-in tunnels was unmarketable when planted in Feb. and Oct. 1997, respectively.

Fruit quality was measured through soluble solids readings (Brix) and fruit skin netting ratings. There was a significant interaction between seasons and cultivars for Brix. Highest soluble solids readings in spring 1999 were 10.4° Brix for 'Galia-H' and 10.0° Brix for 'Galia-Z' (Table 4). However, in fall 1999 'Galia-H' had the lowest soluble solids readings at 8.1° Brix. Other cultivars with low soluble solids in fall 1999 were 'Galia-Z', 'Galor', 'Jalisco', and 'Revigal'. Maximum soluble solids readings in fall 1999 were 11.1° Brix and 11.0° Brix for 'Omega' and 'Golan', respectively. In spring 2000, soluble solids readings were greater than 10.3° Brix for all cultivars. 'Gal-52', 'Galia-H', and 'Galia-Z' each averaged 11.9° Brix for the spring 2000 season, but were not significantly different from 'Galor' and 'Revigal'. Based on literature (Karchi, 1979), soluble solids for 'Galia' melon were expected to be greater than 13° Brix. Since no average soluble solids measurements were greater than 11.9° Brix in any season, other

Table 2. Average fruit weight of 'Galia' and 'Galia-type' muskmelon cultivars for three seasons. Gainesville, Florida. Spring 1999, Fall 1999, Spring 2000.

	Average fruit weight (kg)[z]		
Cultivar	Spring[x,y] 1999	Fall 1999	Spring 2000
Arava-H	1.40	0.63	0.99 b
Arava-Z	1.28	0.66	0.97 b
Capri	—	0.62	1.20 a
Gal-152	—	0.72	0.92 bc
Gal-52	1.55	0.66	0.89 bcd
Galia-H	1.51	0.61	0.80 cdef
Galia-Z	1.52	0.61	0.77 cdef
Galor	—	0.62	0.86 bcde
Golan	1.23	0.57	0.68 f
Jalisco	1.34	0.66	0.84 bcde
Omega	—	0.58	0.71 ef
Revigal	1.20	0.68	0.75 def
Significance	ns	ns	0.0001
R-square	0.38	0.55	0.84

[z]Average fruit weight = total marketable weight per plant divided by total marketable number of fruit per plant. Total marketable number and total marketable weight per plant is the added total of extra small (0.5-0.69 kg), small (0.7-0.99 kg), medium (1.0-1.19 kg), large (1.2-1.49 kg) and extra large (>1.50 kg) size fruit. Means separation within each column using Duncan's multiple range test, $P \leq 0.05$.
[y]Spring 1999 was 31 Mar.-16 July 1999 with 13 harvests. Fall 1999 was 14 Oct. 1999-11 Feb. 2000 with 9 harvests. Spring 2000 was 3 Mar. -28 July 2000 with 17 harvests.
[x]'Capri', 'Gal-152', 'Galor', and 'Omega' were not grown in spring 1999.

Table 3. Average number and weight of cull fruit for each season. Gainesville, Florida. Spring 1999, Fall 1999, and Spring 2000.

Season[z]	Number per plant	Weight per plant (kg)
Spring 1999	0.19 b	0.12 b
Fall 1999	0.69 a	0.21 a
Spring 2000	0.22 b	0.07 b
Significance	0.0001	0.0001
R-Square	0.58	0.51
C. V.	84.5	82.4
Season × Cultivar	ns	ns

[z]Means separation within each column using Duncan's multiple range test, $P \leq 0.05$.

Table 4. Average Brix and netting rating for each cultivar over three seasons. Gainesville, Florida. Spring 1999, Fall 1999, Spring 2000.

Cultivar[z]	Spring 1999	Fall 1999	Spring 2000	Fall 1999	Spring 2000
	Brix			Netting[y]	
Arava-H	8.9 b	10.1 bcd	10.6 cd	4.3 abc	4.5 ab
Arava-Z	9.5 ab	10.3 abcd	10.9 cd	3.8 bcd	4.4 bc
Capri	—	9.9 cd	11.1 bc	3.6 de	4.9 a
Gal-152	—	10.5 abc	10.8 cd	4.7 a	4.7 ab
Gal-52	9.6 ab	9.9 cd	11.9 a	3.7 cde	4.6 ab
Galia-H	10.4 a	8.1 f	11.9 ab	3.1 ef	4.1 c
Galia-Z	10.0 a	8.7 e	11.9 ab	3.0 f	4.4 abc
Galor	—	9.7 cde	11.7 ab	3.6 de	4.5 ab
Golan	8.9 b	11.0 ab	10.8 cd	4.3 abc	4.7 ab
Jalisco	9.8 ab	9.4 de	10.3 d	4.2 abcd	4.7 ab
Omega	—	11.1 a	11.1 bc	4.4 ab	4.6 ab
Revigal	9.6 ab	9.7 cde	11.3 abc	4.3 abc	4.6 ab
Significance	0.0234	0.0001	0.0001	0.0001	0.0433
R-Square	0.43	0.63	0.55	0.67	0.44

[z]Means separation within each column using Duncan's multiple range test, $P \leq 0.05$.
[y]Netting rating scale (1-5): 1 = 0% netting or smooth, 2 = 25% netting, 3 = 50% netting, 4 = 75% netting, 5 = 100% netting. Netting was not rated in spring 1999.

factors may need to be adjusted in the future to obtain higher quality fruit. Research with 'Galia' shows that increased levels of K fertilizer (Gomez, 1996) or elevated EC in irrigation solution (>3.8 mS·cm^{-1}) (Combrink, 1998) can lead to higher soluble solids in melon fruit.

Fruit netting was rated on a scale of 1 to 5 with 1 being smooth skin or no netting and 5 being completely netted (Table 4). In fall 1999, 'Galia-H' and 'Galia-Z' had the lowest netting ratings and 'Gal-152' was the most netted cultivar. In spring 2000, once again 'Galia-H' had a significantly lower netting rating than all other cultivars.

Netting is sometimes considered a subjective tool used by consumers when determining fruit quality (Combrink, 1998) where a more netted fruit is considered to be riper and more flavorful and possibly higher in sugar content. Therefore, correlation coefficients were determined to examine the relationship between Brix measurements and netting ratings (Table 5). In spring 2000, there was no significant relationship between soluble solids and netting for any cultivar and possibly Brix readings were as high as they could possibly be based on plant genetics and the growing environment. In fall 1999, there was a positive relationship between soluble solids and netting for 'Gal-152', 'Galia-Z', 'Galor', 'Golan', 'Jalisco', and 'Omega'. For 'Galia-Z', netting was rated low and Brix measurements were significantly lower than other cultivars, except 'Galor', 'Jalisco', and 'Revigal'.

The United States Department of Agriculture-Agricultural Marketing System (http://www.ams.usda.gov/marketnews.htm) reports terminal market values for 'Galia' melon for June 1999 and Jan. 2000 (Table 6). New York received 5 kg containers of 'Galia' melons from Israel in June 1999 and from Guatemala in Jan. 2000. In those same months, 5 kg containers of 'Galia' melons were received at the Tokyo terminal market from various locations in Japan. The New York terminal market was paying $2.80/kg in June 1999 and $2.00/kg in Jan. 2000. In comparison, the price in Tokyo was $3.60/kg in June 1999 and $7.40/kg in Jan. 2000. In this experiment, plant density equaled 1.85 plants m^{-2}. If New York market values were used to calculate gross value of a 'Gal-52' crop from this experiment in June 1999 (Table 1), possible income could be $248,600/ha each season or $24.86/m^2 (4.8 kg/plant × 1.85 plants m^{-2} = 8.8 kg·m^{-2} × $2.80/kg = $24.86/m^2). During this experiment, expenses and income could not be calculated. Therefore, from the present work it could not be shown what actual profit is possible from a high-roof passive-ventilated greenhouse (structural costs were approximately $40/m^2).

Table 5. Correlation[z] between soluble solids (Brix) and netting rating for each cultivar. Gainesville, Florida. Fall 1999 and Spring 2000.

Cultivar	Fall 1999	Spring 2000
Arava-H	ns	ns
Arava-Z	ns	ns
Capri	ns	ns
Gal-152	0.6528*	ns
Gal-52	ns	ns
Galia-H	ns	ns
Galia-Z	0.4614*	ns
Galor	0.7178**	ns
Golan	0.8177**	ns
Jalisco	0.4678*	ns
Omega	0.6527**	ns
Revigal	0.7305*	ns

[z]Pearson coefficient of correlation, *5% or **1% significance level.

Table 6. Terminal market prices for 'Galia' muskmelon. United States Department of Agriculture, Agricultural Marketing System.

Date	21 June 1999	3 Jan. 2000
Container size	5 kg	5 kg
Terminal	New York	
Size/source	8s /Israel	7s /Guatemala
Price/container	$14.00	$10.00
Price/kg	$2.80/kg	$2.00/kg
Terminal	Tokyo	
Size/source	5s /Japan	4s /Japan
Price/container	$18.00	$37.00
Price/kg	$3.60/kg	$7.40/kg

Waldo (1999) reported the economical feasibility of producing 'Galia' melon in 1-ha of walk-in tunnels, for which initial investments were $245,000/ha for reusable product (tunnels, insect screen, and irrigation equipment) and $53,000 for seasonal costs (seeds, fertilizer, pesticides, bumble bees). Based on yields of 11.1 kg m^{-2}, a seasonal return in Waldo's research was $48,000/ha or $4.80/$m^2$ (Waldo et al., 1998). However, Waldo reported that fruit quality and yields were reduced due to heavy rains (resulting in high humidity inside the tunnel), disease, and poor temperatures. Depending on season and planting date, yields ranged from 0.2 to 7 kg m^{-2} from perlite production in walk-in tunnels (Waldo, 1999; Waldo et al., 1997). Melons produced during this research under a high-roof greenhouse were protected from rain. Furthermore, plant diseases were better controlled through the vertical training of plants, which increased plant coverage with fungicides, ultimately leading to greater yield than 'Galia' produced in walk-in tunnels.

'Galia' or 'Galia-type' muskmelon would be a good alternative crop for hydroponic greenhouse production in Florida. The niche market may drive the cultivar choice of the grower (i.e., fruit size), but 'Gal-52', 'Galia-H', 'Galia-Z', and 'Galor' would be best chosen for high yields and high fruit quality. In 1897, L. H. Bailey wrote, "the fruits (muskmelon) are in every sense luxuries. I doubt if one could grow them in winter for less than $1.00 each, unless he did it upon a large scale. Good muskmelons in midwinter would bring almost any price, if placed before the right kind of consumers." More than a century later, the same statement rings true. The secrets to hydroponically produced 'Galia' melon include: warm temperatures, use of vigorous transplants with well-developed roots, proper pruning and training to avoid excess vegetative growth, irrigation and fertigation in order that plants are not under- or over-irrigated and do not lack in nutrition, effective use of pollinators, and pest and disease control so that leaf area is not reduced. For hydroponically produced 'Galia' melon, further research should be done to develop more precise irrigation and fertigation techniques, develop a suitable biological control program for pest management, and optimize plant populations for greatest fruit yields and quality. Once production methods are defined, research should be done regarding postharvest handling, storage, and shipment, and ultimately marketing and consumer acceptance.

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