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"ICEBOX" WATERMELONS FOR FLORIDA: CULTIVAR AND SPACING EVALUATIONS

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Abstract. **Traditionally, Florida has met the needs of consumers of early spring watermelons, *Citrullus lanatus* (Thunb.) Matsum. & Nakai, by growing cultivars producing large melons of 20-25 pounds or more. Several new "icebox" watermelon cultivars including 'Baby Fun' and 2 Institute of Food and Agricultural Sciences releases, 'Minilee' and 'Mickylee', typically produce watermelons in the 5-15 pound range. These "icebox" cultivars may have an impact on this traditional production. Cultural practices for the "icebox" cultivars differ slightly from those for large-fruited watermelons. In plant population studies from 1981 to 1983, fruit yields were highest in rows 5 ft apart and a 2 ft in-the-row spacing.**

The production of "icebox" watermelons might reverse the decline in per capita watermelon consumption in the U.S. by providing a product size better suited to the small family. In addition to a fruit size more appealing to today's smaller families, several other characteristics make 'Minilee' and 'Mickylee' well suited to the supermarket trade. Fruits are sweet and attractive when cut, with few small black seeds. They are exceptionally uniform in both sweetness and firmness of flesh texture. Fruits hold prime quality for reasonably long periods in storage. Small melons are well adapted to shipment in cartons to both domestic and foreign markets.

About 64,000 acres of watermelons were planted in Florida in 1984; the total value of the crop was $62.1 million (1). The cultivars 'Charleston Gray', 'Crimson Sweet', and 'Jubilee' account for almost all of the watermelon acreage in the state. Their fruits generally range in size from 20 to 35 pounds.

In the U.S., per capita consumption of commercially-produced watermelons fell from 17.9 pounds during the 10-year period 1951-60 to 12.8 pounds during the 1971-80 period. This trend might be reversed if fruit with improved quality were available at the supermarket (4). Some watermelon cultivars develop maximum color before reaching maximum sweetness and perhaps this characteristic has resulted in the harvest of fruits before the development of optimum sweetness (3).

All of the factors contributing to the decline of per capita watermelon consumption in the U.S. have not been considered, but certainly demographic population changes (e.g., smaller family sizes, increase in the number of one- and two-person households, and increase in the population of older citizens) have been important since large-size melons are less appealing to these segments of the consuming public. Over the years there has been limited interest in producing smaller size or icebox watermelons which would meet the demands resulting from these demographic changes and also be suited for packing in cartons or bins for domestic or foreign markets. Until recently, icebox cultivars available from commercial seed companies were not suitable for production in Florida due to susceptibility to Fusarium wilt caused by *Fusarium oxysporum* f. sp. *niveum* (E. F. Sm.) Snyd. & Hans. (5).

For 'Charleston Gray' watermelons, marketable fruit yields decreased while yield/plant and mean fruit weight increased with an increase in plant spacing from 2 to 8 ft and row spacing from 5 to 15 ft (2). Because icebox watermelons are produced on plants with less vine growth than large-fruited cultivars, optimal plant spacing would most likely not be the same.

This paper reports results of field evaluations at Leesburg of recently-released icebox cultivars and a study of the influence of plant spacing on yield and fruit size of 'Minilee' and 'Mickylee' watermelons.

Materials and Methods

Cultivars were grown on Apopka fine sand at Leesburg during the spring from 1981 through 1985. Seeds were planted directly in the field and plants were thinned to a single plant/hill. From 1981 through 1983 plant spacing was 16, 24, or 32 inches in-the-row with a constant row spacing of 5 ft. In 1983-1985, plant and row spacing was 24 inches and 5 ft, respectively. Trials were replicated 4 times in 1981, 1983, and 1985 and 3 times in 1982 and 1984. Planting and harvest dates and plot size are presented in Table 1.

Fertilization included 1600 lb./acre of 5N-6.5P-6.6K in a preplant application and 1300 lb./acre of 15N-11.6K in 3 applications prior to layby. A complete minor element mix (FTE503 or TEM300) was included at a rate of 60 lb./acre. Fungicides and insecticides were applied as needed. Overhead irrigation was provided to supplement rainfall.

After early (first 2 harvests each year) and total marketable yields were obtained, soluble solids content of the flesh was determined in 1984 and 1985 in fruit randomly selected from the first 2 harvests. Sample size for each cultivar was 10 fruits in 1984 and 40 fruits in 1985. A small section of flesh was cut from an area midway between the blossom end and the center of the melon. Soluble solids content of juice expressed by hand from a portion of the section was determined with an American Optical hand refractometer.

Results and Discussion

Plant population varied from about 6,500 plants/acre with the 16-inch plant spacing to 3,250 plants/acre with the 32-inch plant spacing. In 1981 and 1982 the differences in yield among the 3 plant spacings were not significant at the 5% level but in both years the 16- and 24-inch spacing resulted in higher yields than the 32-inch spacing (Table 2). The highest plant population gave the smallest fruit size. In 1983, early and total yields were lowest at the widest plant spacing and fruit size was directly related to plant spacing.

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Table 1. Planting and harvest dates and plot size in the small-melon trials at Leesburg, 1981-1985.

Year	Date Seed planted	Date First harvest	No. of harvests	Plot size (ft^2)
1981	18 Feb.	15 May	4	560
1982	22 Feb.	20 May	3	420
1983	21 Feb.	2 June	4	280
1984	24 Feb.	29 May	4	360
1985	6 Mar.	29 May	3	300

Table 2. Effect of plant population on early and total marketable yields and fruit size at Leesburg, 1981-1983.

Cultivar	Hill spacing (inches)	Marketable Yield (cwt/acre) Early[z]	Total	Melon weight (lb./fruit)
		1981		
Mickylee	16	316 a[y]	427 a	6.1
	24	296 a	411 a	7.2
	32	251 a	378 a	7.4
		1982		
Mickylee	16	—	413 a	6.9
	24	—	437 a	8.3
	32	—	306 a	8.2
		1983		
Minilee	16	307 a	539 a	5.0
	24	321 a	573 a	5.8
	32	281 a	521 a	6.4
Mickylee	16	328 a	521 a	6.3
	24	317 a	538 a	6.7
	32	297 a	480 a	7.0

[z]First 2 harvest each year
[y]Mean separation within columns for each year by Duncan's New Multiple Range Test, 5% level.

In general, 'Minilee' fruits are smaller than those of 'Mickylee'. In 1983, 'Mickylee' planted at a population of 6,500 plants/acre had the same marketable yield and fruit size as 'Minilee' planted at a population of 3,250 plants/acre. Since fruit size is dependent on plant spacing, the grower can plant according to his own particular market. Except in 1981, the 24-inch spacing (4,875 plants/acre) resulted in the highest yield. Based on this information, all cultivars were compared at the 24-inch spacing after 1983.

'Sugar Baby', released in 1956, is grown in Central America and has been grown in Florida. Although under some conditions productivity, fruit quality, and soluble solids content are satisfactory, 'Sugar Baby' presents problems in harvesting and marketing because of an extremely limited time that fruits retain prime quality and the development of off-flavors in over-ripe fruit. Also, 'Sugar Baby' is susceptible to wilt (5). The soil at the research farm in Leesburg is naturally infested with the causal fungus of fusarium wilt (*Fusarium oxysporum* f. sp. *niveum*) since watermelons have been grown there on an 8-year rotation since 1958. In 1981 and 1983 the yield of 'Sugar Baby' was 50% that of the most productive cultivar; in 1984 yield was about 25% less (Table 3).

'Petite Sweet', released in 1970, has fair flesh quality but lacks adequate resistance to fusarium wilt (5). Yield of 'Petite Sweet' was low in 1981 and 1983 (Table 3). Several F_1 hybrid cultivars were released in the 1970s. Two of them, 'Sweet Baby' and 'Garden Baby', are susceptible to Fusarium wilt, which resulted in low yields in both 1982 and 1983. 'Yellow Baby' was the first F_1 hybrid icebox type with sufficient wilt resistance to produce consistently high yields at AREC Leesburg. However, the rind of 'Yellow Baby' fruits is extremely brittle, making it unsuitable for shipping. In addition, the market for yellow-fleshed watermelons is limited.

'Baby Fun', released in the early 1980s, has a round, striped fruit. It is the first red-fleshed hybrid icebox cultivar with good wilt resistance and high quality flesh. This cultivar had the highest yield in 1984 and 1985 and the flesh had a high soluble solids content (Table 3). Under good growing conditions, some of these fruits weigh more than 20 lb. and may exceed the desirable size for an icebox cultivar. Plant spacing studies are needed to determine the effect of plant population on size and yield of this cultivar.

'Bush Charleston Gray' and 'Bush Jubilee' were also released in the early 1980s. Because of their suitability for growing at a closer spacing than standard 'Charleston Gray' or 'Jubilee' they were included in this trial. Yields were low due to wilt susceptibility.Fruit sizes were much smaller than those of the standard cultivars, and most of the fruit had poor shape, possible from poor pollination. Both bush cultivars have a very compact, dense growth habit and blossoms are not as evident or attractive to bees as those on standard vines.

Table 3. Yield, mean melon weight, and soluble solids content of icebox watermelon cultivars at Leesburg, 1981-1985.

Cultivar	Marketable yield (cwt/acre) Early[z]	Total	Melon weight (lb./fruit)	Soluble solids (%)
		1981		
Mickylee	296 a[y]	411 a	7.2	—
Yellow Baby	233 ab	336 a	4.5	—
Petite Sweet	103 c	237 b	5.7	—
Sugar Baby	164 bc	211 b	6.5	—
		1982		
Mickylee	—	437 a	8.3	—
Yellow Baby	—	344 ab	3.8	—
Minilee	—	328 ab	4.7	—
		1983		
Minilee	321 b	573 a	5.8	—
Mickylee	317 b	538 a	6.7	—
Sweet Baby	443 a	508 a	6.7	—
Yellow Baby	244 bc	382 b	5.2	—
Sugar Baby	185 cd	256 c	7.4	—
Petite Sweet	133 de	193 cd	5.5	—
Garden Baby	90 e	94 d	4.2	—
		1984		
Baby Fun	245 a	428 a	10.3	10.6
Mickylee	205 ab	407 a	9.1	10.2
Minilee	147 ab	358 ab	8.9	10.4
Sugar Baby	214 ab	330 ab	6.3	9.9
Bush Charleston Gray	108 bc	273 ab	5.1	9.7
Bush Jubilee	21 c	217 b	5.3	9.5
		1985		
Baby Fun	289 a	334 a	11.6	11.4
Mickylee	252 a	318 a	8.8	11.2
Minilee	127 b	275 a	7.0	11.5
Yellow Baby	179 b	242 a	5.7	11.3

[z]First 2 harvest each year.
[y]Mean separation within columns for each year by Duncan's New Multiple Range Test, 5% level.

'Minilee' and 'Mickylee' were evaluated at Leesburg as breeding lines for several years and approved for release in 1984. Fruit shapes for both are round and rind color is light gray green, with a faintly discernible net. 'Mickylee' has a slightly thicker rind than 'Minilee'; the rind of both is hard and tough. The red flesh color is more intense than that of 'Charleston Gray' or 'Jubilee' but is not as intense as that of 'Dixielee'. Seeds are small and black and the number of seeds per unit weight of melon is considerably less than for other cultivars.

Total marketable yields of 'Minilee' and 'Mickylee' were among the highest each year they were evaluated (Table 3). Soluble solids content of the flesh was high in 1984 and 1985.

In general, icebox cultivars mature from 7 to 10 days earlier than standard watermelon cultivars and are productive over a longer period of time. Since early watermelons ordinarily sell for a higher price than midseason or late watermelons the grower might realize a better return with icebox melons. Their fruits are similar in size to large muskmelons and honeydews and would likely be sold by the piece rather than weight. This could result in an even higher return to the grower.

A significant portion of the Florida production of watermelons goes to the hotel and restaurant trade and large melons have satisfactorily met the demands of this segment of the market. Large-size melons, however, have less appeal to individual home consumers, and retail market outlets have adopted the practice of merchandising watermelons in less than whole portions in order to promote melon sales. We think the 3 new icebox cultivars, 'Minilee', 'Mickylee', and 'Baby Fun', which are productive under Florida conditions and have high internal quality, may contribute significantly to overcoming the decline in per capita watermelon consumption in the U.S. We view these new cultivars as supplementary to rather than competitive with large-melon-size cultivars. In addition, these cultivars may be well adapted to shipment by air in cartons or bins to foreign markets.

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COST COMPARISON OF CONVENTIONAL AND DIRECT SEEDED PLASTIC MULCH WATERMELONS IN NORTH FLORIDA

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Abstract. **An economic comparison of conventionally planted and polyethylene mulch-plug mix planted watermelons was made. The increased variable cost of materials used in the mulch method was compensated by reduced fertilizer, tractor, and labor cost. Difference in per acre costs of the 2 systems resulted from slightly higher fixed ownership or investment costs for mulch equipment and the planter, but lower variable or cash costs. Earlier yields from mulch culture watermelons and in-season price declines appear to be more dominant decision variables than per acre costs for the producer who is considering a shift from conventional to mulch production.**

An economic comparison of conventionally produced and polyethylene mulch produced watermelons was made early in 1985 prior to watermelon planting. The comparison is a set of enterprise budgets, estimating costs and returns for the 2 production methods. Technical coefficients and costs in the budgets were validated by interviewing growers throughout the 1985 season.

Although vegetable crops including watermelons have been grown under polyethylene mulch culture in Florida for decades, the technique is relatively new for producers in north and west Florida. During the 1984 season, producers throughout the panhandle region participated in demonstrations conducted by county and state extension personnel. Two demonstrations conducted by county and state extension personnel. Two demonstration plantings totalling 6 acres were made in Jefferson County.

Leading into the 1985 season, grower interest in polyethylene mulch methods was heightened by the 1984 demonstrations and by the increasing adoption of plastic mulch production technology by South Carolina and Georgia watermelon producers seeking earlier markets in competition with North Florida producers.

Cost and return data based on accounting records of producers from South Florida (5), and conventional budgets from North Florida (2) and Georgia (3) were inappropriate measures of costs related to mulch production in North Florida.

Methods

Fixed Costs. Fixed costs are ownership costs which vary little, in the short term, with variable yield. Depreciation on equipment and interest on capital invested in equipment, buildings and facilities are examples of fixed costs. Fixed costs are incurred whether or not production is car-