the North Florida marketing period(3). An advance of 4-10 days, with a higher percentage of the crop marketed early represents a $0.25 to $0.85 per cwt marketing advantage for polyethylene mulch, whereas, on a cost-of-production basis, no real advantage is apparent.

In the 1985 watermelon season, 5 producers in Jefferson County, Florida adopted the polyethylene mulch methods on approximately 320 acres. An intangible, or nonmonetary, advantage indicated by several producers concerned production logistics and input management. Reduction of labor costs was accompanied by a reduction in labor supervision and personnel management. Mulch appears to have preserved soil moisture during a spring drought, extending by 50% the efficiency of irrigation. That is, time between irrigation events was extended from once every 2 days to once every 3 days. Management of the irrigation system was simplified although total volume of irrigation water applied was constant between mulch and conventional plantings.

The decision by watermelon producers to adopt full bed polyethylene mulch production or to continue production using conventional methods will probably not be made on a basis of cost. The additional cost of equipment ownership is relatively minor. Per acre variable or cash costs are similar. Production decisions will be based on timeliness of yield, given a fairly constant decline in market price during the harvest period. If availability and reliability of labor decline melon producers will substitute inputs such as mulch, machines, and plug mix for labor, regardless of whether there is a change in labor costs.

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Proc. Fla. State Hort. Soc. 98:281-284. 1985.

INFLUENCE OF SEED PRIMING AND ROW COVERS ON EARLY MATURITY IN WATERMELON

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Abstract. **In Florida, spring watermelons, *Citrullus lanatus* (Thunb.) Matsum. & Nakai, are usually planted in late winter when low soil temperatures delay both germination and seedling emergence. Priming seeds in aerated solutions of 2% KNO_3 or 1.5% KNO_3 + 1.5% KH_2PO_4 prior to field planting resulted in faster emergence and seedlings that were more vigorous and darker green than those of non-primed treatments. Rows covered with slitted polyethylene had higher soil temperatures, faster seedling emergence, more rapid vince growth, and earlier induction of female blossoms than rows not covered. A combination of early-maturing watermelon cultivars, seed priming, and row covers resulted in earliest maturing watermelon fruits.**

Florida is a major supplier of spring and summer watermelons for the domestic U.S. market. Total crop value for Florida in 1984 was over $62 million which represented 5.9 percent of the total fresh market vegetable income of the state that year. South Florida growers supply the first domestically-produced watermelons of the season and receive a price higher than the average statewide price for the season. Prices paid to Florida watermelon producers decline as the season advances. North Florida growers plant and harvest later than those in the south and receive lower prices for their crop because they must compete with domestic producers in other states who have a location advantage to major eastern and midwestern markets (3). The weekly average price for the seasons from 1966 through 1977 declined from about $6.00/hundredweight (cwt) in mid-May to less than $3.00/cwt on the first of July.

Slow germination of watermelon seed in cool soil is one reason for the late harvest of fruits in central and north Florida. The optimum temperature for watermelon seed germination is 35°C. Using "salt primed" watermelon seed, Sachs (2) germinated seed at 20°C. Seedlings developed well up to the stage of "fully expanded cotyledons" but further root and shoot development was slow in cold soil. Perforated, or slitted, polyethylene row covers have been used to increase earliness and total yield of muskmelons (1,4,5). These benefits are due to higher temperatures under the covers.

The objective of this study was to evaluate "salt priming" of watermelon seeds and the use of slitted polyethylene row covers as means of producing earlier-maturing watermelons in Florida.

Materials and Methods

In 1980, primed and unprimed seeds of 'Dixielee' watermelon were planted directly in the field on 15 Feb. They were planted 10 seeds/hill with hills spaced 4 ft apart in rows 10 ft apart and 24 ft long. The 2-row plots were replicated 3 times. Primed seeds were soaked for 4 days in an aerated 2% KNO_3 solution at 20°C, rinsed, and dried at 20°C.

In 1981, 'Sugarlee' and 'Jubilee' watermelon seed was primed as in 1980 with a 1.5% KNO_3 + 1.5% KH_2PO_4 solution. Primed and unprimed seeds of 'Sugarlee' were planted directly in the field with, or without, row covers. Seeds were planted 10/hill with 10 hills/plot. Hills were

Florida Agricultural Experiment Stations Journal Series No. 6991.

spaced 5 ft apart in rows 10 ft apart. Clear slitted polyethylene row covers similar to those described by Loy and Wells (1), were used. Seeds were planted 10 and 20 Feb. and 3 Mar. No covers were used with the 3 Mar. planting. In a second trial in 1981, primed and unprimed 'Jubilee' watermelon seeds were planted on the same 3 dates as above, but row covers were not used.

In 1982, 'Sugarlee' and 'Charleston Gray #5' watermelon seeds were primed as in 1981 and planted with and without row covers on 12 and 22 Feb. and 4 Mar. Seeds were planted 5/hill with 18 hills/treatment. Hills were spaced 2.5 ft apart in rows 10 ft apart.

All treatments were replicated 3 times. After plant growth was initiated and ambient temperatures increased, row covers were removed on 10 and 22 Mar. in 1981 and 1982, respectively, to make room for vine growth.

All trials were grown on Apopka fine sand at Leesburg. Fertilizer applications were 800 lb./acre of 5N-6.5P-6.6K preplant and 650 lb./acre of 15N-11.6K in 3 other applications prior to layby. A complete minor element mix (FTE503 or TEM300) was included with preplant fertilizer at a rate of 30 lb./acre. Fungicides and insecticides were applied as needed. Overhead irrigation was provided to supplement rainfall.

As a measure of seedling emergence and early plant growth, seedlings removed at thinning were weighed. In 1981, hills were thinned to 2 plants each on 12 and 26 Mar. and 8 Apr. for the planting dates of 10 and 20 Feb. and 3 Mar., respectively. In 1982, hills were thinned to a single plant; those planted on 12 Feb. were thinned 16 Mar. and those planted 22 Feb. and 4 Mar. were thinned 13 Mar. Marketable melons were harvested and weights recorded 4 times from 22 May to 17 June in 1981, and 5 times from 14 May to 16 June in 1982.

Results and Discussion

The mean minimum air temperature for the 3 days following planting in 1980 was 8°C. Seedlings from primed seed emerged much earlier than those from unprimed seed; 2 weeks after planting seedling emergence was 80% for primed seeds compared with only 5% for the unprimed seeds (Table 1). Seedlings from primed seed were dark green while those from unprimed seeds were pale green. The experiment was terminated when a hard freeze (–5°C) on 2 Mar. killed all seedlings. Seed priming greatly improved seedling emergence from 'Dixielee' watermelon seeds planted in cool soil.

In 1981 and 1982, row covers were used to protect seedlings from the desiccating effect of cold wind and from frost injury. Row covers also result in higher soil and air temperatures which promote rapid growth of seedlings

Table 1. Seedling emergence from primed and unprimed seeds of 'Dixielee' watermelon in 1980.

	Number of seedlings/hill						
	Days after planting[z]						
Treatment	9	10	11	12	13	14	15
Unprimed	0.0 b[y]	0.1 b	0.3 b	0.4 b	0.4 b	0.5 b	0.5 b
Primed	1.8 a	5.3 a	5.9 a	6.7 a	6.8 a	6.9 a	7.0 a

[z]Seeds were planted 15 Feb., 10 seeds/hill, 12 hills/treatment.
[y]Mean separation within columns by Duncan's New Multiple Range Test, 1% level.

Table 2. Effect of planting date, seed priming, and row covers on seedling emergence of 'Sugarlee' and 'Jubilee' watermelon in 1981.

Treatment			Number of seedlings/hill[z]					
			Days after planting					
Date planted	Seed primed	Row cover	8	10	12	14	16	18
			Sugarlee					
February								
10	–	–	–	–	0.5 c[y]	3.0 c	5.0 b	5.6 b
10	+	–	–	–	5.5 a	7.0 a	7.1 a	7.4 a
10	–	+	–	–	2.4 b	5.4 b	5.8 b	6.0 b
10	+	+	–	–	6.3 a	7.2 a	7.4 a	7.7 a
20	–	–	0.1 b	3.3 a	5.4 a	7.1 a	7.3 a	–
20	+	–	0.6 b	4.3 a	6.7 a	8.1 a	8.5 a	–
20	–	+	2.8 a	3.6 a	5.3 a	7.9 a	8.4 a	–
20	+	+	3.7 a	4.5 a	5.3 a	7.4 a	7.7 a	–
March								
3	–	–	0.8 b	4.5 a	7.0 a	7.3 a	–	–
3	+	–	2.1 a	6.2 a	7.8 a	8.0 a	–	–
			Jubilee					
February								
10	–	–	–	–	1.0 b	4.3 b	5.4 a	6.0 a
10	+	–	–	–	4.4 a	5.8 a	6.0 a	6.0 a
20	–	–	0.1 b	3.2 a	4.7 a	6.7 a	7.2 a	–
20	+	–	2.3 a	5.9 a	6.7 a	7.1 a	7.4 a	–
March								
3	–	–	1.4 b	5.2 a	7.3 a	7.7 a	–	–
3	+	–	3.8 a	5.7 a	6.7 b	6.9 a	–	–

[z]Planted 10 seeds/hill, 10 hills/treatment.
[y]Mean separation within columns for each planting date and cultivar by Duncan's New Multiple Range Test, 5% level.

Table 3. Effect of planting date, seed priming, and row covers on seedling emergence of 'Sugarlee' and 'Charleston Gray #5' watermelon in 1982.

Treatment			Number of seedlings/hill[z]		
			Days after planting		
Date planted	Seed primed	Row cover	6	8	10
			Sugarlee		
12	–	–	0.1 b[y]	1.8 b	–
12	+	–	0.5 b	3.4 a	–
12	–	+	0.8 b	3.6 a	–
12	+	+	2.4 a	3.7 a	–
22	–	–	0.0 c	1.5 c	3.6 a
22	+	–	0.5 bc	3.0 ab	3.7 a
22	–	+	1.1 b	2.7 b	3.1 a
22	+	+	2.7 a	3.6 a	3.8 a
March					
4	–	–	0.0 a	0.0 c	4.4 a
4	+	–	0.0 a	0.0 c	4.2 a
4	–	+	0.0 a	1.9 b	4.6 a
4	+	+	0.0 a	2.8 a	4.3 a
			Charleston Gray #5		
February					
12	–	–	0.1 c	2.1 a	–
12	+	–	0.2 c	2.9 a	–
12	–	+	0.8 b	3.0 a	–
12	+	+	1.9 a	3.5 a	–
22	–	–	0.0 b	1.0 b	2.6 a
22	+	–	0.2 b	1.9 ab	2.9 a
22	–	+	0.6 b	2.1 ab	2.8 a
22	+	+	2.0 a	3.3 a	3.5 a
March					
4	–	–	0.0 a	0.0 c	4.1 a
4	+	–	0.0 a	0.1 c	4.2 a
4	–	+	0.0 a	1.5 b	4.1 a
4	+	+	0.0 a	3.0 a	4.3 a

[z]Planted 5 seeds/hill, 18 hills/treatment.
[y]Mean separation within columns for each planting date and cultivar by Duncan's New Multiple Range Test, 5% level.

Table 4. Effect of planting date, seed priming, and row covers on stand, weight of thinned seedlings, and marketable yield of 'Sugarlee' and 'Jubilee' watermelon in 1981.

Treatment			Seedling	Marketable yield (cwt/acre)	
Date planted	Seed primed	Row cover	fresh wt[z] (g/plant)	Early[y]	Total
			Sugarlee		
February					
10	–	–	1.8 c[x]	216 a	455 a
10	+	–	2.3 b	165 a	502 a
10	–	+	2.8 a	220 a	402 a
10	+	+	2.8 a	223 a	445 a
20	–	–	3.2 b	177 a	426 a
20	+	–	3.7 ab	189 a	436 a
20	–	+	3.5 ab	164 a	449 a
20	+	+	4.2 a	188 a	463 a
March					
3	–	–	6.9 a	90 a	394 a
3	+	–	7.6 a	61 a	368 a
			Jubilee		
February					
10	–	–	1.5 a	111 a	708 a
10	+	–	1.9 a	121 a	748 a
20	–	–	2.4 a	48 a	558 a
20	+	–	3.1 a	111 a	623 a
March					
3	–	–	6.0 a	14 a	578 a
3	+	–	6.5 a	0 a	652 a

[z]Seedlings were thinned and weighed on 12 and 26 Mar. and 8 Apr. for seed planted 10 and 20 Feb. and 3 Mar., respectively.
[y]Fruit harvested in May was designated early yield.
[x]Mean separation within columns for each planting date and cultivar by Duncan's New Multiple Range Test, 5% level.

Table 5. Effect of planting date, seed priming, and row covers on weight of thinned seedlings, and marketable yield of 'Sugarlee' and 'Charleston Gray #5' watermelon in 1982.

Treatment			Seedling	Marketable yield (cwt/acre)	
Date planted	Seed primed	Row cover	fresh wt[z] (g/plant)	Early[y]	Total
			Sugarlee		
February					
12	–	–	5.16 c[x]	247 a	383 ab
12	+	–	5.48 c	217 a	334 ab
12	–	+	9.72 b	178 a	256 b
12	+	+	12.72 a	262 a	389 a
22	–	–	9.00 c	108 a	304 a
22	+	–	9.80 bc	141 a	394 a
22	–	+	16.22 ab	190 a	317 a
22	+	+	19.13 a	166 a	309 a
March					
4	–	–	3.91 a	33 a	412 a
4	+	–	3.54 a	52 a	347 a
4	–	+	4.91 a	43 a	358 a
4	+	+	4.42 a	46 a	360 a
			Charleston Gray #5		
February					
12	–	–	5.33 c	66 b	616 a
12	+	–	5.60 c	200 ab	509 a
12	–	+	8.62 b	201 ab	366 a
12	+	+	11.46 a	280 a	478 a
22	–	–	8.55 c	65 a	549 a
22	+	–	11.49 bc	110 a	456 a
22	–	+	13.66 b	118 a	504 a
22	+	+	23.46 a	172 a	475 a
March					
4	–	–	3.54 c	29 a	382 a
4	+	–	4.00 bc	60 a	501 a
4	–	+	5.12 ab	30 a	455 a
4	+	+	5.57 a	60 a	426 a

[z]Seedlings were thinned and weighed on 16 Mar. for those planted 12 Feb. and 23 Mar. for those planted 22 Feb. and 4 Mar.
[y]Fruit harvested in May was designated early yield.
[x]Mean separation within columns for each planting date and cultivar by Duncan's New Multiple Range Test, 5% level.

after germination. At a depth of 2 inches, soil temperatures were from 2° to 4°C warmer with row covers than without. Sachs (2) reported that at low temperatures root and shoot development of watermelon seedlings was very slow even though germination was achieved through the use of salt priming. The mean minimum air temperatures for the 3 days following planting in 1981 were 6°, 8°, and 12°C, respectively, for the 10 and 20 Feb. and 3 Mar. planting dates. In 1982, the mean minimum temperatures were 11°, 7°, and 15°C for the 12 ans 22 Feb. and 4 Mar. planting dates, respectively. In all comparisons in 1981 and 1982, seedlings from primed seeds emerged earlier than those from non-primed seeds (Tables 2 and 3). The biggest difference in emergence rate was for 'Sugarlee' seeds planted on 10 Feb. 1981. Seedling emergence of 55% occurred with the primed seeds after 12 days, but not until 18 days with the non-primed seeds. The use of row covers resulted in earlier seedling emergence from both primed and non-primed seeds.

Seed priming significantly increased total seedling emergence of 'Sugarlee' watermelon seed for the earliest planting date in 1981 when soil temperatures were lowest (Table 4). Priming seed resulted in significantly larger seedlings in 1982 but not in 1981 (Tables 4 and 5). In addition to being larger, the seedlings from primed seed had a much darker green color than those from non-primed seed. For the first 2 dates of planting in 1982, use of row covers resulted in nearly doubling the size of 'Sugarlee' seedlings. For the Mar. plantings, row covers had less of an effect on seedling size since ambient air temperatures had increased by then. Early yield was affected by planting date but not by seed priming or row covers except in 1982 for 'Charleston Gray #5' (Table 5). Total yield was not affected by treatment.

Identification of mature fruit in relatively small plots is difficult and may help explain why possible differences in early yield were not detected. Since fruits develop from female blossoms, female blossom occurrence should indicate potential early yield. 'Sugarlee' is an earlier maturing cultivar than 'Jubilee' (Table 4), and comparing the numbers of female blossoms (Table 6) confirms this. Ten days after the appearance of the first female blossom there were 3 to 8 times more female blossoms on 'Sugarlee' than on 'Jubilee'. Both seed priming and row covers increased the earliness of female blossom anthesis (Tables 6 and 7). The effect of seed priming was greatest for the first planting date when soil temperature was lowest. The effect of row covers on early female blossoms was apparent for all planting dates.

Watermelon growers in Florida might be able to shorten the time from planting to harvest and thus increase the production of early-maturing fruit, which usually command a higher price, by combining the use of early-maturing cultivars, seed priming, and row covers. Seed priming is most beneficial if seeds are planted early in cold soil when germination of non-primed seed is extremely low.

Table 6. Effect of planting date, seed priming, and row covers on female blossom initiation in 1981.

Treatment			Number of female blossoms/hill[z]				
Date planted	Seed primed	Row cover	Days after first female blossom[y] 2	4	6	8	10
			Sugarlee				
February							
10	–	–	0.0 a[x]	0.1 b	0.9 b	2.3 a	4.7 a
10	+	–	0.1 a	0.4 ab	0.9 ab	2.7 a	4.8 a
10	–	+	0.2 a	0.7 ab	2.1 a	3.9 a	6.3 a
10	+	+	0.2 a	0.9 a	2.0 a	3.7 a	6.2 a
20	–	–	0.0 a	0.1 a	0.9 a	2.1 b	3.5 a
20	+	–	0.0 a	0.2 a	0.9 a	2.1 b	3.4 a
20	–	+	0.1 a	0.5 a	1.5 a	3.7 a	5.0 a
20	+	+	0.1 a	0.4 a	1.5 a	3.6 a	4.8 a
March							
3	–	–	0.1 a	0.2 a	1.4 b	2.9 a	3.7 a
3	+	–	0.1 a	0.6 a	1.6 a	2.6 a	3.7 a
			Jubilee				
February							
10	–	–	0.0 a	0.0 b	0.0 b	0.4 a	1.0 a
10	+	–	0.1 a	0.2 a	0.4 a	0.8 a	1.3 a
20	–	–	0.0 a	0.0 a	0.1 a	0.2 a	0.4 a
20	+	–	0.0 a	0.0 a	0.2 a	0.5 a	0.9 a
March							
3	–	–	0.0 a	0.0 a	0.0 b	0.3 a	1.2 a
3	+	–	0.0 a	0.0 a	0.2 a	0.9 a	1.7 a

[z]Numbers are cumulative, hills had 2 plants each and there were 10 hills/treatment.
[y]First female flower anthesis occurred on 13, 15 and 21 Apr. for seed planted 10 and 20 Feb. and 3 Mar., respectively.
[x]Mean separation within columns for each planting date and cultivar by Duncan's New Multiple Range Test, 5% level.

Row covers raise soil and air temperatures which promote accelerated plant growth and provide protection from cold wind and frost damage.

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Table 7. Effect of planting date, seed priming, and row covers on female blossom initiation on 'Sugarlee' and 'Charleston Gray #5' watermelon in 1982.

Treatment			Number of female blossoms/hill[z]				
Date planted	Seed primed	Row cover	Days after first female blossom[y] 2	4	6	8	10
			Sugarlee				
February							
12	–	–	0.1 b[x]	0.4 b	0.5 c	0.9 c	1.2 c
12	+	–	0.1 b	0.4 b	0.6 c	0.9 c	1.3 c
12	–	+	0.2 b	0.8 b	1.4 b	1.9 b	2.3 b
12	+	+	0.4 a	1.3 a	1.9 a	2.8 a	3.2 a
22	–	–	0.0 a	0.0 a	0.0 b	0.0 b	0.1 c
22	+	–	0.0 a	0.0 a	0.0 b	0.0 b	0.2 bc
22	–	+	0.0 a	0.0 a	0.0 b	0.0 b	0.3 b
22	+	+	0.1 a	0.1 a	0.2 a	0.2 a	0.7 a
March							
4	–	–	0.0 b	0.6 a	2.0 a	2.4 a	2.8 a
4	+	–	0.0 b	0.8 a	1.9 a	2.5 a	2.8 a
4	–	+	0.0 b	1.1 a	2.1 a	2.7 a	3.1 a
4	+	+	0.1 a	1.1 a	2.1 a	2.5 a	2.9 a
			Charleston Gray #5				
February							
12	–	–	0.0 a	0.1 a	0.3 a	0.6 a	0.6 a
12	+	–	0.0 a	0.2 a	0.4 a	0.7 a	0.7 a
12	–	+	0.1 a	0.3 a	0.6 a	0.9 a	1.0 a
12	+	+	0.1 a	0.3 a	0.6 a	1.1 a	1.2 a
22	–	–	0.0 a	0.0 a	0.0 a	0.0 a	0.0 b
22	+	–	0.0 a	0.0 a	0.0 a	0.0 a	0.0 b
22	–	+	0.0 a	0.0 a	0.0 a	0.0 a	0.1 ab
22	+	+	0.1 a	0.1 a	0.1 a	0.1 a	0.9 a
March							
4	–	–	0.0 a	0.3 a	1.3 b	1.8 b	2.0 b
4	+	–	0.0 a	0.4 a	1.3 b	1.9 b	2.1 b
4	–	+	0.0 a	0.7 a	1.9 a	2.7 a	2.8 a
4	+	+	0.1 a	0.7 a	1.8 ab	2.4 a	2.6 a

[z]Numbers are cumulative, hills had 1 plant each and there were 18 hills/treatment.
[y]First female flower anthesis occurred on 1, 6, and 17 Apr. for seed planted 12 and 22 Feb. and 4 Mar., respectively.
[x]Mean separation within columns for each planting date and cultivar by Duncan's New Multiple Range Test, 5% level.

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