Variety Trials

Yield and Quality of Triploid Watermelon Cultivars and Experimental Hybrids Grown in Mississippi

Kent E. Cushman,[1]
Richard G. Snyder,[2]
David H. Nagel,[3] and
Patrick D. Gerard[4]

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Summary. **Evaluations of 21 entries (commercial cultivars and breeders' experimental hybrids) of triploid watermelon (*Citrullus lanatus*) were conducted in northern and central Mississippi during 2000 and 2001. The purpose of this research was to identify high-yielding, medium-sized triploid cultivars with good horticultural characteristics and consumer qualities for commercial production in Mississippi. Most entries were similar to 'Tri-X 313' and had red flesh, oval shape, and a mottle stripe rind pattern. SXW 5052, 'Triple Crown,' 'Crimson Trio,' 'SeedWay 4502,' and 'Millionaire' produced the highest total marketable yields; however, SXW 5052 is no longer available. 'Crimson Trio' produced slightly smaller-sized melons compared to other entries and 'SeedWay 4502' produced melons with relatively low soluble solids concentration. Based on total marketable yield, average size of melons, soluble solids concentration, and lack of undesirable characteristics such as hollowheart, black and colored seed, and rind necrosis, 'Triple Crown,' 'Millionaire,' 'Cooperstown,' 'Summer Sweet 5244,' and 'Crimson Trio' can be recommended as mid- to late-maturing cultivars for commercial production in Mississippi. Based on early marketable yield, and using the same criteria listed above, 'Tri-X 313' and 'Tri-X Carousel' can be recommended as early-maturing cultivars for commercial production in Mississippi. 'Tri-X 313' exhibited only one undesirable trait, producing a relatively high number of black and colored seeds. 'Diamond' had high early and total yields, as well as high soluble solids concentration, but it should be recommended only on a trial basis to determine its potential susceptibility to hollowheart.**

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[1]North Mississippi Research and Extension Center, P.O. Box 1690, Verona, MS 38879; e-mail kcushman@ra.msstate.edu.

[2]Truck Crops Branch Experiment Station, Central Mississippi Research and Extension Center, P.O. Box 231, Crystal Springs, MS 39059; e-mail ricks@ra.msstate.edu.

[3]Dept. of Plant and Soil Sciences, Mississippi State University, Box 9555, Mississippi State, MS 39762; e-mail dnagel@pss.msstate.edu.

[4]Experimental Statistics Unit, Mississippi State University, Box 9653, Mississippi State, MS 39762; e-mail pdg1@ra.msstate.edu.

The production and marketing of triploid watermelons in the U.S. has increased steadily since their commercial introduction in about 1990, capturing an estimated 60% of sales of fresh cut and whole watermelon products in retail stores in 2001 (Maynard, 2001; W. McManus, personal communication). Consumers' high level of acceptance of triploid watermelons is due to their excellent flavor and quality, especially when marketed in various fresh cut packages. The appeal of triploid watermelons to consumers continues to increase, even in areas such as Mississippi where large, seeded 'Jubilee'-type watermelons have dominated the market. The value of triploid watermelons marketed at the retail level in the southeastern U.S. in 2000 was estimated to be only 10% of that of diploids. However, in 2001, the value of triploids increased markedly and was estimated to be 40% of that of diploids (W. McManus, personal communication).

The purpose of this research was to identify high-yielding, medium-sized triploid cultivars with good horticultural characteristics for commercial production in Mississippi. Desirable characteristics of interest to growers and consumers include earliness, high soluble solids concentration, and low incidences of hollowheart, rind necrosis, and black and colored seeds.

Materials and methods

Evaluations were conducted at Verona, in northern Mississippi, and Crystal Springs, in central Mississippi, during 2000 and 2001. All triploid entries had red flesh, a mottle stripe rind pattern (mottled dark green stripes on a light green background), mostly oval shape, and were expected to weigh about 15 to 20 lb (6.8 to 9.1 kg) according to seed company descriptions. Triploids were seeded into 72-cell flats (#1206 inserts; TLC Polyform Inc, Beaverton, Mich.) in greenhouses on 21 Apr. 2000 and 9 Apr. 2001 for the plantings at Verona and 17 Apr. 2000 and 9 Apr. 2001 for the plantings at Crystal Springs. Seedlings were planted by hand to the field on 15 May 2000 and 30 Apr. 2001 at Verona and 17 May 2000 and 30 Apr. 2001 at Crystal Springs. At Verona in 2001, 'Genesis' was seeded into flats and transplanted to the field 7 d later than all other triploids due to late arrival of seed.

At Verona, seedlings were spaced 2 ft (0.6 m) apart in plots 30 ft (9.1 m) long making a total of 15 plants per plot. Plant beds were spaced 7.5 ft (2.28 m) apart, resulting in a plant population of 2904 plants/acre (7173

plants/ha) and an area per plant of 15 ft² (1.4 m²). At Crystal Springs, seedlings were spaced 2.5 ft (0.76 m) apart in plots 25 ft (7.6 m) long making a total of 10 plants per plot. Plant beds were spaced 6 ft (1.8 m) apart, resulting in the same plant population as Verona of 2904 plants/acre and area per plant of 15 ft². An area per plant of 15 ft² is considered a higher-than-normal planting density for some states in the southeastern U.S., such as Florida, but is considered within recommendations for other states, such as North Carolina, where smaller melons can be sold at retail outlets (Sanders et al., 1999). In addition, Texas recommends a planting density for triploid watermelons of 13 to 20 ft² (1.2 to 1.9 m²) per plant (Daniello, 1996). A study of the effect of planting density on watermelon fruit size and yield suggested that a density of about 10.8 ft² (1.00 m²) per plant or lower density was optimum for producing fruit of adequate size and yield (Sanders et al., 1999). Motsenbocker and Arancibia (2002) reported that in-row spacing affected the number of triploid melons produced in the small- and extra-small-size categories but not in the medium- and large-size categories. The number of small- and extra-small-sized melons increased significantly as in-row spacing decreased from 8 to 2 ft (2.4 to 0.6 m). This was equivalent to a decrease in area per plant from 64 to 16 ft² (5.9 to 1.5 m²). The authors concluded, in part, that direct-market growers would benefit from high-density plantings by increasing yield of small-sized melons. As with some other southeastern states, high planting densities are acceptable in Mississippi because small-sized melons can be sold at retail outlets.

'Charleston Gray' was used as the pollinizer in this study because of its distinctly different rind pattern. For each location and year, 'Charleston Gray' was seeded into flats and transplanted to the field 6 or 7 d earlier than the triploid entries. Early planting of 'Charleston Gray' assured that pollen was available for the triploid plants when they began to flower. 'Charleston Gray' produces a larger and more vigorous vine than the triploid entries and therefore was planted at half the density of the triploids. The pollinizer was planted similarly to the triploid entries except spacing was 4 ft (1.2 m) apart within the row making a total of seven plants per plot at Verona and 5 ft (1.5 m) apart within the row making a total of five plants per plot at Crystal Springs. Plots of 'Charleston Gray' and triploid entries were arranged in a checkerboard pattern so that each triploid plot was surrounded on all sides by pollinizer plots. Two to four beehives per acre (2.5 to 4.9 per ha) were used at each location.

The soil at Verona is a Quitman fine-loamy, siliceous, thermic, Aquic Paleudults, and at Crystal Springs is a Providence fine-silty, mixed, thermic, Typic Fragiudalf. Preplant fertilizer (13N–8.3P–30K) was applied at Verona before bed making at a rate of 600 lb/acre (672 kg·ha^{-1}) each year according to soil test recommendations. Preplant fertilizer (12.5N–7.5P–30K) was applied at Crystal Springs before bed making at a rate of 400 lb/acre (448 kg·ha^{-1}) each year according to soil test recommendations. Plant beds were made 0.5 ft (0.15 m) high and 2.5 ft (0.76 m) across the top with a press-pan-type bed shaper, and beds were not fumigated. Black polyethylene mulch and drip tubing were applied immediately after bed formation. Water or fertilizer solution was applied through drip tubing to supply at least 4.7 gal/ft (58.4 L·m^{-1}) weekly at

Table 1. Entries, seed sources, locations, and years in trials for selected triploid watermelon cultivars and breeders' experimental hybrids evaluated in 2000 and 2001 in Mississippi.

		Verona[y]		Crystal Springs[y]	
Entry	Source[z]	2000	2001	2000	2001
Constitution	Sunseeds	+	+	+	+
Cooperstown	Seminis	+	+	+	+
Crimson Trio	Syngenta	+	+	–	+
Diamond	Hollar	+	+	+	+
Gem-Dandy	Willhite	+	+	+	+
Genesis	Shamrock	+	+	+	–
Millionaire	Harris Moran	+	+	+	+
RWM 8073-VP	Syngenta	+	+	+	–
Sapphire	Hollar	+	+	+	–
SeedWay 4502	SeedWay	+	+	+	+
Summer Sweet 5244	Abbott & Cobb	+	+	–	+
Summer Sweet 5544	Abbott & Cobb	+	+	+	+
SWT 8705	Sakata	+	+	+	+
SXW 5052	Sunseeds	+	+	–	–
SXW 8062	Sunseeds	–	+	–	–
Triple Crown	SeedWay	+	+	+	–
Tri-X 313	Syngenta	+	+	+	+
Tri-X Carousel	Syngenta	+	+	+	+
Willhite 4830	Willhite	+	+	–	+
Wrigley	Seminis	+	+	+	+
XWT 7703	Sakata	+	–	–	–

[z]Abbott & Cobb = Abbott & Cobb Inc., Feasterville, Pa.; Harris Moran = Harris Moran Seed Co., Modesto, Calif.; Hollar = Hollar Seeds, Rocky Ford, Colo.; Sakata = Sakata Seed America Inc., Morgan Hill, Calif.; SeedWay = SeedWay Inc., Hall, N.Y.; Seminis = Seminis Inc., Oxnard, Calif.; Shamrock = Shamrock Seed Co. Inc., Salinas, Calif.; Sunseeds = Sunseeds Co., Morgan Hill, Calif.; Syngenta = Syngenta, Basel, Switzerland; Willhite = Willhite Seed Inc., Poolville, Texas.
[y]Included (+) or not included (–) in trial.

Verona and 3.7 gal/ft (46.0 $L \cdot m^{-1}$) weekly at Crystal Springs during times of peak demand, when plants were large and weather was sunny and warm. Soluble fertilizer was applied twice by injecting a concentrated solution of ammonium nitrate (NH_4NO_3) or calcium nitrate [$Ca(NO_3)_2$] at about 20 and 30 d after transplant. Soluble fertilizer sidedressings supplied an additional 40 lb/acre (45 $kg \cdot ha^{-1}$) N at Verona and 50 lb/acre (56 $kg \cdot ha^{-1}$) N at Crystal Springs. Ethalfluaralin herbicide was used to control weeds between the plastic-covered rows. Esfenvalerate, permethrin, or endosulfan were mixed with chlorothalonil or azoxystrobin and applied on a 7 to 10 d schedule for insect and disease control. Pest control protectants were alternated every other week.

Harvest began 10 July 2000 and 2 July 2001 and ended 4 Aug. 2000 and 24 July 2001 for the Verona location. Harvest began 12 July 2000 and 6 July 2001 and ended 28 July 2000 and 3 Aug. 2001 for the Crystal Springs location. For each location and year, plots were harvested about once per week for a total of three or four harvests. Melons from each plot were selected for harvest when mature and then weighed individually. At least three melons from each plot were cut open and tested for soluble solids concentration with a hand-held refractometer (model 300010; SPER Scientific, Ltd., Scottsdale, Ariz.). Each melon was cut transversely, midway between the stem and blossom ends, and a portion of flesh was removed from the center of each half. Plant juices were then squeezed onto the instrument by hand. At least two measurements were made to ensure a stable reading, but only one soluble solids concentration was recorded per melon. The instrument was rinsed with distilled water after sampling each melon and dried.

At Verona in 2000 and 2001, opened melons were observed for severity of hollowheart and bacterial rind necrosis, both of which were more severe at Verona than at Crystal Springs. Hollowheart was rated by the maximum width of internal cracking using a rating scale of 1 to 3 [1 = <0.5 in (1.27 cm); 2 = 0.5 to 1.0 (1.27 to 2.54 cm); and 3 = >1.0 in (2.54 cm)]. Rind necrosis was also rated using a rating scale of 1 to 3 according to the relative area of the rind exhibiting necrosis around the circumference of the cut surface (1 = <5%; 2 = 5% to 30%; and 3 = >30%). At Verona in 2001, opened melons were also observed for the number of black, mature seeds and colored seedcoats apparent along the cut surfaces of the melon's flesh. Melons were rated subjectively for shape at Verona (round, oval, or oblong) during 2000 and 2001.

For each location and year, the experimental design was a randomized complete block with four blocks. The MIXED procedure of SAS (SAS Institute, Cary, N.C.) was used to analyze all data. Location and year were not of primary interest in this study; therefore, location and year (environment) were considered random effects. This approach allows for inference across a wider range of environments compared to declaring environment as a fixed effect (Schabenberger and Pierce, 2002). Hence, cultivar (entry or breeder's hybrid) was declared a fixed effect and environment, block within environment, and cultivar by environment interaction were declared random effects. This approach was used for response variables with one value per plot, such as yield (lb/acre or no./acre). The SAS code for these analyses follows:

```
ods output diffs = diffout;
run;
proc mixed data = wmelon;
class env b cv;
model yield = cv;
random env b(env) cv*env;
lsmeans cv/pdiff;
run;
proc print data = diffout;
proc sort data = diffout; by stderr;
proc univariate data = diffout;
var stderr;
quit;
```

where the data set is "wmelon" and env = environment, b = block, cv = cultivar (entry or experimental hybrid), and yield = yield in pounds per acre. Each entry was not always present for each location or year (Table 1). As a result, standard error values varied depending on each particular pairwise comparison. The ods statement and univariate procedure are used to obtain an average standard error for all pairwise comparisons. The average standard error, in turn, was used to calculate an average least significant difference (LSD).

For response variables with more than one value per plot, such as soluble solids concentration, hollowheart, black and colored seed, and rind necrosis, a slightly different mixed model approach was taken. Again, cultivar was taken as a fixed effect, but a cultivar by block within environment random effect was required in addition to those listed above. This extra term is required due to subsampling of melons within each plot. The SAS code for this analysis follows:

```
proc mixed data = ssolids;
class env b cv;
model ssc = cv;
random env b(env) cv*env cv*b(env);
lsmeans cv/pdiff;
run;
```

All terms are as defined above, except the data set "ssolids" was used and the response variable, ssc, was soluble solids concentration.

Marketable yield was based on a 1:1 (area/area) ratio of triploid plants to pollinizer plants. Most commercial growers plant about a 3:1 ratio (Sanders et al., 2002) Only melons weighing 10 lb (4.5 kg) or more were included in the analysis of marketable yield. None of the melons were rejected (culled) on the basis of rind necrosis or hollowheart ratings because these defects were not apparent unless melons were cut open. Only mature fruit with values of 10% or higher were included in the analysis of soluble solids concentration. Early marketable yield was calculated as the portion of the total number of marketable fruit obtained in the first one or two harvests out of a total of three or four harvests, respectively, at each location each year. Numbers of black and colored seed were square root transformed to determine means separation, but reported values were back-transformed to the original unit.

Results and discussion

SXW 5052 produced the highest total yield of marketable melons, 27,500 lb/acre (30,830 $kg \cdot ha^{-1}$), but total marketable yield of SXW 5052 was not significantly different from that of 'Triple Crown,' 'Crimson Trio,' 'SeedWay 4502,' and 'Millionaire' (Table 2). 'Genesis' produced the lowest total yield of marketable melons, producing 55% of that of SXW 5052, but total marketable yield of 'Genesis' was not significantly different from that of 'Wrigley,' 'Willhite 4830,' 'Sapphire,' and 'Gem-Dandy.' Tables 2, 3, and 4 list entries in descending order

Table 2. Total and early marketable yield and average fruit size of triploid watermelon cultivars and breeders' experimental hybrids evaluated in 2000 and 2001 in Mississippi.

	Total yield and size[z]			Early yield and size[z]		
Entry	(lb/acre)	(no./acre)	(lb)	(lb/acre)	(no./acre)	(lb)
SXW 5052	27,500 a	1,770 a–c	15.1 a	4,020 g	230 f	15.5 a
Triple Crown	25,000 ab	1,830 ab	13.6 b–d	7,930 b–f	590 b–e	13.7 cd
Crimson Trio	24,400 ab	1,870 a	13.0 c–f	7,000 d–f	520 c–e	13.6 cd
SeedWay 4502	23,700 a–c	1,670 a–e	14.2 b	9,980 a–c	660 a–c	15.3 ab
Millionaire	23,400 a–c	1,690 a–d	13.7 bc	5,830 e–g	410 d–f	14.2 a–c
SXW 8062	22,900 b–d	1,690 a–d	13.6 b–d	9,170 a–d	660 a–c	14.2 a–c
Tri-X 313	22,500 b–d	1,640 a–e	13.7 bc	9,250 a–d	670 a–c	14.1 b–d
Cooperstown	22,000 b–e	1,610 a–e	13.6 b–d	5,270 fg	390 ef	13.7 cd
RWM 8073-VP	22,000 b–e	1,620 a–e	13.5 b–e	8,650 b–e	600 b–d	14.3 a–c
Summer Sweet 5244	21,700 b–e	1,610 a–e	13.4 b–e	7,650 b–f	560 c–e	13.7 cd
Tri-X Carousel	21,600 b–e	1,610 a–e	13.4 b–e	9,640 a–d	700 a–c	13.8 cd
SWT 8705	21,600 b–e	1,620 a–e	13.3 c–e	7,590 b–f	560 c–e	13.7 cd
Diamond	21,000 b–e	1,600 a–e	13.1 c–f	11,590 a	860 a	13.6 cd
Summer Sweet 5544	20,800 b–e	1,580 a–e	13.1 c–f	8,070 b–f	580 c–e	14.1 b–d
Constitution	19,800 c–e	1,540 b–e	12.8 d–f	7,250 c–f	560 c–e	13.1 cd
XWT 7703	19,700 c–e	1,470 c–f	13.4 b–e	10,380 ab	790 ab	13.4 cd
Gem-Dandy	19,100 d–f	1,450 d–f	13.1 c–f	8,840 a–d	650 bc	13.6 cd
Sapphire	19,000 d–f	1,410 d–f	13.4 b–e	9,820 a–d	710 a–c	13.9 cd
Willhite 4830	18,600 d–f	1,360 ef	13.6 b–d	7,230 c–f	540 c–e	13.2 cd
Wrigley	18,100 ef	1,420 d–f	12.7 ef	5,560 fg	420 d–f	13.3 cd
Genesis	15,100 f	1,220 f	12.4 f	7,820 b–d	610 b–d	12.8 d
LSD_{avg}[y]	4,300	310	0.8	2,840	200	1.3

[z]Values of yield and size based on marketable melons larger than 10 lb (4.5 kg). Yield based on plant population of 2904 plants/acre (7173 plants/ha) or 15 ft^2/plant (1.4 m^2/plant). Yield also based on 1:1 (area/area) triploid:pollinizer ratio. Early yield is yield (no./acre) of the first one or two harvests out of a total of three or four harvests, respectively. Least square means reported. 1 lb/acre = 1.1 kg·ha^{-1}; 1 acre = 0.4 ha; 1.0 lb = 0.45 kg.

[y]Each entry was not always present for each location or year; therefore, standard error values varied depending on each particular pairwise comparison. Standard error values were averaged for each response variable and then used to calculate an average least significant difference (LSD_{avg}) at $P = 0.05$.

according to total marketable yield (lb/acre). 'Crimson Trio' produced the highest total number of marketable melons, 1,870/acre (4,624/ha), but total marketable melons of 'Crimson Trio' was not significantly different from that of 13 other entries (Table 2). 'Genesis' produced the lowest total number of marketable melons, producing 65% of that of 'Crimson Trio,' but total marketable melons of 'Genesis' was not significantly different from that of 'Wrigley,' 'Willhite 4830,' 'Sapphire,' 'Gem-Dandy,' and XWT 7703. Average melon weight of SXW 5052 was significantly higher than any other entry. This indicates that SXW 5052 produced melons of a larger weight class than all other entries and that it performed well with the high planting density of this study. The combined effect of high yield (no./acre) and high average melon weight (lb/melon) resulted in SXW 5052 having the highest yield (lb/acre). Overall, melons in this study were lighter in weight than expected. Seed sources list most of these entries in the expected weight range of 'Tri-X 313'; that is, 15 to 20 lb. Average weight of marketable melons in our study ranged from 12.4 to 15.1 lb (5.62 to 6.85 kg). Motsenbocker and Arancibia (2002) reported that high planting density increased the number of small-sized melons without affecting the number of medium- and large-sized melons. An increase in the number of small-sized melons, while the number of medium- and large-sized melons remained unchanged, would decrease the average weight of each entry and account for the lower average weights obtained in our study.

'Diamond' produced the highest early yield of marketable melons, 11,590 lb/acre (12,985 kg·ha^{-1}), but early marketable yield of 'Diamond' was not significantly different from that of XWT 7703, 'SeedWay 4502,' 'Sapphire,' 'Tri-X Carousel,' 'Tri-X 313,' SXW 8062, and 'Gem-Dandy' (Table 2). SXW 5052 produced the lowest early yield of marketable melons, producing 35% of that of 'Diamond,' but the early marketable yield of SXW 5052 was not significantly different from that of 'Cooperstown,' 'Wrigley,' and 'Millionaire.' Trends in the number of early marketable melons (no./acre) were almost identical to those of early marketable yield (lb/acre). SXW 5052 produced early melons with the highest average weight, but the average weight of early melons of SXW 5052 was not significantly different from that of 'SeedWay 4502,' RWM 8073-VP, 'Millionaire,' and SXW 8062.

Average soluble solids concentration ranged from 11.7% to 12.6% (Table 3). Though this is not a wide range, there were differences among entries. 'Tri-X 313,' 'Tri-X Carousel,' and 'Wrigley' produced melons with the highest soluble solids concentration, but these values did not differ from 14 other entries.

Hollowheart is an undesirable trait, and it refers to internal cracking of the melon's flesh. Average hollowheart ratings ranged from 1.3 (low) for 'Millionaire' to 2.5 (high) for 'Diamond,' but these differences were not significant (Table 3).

Triploid fruit will occasionally produce one or more mature, colored seeds and this is considered normal. Occasionally, however, triploid fruit will produce many hard but empty

Table 3. Soluble solids content, hollowheart ratings, number of black and colored seeds observed, rind necrosis ratings, and shape of triploid watermelon cultivars and breeders' experimental hybrids evaluated in 2000 and 2001 in Mississippi.[z]

Entry	Soluble solids concn (%)	Hollow heart	Black and colored seeds (no./melon)	Rind necrosis	Shape
SXW 5052	12.0 b–e	1.5	0.74 a	1.3	Oval
Triple Crown	12.2 a–e	1.6	0.00 c	1.4	Oval
Crimson Trio	12.2 a–e	2.0	0.00 c	1.8	Oval
SeedWay 4502	11.9 c–e	1.8	0.07 bc	1.3	Oval
Millionaire	12.4 a–c	1.3	0.17 bc	1.6	Oval
SXW 8062	11.8 de	1.9	0.00 c	1.4	Oblong
Tri-X 313	12.6 a	1.8	0.25 bc	1.1	Oval
Cooperstown	12.1 a–e	1.6	0.00 c	1.4	Oval
RWM 8073-VP	12.3 a–d	2.0	0.33 b	1.5	Oval
Summer Sweet 5244	12.3 a–d	1.6	0.07 bc	1.4	Oval
Tri-X Carousel	12.6 a	1.9	0.08 bc	1.3	Oval
SWT 8705	12.2 a–e	1.7	0.08 bc	1.5	Oval
Diamond	12.4 a–c	2.5	0.09 bc	1.6	Oval
Summer Sweet 5544	12.3 a–d	1.7	0.07 bc	1.2	Oblong
Constitution	12.5 ab	1.9	0.14 bc	1.6	Round
XWT 7703	12.2 a–e	2.0	---	1.9	---
Gem-Dandy	12.3 a–d	1.9	0.00 c	1.5	Oval
Sapphire	12.5 ab	2.1	0.08 bc	1.4	Oval
Willhite 4830	12.4 a–c	1.7	0.18 bc	1.7	Oval
Wrigley	12.6 a	1.6	0.08 bc	1.4	Oblong
Genesis	11.7 e	1.5	0.17 bc	1.3	Round
LSD_{avg} [y]	0.5	NS	0.30	NS	

[z]Least squares means of at least three watermelons from each plot. Rind necrosis and hollowheart were rated at the Verona location in 2000 and 2001 on a scale of 1 to 3. Rind necrosis was rated by the area of rind affected along the cut surface; 1 = <5%; 2 = 5% to 30%; and 3 = >30%. Hollowheart was rated by the maximum width of internal cracking; 1 = <0.5 in (1.27 cm); 2 = 0.5 to 1.0 (1.27 to 2.54 cm); and 3 = >1.0 in (2.54 cm). At the Verona location in 2001, melon shape and number of black and colored seeds along the cut surfaces were also recorded. XWT 7703 was grown only in 2000 and was not evaluated for black seed or shape.
[y]Each entry was not always present for each location or year; therefore, standard error values varied depending on each particular pairwise comparison. Standard error values were averaged for each response variable and then used to calculate an average least significant difference (LSD_{avg}) at $P = 0.05$.

seedcoats. Although most experts feel this is caused primarily by environmental conditions, some cultivars may be more likely to produce hard seedcoats under these conditions than other cultivars (T. Williams, personal communication). Most entries in our study were observed to have a very low number of mature colored seeds. However, SXW 5052 produced melons with higher numbers of mature and colored seeds compared to all other entries (Table 3).

Susceptibility to bacterial rind necrosis is also an undesirable trait because the disorder reduces fruit quality and limits marketability. Rind necrosis becomes obvious upon opening a melon and observing highly undesirable brown- or rust-colored lesions in the rind. It apparently does not affect the flesh. The cause of rind necrosis is known to be bacterial, but there is still uncertainty as to the specific causal agent and the conditions under which it occurs. Though the incidence of rind necrosis at the Verona location was widespread in 2000 and 2001, its occurrence in other growing areas is rare. Rind necrosis was rarely observed at the Crystal Springs location. Average rind necrosis ratings ranged from 1.1 (very low) for 'Tri-X 313' to 1.9 (moderate level) for XWT 7703, but these differences were not significant (Table 3).

Most entries were oval and similar in shape to 'Tri-X 313.' However, 'Constitution' and 'Genesis' were more round than oval, and SXW 8062, 'Summer Sweet 5544,' and 'Wrigley' were slightly more oblong than oval (Table 3).

Percentage of fruit weighing less than 10 lb (4.5 kg) ranged from a low of 3% for SXW 5052 to a high of 34% for 'Gem-Dandy' (Table 4). The higher percentage of small fruit of some entries appeared to contribute to their lower rankings in yield (lb/acre and no./acre) because fruit less than 10 lb in weight were classified as unmarketable.

Conclusions

'Tri-X 313' and 'Tri-X Carousel' can be recommended as early-maturing cultivars for commercial production in Mississippi. Each of these cultivars produced high total marketable yields and average-sized melons, and each cultivar exhibited high soluble solids concentrations. 'Tri-X 313' exhibited only one undesirable trait, having a relatively higher incidence of black and colored seeds than most other entries. 'Diamond' had high early and total yields, as well as high soluble solids concentration, but it should be recommended only on a trial basis to determine its potential susceptibility to hollowheart.

'Triple Crown,' 'Millionaire,' 'Cooperstown,' and 'Summer Sweet 5244' can be recommended as mid- to late-maturing cultivars for commercial production in Mississippi. Each of these cultivars produced relatively high total marketable yields and average-sized melons, and each cultivar exhibited average to high soluble solids concentrations without exhibiting undesirable traits. 'Crimson Trio' can also be recommended where a slightly smaller-sized melon is desired. SXW 5052 and RWM 8073-VP performed well in our

Table 4. Relative distribution of fruit weight of triploid watermelon cultivars and breeders' experimental hybrids grown in northern and central Mississippi during 2000 and 2001.

	Fruit wt [lb (kg)]				
Entry	<10 (<4.5)	10–14 (4.6–6.4)	14–18 (6.4–8.2)	18–22 (8.2–10.0)	>22 (>10.0)
			(%)		
SXW 5052	3	39	41	15	2
Triple Crown	18	48	31	4	0
Crimson Trio	19	57	23	1	0
SeedWay 4502	18	45	27	9	1
Millionaire	24	44	27	4	1
SXW 8062	14	45	35	6	0
Tri-X 313	24	46	27	3	0
Cooperstown	22	47	26	4	0
RWM 8073-VP	19	48	30	3	0
Summer Sweet 5244	21	50	25	4	1
Tri-X Carousel	21	51	24	5	0
SWT 8705	21	52	23	3	0
Diamond	28	49	21	2	0
Summer Sweet 5544	23	54	19	3	0
Constitution	29	52	18	1	0
XWT 7703	21	51	28	0	0
Gem-Dandy	34	46	18	2	0
Sapphire	21	52	22	5	0
Willhite 4830	23	44	27	6	0
Wrigley	31	52	17	1	0
Genesis	32	54	13	0	0

trials, but the companies from which they were obtained are no longer promoting these experimental hybrids.

Other universities in the southeastern U.S. have evaluated many of the entries in our study, and these evaluations have lead to recommendations of top-ranked cultivars for commercial production. Evaluations of triploid watermelons conducted every year since 1988 by the University of Florida have identified, among others, 'Genesis', 'Millionaire', 'Summer Sweet 5244', 'Summer Sweet 5544', 'Tri-X 313', and 'Tri-X Carousel' as recommended cultivars (Maynard and Sidoti, 2002). 'Genesis' was the only cultivar recommended for Florida that did not perform well under our growing conditions. 'Summer Sweet 5544' performed marginally under our conditions. In North Carolina, 'Gem-Dandy', 'Millionaire', 'Summer Sweet 5244', and 'Tri-X 313' are recommended cultivars (Sanders et al., 2002). In addition, 'Wrigley' and 'SeedWay 4502' were identified as top-performing cultivars in a 33-entry trial of triploid watermelons in 2000 (Schultheis et al., 2001). 'Gem-Dandy' and 'Wrigley' did not perform well under our growing conditions. In addition, 'SeedWay 4502' produced high early and total yields and had higher-than-average melon size, but it exhibited low soluble solids concentration.

Literature cited

Daniello, F.J. 1996. Seedless watermelon. Texas commercial vegetable production guide. Texas A&M Univ., College Station, Texas.

Maynard, D.N. 2001. An introduction to the watermelon. p. 9–20. In: D.N. Maynard (ed.). Watermelons: Characteristics, production, and marketing. ASHS Press, Alexandria, Va.

Maynard, D.N. and B.J. Sidoti. 2002. Triploid watermelon variety evaluation, Spring 2002. Gulf Coast Research and Education Center Research Report BRA-2002-3. 14 Dec. 2002. gcrec.ifas.ufl.edu/watermelon%20variety%20webpage/triploid%20manuscript.htm.

Motsenbocker, C.E. and R.A. Arancibia. 2002. In-row spacing influences triploid watermelon yield and crop value. HortTechnology 12:437–440.

Sanders, D.C., J.D. Cure, and J.R. Schultheis. 1999. Yield response of watermelon to planting density, planting pattern, and polyethylene mulch. HortScience 34:1221–1223.

Sanders, D.C. (ed.) J.M. Kemble, E.H. Simonne, E.H. Sikora, M.G., Patterson, R.L. Hassel, T. Keinath, D. Ganberry, W.T. Kelley, K.E. Cushman, D.H. Nagel, R.G. Snyder, P.G. Thompson, D. Ingram, J. P. Harris, J. Byrd, N.G. Creamer, J.M. Davis, D.W. Monks, J.R. Schultheis, L.G. Wilson, M.D. Boyette, G.T. Roberson, K.A. Sorensen, J. Walgenbach, D.B. Orr, C.W. Averre, M.A. Cubeta, G. J. Holmes, F.J. Louws, D.F. Ritchie, P.D. Shoemaker, C.R. Crozier, S.C. Hodges, and G.D. Hoyt. 2002. 2002–2003 Vegetable crop guidelines—Recommendations for Alabama, Mississippi, North Carolina, and South Carolina. Vance Publ. Corp., Lincolnshire, Ill., and N.C. Veg. Growers' Assn., Raleigh.

Schabenberger, O. and F.J. Pierce. 2002. Contemporary statistical models for the plant and soil sciences. CRC Press. Boca Raton, Fla.

Schultheis, J., D. Adams, G. Clark, and K. Jones. 2001. Hybrid triploid and diploid watermelon cultivar trials, 2000. p. 22–26. In: J. Kemble and E. Vinson, III (ed.) Spring 2001 Commercial vegetable variety trials. Alabama Agricultural Experiment Station Regional Bull. 07. 14 Dec. 2002. www.ag.auburn.edu/resinfo/vegetables/spring2001.pdf.