

Performance of Cultivars and Selections of Muscadine Grapes in North Florida

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Abstract

Yield and berry quality of muscadine grapes were assessed from 1987 to 1991 in a vineyard established in 1985 at the North Florida Research and Education Center (NFREC)-Monticello. In a separate block, several new cultivars and selections were also evaluated in the 4th leaf. 'Carlos,' 'Noble' and FL AD 3-42 produced consistently high yields (> 7.75 tons/acre), whereas the yield of many large-fruited cultivars (berry wt. > 10 g) such as 'Fry,' 'Summit,' GA 9-37, GA 33-1-4, GA 33-3-4, and 'Tara' averaged less than 4.5 tons/acre. 'Granny Val' had the highest yield of any large fruited cultivars. Percentage soluble solids generally ranged from 13 to 17% and tended to increase with vine age. Percentage dry scar was at least 75% except for 'Farrer,' 'Fry,' 'Jumbo,' 'Magnolia' and 'Noble.' Cultivars have been identified that were best adapted for the fresh market or processing in north Florida.

Introduction

Muscadine grapes (*Vitis rotundifolia* Michx.) are indigenous to the south-eastern United States. Currently 4,000 acres are under cultivation, and the muscadine industry in Florida is stable with about 400-500 acres. Olien (6) summarized the strengths of the muscadine industry to include a greater resistance to insects and diseases, increased vine longevity and increased market diversity compared to Euvitis table grapes. Poor tolerance to wet soils, uneven fruit ripening, wet stem scar, lack of seedlessness, unstable markets and low prices for processed fruit were cited as weaknesses of the muscadine industry. Considerable intra-specific variation in muscadine grapes exist in respect to vine vigor, yield, and berry characteristics. Although cultivars suitable for fresh fruit production or processing have been reported

for Florida (2, 3, 5), new muscadine selections from breeding programs in Georgia, North Carolina, Mississippi and Florida are challenging the supremacy of well-established cultivars.

The purpose of this study is to compare yield and berry quality of several cultivars and selections of muscadine grapes in north Florida.

Materials and Methods

A 0.60 acre vineyard consisting of 23 cultivars and selections of muscadine grapevines was planted in March 1985 at the North Florida Research and Education Center at Monticello (Location: 30.5° North Latitude, 84° West Longitude). Soil type was a Dothan loamy sand with ca. 1% organic matter. Vines were spaced 16 ft within and 10 ft between rows, respectively. Vines were trained to a bilateral cordon system 6 ft above the ground. Spurs, spaced ca. every 3-6 in on the cordon, were pruned to 3-6 nodes.

Fertilizer (10N-4.4P-8.3K, plus micro-nutrients) was applied in June at 0.5 lb (per vine) the first year, 0.5 lb during February and June 1988), and 1.0 lb during February and June 1989 and 1990. During 1989 1.0 lb of fertilizer was applied during April. An in-row weed free strip was maintained by the application of pre- and post-emergent herbicides. Fungicides or insecticides were not applied. Drip irrigation was supplied daily (6 gallons/vine/day) during the 1987, 1988, 1989, and 1990 growing seasons. Irrigation was not provided during 1991 because of abundant rainfall.

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The following cultivars and selections were represented in a completely randomized design: 'Albemarle,' 'Carlos,' 'Cowart,' 'Dixie,' 'Excel,' 'Farrer,' 'Fry,' 'Golden Isles,' 'Granny Val,' 'Jumbo,' 'Magnolia,' 'Noble,' 'Senoia,' 'Summit,' 'Tara,' 'Welder,' FL AD 3-42, GA 9-37, GA 9-50, GA 33-1-4, GA 33-2-1, GA 33-3-4, and FL P 9-15. Each cultivar or selection was replicated five times. Vines were harvested 1987, 1988, 1989 and 1991. Vines were not harvested during 1990 due to labor constraints. Least significant differences are reported. Vines that died during the winter of 1989/1990 or 1990/1991 were not included in the analysis.

In February 1988 the following muscadine grapevines were planted adjacent to the existing block: FL AA 10-40, FL AA 7-10, FL CD 8-81, FL AA 12-3, FL DB 1-41, 'Alachua,' FL AA 12-64, and 'Loomis.' Vine spacing and pruning practices were similar to that described above. Data were collected in 1991 and subjected to analysis of variance procedures. Least significant differences are reported.

Vines were hand-harvested one to three times each year (depending on uniformity of ripening) by vigorously shaking vines by hand and collecting the berries in catchframes positioned below the vines on either side of the trunk. Berries were cleaned of debris and weighed. A sample of 20 berries from each vine was weighed to determine average berry weight and percentage dry scar. An estimate of soluble solids was determined by placing the liquid from ca. 10 hand-crushed berries on a Bausch and Lomb temperature-compensated refractometer. Yield, berry weight, soluble solids and % dry scar were subjected to analysis of variance procedures. Least significant differences are reported. Berry weight, soluble solids and % dry scar data generally did not vary greatly from year to year; hence, mean values are presented.

Table 1. Yield of 23 cultivars and selections of muscadine grapes during 1987, 1988, 1989 and 1991 at the NFREC-Monticello.

Cv.	Color ¹	Yield—tons/acre				Avg.
		1987	1988	1989	1991	
Albemarle	Bl	1.2	3.8	3.2	3.1	2.8
Carlos	Bz	5.7	11.1	7.2	9.0	8.2
Cowart	Bl	1.7	6.1	4.4	4.4	4.1
Dixie	Bz	4.8	5.7	3.9	5.8	5.0
Excel	Bz	1.4	6.8	7.3	6.2	5.5
Farrer ²	Bl	2.6	3.4	5.1	8.0	4.8
Fry ²	Bz	2.3	4.7	5.6	1.3	3.5
Golden Isles	Bz	2.0	6.0	4.6	6.5	4.8
Granny Val	Bz	4.6	9.1	4.7	6.1	6.1
Jumbo ²	Bl	2.6	3.8	3.7	2.5	3.2
Magnolia	Bz	6.0	10.2	4.8	4.5	6.3
Noble	Bl	5.3	9.7	7.0	8.0	7.5
Senoia	Bz	2.7	7.0	6.6	6.6	5.7
Summit ²	Bz	1.8	3.1	4.7	5.6	3.8
Tara	Bz	1.0	2.0	2.0	5.0	2.5
Welder	Bz	5.0	7.3	6.2	5.7	6.1
FL AD 3-42	Bz	6.0	8.6	6.7	9.0	7.6
GA 9-37 ²	Bz	2.9	4.8	4.4	2.0	3.6
GA 9-50	Bz	2.2	5.9	6.0	4.2	4.6
GA 33-1-4 ²	Bz	2.3	2.2	3.2	6.8	3.6
GA 33-2-1	Bz	2.3	2.8	2.6	4.7	3.1
GA 33-3-4 ²	Bz	0.8	2.2	2.3	2.1	1.9
FL P 9-15	Bl	4.3	5.4	5.9	2.7	4.6
LSD 0.05	—	1.9	2.3	2.1	3.0	—

¹Color: Bl = Black, Bz = Bronze.

² = Pistillate cultivars.

Results and Discussion

Average yield was relatively low on young third-leaf vines (mean = 3.1 ton/acre) and increased during subsequent years (mean = 4.9-5.7 tons/acre) (Table 1). 'Carlos,' 'Noble,' and FL AD 3-42 produced consistently high yields with an average of at least 7.5 tons/acre. Acceptable yields (4.5-7.4 tons/acre) were achieved for 'Dixie,' 'Excel,' 'Farrer,' 'Granny Val,' 'Magnolia,' 'Senoia,' 'Welder,' and 'Golden Isles.' Many cultivars with a large berry size ('Fry,' 'Summit,' GA 9-37, GA 33-1-4, GA 33-3-4, and 'Tara') produced

less than 4.5 tons/acre (Tables 1, 2). Yield data were generally consistent with data from other trials (1, 3, 4). For example, yield of 'Noble' and 'Carlos' exceeded 7.0 tons/acre, yet yield of 'Fry' was ca. 4 tons/acre in 3 previous studies conducted in central or north Florida (1, 4, 5). The yield of 'Fry' was low in 1991, and remaining plants were low in vigor perhaps as the result of accumulated winter injury. The following vine mortalities (out of 5) were recorded in 1991: 'Albemarle' (1), 'Carlos' (2), 'Farrer' (2), 'Fry' (2), 'Excel' (2), 'Granny Val' (1), and FL P9-15 (1). Of the cultivars and selections included in this study, Pierce's disease symptoms have been

Table 2. Mean berry wt., % soluble solids and % dry scar of 23 cultivars and selections of muscadine grapes during 1987, 1988, 1989 and 1991 at the NFREC-Monticello.

Cv.	Color ¹	Berry wt. (g)	% Soluble solids	% Dry Scar
Albemarle	Bl	6.5	16.9	88
Carlos	Bz	6.6	14.2	96
Cowart	Bl	8.3	14.9	79
Dixie	Bz	6.1	17.2	78
Excel	Bz	10.0	14.4	84
Farrer ²	Bl	13.4	15.2	69
Fry ²	Bz	12.7	16.3	65
Golden Isles	Bz	10.8	14.7	91
Granny Val	Bz	12.8	14.9	79
Jumbo ²	Bl	13.4	14.1	74
Magnolia	Bz	6.4	13.9	73
Noble	Bz	4.1	14.7	56
Senoia	Bz	8.5	14.3	87
Summit ²	Bz	10.0	16.2	90
Tara	Bz	11.0	16.2	95
Welder	Bz	4.2	13.6	88
FL AD 3-42	Bz	5.3	16.5	88
GA 9-37	Bz	13.5	16.2	83
GA 9-50	Bz	7.5	15.7	96
GA 33-1-4 ²	Bz	12.9	14.9	91
GA 33-2-1	Bz	9.0	16.7	94
GA 33-3-4 ²	Bz	10.0	15.8	98
FL P 9-15	Bl	3.4	16.4	86
LSD 0.05		1.7	2.2	18

¹Color: Bl = Black, Bz = Bronze.

² = Pistillate cultivars.

Table 3. Yield, berry wt., soluble solids and % dry scar of 6 selections and two cultivars of muscadine grapes during 1991 at the NFREC-Monticello.

Cv. ²	Color ¹	Yield tons/acre	Berry wt. (g)	Soluble Solids (%)	Dry Scar (%)
Alachua	Bl	2.8	8.0	17.7	98.0
Loomis	Bl	0.2	9.8	15.1	70.0
FL AA 10-40	Bz	6.0	7.4	15.7	97.5
FL AA 7-10	Bz	4.4	5.4	20.4	61.3
FL CD 8-81	Bl	3.3	10.8	18.8	91.9
FL AA 12-3	Bl	3.3	6.8	19.1	97.5
FL DB 1-41	Bl	2.9	10.3	17.5	91.7
FL AA 12-64	Bl	1.4	6.0	16.5	95.0
LSD 0.05	—	6.8	1.1	2.3	13.8

¹Color: Bl = Black, Bz = Bronze.

²All are self fertile.

previously noted on only 'Carlos' and FL AD 3-42 (Mortensen, personal communication).

Berry weights and remaining variables were fairly consistent for a given cultivar over the experimental period, thus only mean values are reported (Table 2). Bronze grapes with a berry weight greater than 10 g include 'Fry', 'Golden Isles', 'Granny Val', and 'Tara', GA 9-37 and GA 33-1-4. 'Farrer' and 'Jumbo' were black grapes with a berry size exceeding 10 g. 'Granny Val' produced the highest yields of large-fruited cultivars (berry weight > 10 g). While a large berry size is a prerequisite for a successful fresh market grape, characteristics such as tonnage, flavor, color stability, uniform ripening, etc. are priorities for processing into juice, wine or jellies. 'Noble' and 'Welder,' two popular cultivars for processing, had a berry weight of ca. 4 g.

Percentage soluble solids averaged ca. 15.0% in 1987 and 1988, 15.5% in 1989 and 15.9% in 1991 (data by year not shown, means presented in Table 2). 'Albemarle,' 'Dixie,' 'Fry,' 'Summit,' 'Tara' and most of the Georgia selections had an average soluble solids exceeding 16.0%. Cultivars with a soluble solids less than 14.0% were 'Magnolia' and FL AD 3-42. Percentage dry

scar averaged at least 90% for 'Carlos,' 'Summit,' GA 9-50, 'Golden Isles,' GA 33-1-4, GA 33-2-1, GA 33-3-4 and 'Tara' (Table 2). Cultivars that had less than 75% dry scar, indicative of a poorly formed abscission layer at the point of berry attachment, included 'Farrer,' 'Fry,' 'Jumbo,' 'Magnolia' and 'Noble.'

For cultivars planted in 1988 high yields were obtained for FL AA 10-40 (6.0 tons/acre) and moderate yields (2.8-4.4 tons/acre) for FL AA 7-10, FL CD 8-81, FL AA 12-3, FL DB 1-41 and 'Alachua' (Table 3). 'Loomis,' FL CD 8-81 and FL DB 1-41 produced berries that weighed ca. 10 g. Cultivars with

Table 4. General characteristics and recommendation status of muscadine cultivars and selections of muscadine grapes evaluated in north Florida.

Cultivar ¹	Fruit color ²	Vine vigor	Average yield	Berry ³ size	Harvest period	Current ⁴ status	Use			
							Wine	Juice	Fresh	Jams, Jellies
<i>1985 Planting</i>										
Albermarle	Bl	Med	Med	Med	Mid	NR				
Carlos	Bz	High	V High	Med	Early	R	+	+	+	
Cowart	Bl	Med	High	Med-Large	Mid	NR			+	
Dixie	Bz	High	Med	Med	Mid	R	+	+		
Excel	Bz	Low	High	Med-Large	Late	NR				
Farrer ^o	Bl	Med	Med	Large	Mid	T				+
Fry ^o	Bz	Low	Low	Large	Late	CR				+
Golden Isles	Bz	Med	Med	Med-Large	Late	T	+			
Granny Val	Bz	Med	High	Large	V Late	R				+
Jumbo ^o	Bl	Med	Med	Large	Mid	R				+
Magnolia	Bz	Med	Med	Med	Mid	NR				
Noble	Bl	High	V High	Small	Mid	R	+	+		+
Senoia	Bz	High	High	Med-Large	Mid-Late	NR				
Summit ^o	Bz	Med-High	Med	Large	Mid	R				+
Tara	Bz	Med	Low-Med	Large	Mid	T				+
Welder	Bz	Med	High	Small	Mid	R	+	+		+
FL AD 3-42	Bz	High	High	Small	Mid	NR				
FL P 9-15	Bl	Med	Med	Small	V Late	T		+		
GA 9-37 ^o	Bz	Med	Low	Large	Mid	T				+
GA 9-50	Bz	Med	Med	Med	Mid	NR				
GA 33-1-4 ^o	Bz	Med	Low	Large	Mid	T				+
GA 33-2-1	Bz	Med	Low	Med-Large	Mid	NR				
GA 33-3-4 ^o	Bz	Med	Low	Med-Large	Mid	NR				
<i>1988 Planting</i>										
Alachua	Bl	Med	Med	Med	Mid	T				+
Loomis	Bl	Med	Low	Med-Large	Late	NR				
FL AA 7-10	Bz	Med	Med	Small	Mid	NR				
FL AA 10-40	Bz	Med	High	Med	Mid	NR				
FL AA 12-3	Bl	Med	Med	Med	Mid	NR				
FL AA 12-64	Bl	Med	Low	Med	Mid	NR				
FL CD 8-81	Bl	Med	Med	Large	Mid	T				+
FL DB 1-41	Bl	Med	Med	Med-Large	Mid	NR				

¹o = Pistillate (female) cultivar.

²Bl = Black; Bz = Bronze.

³Berry size: Small = 3.0 to 6.0 g; Medium = 6.1 to 9.0 g; Large = 9.1 to 14.0 g.

⁴R = Recommended; NR = Not recommended; CR = Conditionally recommended; T = Recommended for trial.

both a high % soluble solids and a high % dry scar included 'Alachua,' FL CD 8-81, FL AA 12-3, FL DB 1-41 and FL AA 12-64. The flavor of FL CD 8-81 was judged by the author to be superior to all other muscadine grapes at the NFREC-Monticello.

In addition to high yield, berry size and soluble solids, other important characteristics of muscadine grapes are a high percentage dry scar, rapid speed for harvest and uniform ripening especially for mechanical harvesting (5). Since berries were harvested by hand shaking the vines, % dry scar indicated in Table 4 would be lower than if grapes were mechanically harvested or pulled off by hand. Muscadine grapes generally ripen more unevenly than Euvitis grapes which is a disadvantage when once-over harvesting or mechanically harvesting. Mortensen and Harris (5) determined that 'Carlos,' 'Coward,' 'Magoon' and 'Southland' were cultivars that had the best combination of speed of harvest (sec/lb), % marketable fruit, and % dry scar for fresh market grapes. For juice, wine, or processing 'Carlos,' 'Dixie,' 'Doreen,' 'Noble,' 'Redgate,' 'Regale,' and 'Welder' had the best combination of yield, soluble solids and speed of harvest (4). 'Coward,' 'Dixie,' 'Fry,' and 'Southland' have been identified as the best cultivars for the fresh market, and 'Carlos,' 'Doreen,' 'Noble' and 'Welder' were the best choice for juice or wine.

Based upon the data presented in Tables 1-3 and a summary of performance evaluations presented in Florida and in the southeastern United States (Table 4), recommended cultivars are somewhat different from that reported previously (4-7). 'Carlos,' 'Granny Val,' 'Jumbo' and 'Summit' appear to be the best fresh market grapes in this study, although 'Alachua,' 'Farrer,' 'Tara,' GA 9-37, GA 33-1-4 and FL CD 8-81 have sufficient merit to be recommended for trial. All of the above cultivars had at least average yield,

vine vigor, soluble solids and berry weight greater than 10 g except 'Alachua' (8.0 g) and 'Carlos' (6.6 g). The best cultivars for wine, juice or processing must be high in yield and soluble solids and at least average in respect to vine vigor and speed of harvest. 'Carlos,' 'Dixie,' 'Noble' and 'Welder' have been identified as superior in these characteristics. 'Golden Isles' is recommended for trial as a wine grape.

Some other cultivars with potential but not evaluated in this study are: 1) 'Black Fry,' a large black female grape for fresh market use; 2) 'Darlene,' a large bronze self fertile grape for fresh market use; 3) 'Doreen,' a small bronze self fertile grape for juice wine and other processing; 4) 'Isons,' a large black self fertile grape for fresh market use; 5) 'Nesbitt,' a large black self fertile grape for fresh market use; and 6) 'Triumph,' a medium-sized black self fertile grape for fresh market use. These cultivars will be included in future trials.

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