2023 SR SFC Project Report

Proposal Category: _ X_ Research ___Outreach

Proposal Status: __X_ New Proposal ___Previously funded by SRSFC

Title: **Assessment of Improved Newly Released Muscadine Grapes for Alabama Vineyards**

Name, Mailing and Email Address of Principal Investigator(s):

Elina Coneva, Ph.D.
W.A. Jr. & C. Dozier Endowed Professor
Extension Specialist, Pomologist
101 Funchess Hall
Auburn University
Auburn, AL 36849
Edc0001@auburn.edu

Co-PIs:

Patrick Conner, Ph.D.
Professor and Tifton REI Coordinator
Pecan & Muscadine Breeder
2360 Rainwater Rd.
Tifton, GA 31793
Ph.: 229-386-3903
Email: pconner@uga.edu

Sushan Ru, Ph.D.
Assistant Professor
Small Fruit Breeding & Genetics
287 CASIC Building
Auburn University, AL 36849
Ph.: 509-942-9811
E-mail: szr0099@auburn.edu

Margaret Worthington, Ph.D.
Associate Professor, Breeder
Department of Horticulture
Fayetteville, AR 72701
Ph.: 479-575-2122
E-mail: mworthi@uark.edu

Melba Salazar-Gutierrez, Ph.D.
Assistant Professor, Plant Physiology
101 Funchess Hall
Auburn, AL 36849
Ph.: 334-844-4862
E-mail: mrs0146@auburn.edu

Abstract:

The objective of this applied research project was to evaluate the performance of newly released muscadine grape cultivars and advanced selections with improved qualities from the UGA and the University of AR breeding programs in Alabama environment as to gain science based empirical information on their productivity, fruit quality, disease resistance, vine longevity. The outcomes from this project can lead to improved sustainability in small fruit production practices ensuing increased yield, improved fruit quality and increased economic benefits to the grower. The

newly generated knowledge can directly impact crop production and grower success and can enhance the competitiveness of small fruits.

Project Description:

There is a high demand for fresh grapes on the domestic market. According to the 2017 Census of Agriculture, there are 589 acres of grapes in Alabama, while the grape acreage is about four times larger in neighboring Georgia (2086 acres), a state with a similar climatic conditions. Outcomes from the proposed research are going to aid in muscadine grape production expansion in Alabama and the southeast.

Current advances in fresh market muscadine breeding have yielded new fresh market cultivars with larger and more uniform berries, thinner skins, crisp flesh, and skins that adhere to the flesh. These advances have set the stage for the expansion of the muscadine grape industry and to a wider production area and the introduction of new, high quality cultivars to the consumer. The list of UGA's currently released perfect-flowered, large fruited muscadine cultivars with crisp flesh includes 'Lane', 'Hall', 'Paulk', 'Ruby Crisp'. 'Razzmatazz' is another recent release from a private breeding program that produces seedless berries with thin skin and crisp flesh. Since science-based information is currently lacking on the new cultivars productivity and fruit quality attributes in Alabama environment, the proposed research was designed to document the overall performance and develop recommendations for the best adapted muscadine cultivars.

'Paulk', 'Lane', 'Hall', 'Ruby Crisp', 'Razzmatazz', 'Southern Home', 'Supreme' (standard) muscadine grape cultivars and eight advanced selections from the UGA and UA breeding programs have been planted as a RCBD experiment with four single-vine replications at the Chilton REC, Clanton, AL (Fig. 1). Cultivars 'Paulk', 'Lane', 'Hall', 'Razzmatazz', 'Southern Home', 'Supreme' (standard) were planted in fall of 2019 and the advanced selections 'AM-26', 'AM-70', 'AM-77', 'AM-195', 'GA10-1-222', 'GA 6-1-269', 'GA 13-4-2', 'GA 10-1-294' and 'Ruby Crisp' were planted in spring of 2021. Vines are trained to the single wire bilateral training system at a planting distance of 6.1 m X 3.7 m. Vines were pruned according to the ACES Muscadine Grape Production Guide. Vine shoot growth and fruit maturation were evaluated phenologically using the BCCH scale. Inflorescence emergence and flowering were recorded to determine the critical flowering stages. Full bloom was determined when 50% of flower caps have

fallen. Veraison and ripening of berries were assessed throughout the changes of berry color and softening of fruit. Yield per vine was measured at harvest and recorded for each experimental vine using an Adam CPWplus-35 scale; harvest will be conducted by hand. For each individual vine, average berry weight was determined based on a 50 berry subsample per vine using an Adventure Pro digital scale. Following harvest evaluations, grape berries were maintained in a 4 ℃ cooler until fruit quality analysis was conducted. Fruit quality analysis included measurements of soluble solid content (SSC) using a 50 berry subsample/vine and counting the number of berries with wet stem scar at each harvest date to determine the percentage of berries with wet stem scar. Soluble solids content (SSC) was measured at room temperature using extracted juice analyzed via a digital refractometer. Standard statistical analyses was performed to compare the results. Muscadine cultivars and selections were analyzed separately based on their age.

Figure 1. Select muscadine grape cultivars and selections planted at the CREC, Clanton, AL.

During the spring of 2023 muscadine vines started to flower in mid-May and flowering and fruit set continued until the end of June. ‘Razzmatazz’ was the earliest flowering cultivar followed by ‘Lane’ and ‘Hall’, while ‘Paulk’ and ‘Eudora’ had a delayed flowering among the cultivars in our study (Figure 2). Muscadine grape elections ‘AM-26’, ‘AM-70’ and ‘GA-13-4-2’ had an advanced flowering (70% open flowers on June 6), while ‘AM-77’ had 40% open flowers on the same date (Fig. 3).

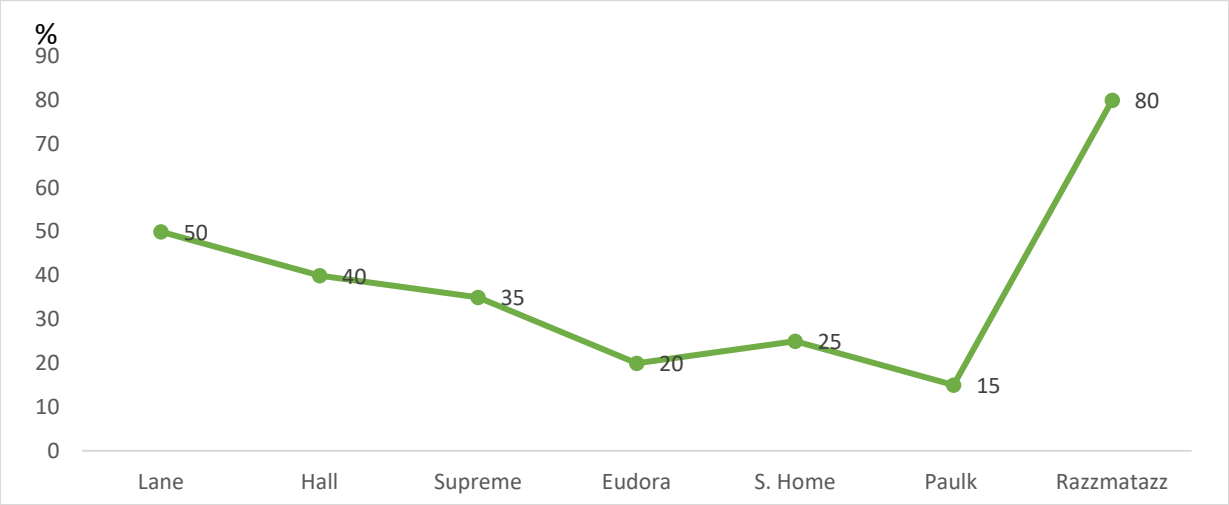

Figure 2. Percent open flowers of selected muscadine cultivars planted at the CREC, Clanton, AL on June 6, 2023.

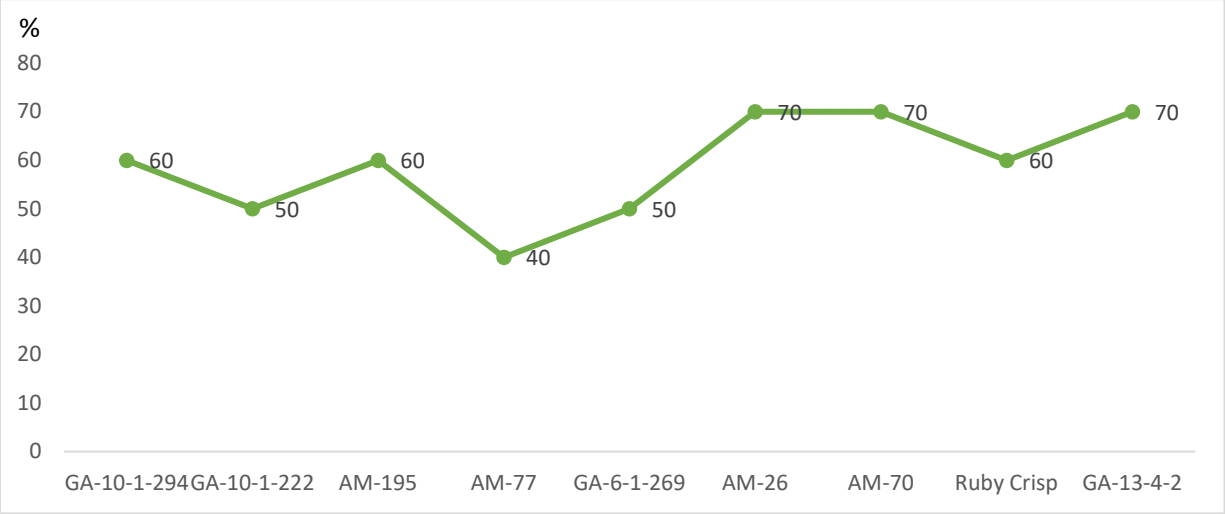

Figure 3. Percent open flowers of muscadine grape advanced selections planted at the CREC, Clanton, AL on June 6, 2023.

Harvest of the cultivars began on July 28 and continued until October 11. There were a total number of eleven harvest dates and data collection points this season. 'Razzmatazz' first harvest occurred on July 28, two weeks before any other cultivar had mature berries. The average 'Razzmatazz' yield per vine (3.6 kg/vine) was over two folds higher on the second harvest date (August 9th) (Table 1) and was the highest (4.6 kg/vine) on August 23rd (Table 2). The mean number of clusters per vine varied between

34 and 158.5 for each of the harvest dates, with a season mean number of clusters/vine of 128.5 and mean berry weight of 1.5 g.

Table 1. 'Razzmatazz' early yield (July 28-August 9) and fruit quality attributes at the CREC, Clanton, AL, 2023.

Yield, kg	No. Clusters/ vine	Mean Cluster Weigth, g	Mean Berry Weigth, g	Average Brix, %
Harvest July 28				
1.4	34	48.5	1.3	17.2
Harvest August 9				
3.6	113	40.4	1.6	18.5

Figure 4. 'Razzmatazz' muscadine grape crop, CREC Clanton, AL, 2023.

'Lane', 'Hall' (Figure 5 A, B), 'Supreme' and 'Eudora' were harvested for the first time on August 16th . Although these cultivars were not significantly different in terms of their first yield of the season, 'Lane' produced the highest early crop of 9.7 kg/vine, followed by 'Hall' with 6.6 kg/vine (Table 2). 'Hall's yield of 13.3 kg/vine was significantly higher in comparison with all other cultivars on August 23rd . 'Southern Home' and 'Paulk' had a delayed harvest season starting on August 23rd. Significant differences were found among studied muscadine cultivars in terms of their total yield for the season with 'Supreme' and 'Hall' producing the highest yield.

No significant differences were found between the total yield of the advanced selections (Table 2). The highest productivity of 20.1 kg/vine was recorded for the 'GA-13-4-2' vines, followed by 'GA-10-1-222' (19.8 kg/vine) and 'GA-6-1-269' yielding 17.6 kg/vine.

Table 2. Selected muscadine cultivars and advanced selections yield by harvest date, CREC, Clanton, AL, 2023.

	Yield, kg/vine									
Cultivar	16-Aug	23-Aug	30-Aug	6-Sep	13-Sep	20-Sep	27-Sep	4-Oct	11-Oct	Total yield
Lane	9.7	2.6 B	1.5 B	1.0 C	0.9	0.5	0.2	0.4	0.4	15.9 B
Hall	6.6	13.3 A	5.3 AB	2.3 BC	0.7	1.3	0.5	0.7	0.5	30.2 A
Supreme	5.8	4.9 B	8.4 A	6.5 AB	2.9	1.8	1.3	0.3	0.6	32.5 A
Razzmatazz	3.4	4.6 B	1.8 B	.	.	.	.	.	.	14.8 B
Eudora	3.3	4.9 B	5.2 AB	8.2 A	4.7	1.4	.	.	.	25.4 AB
S. Home	.	2.1 B	3.9 B	7.0 AB	4.2	4.0	3.2	0.5	0.7	22.5 AB
Paulk	.	1.0 B	5.8 AB	6.8 AB	2.8	1.9	1.6	1.2	0.8	19.9 AB
Selection										
GA-10-1-294	6.5	3.8 ABC	.	.	1.0	.	0.5	.	.	11.8
GA-10-1-222	5.0	8.1 A	6.3 A	1.2 B	0.9	.	.	.	.	19.8
AM-195	3.9	4.2 AB	5.4 A	1.0 B	.	.	1.0	1.7	1.3	14.5
AM-77	3.4	2.8 BC	1.4 BC	0.6 B	.	.	.	.	.	7.7
GA-6-1-269	3.0	4.3 AB	1.3 C	2.3 B	1.4	4.7 A	2.7	1.5	1.5	17.6
AM-26	2.6	2.7 BC	1.7 BC	1.1 B	.	1.1 B	0.7	0.7	0.3	7.5
AM-70	1.4	2.0 BC	1.4 CB	0.4 B	.	1.7 B	3.6	1.3	0.1	7.9
Ruby Crisp	.	3.5 BC	5.2 AB	4.8 AB	2.0	0.9 B	0.6	0.8	0.6	16.4
GA-13-4-2	.	0.6 C	3.6 ABC	7.3 A	4.6	2.3 AB	1.6	0.6	0.2	20.1


A


B

Figure 5 A, B. ‘Lane’ (A) and ‘Hall’ (B) early ripening muscadine grapes grown at the CREC, Clanton, AL, 2023.

Mean berry weight varied significantly between the cultivars and selections. 'Supreme' and 'Paulk' had the largest berries of 14.7 and 14.2 g respectively, while 'Razzmatazz' average berry weight was 1.5 g (Table 3). Berry size of selection 'GA-6-1-269' was similar to the size of 'Ruby Crisp' control. 'Razzmatazz', 'Eudora' and selection 'AM-195' produced the sweetest berries. Percent of berries with a wet stem scar varied between 8.7 and 32.6% respectively for 'Hall' and 'Paulk' and between 3.0 and 19.8% for 'GA-10-1-294' and 'Ruby Crisp' respectively.

Table 3. Mean berry weigth, soluble solids content and percent wet stem scar of muscadine cultivars and selections, 2023.

Cultivar	Mean Berry Weigth, g	SSC	Wet Stem Scar, %
Lane	9.0 B	16.9 AB	19.8 AB
Hall	10.2 B	17.1 AB	8.7 B
Supreme	14.7 A	14.9 C	9.5 B
Razzmatazz	1.5 D	17.9 A	.
Eudora	10.0 B	17.9 A	19.6 AB
Paulk	14.2 A	15.9 BC	32.6 A
S. Home	6.5 C	15.8 BC	19.0 AB
Selection			
GA-10-1-294	11.6 AB	17.0 AB	3.0
GA-10-1-222	11.0 AB	14.9 BC	11.7
AM-195	10.9 AB	17.6 A	12.4
AM-77	8.3 B	13.7 C	16.2
GA-6-1-269	12.4 A	16.6 AB	7.9
AM-26	10.1 AB	16.4 AB	6.7
AM-70	10.2 AB	16.8 AB	4.0
Ruby Crisp	13.0 A	16.3 AB	19.8
GA-13-4-2	10.3 AB	15.5 B	14.5