

poor fruit ripening. Unfortunately, few fungicides except Copper are labeled for use on this minor crop. Some growers have had success with Nutriphyte nutrient spray, which has similar active ingredients as Alliete fungicide. Clean leaves produce a much more consistent and heavier crop. Other severe problems include *Cephalosporium* wilt that kills entire trees and can spread through an orchard by transmission from twig girdlers, and death from latent freeze damage to cambial tissues. Some growers have had problems with deer eating new growth in spring, and with wildlife such as raccoons eating fruit on the trees. Replanting when tree vigor slows down, after 10 years, may present a viable method to keep orchard yields high, just as with peaches.

Harvest and Post-harvest Storage

Persimmons must be harvested by hand-clipping, like tangerines, to keep from breaking limbs. Fruit are then washed, dried and sorted by size. Fruit is packed in 16, 18, or 20 'Panta-pack' trays and shipped in single layer breathable boxes. Fruit can be stored for 30-60 days at 55 degrees F, but storage at colder temperatures can cause premature ripening. Average size of fruit is 6-8 oz. A swelling of 20-30% in fruit size occurs in the last 3 weeks before harvest once the fruit colors up. Fruit can be harvested once the fruit has turned from green to yellow-orange. Time of picking depends upon the market.

Marketing

A large market exists for high quality, non-astringent fruit. Asian food markets in large metropolitan areas of the eastern US such as Orlando, Miami, Atlanta, Washington DC, New York, Chicago, etc. are virtually untapped targets. Many Asian markets prefer fruit that is barely ripe, just turning from green to yellow, so it is important to know the customer and

their demands clearly before harvesting and shipment. Supermarkets, such as Publix in Florida, can be price-conscious markets, especially when the California persimmon crop hits the market in early November. California typically produces small (24 pack) Jiro fruit that can be overripe or bruised upon arrival in Florida, but available at a low price per unit. Sharon-fruit, the astringent persimmon variety Triumph grown in Israel and gassed to remove astringency, is of even poorer quality. Florida-grown persimmons are much larger and of much better quality, especially if allowed to swell during ripening on the tree before shipment. However, growers must again know their market, and locate outlets that are willing to pay a higher price for premium quality fruit. The Growers Cooperative is an important step in the establishment of quality standards for communication between growers and buyers, and in advertising and locating markets to bring the highest return for Florida growers. There is far more demand than there is available supply.

Conclusions

Kaki persimmons can be a profitable orchard crop for Florida growers. As with all commercial orchard crops, growers must plant the best varieties, give proper care, and above all, work to market their crop to outlets that will provide good prices and move sufficient quantities. They are not difficult to grow, and the demand is strong for good quality products and will continue for the foreseeable future.

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Proc. Fla. State Hort. Soc. 110:162-166. 1997.

CONSUMER PERCEPTION AND WILLINGNESS TO PURCHASE MUSCADINE GRAPES AS FRESH FRUIT: TALLAHASSEE STUDY

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Abstract. A survey of 1,480 consumers in 1995 and 1996 in Tallahassee showed that half of the respondents had never purchased muscadine grapes. Among those who had purchased muscadine grapes before, 61% of respondents were African American and 30% were Caucasians. The largest group of respondents who had purchased muscadine grapes at least once was female African American (65%) and the smallest group was male Caucasian (22%). In general, those who had purchased muscadine grapes before are more likely to have a

favorable perception and willing to purchase the grapes compared to those who tried it the first time. Between racial groups, more African Americans have favorable perceptions about muscadine grapes and are also more willing to purchase the grapes than Caucasians. The proportion of males and females with favorable perceptions ranged from 66%-79% and appeared to increase with age. Price has a negative impact on potential demand. The proportion of respondents who were willing to purchase muscadine grapes declined significantly from 78% to 60% as the price increased from \$0.79 to \$1.39 per pound. Similarly, the average quantity they were willing to purchase also declined from 2.22 to 1.39 pounds, respectively. Similar relationships were observed by race, sex, age group, and household size. The results of this study show that muscadine grape as fresh fruit has good market potential, particu-

larly among the African American community and those who are familiar with muscadine grapes.

Most of the muscadine grapes as fresh fruit are sold through pick-your-own outlets with smaller quantities being sold to supermarkets. As acreage and production of muscadine grapes for fresh fruit increased, there is an increasing need for new market outlets, and supermarkets provide the most promising outlets for muscadine grapes as fresh fruit because of their extensive retail network and capacity to purchase large volumes. Studies have shown that store managers are willing to purchase and sell muscadine grapes if growers have adequate quantities and are willing to deliver the grapes at regular intervals (Leong, 1989), while this is encouraging news, there are still store managers who are not convinced of the fruit's marketability and down-rate its market potential (Degner & Mathis, 1980). Although, we have a mixed signal, many growers believe that supermarket produce managers can be convinced that muscadine grapes as fresh fruit are marketable. The use of supermarket sales looks promising if it is possible to identify target consumers who may have an inherent preference for muscadine grapes as fresh fruit and promote their consumption through advertising activities. As more consumers become aware of muscadine grapes and their health benefits, it is certain that market demand for the grapes will increase.

This paper presents an update of some of the results of the market survey conducted in 1995 and 1996 which was discussed at this meeting (Leong et al., 1996).

Objectives

The objectives of the ongoing study are (1) to determine the consumer's perception of muscadine grapes as fresh fruit, (2) to determine the extent familiarity impacts on their perceptions and willingness to purchase muscadine grapes, and (3) to determine if socioeconomic characteristics have an impact on their willingness to purchase muscadine grapes in Florida.

Methods and Procedures

Three Winn Dixie supermarkets in Tallahassee participated in the study. The stores selected were located in the northern, southern and central part of the city where a good cross-section of shoppers could be sampled. In addition, shoppers at the Tallahassee Mall were also interviewed. A survey questionnaire developed by the University of Arkansas was adapted for this study. Shoppers were randomly selected in the stores and asked if they would like to participate in the study. Willing participants were given a muscadine grape, "Fry" to taste and then asked to answer the survey questionnaire.

The responses were often categorized as ordinal or nominal data and the chi-square test was used to analyze them. Statistically, the chi-square is less restrictive than the traditional t and F tests, makes no assumption of the normality of the sampling distribution of the data and can be used to analyze small and discreet data sets (Siegel, 1956). However, the t-test was used to determine whether differences in proportions of respondents in different categories who were willing to purchase muscadine grapes were significant. In this study, the chi-square was used to determine if there was any significant relationship between the variables of interest in the contin-

gency table. This was done by comparing the expected frequencies and the observed frequencies for the respective comparisons. If the postulated null hypothesis is true, then there is no significant difference between the expected frequencies and the observed frequencies as shown by the chi-square statistic.

Sample size. The number of shoppers to be randomly selected for the study was based on Tallahassee's population of 135,750 with a 95% confidence level and a 3% margin of error is shown below (McCall, 1982). The total number of shoppers interviewed was 1,480, or 424 more than the necessary number.

Results and Discussion

Details of respondents surveyed and their socioeconomic characteristics are shown in Table 1. The discussions in the preceding sections will focus on African American and Caucasian respondents as they formed the largest group of consumers in the study. Hispanic and "Other" respondents have been excluded in the discussion because of their relatively low number in the survey.

Consumers' perceptions. Consumers' perceptions for muscadine grape were based on the color, taste and texture of the grape they tasted. As expected, a larger proportion of African Americans have purchased muscadine grapes than Caucasian shoppers. Only 36% of Caucasian females and 22% of Caucasian males have purchased muscadine grapes compared to 65% and 53%, respectively. However, after they tasted the grapes, the percentage of Caucasian respondents with favorable perception of muscadine grapes were very close to those of African Americans with only a 4% and 6% difference for texture and taste (Table 2). The percentage difference in favorable perception for color was 15%.

Between gender, there was only 5-6% different in favorable perceptions between males and females for taste and color. There was no percentage difference for texture.

Table 1. Selected characteristics of respondents in the survey.

	Number	%
Race:		
African American	827	58.4
Caucasian	502	35.5
Others	86	6.1
Total:	1480	100.0
Sex:		
Male	532	35.9
Female	948	64.1
Total:	1480	100.0
Age group:		
< 25 yrs	548	37.0
25 - 34 yrs	307	20.7
35 - 44 yrs	279	18.9
45 - 54 yrs	192	13.0
55 - 64 yrs	154	10.4
Total	1480	100.0
Household size:		
1 Person	203	13.7
2 Persons	461	31.2
3 Persons	331	22.4
4 Persons	262	17.6
5 Persons	183	15.1
Total	1480	100.0

Table 2. Respondents with favorable perceptions of muscadine grapes by selected characteristics.

		Taste	Color	Texture
		%	%	%
Race:				
	African American	80	76	76
	Caucasian	74	61	72
	$\chi^2 = 0.562$			
Sex:				
	Male	74	72	74
	Female	79	66	74
	$\chi^2 = 0.422$			
Age group:				
	< 25 yrs	75	68	71
	25 - 34 yrs	79	69	76
	35 - 44 yrs	81	72	75
	45 - 54 yrs	74	72	78
	55 - 64 yrs	83	78	84
	$\chi^2 = 0.531$			
Have purchased muscadines.		84	82	82
Never purchased muscadines.		71	58	67
	$\chi^2 = 0.633$			

Between age groups, the difference in perceptions was relatively small, except that between the 18-24 and 55-64 year cohorts. Results of the chi-square test showed no significant relationship between perceptions and the different socioeconomic characteristics.

Classifying the respondents into those who have tried muscadine grapes before and those who tried it the first time produced an important finding that substantiate the long held opinion that the muscadine taste is an acquired one. For both African American and Caucasian respondents, the percentage of respondents who have a favorable perception of muscadine grapes is significantly higher among those who have tried the fruit before as compared to those who tried it the first time, with a difference, ranging from 13%-24% (Table 2).

Willingness to Purchase. When the respondents were asked if they had ever purchased muscadine grapes before, about 50% responded they had. The percentage of African Americans exceeded those of Caucasians by a large margin (Table 3). In particular, 31% more male and 29% more female African Americans had purchased muscadine grapes before compared to their Caucasian counterparts. The same pattern was observed between races across age groups and household sizes.

The willingness of respondents to purchase muscadine grapes between age group and gender also provide useful market information in identifying the most promising group of buyers. The proportions of African American females in all age groups who were willing to purchase the muscadine grapes were greater than their Caucasian counterparts. The same was observed between African American and Caucasian males (Table 4). African American of both sexes showed a willingness to purchase of 64% or better while Caucasians of both sexes showed a much lower willingness to purchase. In general, there is 10% or more percentage difference in willingness to purchase between African Americans and Caucasians across age groups. However, within the same racial group, there appears to be no significant relationship between males and females in the different age groups and their willingness to purchase muscadine grapes.

Table 3. Respondents who were willing to purchase muscadine grapes by selected characteristics.

		%
Overall		51
African American	- Female	65
	- Male	53
Caucasian	- Female	36
	- Male	22
African American	< 25 yrs	54
	25 - 34 yrs	73
	35 - 44 yrs	66
	45 - 54 yrs	74
	55 - 64 yrs	73
Caucasian	< 25 yrs	20
	25 - 34 yrs	22
	35 - 44 yrs	32
	45 - 54 yrs	38
	55 - 64 yrs	33
Household size		
African American	1 Person	56
	2 Persons	54
	3 Persons	62
	4 Persons	65
	5 Persons	72
Household size		
Caucasian	1 Person	34
	2 Persons	26
	3 Persons	29
	4 Persons	34
	5 Persons	35

Familiarity and Willingness to Purchase. The percentage of African American and Caucasian respondents who have tried muscadine grapes before and willing to buy them is substantially higher than those who tried the muscadine grape the first time or never purchased them before (Table 5). The same pattern was observed across age groups and household sizes. Results of the t-test showed that the differences between the two proportions were significant, $Pr(t < 0.05)$.

Willingness to Purchase by Respondents with Favorable Perceptions. It was also observed that a very large percentage of those who had favorable perceptions of the taste, color and texture of muscadine grapes were also willing to purchase the grapes (Table 6). The survey data shows that respondents who have

Table 4. Respondents who were willing to purchase muscadine grapes by race, gender and age group.

		Female	Male
		%	%
African American	< 25 yrs	64	64
	25 - 34 yrs	83	75
	35 - 44 yrs	77	85
	45 - 54 yrs	83	71
	55 - 64 yrs	71	83
	$\chi^2 = 2.670$		
Caucasian	< 25 yrs	62	4*
	25 - 34 yrs	63	54
	35 - 44 yrs	64	76
	45 - 54 yrs	58	62
	55 - 64 yrs	60	72
	$\chi^2 = 4.410$		

Table 5. Respondents who were willing to purchase muscadine grapes by selected characteristics and familiarity.

		Willing to Purchase	
		Never purchased muscadines	Have purchased muscadines
African American	- Female	55	83
	- Male	64	80
	t = 4.639*		
Caucasian	- Female	54	78
	- Male	54	80
	t = 25.0*		
African American	< 25 yrs	47	79
	25 - 34 yrs	74	84
	35 - 44 yrs	67	86
	45 - 54 yrs	72	81
	55 - 64 yrs	63	83
	t = 3.650*		
Caucasian	< 25 yrs	49	89
	25 - 34 yrs	53	81
	35 - 44 yrs	61	84
	45 - 54 yrs	59	61
	55 - 64 yrs	48	80
	t = 4.602*		
Household size			
African American	1 Person	58	85
	2 Persons	57	81
	3 Persons	58	79
	4 Persons	61	83
	5 Persons	64	85
	t = 13.240*		
Household size			
Caucasian	1 Person	56	72
	2 Persons	53	77
	3 Persons	48	78
	4 Persons	52	89
	5 Persons	69	81
	t = 5.229*		

*Significant at least at the 0.05 level.

tried muscadine grapes before and have favorable perceptions about the grapes are also more likely and willing to purchase them again. The percentage of Caucasians with favorable perceptions who were willing to purchase the muscadine grapes they tasted were encouraging high, ranging from 79%-92%, compared to 90%-92% for African Americans.

There appears to be no significant relationship between favorable perceptions for taste, color and texture, and willingness to purchase muscadine grapes between race, gender, and age group.

Willingness to Purchase at Different Prices

When price was introduced to the respondents, 78% of them were willing to buy it at \$0.79 per pound. At \$1.39 per pound, 60% of the respondents indicated that they were willing to buy compared to 68% at \$1.09 (Table 7). An increase of 38% in price from \$0.79 to \$1.09 per pound resulted in only a 10% decline in the number of respondents who were willing to buy muscadines. Similarly, a 28% price hike from \$1.09 to \$1.39 per pound showed an 8% decline in respondents who were willing to purchase muscadines. The small decline in number of respondents willingness to purchase as

Table 6. Respondents with favorable perceptions and who were willing to purchase muscadine grapes by familiarity and selected characteristics.

		Taste	Color	Texture
		%	%	%
Race:	African American	91	93	90
	Caucasian	83	92	79
	$\chi^2 = 0.322$			
Sex:	Male	89	94	84
	Female	87	92	87
	$\chi^2 = 0.095$			
Age group:	< 25 yrs	82	88	82
	25 - 34 yrs	91	94	87
	35 - 44 yrs	91	98	91
	45 - 54 yrs	92	94	89
	55 - 64 yrs	92	96	89
	$\chi^2 = 0.127$			
Have purchased muscadines.		96	97	95
Never purchased muscadines.		79	87	76
$\chi^2 = 0.316$				

price increased suggests that demand for muscadine grapes is still good, even at a relatively high price. This pattern was observed for all age groups, and household sizes.

Between race, a 14% decline in number of African Americans was observed when price increased from \$0.79 to \$1.09 per pound, compared to 5% for Caucasians. However, when the price was increased from \$1.09 to \$1.39 per pound, only an 8% decline was observed for African Americans and Caucasians. In terms of quantity decline to price increase, African Americans appear to be more sensitive between \$0.79 and \$1.09 with about 40% decline in average poundage, compared to 9% for Caucasians. For Caucasians, the greatest decline was observed between \$1.09 and \$1.39 with a 24% decline in poundage, compared to 0.6% for African Americans.

Conclusions

The study, though preliminary, provides useful market information on consumer perception and willingness to purchase muscadine grapes.

Table 7. Respondents who were willing to purchase muscadine grapes by price and selected characteristics.

		Price per pound		
		\$0.79	\$1.09	\$1.39
		%	%	%
Overall		78	68	60
Have purchased muscadines		92	84	68
Never purchased muscadines		64	54	52
Sex:	Male	76	65	61
	Female	78	70	59
Race:	African American	85	71	63
	Caucasian	67	62	54
Age group:	< 25 yrs	72	61	55
	25 - 34 yrs	75	72	68
	35 - 44 yrs	83	74	61
	45 - 54 yrs	91	71	61
	55 - 64 yrs	91	75	58
Household size:	1 Person	77	62	65
	2 Persons	74	63	59
	3 Persons	76	66	55
	4 Persons	80	75	61
	5 Persons	83	88	60

chase muscadine grapes. There is adequate information to suggest that muscadine grapes as fresh fruit is marketable in supermarkets. Although more than half of those surveyed had never purchased muscadines. The current market for muscadine grapes, as data suggest, is in the African American community, particularly, among female African Americans who are familiar with the grapes and showed the greatest willingness to purchase them. African Americans, in general, also have more favorable perceptions of muscadine grapes than Caucasians. However, Caucasians with favorable perceptions have a high likelihood and willingness to purchase muscadine grapes. A good percentage (74%) of Caucasians like the taste of muscadines after they tasted it, and a great percentage of those who like the taste, texture or color exhibited a willingness to purchase the grapes. The Caucasian market for muscadine grape represents an immense market potential that could be developed and exploited with consistent market promotion.

The study also shows that the taste of muscadine grapes is an acquired one. Those who are familiar with the muscadine taste are also more likely to purchase the grapes. Therefore, market promotions will greatly help to familiarize consumers

and educate them to the taste and flavor of the muscadine grapes. This will have a positive impact on market demand and make muscadine grapes more marketable.

Acknowledgment

The authors would like to recognize the assistance of Ms. Lucinda Theodore for helping in the survey and tabulating the data.

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Proc. Fla. State Hort. Soc. 110:166-168. 1997.

ORIENTAL VITIS SPECIES - A NEW GERMPLASM SOURCE FOR FLORIDA GRAPE BREEDING?

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Additional index words. Asiatic species, germplasm, disease resistant.

Abstract. Eight Asiatic *Vitis* species were cultured at the Center for Viticultural Sciences, Florida A&M University. Evaluation of these germplasm was conducted last three seasons. Resistance to grape fungal disease anthracnose and Pierce's disease (PD) caused by Gram-negative bacterium was found among the Oriental *Vitis* species. Some of these species also demonstrated high adaptability to the north Florida environment, namely humid and hot summer with excessive rainfall. Results from this study indicate that the oriental grape species are a potential source for breeding disease-resistance grapes for Florida and the southeastern United States.

Grapes belong to the genus *Vitis* which consists of 60 plus species. The most popular cultivated grape species, *V. vinifera*, also known as the European grape, is believed to have originated from the Black and Caspian Sea areas (Einset and Pratt, 1975). It was domesticated 5,000 years ago westward from Asia Minor throughout Europe and eastward throughout Asia (Al-

leweldt and Possingham, 1988). The other *Vitis* species originated from East Asia (Zhang et al., 1989) and North America, which account for about 30 species in each group. Several Florida native species have been described, namely, *V. aestivalis*, *V. shuttleworthii*, *V. rotundifolia*, *V. smalliana* etc. They are all characterized by high resistance to Pierce's disease, anthracnose and downy mildew.

Early settlers attempted to grow the European grapes in Florida and the other southeastern States over 300 years ago. Through centuries of experimentation, however, scientists and grape growers found that non-native grape vines could not endure the region's climate, being hot and humid, with too much rainfall and with high night temperature during most of the growing season. These unfavorable climatic conditions caused serious disease problems for the grape, such as Pierce's disease (caused by the Gram-negative bacterium *Xylella fastidiosa* (Hopkins, 1989; Wells et al., 1987), fungal diseases (downy mildew [*Plasmopara viticola* (Berk. & Curt.) Berl. & de Toni]), and anthracnose [*Elsinoe ampelina* (de Barry) Shear]). Most of the grapes died a few years after planting. Through years of research and cultural practice, it is clear now that *V. vinifera* is extremely susceptible to all the American pests, and diseases, including downy mildew, anthracnose, black rot, powdery mildew, phylloxera and Pierce's disease (Pearson and Goheen, 1988).

Species native to the southeastern United States, such as 'bunch' grapes *V. aestivalis*, *V. shuttleworthii* and the 'muscadine' grapes *V. rotundifolia*, are resistant to various fungal and

This study was supported in part by a USDA grant #59-5306-7-872.