grapes to some degree. Eighty-nine percent of those familiar with them intended to buy them again, 4 percent did not and 8 percent were undecided.

Of the 25 people that were unfamiliar with muscadine grapes prior to buying them during the in-store sales test, 21 or 84 percent intended to buy them again. Four purchasers or 16 percent did not plan to buy them again; none were undecided. Repeat purchase intentions were similar regardless of the muscadine variety purchased.

Other Grape Purchasers' Awareness of and Aversions to Muscadine Grapes

The sample of 290 shoppers that purchased grapes other than muscadine grapes were interviewed to determine whether or not they had seen the muscadine grapes and if so, why they had not purchased them. The interviews also provided insight as to whether these shoppers had any identifiable socioeconomic or demographic characteristics which would set them apart from the shoppers that had purchased muscadine grapes. Since many shoppers shop and buy out of habit, unawareness of the muscadine grapes was a major reason why muscadine grapes were not purchased by more customers without recall assistance. Only 42 respondents, 14 percent of the other grape purchasers, recalled seeing at least one variety of muscadine grapes.

Aversions to muscadine grapes

All shoppers that recalled seeing muscadine grapes in the stores were asked why they had not purchased them. The most common reason given, mentioned by almost 43 percent of the respondents, was that muscadines contain seeds. A sizeable proportion, almost 27 percent, mentioned price as being the primary reason for not buying them. Appearance and uncertainty as to the nature of the grape were reasons given by almost equal numbers of shoppers, roughly 12 and 11 percent, respectively. Tough skin was the major reason given by two of the respondents, or 3.6 percent.

Conclusions

Muscadine grapes can be marketed satisfactorily through retail supermarkets in Florida. Sale of muscadines compared favorably with sales of black seeded and red seedless grapes. Muscadine grapes particularly appeared to black consumers, but consumer acceptance of muscadine grapes was generally favorable for all socioeconomic groups. Consumers' repeat buying intentions were particularly encouraging. These optimistic findings should be tempered by the recognition that the in-store portion of this research was very limited. It was conducted during the Labor Day weekend, a time when all grape sales were very high. Because the muscadine grapes were all sold over a four day period, shelf life problems were non-existent. A retail experiment over a longer period of time, with these or other varieties, may reveal problems. Other varieties of muscadines may also affect consumer acceptance. Also, varying price levels for muscadine grapes and other types of grapes will affect sales. However, it appears that consumer demand through retail food stores can provide a viable market for Florida's expanding muscadine grape production.

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Proc. Fla. State Hort. Soc. 93:143-145. 1980.

EFFECTS OF ETHEPHON ON EASE OF HARVEST OF MUSCADINE GRAPES[1]

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Additional index words. abscission, mechanical-harvesting, *Vitis*.

Abstract. **'Hunt', 'Noble', and 'Dulcet' muscadine grapes** (Vitis rotundifolia **Michx.) were sprayed with ethephon 24 hr before harvest in 1978, 1979, and 1980. The purpose was to induce abscission of berries and facilitate mechanical harvesting of these cultivars that are normally difficult to harvest. In 1978 an application of 600 ppm ethephon increased dry stem scars on 'Hunt' berries from 40% to 90%, and reduced picking time from 10.5 to 5.5 minutes using a vibrator harvester. In 1979, an increase from 37% to 82% dry scar was obtained with 'Noble' and an increase from 9% to 100% with 'Dulcet' using 600 ppm ethephon. In 1980, sprayed and unsprayed 'Noble' vines had 43% and 19% dry scar, respectively, at 600 ppm and 66% and 17% at 1200 ppm, whereas 'Dulcet' had 80% and 3% dry scar, respectively, using 1200 ppm. Pre-harvest berry drop began 30 hr after spraying and became serious by 48 hr after spraying; unsprayed vines held fruit for weeks if left unpicked. No leaf abscission occurred following ethephon application. Translocation of ethephon from sprayed to unsprayed arms on the same vine was slight or nonexistent.**

Mechanical harvesting of muscadine grapes has been successful using cultivars with berries that separate readily from the pedicel, such as 'Carlos', 'Roanoke', and 'Southland' (1). However, many muscadine cultivars have berries that do not separate readily from the pedicel because no abscission layer is formed. Berry ripening in some cultivars is so uneven that once-over harvesting is impractical. The use of 2-chloroethylphosphonic acid (ethephon) to promote abscission of *Vitis vinifera* berries was first reported in 1969 (5). In *V. labrusca* cv. Concord berry abscission was increased by 250 ppm ethephon if applied within 6 days

[1]Florida Agricultural Experiment Stations Journal Series No. 2741.

of harvest. Foliage coverage with ethephon was important since mere dipping of clusters was ineffective (2).

Lane and Flora (3) applied ethephon at 0, 50, 100, and 200 ppm on nearly ripe 'Cowart' muscadine vines. Dry scar was increased from 44% to 74% with 200 ppm, whereas 50 ppm was ineffective. The force required to release the berries from the stems decreased as the concentration of ethephon increased and as time between treatment and harvest increased from 24 to 72 hr. With 100 and 200 ppm, preharvest fruit drop increased between 24 and 48 or 72 hr.

A North Carolina study over several years with 'Carlos', 'Magnolia', and 'Noble' muscadines revealed that 600 ppm ethephon caused uniformly abscissed fruit in 24 hours if applied at ripe stage (4). Ten percent preharvest berry drop was observed by 36 hr after spraying. Treated fruit kept longer than untreated in storage at 70°F and 40°F (4).

The purpose of this investigation was to determine the effect of ethephon sprays on muscadine cultivars with berries that normally have a high percent wet scar and do not separate readily from the pedicel when vibrator-harvested.

Materials and Methods

An exploratory application of ethephon on 'Hunt' muscadine grapes was made in 1978 by T. E. Crocker at the Agricultural Research Center, Leesburg. Two 'Hunt' vines with ripe grapes were sprayed Aug. 16 with 600 ppm ethephon and X-77 spreader and another 2 were left untreated. After 27 hr the vines were vibrator-harvested with a hand-held blueberry picker. Picking time and percentage dry stem scar were determined.

In 1979 ethephon at 600 ppm was applied to 3 of 5 vines of 'Noble' muscadine. After 24 hr, clusters were hand picked and percentage dry stem scar was determined. To test the arm-to-arm translocation of ethephon effect, berries were hand-picked from 2 treated and 2 untreated arms of a 'Dulcet' muscadine vine. A different vine of 'Dulcet' was left untreated as a control. Vines were harvested mechanically after cluster picking.

In 1980 ethephon at 600 ppm was applied to 2 of 4 vines each of 'Hunt' and 'Noble' muscadines, and dry stem scar was determined. Since ethephon was less effective than in the previous year, a 1200 ppm solution was applied to 2 'Dulcet' and one 'Noble' vine on Aug. 29. Sprayed and unsprayed arms were labeled on each vine to test translocation effect. Dry stem scar was recorded by cluster removal and classifying the stem scars as wet or dry when pulled off the clusters 26 hr later. Vines were harvested mechanically after clusters were picked.

Results and Discussion

In all 3 years shaking of fruit from the vines by vibrator harvester was easier on ethephon-treated vines than on untreated vines. In 1978 treated 'Hunt' vines required 5.5 minutes picking time and yielded fruit with 90% dry stem scar compared with 10.5 minutes picking time and only 40% dry scar in the unsprayed vines. This represented a 48% reduction in picking time and 125% increase in percent dry scar due to ethephon.

Percent dry scar averaged 82% vs. 37% in 1979 for sprayed and unsprayed vines, respectively (Table 1). Ethephon-sprayed vines dropped much of their fruit on the ground after 48 hr whereas unsprayed vines left unharvested retained their fruit for weeks. Early defoliation (October) occurred on unsprayed vines that had been allowed to hold fruit until dried, whereas sprayed vines held their leaves through November. No leaf abscission occurred due to ethephon application.

Table 1. Berry abscission and percentage dry scar observed 24 hr after spraying 'Noble' muscadine with 600 ppm ethephon (1979).

Vine no.	Treatment	No. berries		Dry scar (%)
		dry scar	wet scar	
1	sprayed	118	30	79.7
2	unsprayed	57	88	39.3
3	sprayed	136	33	80.5
4	unsprayed	44	85	34.1
5	sprayed	59	5	92.2
1, 3, 5	sprayed	313	68	82.2
2, 4	unsprayed	101	173	36.9

A 'Dulcet' muscadine vine was sprayed on 2 of 4 arms to test the translocation of ethephon effect. The sprayed arms both had 100% dry scar after 24 hr, whereas the unsprayed arms on the same vine had 8% and 16% dry scar. A different vine of 'Dulcet' was left unsprayed and had only 2% dry scar, indicating limited translocation of ethephon effect from arm to arm on the partly sprayed vine (Table 2).

Table 2. Berries with dry scar on 2 sprayed and 2 unsprayed arms of a 'Dulcet' muscadine vine 24 hr after spraying ethephon at 600 ppm (1979).

Vine no.	Position of Arm	Treatment	No. berries		Dry scar (%)
			dry	wet	
1	N, lower	Unsprayed	14	74	15.9
1	N, upper	Sprayed	25	0	100.0
1	S, upper	Unsprayed	6	58	7.9
1	S, lower	Sprayed	58	0	100.0
2	all 4	Unsprayed	3	140	2.0
1	2 arms	Sprayed	83	0	100.0
1	2 arms	Unsprayed	19	132	12.6
2	4 arms	Unsprayed	3	140	2.0

In 1980, dry scar percent for 'Hunt' vines treated with 600 ppm ethephon was not significantly different from the untreated (45% vs. 43%, respectively). A reduced effect was also noted on 'Noble' as compared with 1979, 43% dry scar for sprayed vs. 19% for unsprayed. With the theory that the ethephon stock solution was losing activity a 1200 ppm solution was sprayed on portions of 'Dulcet' and 'Noble' grapevines on Aug. 29. Dry scar percent increased markedly for both cultivars due to ethephon (Table 3). No translocation of ethephon effect from sprayed to unsprayed arms on the same vine was evident. One arm which had marked Pierce's disease symptoms did not respond to ethephon spray. This was probably due to reduced translocation from leaves to fruit.

Ethephon-sprayed vines of muscadine cultivars normally

Table 3. Percentage dry scar resulting from berry abscission 26 hours after spraying 'Dulcet' and 'Noble' muscadines with 1200 ppm ethephon (1980).

		Dry scar (%)	
		Dulcet	Noble
Means	Sprayed arms	80.0[z]	65.9
	Unsprayed arms	3.1	17.1

[z]One sprayed arm was infected with Pierce's disease which apparently blocked translocation from leaves to fruit, so was not included in sprayed arm means.

difficult to harvest mechanically can be picked more easily and with less damaged fruit than unsprayed vines. Undesirable side effects such as defoliation did not occur in any Florida tests, but premature berry drop can be serious within 30 hr after applying ethephon (4). For this reason, harvest should be scheduled the day after spraying. Experience has shown that rainfall after spraying nullifies the ethephon abscission effect.

Spraying of ethephon on grapevines is not yet cleared by the Environmental Protection Agency for grower use on muscadine grapes.

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Proc. Fla. State Hort. Soc. 93:145-149. 1980.

EFFECT OF AMINOETHOXYVINYLGLYCINE, CARBOXYMETHYLCELLULOSE AND GROWTH REGULATORS ON LONGEVITY OF FRESH RABBITEYE BLUEBERRIES

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Additional index words. L-2-amino-4-(2-aminoethoxy)-*trans*-3-butenoic acid hydrochloride, ethylene inhibitors, bioregulators, coating mixture, sodium carboxymethylcellulose, CMC, ethephon, daminozide, blueberry storage, texture, quality, *Vaccinium ashei*.

Abstract. **Rabbiteye blueberries** [Vaccinium ashei **Reade cvs. 'T-19' (E. C. Lott) and 'Tifblue'] sprayed before harvest with daminozide [butanedioic acid mono(2,2-dimethlhydrazide)] and/or ethephon at specific stages of berry development and placed in storage at 3°C and 95-100% relative humidity effectively maintained storage quality for 2 1/2 months—a prolongation of their market life. The waxy bloom, which is characteristic of freshly harvested blueberries, was retained throughout storage. Berries with the daminozide/ethephon treatment retained firmness especially well during storage.**

Berries that had been sprayed twice before harvest with ethephon and coated after harvest with a mixture of carboxymethylcellulose, gum tragacanth and citric acid retained firmness and acidity better than berries similarly coated but not sprayed, and berries that had been neither sprayed nor coated.

Immediately after harvest, treating both sprayed and control berries with L-2-amino-4-(2-aminoethyxy)-trans-3-butenoic hydrochloride (AVG) as a dip improved firmness and color retention during storage. Even after 7 months of storage, as much as 62% of the dipped berries appeared fresh and marketable. This marked increase in marketable life of blueberries may mean that AVG, an inhibitor of ethylene, retarded ethylene-induced senescence. Doubling the concentration of AVG from 1000 to 2000 ppm increased the percentage of marketable fruit.

The rabbiteye blueberry (*Vaccinium ashei* Reade), which is native to the southeastern United States, is a cash crop in rural areas of the South. It is one of 3 types of blueberries that are grown commercially.

Since most Southern blueberries are sold in the fresh market, their perishability is a concern. Blueberries have a much shorter shelf life than most other fresh fruits (11); yet, knowledge on ways to prolong their storage life, by use of appropriate packaging, storage conditions and growth regulators, is limited (6, 7). Presently, commercial storage life of blueberries is approximately two weeks.

Studies of various crops have shown that retardation of senescence and deterioration is associated with inhibited respiration and ethylene production (1, 5, 18). Ripening inhibitors prolong the storage life of fruit. Daminozide suppresses ethylene production and delays ripening (14, 15, 16). Also, aminoethoxyvinylglycine (AVG) inhibits ethylene production in pears and other plant tissue, and increases the longevity of various cut flowers (3, 4, 13, 19, 20, 21).

No work has been done to test whether the application of ethylene inhibitors to rabbiteye blueberries would increase their longevity. Previously, I found that a CMC mixture (carboxymethylcellulose, gum tragacanth and citric acid) was effective in retarding the deterioration of frozen rabbiteye blueberries (8). I now report the results of a study I undertook to determine:

1) the effect of preharvest applications of daminozide and/or ethephon on the storage life of the berries;
2) whether the ethylene inhibitor, AVG, applied after harvest, would effectively delay senescence and extend the longevity of fresh berries;
3) whether CMC coated on blueberries would retard their deterioration during storage and extend their life; and
4) whether the chemicals applied on the berries would interact to affect their keeping quality.

Materials and Methods

Plot design and details of growth regulator applications are described in previous papers (6, 9). The rabbiteye blueberry plants, 'T-19' (E. C. Lott) and 'Tiftblue', were grown commercially in Alma, Georgia. Three spray treatments were compared: 1) no spray application (control), 2) one application of 500 ppm ethephon on May 20 plus another

[1]I thank Dr. A. Stempel of the Research Division, Hoffman-LaRoche, Inc., Nutley, New Jersey, for the gift of L-2-amino-4-(2-aminoethoxy)-*trans*-3-butenoic acid hydrochloride. Mention of bioregulators in this paper does not constitute a recommendation for use by the U. S. Department of Agriculture.