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Ethephon as Harvest-aid for Muscadine Grapes[1]

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Additional index words. (2-chloroethyl)phosphonic acid, *Vitis rotundifolia*, abscission, skin rupture

Abstract. **(2-Chloroethyl)phosphonic acid (ethephon) was applied at 0, 570, 1000 and 2000 ppm to muscadine grapes (*Vitis rotundifolia* Mich. cv. Hunt), 1, 2, or 3 days before once-over harvest. All ethephon treatments increased berry abscission and reduced skin tear due to harvest when berries were harvested 2 days or 3 days after spraying. Delaying harvest to 3 days after treatment with 2000 ppm ethephon increased berry abscission to 46% and reduced skin tear to 9% in 1977. In 1978, 2000 ppm of ethephon increased berry abscission to 29% and reduced skin rupture to 29%. Taste panels could not detect flavor difference from the ethephon treatments.**

Muscadine grape production in the southeastern United States is increasing rapidly. In Georgia, most of these non-bunch type grapes are grown for fresh market and are harvested individually by hand. During harvest, the skin is ruptured at the point of attachment of fruit and stem of a large percentage of berries. Juice oozes from berries with ruptured skins and ferments, making a sticky-unattractive product for the fresh market. Also, microbial infections occurs through the rupture in the skin. Consequently, shelf-life of these berries is short.

Ethephon[2] has been successfully used to induce flower and fruit abscission in tomatoes (5), sweet cherries (1), apples, pears and cherries (3) and 'Concord' grapes (2, 4, 7). This report summarizes the effect of ethephon on skin-tear and berry abscission of 'Hunt' muscadine grape.

Thirty-three-year-old 'Hunt' vines, located at the Coastal Plain Experiment Station, were used. Ethephon at 0, 570, 1000 and 2000 ppm in distilled water was sprayed covering individual vines to run-off. All treatments were to single vines and were replicated 4 times. Grapes were hand harvested once-over 1, 2 or 3 days after treatment. Before hand harvesting, berries on the previously cleaned ground beneath the vines were recorded as abscised berries. The studies were conducted in 1977 and repeated in 1978. Analysis of variance was used to analyze foliar injury and yield 1 year after treatment. Berry abscission and skin rupture data were analyzed using least squares analysis of variance (regression). Data presented are the predicted values from the best-fit least-term model (6). For clarity, the points in the figures were connected by straight lines to emphasize trends.

Berry abscission was influenced by ethephon concentration and time interval of harvest (Fig. 1, 2). Ethephon concentration and harvest time interval interactions were significant. General trends in berry abscission were the same in both years. However, fewer berries abscised in 1978 than in 1977. This was probably due to the comparatively dry weather conditions in 1977 when the vineyard was not irrigated. In 1978, the vineyard was irrigated with a drip irrigation system. Berry abscission increased with every increase in ethephon concentration when harvested 2 or 3 days after treatment in 1977 and only 3 days after treatment in 1978. Ethephon at 2000 ppm was most effective when harvesting was delayed to 3 days after treatment, with 48% and 29% berry abscission in 1977 and 1978, respectively. All berries which abscised to the ground showed no skin rupture. These abscised berries may be collected by the familiar practice of mechanical shaking over the catching frame before drop. For non-treated checks, berry abscission percentages were 10 in 1977 and 2 in 1978 for vines harvested 3 days after treatment. Similar results were reported for 'Concord' grapes (2, 4, 7).

Skin rupture of hand harvested berries on any single day was affected by ethephon concentration and time interval of harvest (Fig. 3, 4). Harvest time and concentration of ethephon interactions were significant. Similar trends in berry skin tear were observed both years. However, more berries had ruptured skin in 1978 than in 1977, probably due to differences in moisture status as mentioned above. Only 19% and 29% hand harvested berries showed skin tear in 1977 and 1978, respectively, when 2000 ppm ethephon-treated grapes were harvested 3 days later. Whereas, for non-treated check, 61% berries in 1977 and 53% berries in 1978 showed ruptured skin when harvested once-over by hand the same day. Berry rupture decreased with every increase in ethephon concentration if harvested 2 or 3 days after sprays.

With 2000 ppm concentrations of ethephon, 48% (1977) and 29% (1978) berries abscised before hand harvest. Thus, only 52% and 71% of total number of berries were harvested by hand in 1977 and 1978, respectively. Therefore, on total yield basis, 10% of the berries in 1977 and 21% berries in 1978 showed ruptured skin for 2000

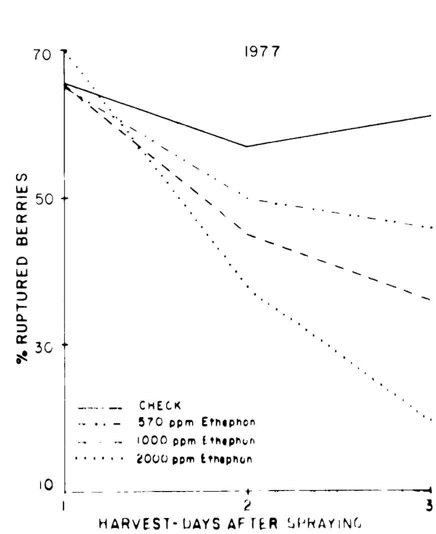

Fig. 1. Regression for percentage berry abscission and harvest time in days after ethephon treatments in 1977 for muscadine grapes.

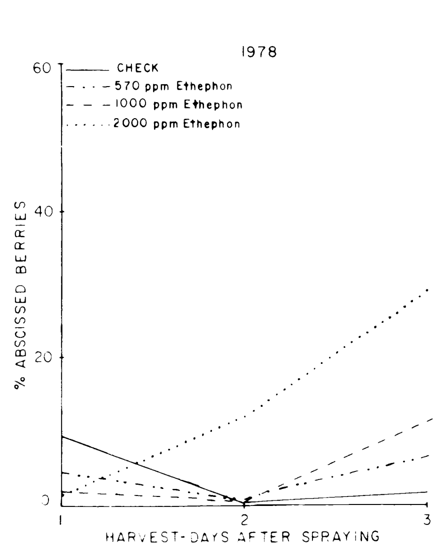

Fig. 2. Regression for percentage berry abscission and harvest time in days after ethephon treatments in 1978 for muscadine grapes.

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[2] Ethephon was provided by Amchem Products, Inc., Ambler, PA.

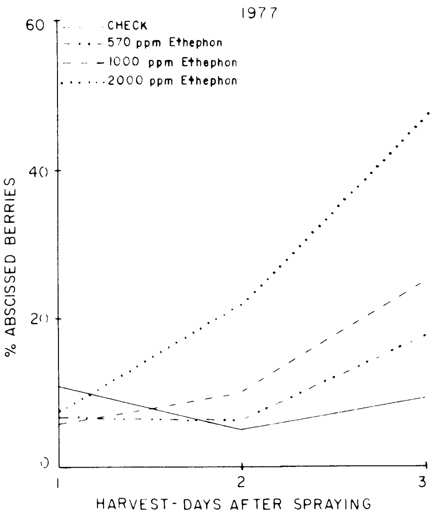

Fig. 3. Regression for percentage berries with ruptured skin and harvest time in days after ethephon treatments in 1977 for muscadine grapes.

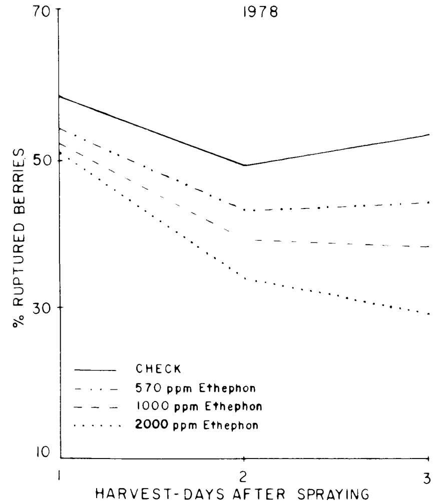

Fig. 4. Regression for percentage berries with ruptured skin and harvest time in days after ethephon treatments in 1978 for muscadine grapes.

ppm ethephon treated vines harvested 3 days after treatment. In contrast, 55% and 52% of the unsprayed berries had ruptured skin in 1977 and 1978, respectively. Taste panels could not detect flavor differences among treatments.

Ethephon had no visible phytotoxic effects on the leaves of grape vines treated in 1977. In 1978, however, yellowing of the leaves increased with every increase in ethephon concentration (Table 1). There was no senescence and most vines turned green later in the season. Yield, one year after the ethephon treatment, was not different (Table 2).

Our data indicate that ethephon has excellent potential for use as a harvest-aid for muscadine grapes.

Table 1. Effect of ethephon muscadine grape foliage.[z]

Ethephon concn. (ppm)	Phytotoxicity rating — Days after treatment 1	2	3	Avg[y]
0	0.0	0.0	0.0	0.0c
570	0.8	1.0	1.0	0.9b
1000	1.5	1.5	1.0	1.3b
2000	2.3	2.5	2.8	2.5a
Avg[y]	1.2a	1.3a	1.2a	

[z]Rated on a scale of 0 to 5 at harvest time with 0 = no visible effect and 5 = complete yellow.
[y]Mean separation within averages for ethephon treatments or time interval of harvest, 5% level.

Table 2. Effect of ethephon applied as a harvest-aid on yield of muscadine grapes one year later.

Ethephon concn. (ppm)	Yield (kg/plant) — Days after sprays 1	2	3	Avg
0	10.73	6.87	12.45	10.02
570	12.73	7.62	5.43	8.59
1000	9.99	13.25	8.82	10.42
2000	11.59	9.27	7.33	9.40
Significance	NS*	NS	NS	NS

*NS = not significantly different.

Literature Cited

1. Bukovac, M. J., J. H. Levin, and R. T. Whittenberger. 1976. Facilitated harvest of sweet cherries (*Prunus avium* L.) with 2-chloroethylphosphonic acid. *HortScience* 5:348.
2. Clore, W. J. and R. D. Fay. 1970. The effect of pre-harvest applications of ethrel on 'Concord' grapes. *HortScience* 5:21-23.
3. Edgerton, L. J. 1968. New materials to loosen fruit for mechanical harvesting. *Proc. N. Y. State Hort. Soc.* 113:99-102.
4. Hull, J., M. J. Bukovac, and G. S. Howell. 1970. Promotion of berry abscission in 'Concord' grape with 2-chloroethanephosphonic acid. *HortScience* 5:348.
5. Phatak, S. C., G. H. Collin, and W. J. Bouw. 1969. Concentration of tomato fruit ripening with ethrel. Hort. Res. Inst. Ontario Rep. p. 86-90.
6. Snedecor, G. W. and W. G. Cochran. 1967. Statistical methods, 6th ed. Iowa State Univ. Press, Ames.
7. Weaver, R. J. and R. M. Pool. 1969. Effect of ethrel, abscissic acid and a morphactin on flower abscission and shoot growth in *Vitis vinifera*. *J. Amer. Hort. Sci.* 94:474-478.

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Property of Sorbitol-6-phosphate Dehydrogenase and its Connection with Sorbitol Accumulation in Apple[1]

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Additional index words. Malus domestica

Abstract. **Sorbitol-6-phosphate dehydrogenase was found in the cotyledons of apple seedling (*Malus domestica* Borkh). A rise in enzyme activity coincided with sorbitol accumulation.**

In Rosaceous plants, sugar is mainly translocated as sorbitol (2, 8), but the interrelationship among translocated sorbitol, stored starch, and other sugars is not clear. The ambiguity rests on incomplete studies concerning sorbitol enzymes. Recently Hirai (5) found that sorbitol-6-phosphate dehydrogenase (S6PDH) catalyzed the interconversion between glucose-6-phosphate (G6P) and sorbitol-6-phosphate (S6P) in loquat fruit. Negm and Loescher (6) found sorbitol dehydrogenase catalyzing the change between sorbitol and fructose in apple callus tissue. The purpose of this paper was to determine the presence of S6PDH in the cotyledon of apple, and to corelate activation of this enzyme with sorbitol accumulation.

Seeds of apple were stored for several months in a cold room and seed coats were removed after a short term imbibition prior to germination tests at 20°C. During germination, seeds were exposed to normal daylight in the first experi-

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[2]The author expresses his sincere thanks to Mrs. Ishikawa in our laboratory for her kind help in the analysis of sugar.