Ethephon hastens maturation of Thompson Seedless raisin grapes

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In previous work with colored table grapes, several investigators found that the amount of anthocyanin pigment and the degree of color were usually increased by application of ethephon, but that there was little or no effect on °Brix. In this report the °Brix is construed to be the equivalent of percent sugar. Similar results were obtained with ethephon applications on several wine grape cultivars. The present study was designed to determine whether ungirdled Thompson Seedless grapes will ripen faster as a result of ethephon sprays at véraison. (Véraison refers to the stages of development when berries begin to soften or color, or both.)

Methods

A block of mature vines of Thompson Seedless grapes, growing in an irrigated vineyard at the University of California, Davis, was used. The vines were head-trained and cane-pruned, usually to four canes each bearing 12 to 14 buds. There were two vines per treatment, replicated four times in a randomized block design.

Vines were sprayed with ethephon at 0, 100, 250, and 500 ppm on July 26, 1977, at véraison, when °Brix was about 10.5. The ethephon was applied in an aqueous solution containing 0.1 percent Regulaid for a wetting agent. Application was made using an 8-L Hudson hand sprayer. Each vine received 2 liters of solution, completely wetting the vine. The control vines received only water plus the wetting agent.

Harvesting and fruit analysis

The crop of each treatment was harvested and analyzed when °Brix reached about 19 percent. Weight and volume of berries were determined from a sample of 100 berries per vine. Volume was determined by water displacement. For juice weight, 100 g of berries were crushed with a mortar and pestle. The juice was then removed from the must by squeezing it through cheesecloth before weighing. °Brix was determined with a hand refractometer, and total acid (expressed as acid per 100 ml of juice) was determined by titration with NaOH, using phenolphthalein as an indicator.

Results

Fruits from all ethephon-treated vines matured 16 days earlier (by August 12) than did fruits from non-treated vines (by August 28). (See table 1.)

Vines treated with any level of ethephon at véraison had no significant yield differences compared with the control (table 1). Also, cluster weight and compactness did not differ from the control (table 1).

Weight per berry and volume per berry of ethephon-treated fruit did not differ significantly from control values, but weight of juice was greater in berries sprayed with ethephon (table 2). There were no significant differences in °Brix at harvest because of the ethephon treatments. This was to be expected as care was taken to harvest all grapes at the same °Brix. The advance in ripening is expressed as number of days that the ethephon-treated fruit ripened before that of the control.

Ethephon treatments reduced the acidity in berry juice compared with the control, but increased the °Brix/acid ratios compared with the control ratio. Ethephon, at 100, 250, and 500 ppm, was equally effective on all parameters studied except for the °Brix/acid ratio.

Discussion

Probably the most significant observation in our study was the earlier accumulation of sugar (° Brix) on Thompson Seedless grape vines sprayed with ethephon. This observation could be of value to the raisin industry, where an advance in maturity would enable earlier picking and increase the possibility of avoiding fall rainfall on the vines or on clusters drying on picking trays.

Ethephon increased the amount of juice produced, probably because of more rapid maturation of the pulp, as induced by the chemical. Ethephon reduced the acidity in the juice, probably as a result of the general advance in maturity, including higher sugar content. However, application of ethephon has frequently resulted in a reduction in acidity in several table and wine grape cultivars, even though there was little or no effect on °Brix. In such cases, increase in °Brix/acid ratio by ethephon was mainly because of the decrease in total acid.

Ethephon has not yet been cleared for use on grapes by the Environmental Protection Agency.

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TABLE 1. Effects of Ethephon on Several Characteristics of Thompson Seedless Grapes

Concentration of ethephon	Harvest date	Yield per vine (kg)	Increase over control (%)	Wt. per cluster (g)	Increase over control (%)	Cluster compactness*	Increase over control (%)
0 (control)	Aug. 28	12.5a†	—	332.2a	—	1.0a	—
100 ppm	Aug. 12	21.8a	2.4	328.4a	0.98	1.0a	0.0
250 ppm	Aug. 12	13.8a	10.4	336.2a	1.20	1.0a	0.0
500 ppm	Aug. 12	13.6a	8.8	337.6a	1.62	1.0a	0.0

*1 = very loose
2 = moderately loose
3 = well filled
4 = compact

†In a given column, mean values followed by different letters are significantly different at the 5% level.

TABLE 2. Effects of Ethephon on Some Harvest Parameters of Thompson Seedless Grapes

Concentration of ethephon	Wt. per berry (g)	Increase over control (%)	Volume per berry (ml)	Increase over control (%)	Wt. juice (100 g berries)	Increase over control (%)	°Brix (%)	Total acidity (g tartaric per 100 ml)	°Brix/acid ratio
0 (control)	1.22a*	—	1.16a	—	65.5b	—	20.07a	0.76a	26.5c
100 ppm	1.25a	2.46	1.15a	– 0.87	68.7a	4.89	20.20a	0.69b	29.1b
250 ppm	1.24a	1.65	1.14a	– 1.75	69.5a	6.10	20.13a	0.68b	29.5a
500 ppm	1.20a	– 1.67	1.12a	– 3.57	69.8a	6.56	20.63a	0.66b	31.3a

*In given column, mean values followed by different letters are significantly different at the 5% level.