Effects of Temperature on Quality of Mechanically Harvested Concord Grapes

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CONCORD grapes are harvested mechanically for the processing industry in Arkansas. Grapes in southern vineyards generally are harvested at relatively high temperatures and this plus the mutilation that occurs during harvesting result in deterioration during transfer from the field to the processing plant.

In 1967 and 1968, the effects of storage temperature on quality of 2-pound samples of machine-harvested Concord grapes were studied in the laboratory (see Vol. 17, No. 2, and Vol. 18, No. 5 of Arkansas Farm Research). The data showed that machine-harvested grapes can be held at 85° to 95°F for 12 hours, at 75°F for 24 hours, and at lower temperatures for longer periods with no critical changes in the quality attributes studied.

In 1968 and 1970 field studies were conducted on the effect of storage temperature on quality of machine-harvested grapes held in transit pallet boxes of the type used to transfer grapes from the field to the processing plant (see Vol. 17, No. 6, and Vol. 20, No. 1 of Arkansas Farm Research).

It was found that temperatures of large masses of grapes (1,890 lb) did not change markedly during the holding period regardless of outside air temperature. The data also showed that machine-harvested grapes can be held 18 hours at about 90°F, and 24 hours at about 75°F, in pallet boxes without greatly affecting quality. This closely agreed with earlier studies on time, temperature, and quality.

In 1971 research was begun on the effects of temperature, sulfur dioxide, harvest method, and holding time on juice quality (see Vol. 21, No. 2 of Arkansas Farm Research). The ambient air temperature varied from 70° to 90°F near pallet boxes left in a nonshaded area of the vineyard, and the juice temperature varied from 84° to 112°F during the 72-hour holding period. In light of subsequent research, these juice temperature variations undoubtedly were caused by radiant heat trapped under the plastic cover of the pallet box.

Research was continued in 1972 to study the interactive effects of rate and time of SO_2 application, harvest temperature, and post-harvest holding time on juice quality (see also article on facing page). Also, effects of increased grape temperature and development of alcohol during the holding period were studied.

The grapes were harvested at 75° and 95°F, packaged in 2-pound polyethylene bags, placed in styrofoam boxes, and held in temperature controlled rooms adjusted to 75 ° and 95°F. Grape temperatures were recorded each hour in the boxes during the test; the SO_2 levels were 0, 40, and 80 ppm for SO_2 applications at 0, 6, and 12 hours after harvest.

In the room with temperature controlled at 75°F, grape temperatures ranged from 72° to 76°F during the 42hour holding period. In the 95°F room grape temperatures ranged from 90° to 95°F during the 42 hours. Grape temperatures were not markedly affected by either alcohol formation or any $S0_2$ level at any application time.

Temperature of grapes on the vine varied with the amount of sunlight on each berry (Fig. 1). Grapes with no shade may have a temperature 20°F above ambient air temperature, while well-shaded fruit stays within 2° or 3°F of the ambient air. At night, when all grapes are "shaded", grape temperature approximates ambient air temperature (Reported in ASAE Trans., Vol. 12, No. 6). In northwest Arkansas during the 1972 harvest season maximum air temperature ranged from 77° to 98°F (Fig. 2).

The most important factor influencing post-harvest quality deterioration of mechanically harvested Concord grapes is the high fruit temperature at time of harvest (Fig. 3). To reduce this effect during periods when day-time temperatures are high, grapes should be harvested at night or in the early morning and the pallet boxes in which they are held should be shaded. The article on the facing page provides another approach to maintaining juice quality when fruit temperatures are high.

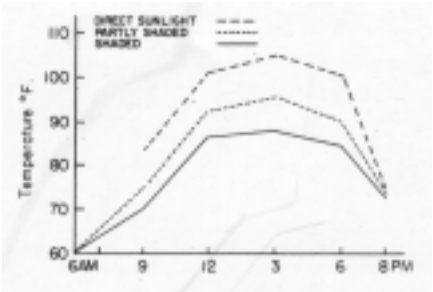

Fig. 1. Variations in Temperature of Grapes on the Vine under Different Degrees of Sunlight

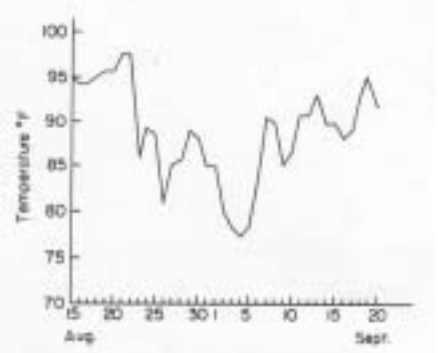

Fig. 2. Maximum Northwest Arkansas Temperatures, Aug. 15 to Sept. 20, 1972

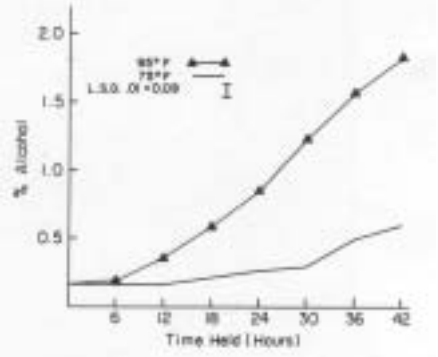

Fig. 3. Effects of Temperature on Alcohol Formation in Concord Grapes Harvested and Held at 95°F and 75°F