Studies on Strawberry Quality

high temperatures that may occur in harvesting and handling of strawberries influence the rate of fruit deterioration

E. C. Maxie, F. Gordon Mitchell, and Arthur Greathead

The following article is the second of two reports on Quality Studies with Strawberries. The first report appeared in the January issue.

Strawberries and the decay organisms that attack them are alive and temperature has a tremendous influence on the rates of their life processes. At temperatures between 32°F and 75°F the rates of these life processes would be expected to increase two to four fold for each 18°F temperature increase. The deterioration of the fruit depends on how fast these processes occur. Thus the rate of deterioration can be expected to be influenced in the same way by temperature.

To measure the effect of temperature on strawberries, studies were started by measuring the respiration rate of the Shasta variety. Rate of respiration closely parallels the rate of other life processes in both fruits and decay organisms.

Fruit was obtained from plantings at Davis. The berries were picked in the early morning and immediately used in the experiment. Duplicate 500 gram samples were prepared for each treatment. The fruit was selected for freedom from defects, weighed, and sealed in respiration jars. These jars were then placed at five different temperatures—32, 41, 68, 86, and 100°F.

As shown in the lower left graph, temperature has a marked influence on the respiration rate of the Shasta strawberry. The initial respiration rates at the higher temperatures exceeded the rate at 32°F by the following factors: 41°F—1.4 times, 68°F—7.2 times, 86°F—19 times, and 100°F—19.6 times. After about six hours oily, red droplets appeared on the surface of berries held at 86°F and at 100°F, indicating skin damage. This was followed by bleaching of the red in the berries, and still later by mushy breakdown of the tissue. No mold growth was observed at 86°F and 100°F. The tests at the lower temperatures were discontinued when mold appeared on the berries.

These results clearly show the effect of temperature on the two major causes of strawberry deterioration—decay and self-destruction. At 86°F and 100°F the berries were quickly destroyed by the speed of their own life processes. The berries at 68°F showed mold growth after two and one half days; at 41°F after five days; and, at 32°F, the berries showed mold after 11 days. Under commercial conditions, with picking damage added, it is probable that deterioration would be more rapid than in these tests.

The effect of delayed cooling at high temperatures on the keeping quality of the Shasta variety was next considered. Two large insulated boxes were used. One was fitted for thermostatically controlled heating, the other for forced-air cooling. The warm-air box was preheated to 85°F and held at that temperature for the duration of the experiment. The cool box was iced, and cooled to about 41°F. Sixteen crates of berries were picked by the commercial picking crew on a farm near Salinas. The picking required less than one hour and was completed at 8:30 a.m. Two crates were cooled immediately. The other 14 crates were placed in the warm box and held without air circulation. These crates were transferred to the cold box, two at a time, at the end of one half, one, two, three, four, six, and eight hours. All fruit was quickly

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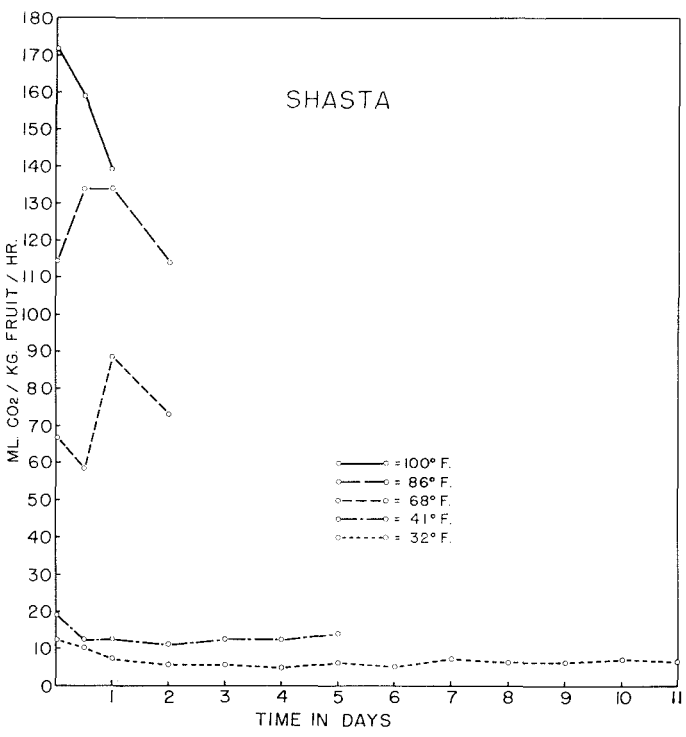
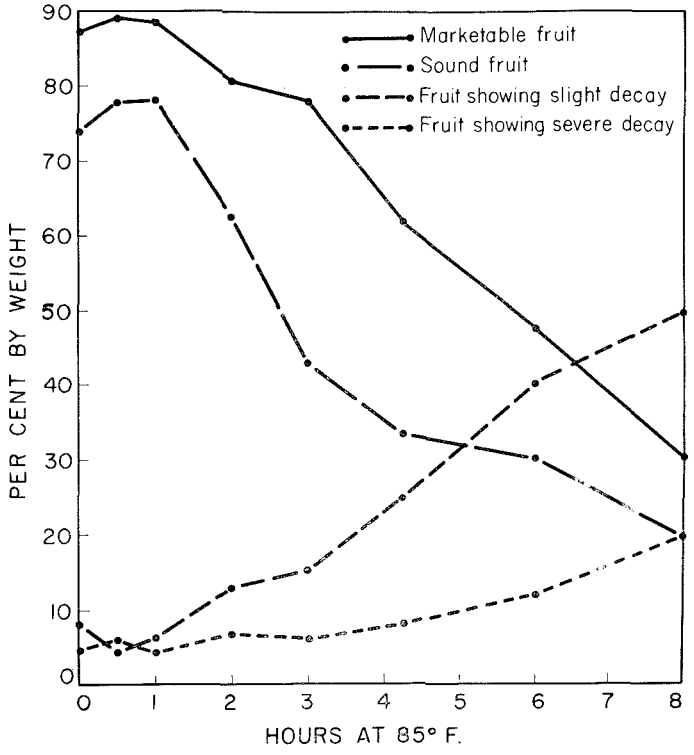
The influence of temperature on the respiration rate of variety Shasta strawberries.



The effect of delayed cooling at high temperatures on keeping quality of Shasta strawberries.



STRAWBERRIES

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cooled using the forced air principle, and then held for seven days at 41°F. It was then removed and sorted immediately into four classes: sound or undamaged, badly bruised but not decayed, slight decay, and severe decay. Sound fruit and bruised but not decayed berries were considered marketable.

As shown in the lower right graph on page 11, the quality of strawberries drops sharply after two hours at 85°F. The fruits represented by the graph were evaluated while still cool.

All badly bruised berries could be expected to be lost within a short time in commercial marketing channels. Under these conditions only the sound fruit would be marketable.

Another important trend is the increase in decay with increasing time at this high temperature. It seems likely that berries held for more than three hours would have been an almost complete loss in retail channels within 24 hours.

These experiments indicate that strawberries must be cooled very soon after harvest if satisfactory quality is to be maintained. While the temperature used may seem high for some strawberry growing districts, the information obtained in the studies indicates that such temperatures may be quite commonly reached or exceeded under actual field conditions.

The grower often can not move his berries to the cooler as quickly as would be desirable. However, every effort should be made to give maximum protection to the fruit. It should be placed in the shade if possible, hauled in a covered closed truck, moved to the cooler as soon as practical, cooled rapidly and kept cool thereafter. These experiments show clearly that strawberries would quickly destroy themselves at high temperatures, even if they were sterile of all decay organisms.

E. C. Maxie is Assistant Pomologist, University of California, Davis.

F. Gordon Mitchell is Extension Marketing Technologist, University of California, Davis.

Arthur Greathead is Farm Advisor, Monterey County, University of California.

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