Quality Study on Strawberries

Experiments with Shasta berries show harvested fruit should be protected against the effects of high field temperatures

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

The following article is the first of two reports on Quality Studies with Strawberries. The second article will appear in the near future.

Strawberries—among the most perishable of fruits—have thin skin, soft flesh, a high rate of metabolism, and susceptibility to decay which all contribute to high losses in transit and marketing channels.

California strawberry growers often leave harvested fruit in the field for several hours after picking. The berries may be hauled—before or after cooling—for considerable distances on open, nonrefrigerated trucks. As a consequence, the berries are subjected to relatively high temperatures for prolonged periods.

In 1957 a study of the effect of high temperatures on Shasta berries was initiated by measuring berry temperatures under simulated field conditions. Thermocouples were placed in the centers of eight Shasta berries of uniform size, shape, and color. Two berries were placed at the top of a pint basket in open sunlight; two berries were put at the bottom of a pint basket in the open sun; two more berries were placed at the top of a pint basket covered by two layers of canvas; and the fourth pair of berries were put at the bottom of a pint basket also under two layers of canvas. A thermocouple was used to measure the air temperature in the open sun. Both berry and air temperatures were recorded by a thermograph.

The temperature of berries exposed to direct sun quickly surpassed that of the surrounding air, and remained higher for the rest of the day. The maximum berry temperature was 107°F at 3:00 p.m. At 5:00 p.m. the exposed berries still were 14°F warmer than the air around them. The temperature of berries in the bottom of exposed baskets was somewhat lower than the surrounding air until about 2:30 p.m. and reached a maximum of 100°F at 3:30 p.m.

Berries at the top of covered baskets were cooler than the air for most of the day and reached a high of 93°F. Berries in the bottom of the covered basket were considerably cooler than the air.

The temperature pattern which developed in this test indicates the problems encountered in a commercial field. The temperature of the berries at the start of the experiment was already in the range where growth of decay organisms is a serious problem. Loss by decay alone would be expected to be severe if the fruit were held for any period of time in the field at these temperatures. Even under more moderate temperature conditions, fruit held in the field would be expected to be affected by decay losses which may not show until after the fruit leaves the shipping area. Any delay in cooling is bad but some temporary delays may be unavoidable in the orderly handling of the fruit. In such cases the fruit should always be covered to minimize the losses which will occur.

Warming-rates of Shasta berries were next considered in the fruit quality studies. Duplicate, full crates were used. The berries were cooled to 41°F. A basket in the center of the crate was emptied, and four berries of uniform size and maturity selected. The selected berries were held in the cold room while all other preparations were made. The crates were placed at either 85°F or 100°F. The thermograph was started, and the experimental berries were brought from the cold room. The thermocouples were quickly inserted into the four berries. Two of the selected berries were placed in the bottom of an empty basket, and the basket was refilled. The two remaining experimental berries were placed on the surface of the filled basket. This procedure was required to avoid temperature rises in the berries during the manipulations involved in setting up an experiment. One experiment was run in still air at each temperature, and a second with air blowing across the crate at a velocity of 10 miles per hour.

Concluded on page 15
The berries placed in 85°F reached maximum temperatures in about the same time as those at 100°F. However, surface berries did not reach the air temperature.

The evidence on the temperatures developed under field and handling conditions obtained in these studies indicates the desirability of carefully scheduling strawberry harvest operations. To avoid high temperatures and their detrimental effect on the fruit, exposure to normal field temperatures after harvest should be minimized by rapid handling of the fruit in the field, by careful protection against exposure to the sun or moving air, and by rapid and thorough cooling. Protection should be provided against exposure to high temperatures after the fruit has been cooled. A good cooling job may be undone in as little as 20 minutes, if the berries are exposed to moving, warm air.

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 Adviser, University of California, Monterey County.

The above progress report is based on Research Project No. 1636.

DONATIONS FOR AGRICULTURAL RESEARCH

Contributions to the University of California, Division of Agricultural Sciences

BERKELEY

California Board of Equalization .......................... $1,000.00
For timber tax study
California Department of Fish and Game ...................... $38,775.00
For research on brush removal on game ranges
California Department of Natural Resources Division of Forestry ........................................... $8,825.00
For soil-vegetation survey
California Spray Chemical Corp. .......................... $2,950.00
For research on invertebrates
California Technology Co. ...................................... $1,000.00
For research on alfalfa insects
Victor H. Clausen ........................................ $2,950.00
Tasman logs and lumber
County of Mendocino ................................... $1,000.00
For study of young growth timber taxation in Mendocino County
Diamond Gardner Corporation ........................................ $3,500.00
For research on bacterial infestation of Ponderosa pine logs and lumber
National Science Foundation ................................ $500.00
For research in agricultural chemistry
Onorite Chemical Company ........................... Up to 5 drums per month of Onorite acetone
For research on chemical processing of forest products
Rohn and Haas Company .................................. 10 gals. Kelthane EC emulsion
300 lbs. 5% Kelthane dust
For walnut and melon insect investigations
Stauffer Chemical Co. ...................................... 150 lbs. 3% Triathlon dust
For melon insect investigations
U. S. Atomic Energy Commission ................................ $2,519.22
For research on soils containing salts and radioactive elements
U. S. Public Health Service ................................ $3,157.60
For basic study relating to animal and human nutrition
For insect virus studies
For research on the dynamics of anthropod populations
For research in nutrition on the effect of the composition of food fat on cholesterol absorption and synthesis
For research in nutrition on the effect of dietary protein deficiencies on the utilization of body fat
For research on the influence of microenvironmental factors on infectivity
For research on the nature of infectious processes in insects
For research on soils containing salts and radioactive elements

DONATIONS FOR AGRICULTURAL RESEARCH

CONTRIBUTIONS TO THE UNIVERSITY OF CALIFORNIA, DIVISION OF AGRICULTURAL SCIENCES

DAVIS

Alamine Company of America ............................ 2 12" samples of corrugated fiberglass panel
For studies on light transmission
American Cyanamid Company .......................... 600 lbs. calcium cyanamide
For field crop fertilization studies
Atkins, Kroll and Co., Ltd. .......................... 600 lbs. Urea
For field crop fertilization studies
Best Fertilizers Co. .................................. 1,120 lbs. 6-24-0 and 13-39-0
For field crop fertilization studies
California and Hawaiian Sugar Refining Corp. .......................... $4,000.00
For study on ice cream production
California Fresh Peach Advisory Board .......................... $1,500.00
For research on maturity of several shipping varieties of peaches
California Olive Advisory Board .......................... $1,000.00
For research on canning, storage, and processing of olive oils
California Tree Fruit Agreement .......................... $2,500.00
For research on various roostrocks and diseases peculiar to olive trees
California Wine Advisory Board .......................... $5,000.00
For research on the effect of environment on the chemical constitution of grapes
For research on the effect of environment on the chemical consti-

Staff members of the California Agricultural Experiment Station published 1,322 separate articles during the fiscal year 1957-58, to disseminate information on their research findings to farmers, fellow scientists, and to the public.

Of the 1,322 articles—totaling 11,876 printed pages—1,163 or 87.8% appeared in farm journals, commodity publications, magazines, scientific journals, and other outlets which printed and distributed the material to their readers. The remainder—159 articles or 12.2%—was published and disseminated by the University in its Agricultural Experiment Station publications, in the form of leaflets, circulars, bulletins, and manuals, and in Hilgardia and California Agriculture.

Of the 11,876 printed pages, 9,872 pages or 83.1% appeared in popular magazines and scientific journals, the rest in Experiment Station publications.

The Agricultural Experiment Station compiled the printed figures of its staff on occasion of its annual report to the United States Department of Agriculture.