DILLON S. BROWN

Temperature and Bud Development of deciduous fruits

There is a rest period for buds of deciduous fruit trees during which they do not expand into shoots or flowers even though environmental conditions for growth are favorable. Buds enter this period of rest shortly after they are formed in the late spring or early summer and develop only microscopically until after they are exposed to the chilling temperatures of winter. Cold temperatures bring about physiological changes in the bud which end the rest period and enable the buds to expand when conditions for growth become favorable in the spring.

Development of the buds throughout the entire period from their formation in one spring to their bloom in the following year is intimately related to temperature. The microscopic development of buds during the rest period is retarded when temperatures are above average. After the rest period is completed, which occurs usually between mid-January and mid-February, the rate of bud development is directly related to the favorability of temperatures for growth. The more favorable the temperatures, the more rapid the growth and enlargement of the buds.

Varieties of fruit differ in the intensity of the rest-period influence and the amount of winter chilling required to end it. The buds of a variety with a low-chilling requirement emerge from the rest period earlier in the winter and begin to enlarge sooner in the spring than the buds of a variety requiring more cold to break the rest. Flower buds of high-chilling varieties of the stone fruits, such as apricot and peach, may be injured when temperatures are above average during the fall and early winter with the result that the buds drop from the trees, unopened, before bloom.

A growth inhibitor appears to be present in buds during the rest period, and the ability of buds to develop as the rest period ends depends on the relationship of the inhibitor to the naturally occurring growth-promoting substance or auxin present in the buds. The auxin-inhibitor relationships throughout the entire period of bud development, as affected by temperature and in relation to bud drop as it differs in varieties of different chilling requirement, need further study. When such relationships have been explored and are understood, the feasibility of devising means of manipulating trees to hasten the end of the rest period, to prevent bud drop and to promote normal flowering and leafing in orchards in mild-winter areas may be greater than is presently the case.

Dillon S. Brown is Professor of Pomology, University of California, Davis.

FREEZE

Continued from preceding page

whether they were near the wind machine or not. Damage in individual fruit, however, was less near the wind machine.

In the sprinkled grove, near the wind machine, leaf and fruit damage was approximately one-third of the damage on trees distant from the machine. Only 37% of the fruit sampled near the wind machine showed that they had been frozen. Since out of 6,642 boxes picked, there were only 1,046 boxes of culls from all causes, more than half of the 37% frozen fruit must have recovered from freezing without damage. The remarkable condition in this grove is best illustrated by the pack-out of 3,874 cartons of first grade, 540 cartons of choice, and 2,555 cartons of orchard run. The wind machine was not turned on in this grove until the air temperature reached 27°F. The grove might have escaped damage almost entirely if the wind machine had been started when the air was 32°F.

A Valencia orange grove at Elsinore —where air temperatures were similar to those in the Washington Navel orange groves—was irrigated with low sprinklers the day preceding and during the night the freeze occurred. The grove suffered considerable leaf and fruit damage. The grove had a cover crop of grass, and was protected by heaters and by a wind machine of small horsepower. Near the wind machine there was very little leaf damage and, although 92% of the fruit was frozen, only 64% was damaged. There was 2–3 times as much leaf damage and individual fruit damage where the trees could not be reached by the wind machine.

In the groves at Ventura, Indio, and Elsinore, there were higher percentages of frozen fruit than damaged fruit near the wind machines except in the furrow irrigated Washington Navel grove at Elsinore.

Lemons drop off the tree when frozen and, therefore, were not included but a comparison of the orange groves suggests that a portion of the frozen fruit recovered without serious pulp damage. Both at Indio and at Elsinore, air temperatures were below the freezing points of leaves, peel and pulp by 0.50°F to 1.50°F for several hours, and must have been below the undercooling temperatures for a considerable period also.

No peel damage occurred, with or without frost protection, probably because of a combination of the very low undercooling temperatures of peel and small surface-weight ratios of the fruit, which would delay their rate of cooling and thus shorten the period at which they were at low temperature.

There was only a relatively small amount of leaf damage in groves protected by wind machines as compared with groves without frost protection.

In leaves, the surface-weight ratio is 75–85 times larger than in fruit and thus the leaves must have been at subfreezing temperatures much longer than the fruit. Also, because there were fewer damaged fruit pulps than frozen pulps, despite their high undercooling temperature, the wind machines must have been able to effect a certain amount of recovery in leaves and fruit pulps after freezing.

F. M. Turrell is Plant Physiologist in Plant Biochemistry, University of California, Riverside.

S. W. Austin is Senior Laboratory Technician in Plant Biochemistry, University of California, Riverside.

The above progress report is based on Research Project No. 1731.