

Temperature and Bud Rest Period

effect of temperature and exposure on the rest period of deciduous plant leaf buds investigated

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Breaking the rest period of leaf buds of deciduous plants is generally admitted to be brought about mainly by the low temperatures of late fall, winter and early spring.

The amount of exposure required to fully break the rest varies with different plants and with the temperature. If the exposure is too short or the temperature not low enough—or both—incomplete breaking occurs; fewer buds grow, and growth is relatively less vigorous than on normal plants.

The rest of many plants may be effectively broken by cold storage. The requirements are a temperature between freezing and about 45° F and a period of continuous exposure of two to three months.

If plants which have clearly recognizable rest periods and are in the resting state are held continuously at temperatures of 60° F to 80° F, the rest may be prolonged for many months and sometimes for a year or more.

In the intermediate temperature range—45° F to 60° F—the results of continuous exposure vary with the kind of plant, but in general, an incomplete ending of the rest occurs.

A relatively short exposure to excessively high temperature—a few hours or days at 110° F to 130° F—will often start resting buds into growth. How the different temperature levels prolong or bring about the ending of the rest condition is still unknown.

The relation of exposure for varying periods to a temperature very effective in breaking the rest is shown in the larger illustration.

The plants shown in the photograph are one-year-old Hardy pear trees bearing only leaf buds. They were transplanted in November from an outdoor nursery to a greenhouse with a temperature range from 60° F to about 90° F, where they remained completely dormant for many months. No buds grew until the following August, and then only a portion of the terminal buds.

At intervals of several days, beginning in April, a few of the dormant trees were transplanted into peat moss and placed in a cold storage room at 37° F. At the end of 81 days, the ten lots were removed to the greenhouse. Two months later one tree from each lot was photographed with

one which had remained continuously in the greenhouse.

The picture shows that trees which had been stored at 37° F continuously for 56 to 81 days opened most of their buds, as they do after a normal winter outdoors. With decreasing length of cold treatment below 56 days, an increasing proportion of buds remained inactive until at no exposure and at 10 days exposure only two injured buds grew feebly.

The trees which were in the cold room from 19 to 42 days resemble typical examples of delayed foliation found in the orchard after a too warm winter.

The results described above were obtained with continuous storage at 37° F.

Trees outdoors are subjected to widely varying climatic conditions.

The temperatures to which they are exposed are, part of the time, favorable for breaking the rest, part favorable for prolonging it, and part in the intermediate range. It is difficult to estimate how large an influence each temperature level may have upon the subsequent behavior of resting buds.

To get a basis for judging the possible effect of daily temperature changes, the following experiment was carried out,

based upon some results obtained in Europe with water plants.

The trees used were essentially the same as used in the previous work, one-year-old Hardy pears bearing only leaf buds, brought into the warm greenhouse in November and used while still in the resting condition the following spring.

On April 1st three lots of ten trees were transplanted into peat moss and placed in cold storage at 37° F. Lot 1 was held continuously in the cold room for 71 days. Lot 2 was daily removed from the cold room and placed in a dimly lighted room at a mean temperature of 73° F for about six hours, then returned to the cold room. Lot 3 was likewise daily removed from the cold room and placed outdoors where the mean temperature was 64° F and it received direct daylight for about six hours before return to the cold room.

Of the total outdoor exposure 76% was recorded by the United States Weather Bureau as sunshine, 24% as cloudy.

On April 20th a fourth lot of ten trees was placed in the cold room and held there continuously for 52 days.

On June 11th all trees were planted in the greenhouse. On June 20th a few

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Hardy pear trees held at 37° F: Lot 1, 71 days continuously; Lot 4, 52 days continuously; Lot 2, 71 days, 18 hours per day at 37° F, 6 hours per day at 23° F in dimly lighted rooms; Lot 3, 71 days, 18 hours per day at 37° F in unlighted room, 6 hours per day outdoors in daylight, of which 76% was direct sunlight. Photographed one month after return to greenhouse.



