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THE HARVESTING, STORING AND RIPENING OF PEARS FOR CANNING
PURPOSES

by

Henry Hartman

The handling of pears for canning purposes does not differ materially from the handling of pears for the fresh fruit trade. Any program of harvesting, storing and ripening that will produce pears which are juicy, fully flavored and of good texture will generally meet the requirements of the canning industry. It is now recognized, however, that the ultimate commercial worth of pears for any purpose depends largely upon the manner of handling. Probably no other fruit responds more readily to harvesting, storing and ripening treatments than does the pear.

The present paper is based largely upon the results of experiments and field observations by the Oregon Experiment Station. Studies relating to the handling of pears have been conducted by the Oregon Experiment Station since 1917 and have included such commercial varieties as Bartlett, Comice, Anjou, Bosc, Winter Nelis, Seckel, and Howell. This discussion, however, is confined entirely to Bartlett, since the canning trade is interested primarily in this variety.

A Pear is a Living Organism

A pear, whether attached to the tree or whether in storage or in transit, is a living organism. It carries on life activities and its ultimate quality and length of life are dependent upon both external and internal factors. Consequently it must be treated as a living thing and not as a mere mass of dead or inert matter.

Time of Picking

Casual observations and experimental evidence have emphasized the fact that the degree of maturity attained at picking time exerts a pronounced influence upon the dessert, canning and keeping quality of pears. When picked prematurely pears are usually undersized and may wilt considerably in storage. They lack in sweetness and flavor; when canned they yield a product that is more or less flat in taste. They are very susceptible to scald and usually break down rapidly after reaching prime condition. When picked too late, on the other

hand, pears ripen quickly and lack in juiciness. They are subject to core break-down and when canned they are apt to be gritty in texture. The practice of leaving canning pears on the trees until they turn yellow is now known to be wrong.

Determination of Maturity

In the case of the pear one is confronted with the problem of determining time of picking long before the common indicators of maturity make their appearance. Size of fruit, color of seeds, ease of separation from the spur and even color of the skin are not definite indexes of time of picking in pears. There is need, therefore, for a test of maturity that indicates rather definitely the degree of ripeness attained and that can be easily and quickly applied.

Several tests of maturity for pears were considered by the Oregon Experiment Station. The so-called iodine test was given a thorough trial but proved to be unsatisfactory. The specific gravity test, used with oranges and other fruits, likewise was unsatisfactory and it soon became apparent that any test applicable to the pear must be based wholly or in part upon "the physical rather than the chemical contents of the cells," and of all the schemes tried, the so-called pressure test was the only one to give promise.

The Pressure Test

This test is based upon the fact that during the growth and ripening of pears, there is a gradual and consistent lowering of the physical resistance to pressure or wounding of the skin and neighboring tissue. In the case of Bartlett, for example, the decrease in resistance over an area one-half inch in diameter is close to one-half pound or two per cent every 24 hours. To measure the changes in resistance a simple apparatus now known as the "iron thumb" or pressure tester has been perfected. Portable types of pressure testers are now on the market.

To make the pressure test useable it is first necessary that tables giving the proper picking pressures be prepared. This usually requires several seasons. The picking pressures now recommended for Bartlett in Oregon are based on ten years of observations.

Picking Pressures

Bartlett as grown in Oregon attains its best quality when harvested at pressures varying from 32 to 26 pounds. This is with the Oregon tester, which has a plunger $7/16$ of an inch in diameter, the test being made without removal of the skin. When the federal or Ballauf tester is used the desirable picking range is between 20 and 16 pounds. The test in this case is made with a plunger $5/16$ of an inch in diameter and with the skin removed. From 10 to 12 representative specimens are necessary to

give a fair pressure test. Three or four determinations are usually made on each specimen.

Pressure Test Requires Care

While the pressure test has proved to be a reliable index of time of picking in pears it is clear that this test is of little value unless used with reasonable care. It should be applied only by some one who has made a study of the factors involved. The best results have been obtained when the matter of testing has been left entirely to one or two responsible individuals.

Amount of Crop Affects Maturity

With the general use of the pressure test, some interesting and valuable information has come to light. It has been found, for example, that there is a close correlation between the amount of crop on the trees and the maturity of the fruit. Invariably, the fruit from the heavily loaded trees, though usually smaller in size, is more mature than that from the lightly, or moderately loaded trees, the difference in time of picking amounting to as much as 12 days in extreme cases. This is significant, since in some districts pears are still picked largely according to size. Obviously when this practice is in vogue the less mature is often the first to be harvested.

Storage of Pears

Since the pear must be harvested while still in a comparatively green condition it is apparent that storage must play an important role in the handling of this fruit. Storage of some kind, in fact, is indispensable in the disposal of the pear crop.

Undoubtedly the most important single factor relating to the storage of pears is temperature. As with other fruits the rate of ripening in pears, within certain limits, is increased by two or three times with each increase in temperature of 18° F. This means that at 70° F. pears ripen approximately ten times as rapidly as they do at 52° F. For long keeping, pears should be stored at temperatures of 30° to 32° F. Pears do not freeze unless subjected to temperatures below 28° F. for a considerable period of time.

Promptness of storage has material bearing on the successful handling of pears. It has been shown with the Bosc variety, for example, that a delay of 7 days at 65° F. may be responsible for a reduction of at least 60 days in the possible cold storage life of the fruit. The length of time that Bartlett pears can be held in cold storage depends largely upon the conditions under which they were grown, the time of picking and the promptness of cooling. Usually the successful cold storage period varies from 25 to 40 days.

Pears wilt badly in storage unless they are kept at fairly high humidities. This is especially true of the early picked fruit. Relative humidities varying between 78 and 85 per cent are usually sufficient to prevent excessive wilting.

Since pears are very sensitive to odors they should not be stored with strong smelling products. The smells of vegetables, meats, etc., are readily absorbed by pears and may persist after storage to the extent that they are detectable even in the canned product.

Ripening of Pears

Even though Bartlett pears may be kept at 30 to 32° F. for a considerable period of time they do not develop their best quality unless they are removed from cold storage and allowed to ripen at comparatively high temperatures. Ripening temperatures varying between 60° and 70° F. are essential to the development of full quality in pears.

Pear Scald Caused by Ripening at Low Temperatures

Attempts to ripen pears in cold storage are responsible for much of the spoilage that now occurs in the handling of this fruit. Pear scald, a physiological trouble characterized by browning and disintegration of the skin, is largely associated with this practice. When the fruit is removed to a warm room before yellow color appears very little scald is encountered.

Time of Picking Affects Ripening

Time of picking has considerable bearing upon the length of time required for ripening after harvest. In the tests of the Oregon Experiment Station, several pickings of Bartlett pears were made at intervals of 5 days throughout the harvesting period. The fruit in each case was ripened at a temperature of 66° F. These tests were repeated for several seasons and the data obtained show that, on the average, the fruit from the first picking required 15 days to become fully ripe. The fruit from the last picking, on the other hand, attained full maturity in 4 days.

Core Break-down

Core break-down is evidently a physiological trouble of the pear. It is primarily a storage trouble associated with the ripening processes. The disease is characterized by break-down and darkening of the core area and the surrounding portion of the fleshy torus. A foul odor is present in the final stages. Except in advanced cases the fruit is sound to outward appearances. Although all pears may show core break-down at times, the trouble is especially severe in certain districts.

Core break-down seems to be more or less correlated with time of picking. Usually it is the late picked fruit that develops the greatest amount of core break-down. Losses from core break-down can generally be minimized by picking at the proper time and by processing before the fruit becomes overripe.