Bartlett Pears for Canning

ripeness of fruit at time of processing affects color, flavor, aroma, and over-all quality of finished product

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Proper ripeness of Bartlett pears at canning time is important to the quality of the product.

Opinions as to the best stage of ripeness for canning and the range of pressure test used by California canners are variable. A further complication is the difference in quality of pears grown in localities with differing soil conditions, cultural practices, and climatic conditions.

Color and firmness are the basis of the maturity standards adopted as a part of the California Fruit, Nut, and Vegetable Act of 1929. The firmness of Bartlett pears for fresh fruit shipment must range between 18 and 20 pounds and not exceed 23 pounds as measured by a Ballauf fruit pressure tester—5/16″ plunger. Pears in this range are immature and must be stored and ripened. The pears must be transported to the point of processing for storage and ripening and held until the production schedule permits processing. It is during the ripening period that the pears reach this maximum dessert quality. Usually the green pears can be kept for two months at 29°F to 30°F and 90% relative humidity, provided they are harvested at proper maturity and cooled quickly—within 24 hours—to 31°F. Before marketing, the cold-storage pears must be ripened at 68°F to 70°F for 4–5 days to get the maximum dessert quality, which corresponds to 2–3 pounds pressure test.

An investigation was undertaken to describe the physical and chemical changes of Bartlett pears stored at 34°F and ripened at 70°F. With this information to supplement the pressure test, a series of samples of pears of different ripeness was canned. The acceptance data of the experimental canned pears were correlated with the physical and chemical properties of the fresh fruits.

Storage at 34°F

Fresh Bartlett pears at 20 pounds pressure test were held for 10 days at 34°F. Random samples of pears were taken out at various time intervals for chemical analysis. The ripening process of green pears—with an initial pressure test of 20 pounds—was still proceeding at 34°F, although the rate was very slow. Within a period of 10 days, the pressure reading dropped from 20.4 pounds to 16.9 pounds. Accompanying the drop in firmness of the fruit, there was a gradual decrease in total acid and ascorbic acid content. The ratio of soluble solids to total acid increased from 40.2 to 46.5. There was a slight increase in total solids, possibly caused by a loss of moisture to the atmosphere. The color change during this period of storage was much less than the change in firmness.

Ripening at 70°F

After 34°F storage for 10 days, the pears were ripened in a 70°F room for different time intervals. Pears of the desired ripeness as judged by pressure test and skin color were taken out at designated time intervals for chemical analysis and canning.

The examination indicated a gradual increase of soluble solids content with ripening. The total titratable acidity decreased with ripening. When the pressure test of the fresh pears decreases to below 4.9 pounds, the acid content apparently increases slightly, accompanied by rapid softening of the pears. Possibly a new phase of physiological change begins at this stage.

Ascorbic acid content gradually decreased with ripening. Tannin content also tended to decrease slightly during ripening. Color change was much more rapid when the pressure test dropped to below 4.9 pounds. The green skin color decreased whereas the yellow color increased with ripening. However, other research workers have suggested that color difference alone is not a reliable criterion for ripeness of Bartlett pears, as the tissue may remain hard even after the pears have turned yellow if they have been kept long in storage at low temperature and have thus lost ripening capability.

Firmness of the pears decreased with ripening. A tissue softening during ripening was more pronounced than the changes in soluble solids, titratable acid, or ascorbic acid content. The Christel Texture Meter failed to register any reading on samples that read 2.6 and 1.1 pounds by the pressure tester. The dicing operation used to sample the pears for the Christel Texture Meter reading may have caused this difference. Bartlett pears grown at different localities in California may differ in pressure test, yet yield the same dessert quality. Thus, pressure test alone—still widely used—may not be the perfect means of ascertaining the ripeness of pears before canning.

In this investigation, pears at different stages of ripeness as judged by pressure test, color, and soluble solids were canned in 25° Brix sucrose syrup and then stored at room temperature for three months to allow exchange of constituents between the fruit and the syrup. The canned pears were then tested for organoleptic—aroma and flavor—quality in the acceptance laboratory.

In general, pears with an average pressure test of 4.9 pounds did not achieve as high a score in aroma and flavor as those with a lower test. Those with a test of 2.55 pounds yielded a canned product of the highest score in general appearance and texture. Maximum scores for flavor and aroma were obtained from pears with an average pressure test of 1.5 pounds but their scores for texture and general appearance were lower. Pears with a test of 1.1 pounds were graded as overripe because of their lower scores in aroma and flavor. These results suggest that fresh pears with average pressure ranges of 2–3 pounds immediately before peeling may be considered as most suitable for canning. It is not feasible to can pears of exactly the same pressure test, but they should be uniform and of optimum ripeness before canning.

The range of flavor difference among the samples of the experimentally canned Bartlett pears—due to the variation in ripeness of the fresh fruit—was significant at the 2% level. The difference in aroma was significant at less than 1% and no significant difference in texture was observed. Although as the pears ripen their texture tends to soften rather rapidly, their texture acceptability apparently does not change. Flavor and aroma improve until the overmature stage is reached. Both color and general appearance showed highly significant differences, with the highest score going to those pears with a pressure test of 2.55 pounds.

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PEACH TREE BORER

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zene, they have no advantages in cost or ease of application.

A series of trunk treatment plots were also established in 1956 to test out new materials, and evaluate standard materials with and without stickers. The materials were applied at monthly intervals, starting in May and continuing through September. Emergence records of the moths were used for timing of the sprays, and the emergence data show the difficulties involved with trunk sprays. The chart on page 3 gives the seasonal emergence records for the 1956 season. Emergence starts in May, reaches a peak in July, and continues into September. Because of this long emergence, sprays must be applied several times or materials must be found that possess long residual values.

Because the only way to evaluate the plots is by emergence records, it will not be possible to ascertain the results of the 1956 trunk sprays until the end of the 1957 season.

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The slight increase in total titratable acidity that occurred during the ripening of fresh pears below 4.9 pounds pressure test is reflected in the canned product. This increase in acidity might be related to the improvement in aroma and flavor during the second phase of ripening.

As the pears matured, their volatile reducing substances increased while the pressure test decreased to 1.5 pounds. The sample that scored high in aroma and flavor had high content of volatile reducing substances. Thus, the volatile reducing substances content might provide a measurement for evaluating flavor and aroma of canned Bartlett pears.

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NEMATODES

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equivalent, and the soil temperature was 95°F at a depth of 9″. The air temperature was 110°F. The root-knot nematode species was *M. javanica*. Four replicate plots, each two rows wide and 200′ long, were provided for each treatment. The row applications were made with two chisels, 12″ apart—6″ on either side of the planting row. Fumigants were injected to a depth of 11″ in the bed and the surface sealed by a V-shaped drag. Early Pak tomatoes were direct-seeded six weeks after soil treatment. No significant differences in yield occurred between plots in which fumigants were applied in the row or as solid applications. Root scores obtained at the end of the picking season indicated all treatments—with EDB the most effective—were significantly better than the untreated check plots. Row placement applications were as effective as solid applications in reducing the amount of galling on the main lateral roots.

The San Joaquin County plot soil was a clay loam having a moisture content of 17.3% and soil temperature range of 62°–65°F. The moisture equivalent was 17.1%. Applications for control of nematode species—*M. incognita* var. *acrita*—were made by chisel to four replicate plots each 10′ × 175′. Three weeks after treatment New Improved Pearson tomatoes were transplanted by machine into the plots. Yields obtained by commercial pickers showed no significant increase in any treatment over the untreated plots. A solid application of Nemagon at 2.5 gallons per acre resulted in a significant decrease in yield. Root scores showed EDB and Nemagon to be the most effective.

Again—in 1955—two plots were established, one involving a fresh fruit crop near Reedley in Fresno County and the other a canning crop near Nicolaus in Sutter County.

The plot in Fresno County was established for control of *M. incognita* var. *acrita* on staked tomatoes grown for the fresh fruit market. The treatments were made in February to six replicate plots, each treatment covering an area of 10′ × 132′. The soil was a clay loam with a pH acidity—relative acidity-alkalinity with seven as neutral—of 6.5 and a moisture equivalent of 12.3% to 15.3%. Soil moisture at the 8″ depth at time of treatment was 8.1% to 8.8% with the soil temperature at 50°F. Three weeks after treatment, New Improved Pearson tomato plants were set by hand in all plots. Harvest of the plots was begun on July 20 and subsequent pickings made at 3–7 day intervals until August 23. Plots were harvested 6–9 times, depending upon the relative yields of the vines. Results showed that D-D at 20 gallons per acre, solid application, produced the highest yields. Nemagon appeared to give the best nematode control based on root scores. Vapam, at the dosages used in this experiment, applied by chisel or disk, did not effectively control nematodes. Nemagon, at the rate of 1.5 gallons per acre, solid application, or 0.6 gallon per acre, row-placement application, appears to depress tomato plants with a resulting decrease in yields. However, when the dosage was decreased to 0.75 gallon per acre, solid application, or 0.3 gallon per acre, row-placement application, there was no apparent depression of yields and excellent control of root-knot resulted. However, there was a marked effect on the roots of plants grown on any plot treated with Nemagon. Roots were brown with a coarse texture and fewer lateral roots.

The experimental plot in Sutter County comprised about four acres. Treatments were for control of *M. javanica* and were made in February and March to a sandy soil having a moisture equivalent of 7.7% and a pH of 6.9. The soil temperature was 40°–48°F and the moisture content was 14.9% at the time the injection treatments were made. The soil temperature was 50°–58°F at the time of the plow, disk, and sprinkler applications of Vapam. The size of plot utilized for treatment by chisel applicator was 10′ × 174′. The disk and plow applications were made to plots each 20′ × 174′. The treated areas for the sprinkler plots each were approximately 120′ × 120′. Six sprinkler heads were used per plot, at a spacing of 30′ in the row with rows 60′ apart.

One month after treatment the plots were direct-seeded with New Improved Pearson tomato seed. Shortly after the seedlings emerged, a heavy wind and drifting sand caused a total loss to the seedlings. The plots were disked and transplants set the last part of April. Because of these operations, some of the transplanting did not occur exactly in the treated areas of the row-placement series. Consequently, data from row-placement application plots were not reliable. Also, because of very poor nematode control in the Vapam-treated plots and poor stands because of competition with bermudagrass and saltgrass, no yield records were obtained from two of the four replications. However, one picking was obtained on the other two replications. A 100′ section of each plot was utilized for yield records which showed that D-D, Nemagon, and EDB were about

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