

FRUIT COLD STORAGE RESEARCH.

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This report gives the main points emerging from the storage investigations of the Dominion Laboratory, the Appleby Research Orchard, the Horticulture Division of the Department of Agriculture, and the Cawthron Institute.

REFRIGERATED GAS-STORAGE.

Experiments have been continued on the Jonathan and Sturmer varieties by the Dominion Laboratory, and fifteen variations of storage conditions have been employed.

At each of the temperatures 38° F., 40° F., and 42° F. the following atmospheres have been used : (a) 10 per cent. carbon dioxide, with 11 per cent. oxygen ; (b) 8 per cent. carbon dioxide, with 13 per cent. oxygen ; (c) 6 per cent. carbon dioxide, with 15 per cent. oxygen ; (d) air ; (e) air.

As in the previous year, treatments (a) to (d) have been carried out in cabinets at a relative humidity of 92 per cent. to 93 per cent., while treatment (e) has been in the air of the storage chamber at a much lower relative humidity and under much greater air movement.

The fruit has again been of standard commercial type, drawn from the Appleby Research Orchard and the sizes used have been a uniform mixture of 125, 138, and 150 counts in Jonathan, and 125, 138, 150, 163, and 180 counts in Sturmer.

Jonathan.—The Jonathans were stored on the 13th March, 1940, and the maturity was such that at 20° C. the average time for the fruit to reach its climacteric was 7.6 ± 0.7 days. (Standard error 0.7.)

The best treatment appeared to be a temperature of 42° F., with an atmosphere containing 8 per cent. carbon dioxide. At this temperature 10 per cent. carbon dioxide induced a small amount of brown-heart later in the season. In 8 per cent. carbon dioxide, the fruit was firmer and greener at a temperature of 40° F. than at 42° F., but had a definite, slight tendency to develop internal breakdown at the lower temperature.

These results confirm the findings of the previous year, when the best results were obtained at 42° F. in an atmosphere containing 9 per cent. carbon dioxide.

At the end of September, after twenty-nine weeks in storage, the Jonathan under the best treatments was still in very good condition. In 8 per cent. carbon dioxide at 42° F. the fruit showed only 2 per cent. of internal breakdown. Subsequent holding of this fruit for two weeks at 68° F. (20° C.), with a relative humidity of 90 per cent., increased the breakdown to 12 per cent. The flavour of all fruit held at 42° F. was good, but at lower temperatures the fruit was almost flavourless.

At the final examination on the 18th November, after thirty-six weeks in storage, the amount of breakdown had not increased, and subsequent storage for two weeks under warm, moist conditions again increased the breakdown to only 12 per cent.

As in the previous year, it has been noted that gas-storage has given complete control of Jonathan-spot.

The results of the two years' experiments suggest that Jonathans can be successfully gas-stored until early October at 42° F. in an atmosphere containing 8 per cent. carbon dioxide and 13 per cent. oxygen.

The work is being taken to the semi-commercial stage during the 1941 season. A small gas-store consisting of two chambers, each capable of holding 10 tons of fruit, has been erected. It is designed on orthodox lines, with sheet-metal lining inside the cork insulation to make the space gas-tight. Cooling is by forced draught over an external cooler, and temperature control is automatic, while gas concentration is controlled manually. In one of the chambers Jonathans are to be stored at a temperature of $41^\circ \pm 1^\circ$ F. in 8 per cent. carbon dioxide with 13 per cent. oxygen.

Sturmer.—The Sturmers were placed in storage on the 18th April, 1940, and the maturity was such that at 20° C. the average time for the fruit to reach its climacteric was 12.7 ± 1.3 days.

With this variety, several treatments have appeared to be more or less equally satisfactory—viz., 40° F. and 42° F., in 8 per cent. or 10 per cent. carbon dioxide, with 13 per cent. or 11 per cent. oxygen respectively. The only point of difference has been that at the beginning of December, after thirty-three weeks' storage a slight amount of internal breakdown developed at 40° F. in 10 per cent. carbon dioxide. At 40° F., however, the fruit was slightly harder and greener than at 42° F.

In the previous season the best results were obtained at 42° F. in 9 per cent. carbon dioxide.

By the end of the storage period a small amount of superficial scald was apparent on the gas-stored fruit, but it was not serious. The air-stored controls on the other hand, were quite badly scalded, despite the fact that the fruit was wrapped in oiled wraps. Gas-storage thus gives very good control of superficial scald on the Sturmer.

Under the best storage treatments the fruit remained firm, crisp, and of excellent flavour, and when removed from store had the appearance of freshly-picked fruit. It appears, therefore, that gas-storage should enable Sturmers to be kept in very good condition till December.

The Sturmer is also being tested on a semi-commercial scale during the 1941 season, at a temperature of 41° F. $\pm 1^\circ$ F. in 9 per cent. carbon dioxide with 12 per cent. oxygen.