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## FRUIT COLD STORAGE RESEARCH.

*Advisory Committee.*—Mr. W. K. Dallas (Chairman), Sir Theodore Rigg, Messrs. H. G. Apsey, W. Benzie, F. R. Callaghan, J. T. Cross, F. W. Grainger, H. C. Heays, J. L. Mandeno, A. Powell, A. M. Robertson, H. E. Stephens, and L. W. Tiller (Secretary).

This report on fruit cold storage covers associated activities of the Dominion Laboratory, the Appleby Research Orchard, and the Plant Diseases Division of the Department of Scientific and Industrial Research, the Horticulture Division of the Department of Agriculture, and the Cawthron Institute.

## REFRIGERATED GAS-STORAGE.

In continuance of its investigations into this aspect of storage, the Dominion Laboratory commenced work on the gas-storage of apples of the Jonathan and Sturmer varieties in the small-scale plant referred to in the annual report for 1937.

Temperatures adopted in the 1939 tests were 35° F., 38° F., and 42° F. At each temperature the following storage atmospheres were maintained: (a) 9 per cent. carbon dioxide, with 12 per cent. oxygen; (b) 6 per cent. carbon dioxide, with 15 per cent. oxygen; (c) 3 per cent. carbon dioxide, with 18 per cent. oxygen; (d) air; (e) air.

In treatments (a) to (d) the fruit was held in cabinets, and in these it was under approximately uniform conditions of relative humidity and air movement. In treatment (e) the fruit was held in the air of the storage chamber, where the relative humidity was much lower and the air movement greater.

Fruit of a standard commercial type and of known history, from the Appleby Research Orchard, was used for the work. Size-counts in both varieties were 163 and 180, corresponding to diameters of 2½ in. to 2⅝ in.

*Jonathan.*—The Jonathans were placed in storage on the 8th March, 1939. The stage of maturity was such that at 68° F. (20° C.) the average time for the fruit to reach its climacteric, or peak of respiratory activity, was ten to fourteen days.

For this variety the most suitable of the storage conditions tested appeared to be a temperature of 42° F. with an atmosphere containing 9 per cent. carbon dioxide with 12 per cent. oxygen.

Under this treatment the fruit at the first examination, at the end of eighteen weeks' storage, was found to be in hard, green condition. A sample removed from storage and maintained for two weeks at a temperature of 68° F. and a relative humidity of 90 per cent. remained in sound, firm condition.

A second examination was made at the end of twenty-eight weeks' storage, and the third at the end of thirty-seven weeks' storage. At this last examination the fruit upon removal from store was still firm, crisp, and of good flavour. At the end of the two weeks' treatment under the severe post-storage conditions of 68° F. and 90 per cent. relative humidity, only about 10 per cent. of the fruit had reached an unsaleable state.

These results suggest that it should be possible to gas-store Jonathans in excellent condition until about October or November. As the fruit varies from year to year, however, it is obviously necessary to repeat the work for confirmation.

A striking fact that has emerged is the complete absence of Jonathan-spot from the gas-stored fruit, whereas the controls stored in air showed a considerable amount.

*Sturmer.*—The Sturmers were placed in storage on the 19th April, 1939. Respiration measurements suggested that even at this date the fruit was very close to its climacteric and was therefore perhaps slightly too mature to give the best results in gas-storage.

Nevertheless, great improvement in the keeping of the variety was effected by gas storage; the most successful treatment was a temperature of 42° F. with an atmosphere containing 9 per cent. carbon dioxide and 12 per cent. oxygen.

Under these conditions the fruit kept without loss for twenty-eight weeks, and a portion then held for two weeks at a temperature of 68° F. suffered only a 2 per cent. wastage, due to fungus. At the same stage 30 per cent. of the air-stored control fruit was damaged, due mainly to severe scalding but partly to fungus.

After thirty-five weeks' storage a loss of approximately 6 per cent. was experienced, but this was again due chiefly to fungus, with a slight amount of breakdown becoming apparent. The further two weeks at 68° F. did not appear to increase appreciably the amount of damage. The fruit was still firm, crisp, and of very good flavour, and had the appearance of being freshly picked.