

## LENGTHENING THE STORAGE LIFE OF APPLES BY REMOVAL OF VOLATILE MATERIALS FROM THE STORAGE ATMOSPHERE

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McIntosh apples held in controlled atmosphere storage (*i.e.*, controlled oxygen and carbon dioxide levels) will keep two to three times as long as similar apples held in ordinary cold storage. When this technique is used, volatiles produced by the apples tend to accumulate in the gas tight chamber. Because of such accumulations the apple scald disease is likely to be severe unless shredded oiled paper is used in quantities around the fruit.

Attempts have been made to find a cheaper and more satisfactory control of this disease than the use of oiled papers. In an earlier report<sup>1</sup> it was noted that some promise was shown by various methods of removal of these volatiles by "air conditioning" the atmosphere. During the 1942-1943 season a semi-commercial trial with 1800 bushels of McIntosh apples was made of air conditioning the storage atmosphere with a highly refined oil. This technique controlled the scald on the more mature lots of fruit in storage; but on the greener lots there was four per cent. of scald. While this might have been considered commercial control, it is not perfect control. A semi-commercial trial of air conditioning the atmosphere of a 300-bushel controlled-atmosphere chamber full of McIntosh with activated lignite charcoal did not give commercial control of scald. While it controlled the disease on the mature lots of fruit, there was thirty per cent. of scald on the greener fruits.

In a series of trials with two-bushel lots of McIntosh apples in controlled-atmosphere storage, the only air conditioning agent that gave perfect control of scald was activated charcoal on which bromine had been adsorbed. Untreated activated charcoal did not give control. An oil wash for the atmosphere gave results comparable to those described in the semi-commercial test. Alkaline potassium permanganate did not give control.

A second result noted in the use of brominated charcoal was that the storage life of the apples was considerably lengthened (aside from scald control). Approximately two or three months was added to their storage life. Apparently enough ethylene is generated even in controlled atmosphere storage by the fruit, that its removal may retard ripening.

In laboratory trials it had been found that brominated charcoal was the only really effective agent in removing naturally evolved ethylene from rather ripe fruits. The effect of a rather ripe lot of apples in storage in stimulating the ripening of another less ripe lot of fruit in air storage (presumably through its evolution of ethylene) was eliminated by air conditioning the air with brominated charcoal.

It was found that activated lignite charcoal was not effective in controlling scald, although it seemed an excellent absorbent for artificially

<sup>1</sup> SMOCK, R. M., and SOUTHWICK, F. W. Some factors affecting the apple scald disease. *Science* n.s. 95: 576-577. 1942.

added esters. This would seem suggestive that esters were not the causative agent of scald. The fact that bromine is so effective in controlling scald suggests that scald is in some way related to an unsaturated hydrocarbon.

The production of volatiles by McIntosh apples was less in 1942-1943 than in the previous season—so the results reported may not be as favorable in a year of high volatile production and high incidence of scald.

Preliminary experiments indicate that it is unlikely that scald can be easily controlled on a very scald-susceptible variety like Rhode Island Greening by air conditioning the atmosphere with brominated charcoal, since excessively rapid air movement is necessary to accomplish control even by ventilation with fresh air.

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