

PROGRESS REPORT

PROJECT NO: ARS-530

TITLE: Condition and Storage of Apple Cultivars in Controlled and Regular Atmosphere Storage

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REPORTING PERIOD: 1994-1997 **TERMINATING YEAR:** 1997

ACCOMPLISHMENTS:

1. Organic MeBr residue present in fumigated 'Delicious' apples after waxing is dependent upon the type of wax used and the time after MeBr exposure. Use of carnauba wax allows the MeBr residue to dissipate faster than does the use of shellac wax. With carnauba wax, the MeBr residue levels were less than 0.001 ppm when apples were waxed 5 days after fumigation. With shellac wax, the residue levels were 0.003 ppm 7 days after fumigation. MeBr residue levels were less than 0.010 ppm using either carnauba or shellac wax 3 days after fumigation. Use of MeBr as a fumigant did not influence the internal color, firmness, or soluble solids of 'Delicious' apples regardless of the type of storage (regular or controlled atmosphere) from where the apples were obtained. Fumigated apples from CA storage retained a higher acid content than apples not fumigated. The use of either carnauba or shellac wax resulted in a redder apple.
2. 'Fuji', 'Gala' and 'Jonagold' apples of good quality from either regular or controlled atmosphere storage can be fumigated with MeBr after storage with minimal effects on fruit quality. Some quality loss, particularly in internal color, is possible at 48 and 56g/m³ MeBr doses for 'Fuji', 'Gala' and 'Jonagold' from CA storage. 'Braeburn' apples from either RA or CA storage are not good candidates for fumigation by MeBr, particularly at a fumigation temperature of 10C. Both the Hunter and visual internal color scores for 'Braeburn' apples from CA storage did not lose quality to the extent of 'Braeburn' apples from RA storage, but enough damage was observed to suggest that 'Braeburn' apples from RA or CA can not be fumigated with

MeBr. Apples with watercore are not acceptable for fumigation with MeBr.

Regardless of cultivar, only apples of superior quality can be successfully exposed to the stress of MeBr fumigation.

3. Low dose irradiation (<0.90 KGys) can be used as a quarantine treatment in 'Fuji', 'Gala' and 'Granny Smith'. Fruit response to irradiation was cultivar dependent. Some quality loss was evident, but not to the extent to reduce quality grade. Both, 'Gala' and 'Granny Smith' apples lost firmness at irradiation levels above 0.30 KGys. At 60 days storage after irradiation treatment, all apples regardless of cultivar, maintained 12 lbs or more firmness. No loss of firmness was evident for 'Fuji' apples regardless of irradiation treatment. 'Gala' apples lost acid content when exposed to irradiation in excess of 0.60 KGys. No loss in acid content was evident for 'Fuji' or 'Granny Smith' apples. The external color of 'Fuji', 'Gala' and 'Granny Smith' apples was not influenced by irradiation exposure. The internal color of 'Gala' and 'Granny Smith' apples was more yellow after exposure to irradiation at 0.60 KGys and above.
4. Exposure of 'Gala' apples (Royal, Imperial, Crimson, GoRed, Galaxy and Scarlet) to high carbon dioxide (12%) for 7 or 14 days before normal CA storage did not result in better quality fruit. CA stored 'Gala' apples maintained firmness for 150 days of storage with little or no loss in quality. After 150 days of storage all strains of 'Gala' apples exceeded 15 lbs in firmness. Early harvested fruit tended to maintain higher firmness levels during storage, but earlier harvested fruit were lower in soluble solids. Maturity at harvest was similar between strains of 'Gala', but color was highest in Crimson, GoRed, Galaxy and Scarlet compared to Royal and Imperial.
5. Growing location had a strong influence on the harvest and storage quality of 'Fuji' apples (nagafu 2, 6 and 12). No internal breakdown or cavities were evident regardless of the carbon dioxide in the storage environment. 'Fuji' apples maintained good quality during long-term CA storage at 1% oxygen and 1 or 3% carbon dioxide. Nagafu 12 lost firmness more rapidly than nagafu 2 and 6 during CA storage. Color of nagafu 2 and 6 was superior to the color of nagafu 12.

PUBLICATIONS:

Drake, S.R., J.D. Hansen and H.R. Moffitt. Apple waxing after methyl bromide fumigation. TFPJ (submitted).

Drake, S.R. and H.R. Moffitt. Response of several apple cultivars to methyl bromide fumigation. HortTechnology (submitted).

Drake, S.R., P.G. Sanderson and L.G. Neven. Apple and winter pear response to irradiation as a quarantine treatment. (In review).