PROGRESS REPORT

PROJECT NO.: ARS - 528

TITLE: Developmental Regulation of Fruit Volatile Synthesis

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ACCOMPLISHMENTS:

1. **<u>Factors influencing apple volatile production following controlled atmosphere (CA) storage.</u> Production of volatile compounds that contribute to Delicious aroma after controlled atmosphere storage is determined primarily by maturity at harvest and storage O_2 concentration. Studies where apples were harvested at weekly intervals showed the developmental stage that is optimal for long term CA storage (starch <2, firmness >16 lbs, ethylene <1 ppm) occurs prior to development of the capacity for rapid production of aroma compounds. This developmental limitation of Delicious is not manageable by increasing the storage O_2 concentration without losing firmness and acidity. For Gala and Fuji apples, development of the capacity for production of ripening related volatile compounds occurs prior to the optimum maturity for CA storage. This indicates manipulating the CA environment may be a means to improve post-storage flavor and aroma of these varieties provided other benefits to fruit quality afforded by CA are not reduced.**

2. **<u>Gala apple response to CA storage with high carbon dioxide (CO_2) concentrations.</u> Production of volatiles contributing to Gala apples aroma was negatively impacted by storage in 5% CO_2 for 90 or 120 days with 1% or 3% O_2. Although no internal or external symptoms of CO_2 injury were observed, the aroma and flavor of Gala apples stored in relatively high CO_2 would be expected to decline as volatile production was reduced. The impact of high CO_2 storage was more pronounced with 3% O_2 compared to 1%. Additional firmness loss was also observed in response to high CO_2.**

3. **<u>Volatile production by Gala apples after sequential or dynamic atmosphere storage.</u> Prolonged storage in low O_2 is an important factor negatively impacting post-storage volatile production by apples. Increasing the O_2 concentration during storage (sequential atmospheres) did not prove to be an effective means of improving volatile production by Gala apples, and this atmosphere manipulation also resulted in additional firmness and acidity loss. Dynamic atmosphere storage, where deviations from the low O_2 setpoint are temporary, has measurably improved production of volatile compounds contributing to Gala apple flavor while not resulting in additional firmness or acidity loss. Further work to identify optimal dynamic conditions for Gala apples is warranted.**

4. **<u>Postharvest Management of Fuji watercore.</u> The presence of slight watercore at harvest in Fuji apples is an indicator of good fruit quality. Slightly watercored fruit respond well to CA storage, however, the likelihood of internal breakdown due to watercore increases in CA with advanced maturity and the development of moderate to severe watercore. The risk of internal breakdown due to watercore is low for apples stored in RA, this indicates the availability of O_2 is a factor increasing the risk of injury. Storage studies using O_2 concentrations up to 5% have shown some potential for reduction of injury, but a significant incidence of injury was still observed. Continuous storage at 5% O_2 results in additional fruit quality loss, particularly loss of titratable acidity. The additional quality loss may be unacceptable for long-term and in some cases mid-term storage. Alternative storage regimes that incorporate delays in establishment of CA conditions and a stepwise reduction in O_2 concentrations during storage may prove to be a more successful means to manage watercored Fuji apples.**

PUBLICATIONS:

Mattheis, J.P. Maturity and storage of Fuji apples. Wash. Apple Maturity Program Newsletter, Jan, 1995.

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