PROJECT NO.: New - ARS

TITLE: Management of Pear Fruit Ripening with 1-Methylcyclopropene (MCP)

YEAR INITIATED: 2000-2001 **CURRENT YEAR:** 2000-2001
TERMINATING YEAR: 2002-2003

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JUSTIFICATION:

A primary objective of postharvest management of pears is to prolong storage life by reducing the rate of fruit ripening. The combination of optimum maturity, refrigeration, postharvest chemical treatments and controlled atmosphere storage slow ripening and reduce physiological disorders and decay. Controlled atmosphere storage in particular reduces ethylene production as well as the capacity of fruit to respond to ethylene, responses that provide the residual effects of CA after fruit is removed from storage. Because of the importance of ethylene in regulating the processes of fruit ripening, practices that interfere with its production and/or action are useful in the commercial storage of pears.

Researchers at North Carolina State University, Dr. Ed Sisler and Dr. Sylvia Blankenship, have identified a compound that interferes with fruit ethylene metabolism. This compound, 1-methylcyclopropene (MCP), inhibits ethylene perception and shows great potential as a tool for postharvest management of pears. MCP is a volatile compound that can be applied as a gas treatment without drenching fruit. Results with a number of fruit crops have demonstrated MCP treatment at harvest can reduce the rate of ripening as well as development of a number of physiological disorders.

OBJECTIVES:

1. Determine treatment conditions (concentration, duration, temperature) to maximize responses of pear cultivars to MCP.

2. Determine duration of responses when treated fruit are stored in RA or CA conditions.

3. Determine the impact of MCP treatments on fruit physiological disorders and decay.

PROGRESS TO DATE

1. MCP treatment concentration, duration and temperature combinations were evaluated using 'Bartlett' and 'd'Anjou' pears harvested at commercial maturity. Positive effects of MCP treatment on firmness, titratable acidity and other quality attributes were detected. Temperature during treatment (32, 50 or 68°F) did not consistently influence the response to MCP. The storage duration over which MCP was effective was dependent on treatment concentration and duration at harvest. For example, 'Bartlett' pears treated with 10 ppb MCP for 1 hour were less ripe compared to controls after 2 months storage, however after 6 months only fruit treated with 1 ppm for 12 hours were superior to control fruit. For most fruit tested, treatment durations of 4 or 12 hours resulted in similar responses. Color changes (green to yellow) were delayed but not prevented. Multiple gas treatments at low rates effectively maintained quality compared to a single low rate treatment applied at harvest or after several months storage.

2. Fruit treated with MCP then stored in RA or CA were compared with non-treated fruit stored under the same conditions. Fruit stored in either: CA; treated with MCP and then stored in RA; or treated with MCP then stored in CA were similar in quality after 3-5 months storage. For longer storage durations, fruit treated with MCP then stored in CA had superior quality compared to treated fruit stored in RA or non-treated fruit stored in CA. Volatile production increased in treated fruit stored in RA after several months and firmness and titratable acidity remained higher than non-treated RA stored fruit and comparable to CA fruit without MCP.

3. The incidence of superficial scald on pears was essentially prevented by MCP treatment. When scald did occur fruit were already overripe and not

commercially useable. Development of brown core was also prevented by MCP treatment. MCP treatment reduced decay on field run 'Bartlett' and 'd'Anjou' pears, however, MCP treatments did not prevent decay if fruit were inoculated following wounding or by dipping in a spore suspension.

4. Increased moisture loss and shrivel occurred following MCP treatment of 'Bartlett' and 'd'Anjou' pears. MCP treatment of the Asian pear cultivars 'Chojura', 'Hoseui', 'Twentieth Century' and 'Yali' did not result in a reduced development of physiological disorders or prolonged storage life.

PROCEDURES: 2000-2001

1. Optimization of treatment conditions. Factors to be evaluated include MCP concentration, treatment duration and treatment in water.

2. Response of treated fruit stored in RA or CA. Long-term (8-9 months) CA storage will be included. Repeated low concentration treatments will be conducted to evaluate recovery of the ability to ripen during storage.

3. Impacts on fruit decay will be evaluated by using larger lot size with MCP followed by RA or CA storage. Lot to lot variation in disorder development will be evaluated. The use of MCP in combination with low rates of fungicides and/or biological control agents will be evaluated.

ANTICIPATED BENEFITS AND TECHNOLOGY TRANSFER

Development of MCP treatment protocols for use by industry is the goal of this project. This material also provides a useful tool to study ethylene regulation of various processes of fruit ripening and senescence, furthering our understanding of fruit ripening in general. Information will be made available by journal articles, presentations at industry meetings and via our Internet web site (www.tfrl.ars.usda.gov).

BUDGET:

1. Request for 2000-2001: $21,016

Salary[1]	$14,012
Operations (lab supplies, fruit)	$2800
Employee Benefits	$4204
Total	$21,016

[1]Biological Science Technician, 0.5 FTE