

**Project Title:** Baseline tracking of MCP use and fruit response

**PI:** Dana Faubion  
WSU – Yakima County  
128 N 2<sup>nd</sup> street, Yakima, WA 98901  
509.574.1600  
faubiond@wsu.edu

**Cooperators:** Jim Mattheis, USDA, Wenatchee.  
Gene Kupferman, WSU, Tree Fruit Research and Extension Center, Wenatchee.  
Chang Lin Xiao, WSU, Tree Fruit Research and Extension Center, Wenatchee.

*This report only covers storage tracking progress up to the end of May, 2003. A complete report will be available at the review.*

**Objectives 2003:** The original objective for 2003 was to track fruit quality of MCP treated fruit with a focus on newly labeled and minor varieties. Due to the severe growing climate in 2003 I changed my focus slightly to try to determine the impact of potentially poorer fruit quality at receiving and the impact of MCP on that fruit relative to fruit quality responses found in 2002.

Other areas to be investigated included in 2003:

- New practices like changing the storage parameters such as elevating temperature, increasing O<sub>2</sub> and CO<sub>2</sub> and mixed variety loading.
- The influence of changing maturity standards and impact on fruit response (potential to enhance grower returns by increasing percentage of targeted fruit).
- Historically weak CA storage lots.

#### ***Significant Findings 2002-2003***

- Fruit commercially treated with MCP maintained superior fruit quality attributes compared to untreated fruit.
- Fruit firmness was maintained in all but several of the ~1,300 lots of fruit tracked.
- The several failures tracked were primarily due to delays in treatment with MCP.
- Fruit picked within the guidelines for mid to late term CA and treated with MCP a timely manner had enhanced firmness.
- My ethylene protocol did not work and will be revised for the 2003 harvest.

#### ***Significant Findings 2003-2004***

- Fruit measurements (starch, watercore, firmness and standard deviation) at receiving were similar in 2003 and 2002.
- MCP generally maintained superior fruit quality attributes compared to untreated fruit.
- The majority of the failure of MCP to maintain fruit quality seems to be due to fruit maturity, delay in MCP application or physiological problems in the room (DSB, gala internal browning (IB), and Fuji IB).
- Accomplishing postharvest decay control preharvest may lower decay amount at packing and minimize lenticel darkening.
- DSB in MCP treated Golden rooms may be related to the rate of room temperature pull down.
- Gala internal browning does not appear to be related to temperature pull down rate.
- Early picked Granny Smith (9/3/03) and the effect of MCP or DPA on development of scald and delayed sunburn was demonstrated.

**Methods (2003 –2004):**

**Tracking:**

Smart Sample from a limited number of warehouses with good receiving QC data, data handling systems and a successful habit of keeping untreated controls.

1. Track fruit quality after storage plus 7 days at room temperature.
2. Communicate with cooperating packers the fruit quality data with immediate data feed back (room fax back sheets). Assist them in incorporating this type of data in management feedback systems.
3. Use tracking data to determine influence of fruit maturity, MCP treatment protocol, storage protocol and storage duration on final fruit quality.

**Results and Discussion:**

Receiving data were similar between 2002 and 2003. Even with the challenging growing conditions in 2003, packers were able to keep maturity appropriate for the various storage periods (Table 1).

Table 1. Average fruit maturity data at receiving (most of these lots are mid to late term CA fruit).

Attribute	2002-2003				2003-2004			
	Reds	Goldens	Gala	Granny	Reds	Goldens	Gala	Granny
Firmness	16.9	15.5	17.0	16.8	<b>16.2</b>	<b>15.1</b>	<b>17.0</b>	<b>16.6</b>
Std Dev	1.6	1.3	1.8	1.4	<b>1.67</b>	<b>1.6</b>	<b>1.59</b>	<b>1.43</b>
Starch	2.4	4.5	3.7	2.9	<b>2.9</b>	<b>3.9</b>	<b>3.9</b>	<b>3.3</b>
Watercore	0.9	--	--	0.6	<b>0.6</b>	--	--	<b>0.5</b>
Brix	13.1	13.2	13.6	13.8	<b>13.3</b>	<b>12.1</b>	<b>12.8</b>	<b>12.1</b>
TA	0.18	0.29	0.26	0.56	--	--	--	--
Lots tracked	457	204	387	172	<b>127</b>	<b>51</b>	<b>176</b>	<b>87</b>

The accumulated database two year data base of over 1800 lots of stored fruit will be analyzed for impact of MCP treatment and storage protocol, storage duration, receiving maturity and variety differences at the end of the 2003 season. This information will be presented at the review and at the August Quality Control meetings.

At the time of writing this report, the tracking project is progressing well. We have analyzed over 500 grower lots of fruit so far. The fruit quality data for some varieties is behaving differently than in 2002/3.

Variety	lots analyzed	Firmness after 7 days at 68°			
		Untreated		MCP	
		2002 <sup>1</sup>	2003	2002 <sup>1</sup>	2003
Red Delicious	131	14.6	<b>12.6</b>	15.4	<b>15.3</b>
Golden	55	12.9	<b>12.8</b>	14.1	<b>13.2</b>
Gala	180	14.4	<b>13.0</b>	15.9	<b>14.3</b>
Granny	91	16.4	<b>16.5</b>	17.5	<b>16.6</b>
Fuji	32	--	<b>14.6</b>	--	<b>15.0</b>

<sup>1</sup> includes late stored apples, 2003 does not.

## Other Fruit Quality Issues with MCP treated fruit in 2003

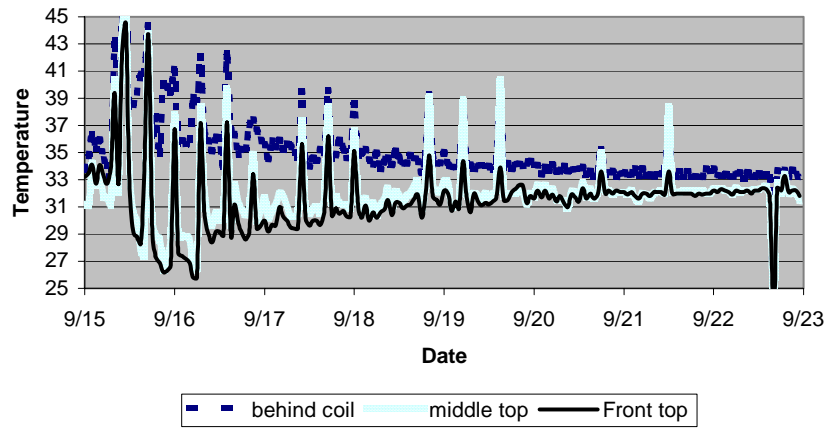
### Quality issues potentially related to storage room conditions:

#### 1. Diffuse Skin Browning (DSB) on Golden:

This disorder was described by Dr. Kupferman early in 2003. It appeared to effect rooms treated with MCP and held at lower temperatures for export issues. Mid winter a unique room with DSB came to my attention. This room was a side loaded, golden room with a high rate of DSB. From behind the coils out to the front of the room was the same lot, same pick day. My theory was that rate of cooling might be important in DSB symptom expression. Behind the coil the air is slightly warmer then in front of the coils for the first week or so after closing a room (Figure 1). Fruit from across the top of the stack was evaluated for DSB. In the picture below the percent of DSB occurrence in each bin is written on the bin. The data implies a role for rate of cooling in DSB occurrence on MCP treated Golden. Effort has been made to try to repeat this sampling in other DSB affected rooms. I have a room that will come open at the end of June that has a similar stacking pattern and DSB expression. I will present those finding at the review.



Figure 1. Room thermocouple data for the above room.

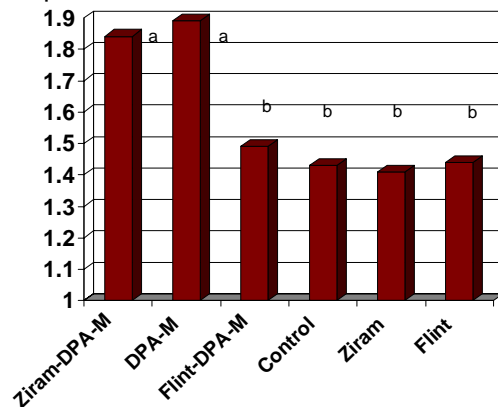


2. Internal Breakdown on Gala:  
Several late MCP treated Gala rooms have had severe levels of Internal Browning. This disorder in one room showed a significant effect of position in the room with level of internal browning. In a second room, the position of the bins allowed for a more thorough test of bin position and internal browning and no relationship was found. The internal browning typically is found in more mature large sized gala. Interestingly, there was no relationship between degree of internal browning and the presence or absence of a stem crack, a common indicator of over maturity.
3. Internal browning Fuji: At the time of writing this report I have not found a Fuji room with internal browning suitable to test the rate of cooling hypothesis on.

**Quality Issues related to increasing the amount of target fruit at packing:**

1. Granny Smith: Early harvest (9/1/03) from four different Yakima Valley orchards (700 to 1500 feet in elevation). Fruit was treated at harvest with MCP or DPA/TBZ or nothing, stored in RA and analyzed for scald and delayed sunburn every two months. This data is not yet analyzed. It will be presented at the review.
2. MCP Fuji with Preharvest vs. Postharvest Decay control and the effect on fruit quality. In cooperation with Dr. Chang-Lin Xiao. Pre-harvest fungicide vs. Post-harvest drench trial, Fuji, Borton Fruit Co.
  - Methods: Ziram or Flint @ 2 weeks Pre-Harvest and/or DPA + Mertect drench prior to storage
  - Fruit packed after 6 months in RA storage, all treatments treated with MCP. 30 bins per treatment.
  - Dr. Xiao will discuss the findings regarding decay issues in a separate report. I will discuss finding in relation to fruit quality: After packing the fruit, two boxes from each replicate (36 boxes) were analyzed for quality attributes after 7 days at room temperature. One of the quality traits measured was lenticel darkening (see below).

Figure 2. Lenticel darkening of packed fruit after 7 days at room temperature. 1 = no discoloration, 5 = severe.



The findings of this project have been and will continue to be communicated to the industry by: direct fax and email, the newly formed QC groups, the August QC meeting and the Winter Postharvest meeting.

Project Title: Baseline tracking of MCP use and fruit response  
 PI: Dana Faubion  
 Project total: 2 years: \$47,983