

**PROJECT NO:** 1594 Termination Report  
**TITLE:** Quality of Apples Shipped From Washington State  
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**REPORTING PERIOD:** 1989 - 1994  
**TERMINATION DATE:** Spring 1995

**ACCOMPLISHMENTS:**

Numerous packinglines were repeatedly sampled throughout the packing season for Red Delicious, Golden Delicious, Fuji and Gala apples. Fruit were brought back to the laboratory and evaluated both immediately and after shelf-life testing.

Data were collected from each packingline on temperature management and postharvest chemical use.

**RESULTS:**

1. Red Delicious apples were sampled from 16-26 packinglines on a regular basis from October 1989 through May 1993, with an average of 315 grower lots sampled each year. Firmness averaged 15.4 lb. and dropped 0.75 lb. after being held at 70°F for 7 days ('shelf-life test'). Firmness of fruit harvested in 1989 was significantly lower than each of the other crops. Firmness of fruit harvested in 1991 was significantly higher, both directly out of storage and after shelf-life tests.

Red Delicious fruit stored in CA, even for a short time (<90 days), was 0.6 lb. firmer than that stored in regular storage. Following shelf-life tests, loss of firmness was higher in fruit stored in regular storage than that stored in CA (1.0 vs 0.5 lb. resp.).

Changes in soluble solids and acid levels were erratic during the packing season. The general trend was for solids to rise. Postharvest chemical management systems were evaluated in each packingline.

The temperature of Red Delicious apples rose 18°F (0.5" under skin) while on the packingline. Temperature at time of tray filling averaged 60°F. The largest rise in temperature occurred during the time the fruit was in the dump tank. The water in the dump tanks averaged 79°F.

2. Golden Delicious apples were sampled from November 1990 through May 1993 from 17-20 packinglines. An average of 167 grower lots were sampled each season. Firmness levels averaged 14.0 lbs. at time of packing.

Following shelf-life tests, Goldens which had been stored in CA remained firmer than those out of regular storage (0.9 lbs. vs. 0.5 lb. resp.). Goldens stored in CA

for even a short period of time (<90 days) were 0.9 - 1.8 lb. firmer than those stored in regular storage for the same period.

Soluble solids remained constant each packing season (12.9%) and acid levels were erratic. Postharvest chemical management information was obtained from each packer.

Packingslines in which Goldens were packed without the use of a heated drier showed a rise of 9°F during packing resulting in fruit temperatures of 50°F at the tray filler. Goldens packed using a hot air drier showed a rise of 14°F during packing and a final temperature of 55°F. As with Red Delicious, the dump tank was the location at which fruit temperature rose. The water temperature was 63°F in lines not using hot air dryers and 60°F in lines using hot air dryers.

3. Fuji apples harvested in 1992 and 1993 were sampled from seven packingslines. An average of 21 samples was obtained each year. The firmness of Fuji averaged 16.6 lb. and the apples lost only 0.5 lb. during shelf-life tests. Soluble solids averaged 15% in 1992 and 14.5% in 1993. Acidity of Fujis averaged 0.427% malic acid and samples from 1993 were significantly lower than in 1992. Firmness and solids levels were higher than either Red or Golden Delicious. Acidity was higher than Reds and close to Goldens.

The temperature of Fuji apples at time of tray filling was 55°F in 1992 and 64 in 1993.

4. Gala apples from the 1992 and 1993 crops were sampled from an average of 13 packinghouses. Each year, 40 and 50 grower lots (1992 and 1993 resp.) were sampled from August through March.

It is no surprise that Gala apples packed early in the season were far firmer than those packed later. Overall, Gala apples averaged 17.0 lb., with those sampled in 1993 firmer than the those sampled from the preceding harvest. The decline in firmness following shelf-life tests was severe. Experiments done by Dr. Drake address the value of short-term CA on this variety.

Soluble solids levels in Galas averaged 13.0%, while acidity averaged 0.476% over the two year period.

Temperature management of this very sensitive variety was no better than that described for other varieties. Fruit temperature at time of box filling averaged 63°F and in some locations as high as 77°F! It appears that packers need to pay more attention to cooling apples prior to packing, reducing dump tank temperature and exploring methods to cool boxed fruit.

## PUBLICATIONS:

Kupferman, E. 1994. Report to the Industry on fruit quality and packing practices for Washington grown apples. *Tree Fruit Postharvest J.* 5(2):3-4.

Kupferman, E. 1994. Packing Red Delicious Apples in Washington State. *Tree Fruit Postharvest J.* 5(2):5-11.

Kupferman, E. 1994. Packing Golden Delicious Apples in Washington State. *Tree Fruit Postharvest J.* 5(2):12-18.

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Kupferman, E. 1994. Packing Fuji Apples in Washington State. *Tree Fruit Postharvest J.* 5(2):23-25.

Kupferman, E.; Miller, K.; Kutch, L.; and C. Parish. 1994. Quality of Apples Shipped from Washington State. *Industry Report* 38 pp.