

THE QUALITY OF WASHINGTON APPLES

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We have conducted a series of studies that look at the quality of Washington grown apples through the packing, shipping and distribution system to inform the industry and examine whether changes are necessary to ensure consumers that every apple is an edible apple. These studies are a joint funding from the Washington Tree Fruit Research Commission and Washington State University in cooperation with numerous Washington packers. The efforts of technicians Jake Gutzwiler, Chris Sater and Nancy Buchanan are greatly appreciated.

The projects can be broken down to four types of studies:

- Define the quality of apples at time of packing
- Gauge the deterioration in quality from distribution through retail
- Report on the quality of apples in multiple domestic retail locations
- Evaluate new technologies to determine quality.

The term quality used here can be defined as ‘edible quality’ as measured by the firmness, soluble solids content and titratable acidity of the fruit. Quality deteriorates from the time the apple is harvested through storage and distribution. The rate of deterioration can be accelerated or delayed by temperature, but quality cannot be improved after harvest. We examined temperature management and generally found a lack of respect for the role of temperature in preserving quality at every step in the process.

APPLE QUALITY AT TIME OF PACKING

Apples of each of the major varieties were sampled from packinglines in multiple locations throughout Washington over a 1.5-year period. Fruit temperature was observed and samples evaluated for quality on a regular basis. There was quite a range in edible quality among the fruit sampled. Histograms demonstrate range in firmness with 11.5% of the Red Delicious apples below 12 lbf at time of packing (Figure 1), 6% of Golden Delicious below 10 lbf (Figure 2) and 6.5% of Galas below 11 lbf (Figure 3).

It was disconcerting to note that the SSC in Fujis sampled were no higher than that of most other varieties, yet this variety is know as a ‘sweet’ apple. Temperatures at time of packing were 64 to 69°F on the surface of the fruit and 53 to 56 °F internally (Figure 4).

Over the 2000 packing season there was a slight decline the firmness and acidity in Red Delicious and Fuji; a marked decline in these constituents of Granny Smith; a decline in firmness of Gala and a great variability in quality of Golden Delicious.

When this data was compared with that obtained in previous surveys done by the author in 1991 to 1993, the firmness of the 2000 crop was in most cases inferior to that from previous years (Figure 5).

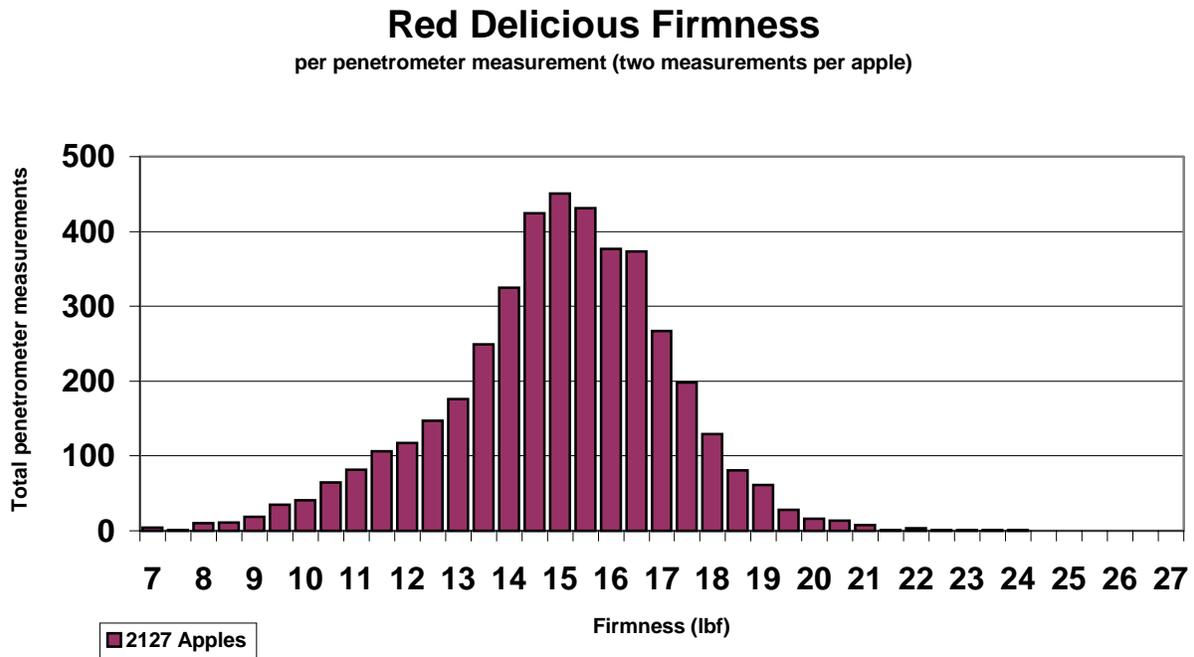


Figure 1. Red Delicious firmness (per penetrometer measurement), 2000 crop.

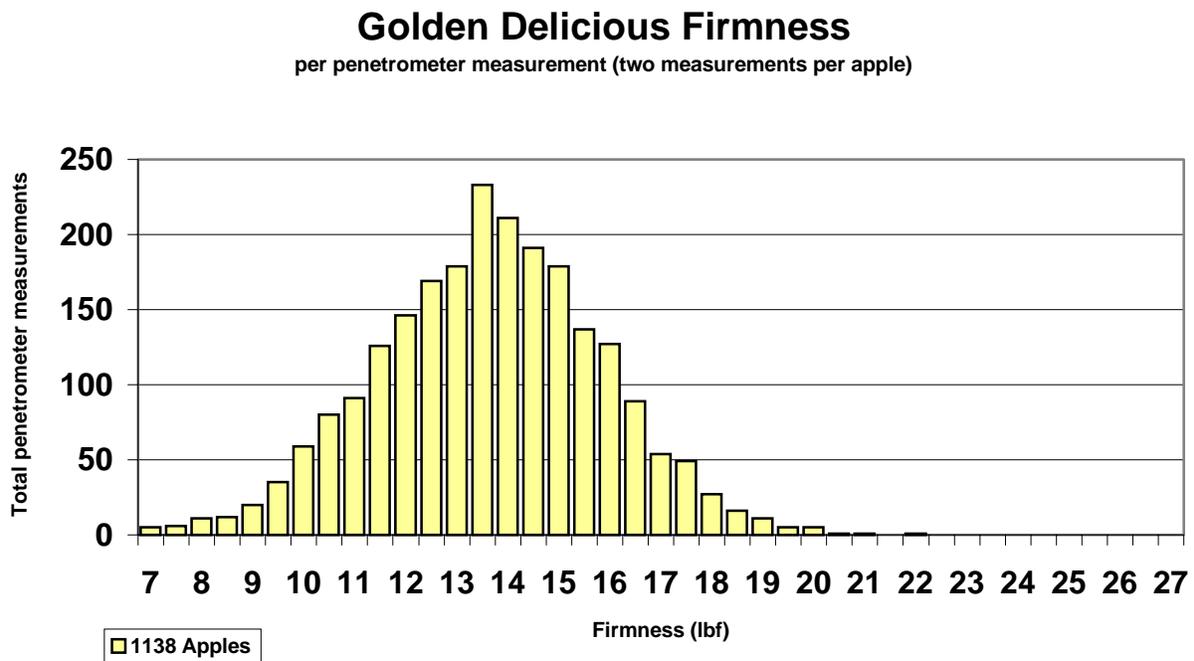


Figure 2. Golden Delicious firmness (per penetrometer measurement), 2000 crop.

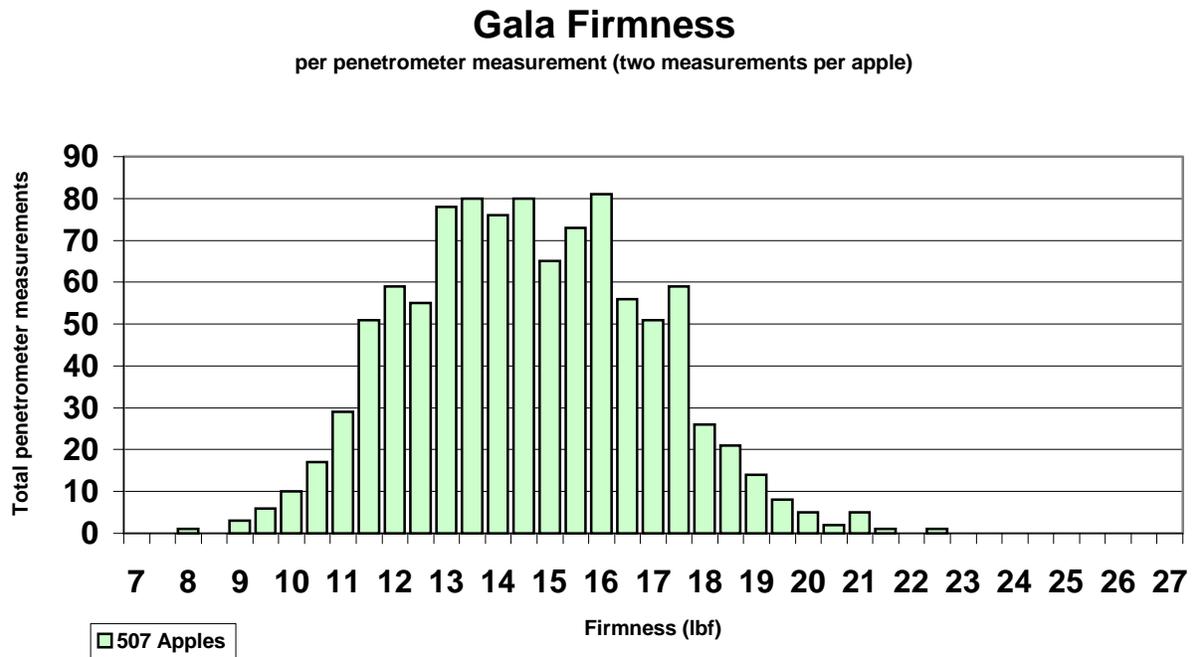


Figure 3. Gala firmness (per penetrometer measurement), 2000 crop.

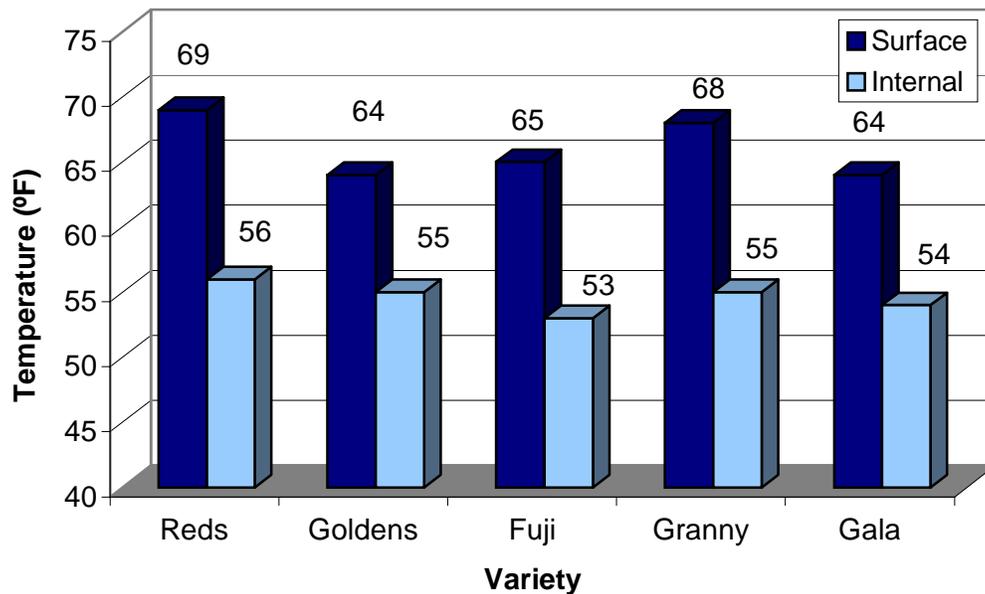


Figure 4. Average apple temperature at time of packing, 2000 crop.

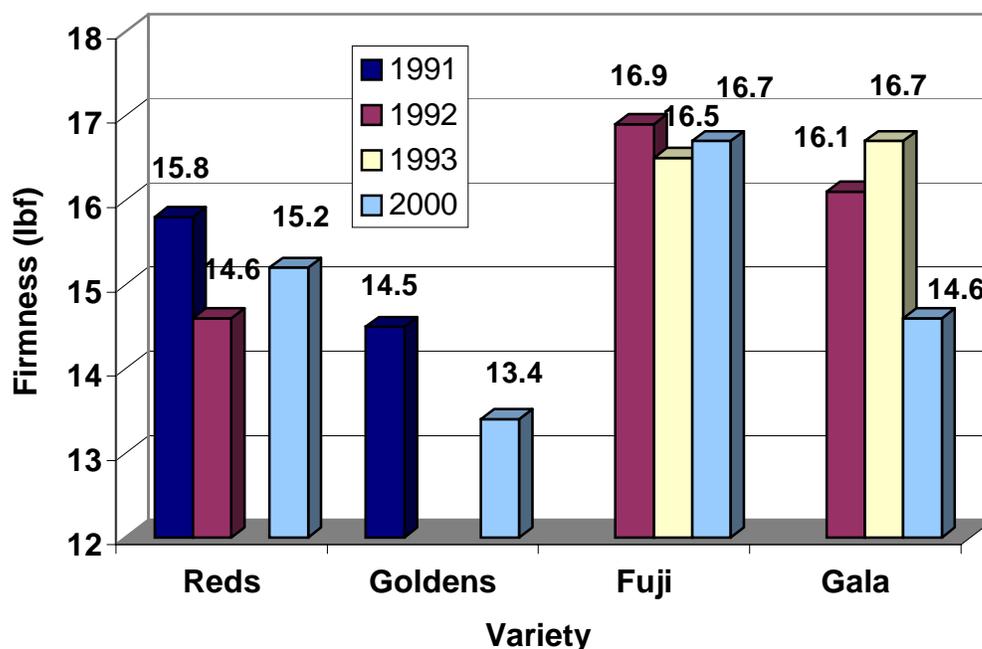


Figure 5. Historical lot average firmnesses.

DETERIORATION FROM WASHINGTON TO THE RETAIL SHELF

We followed three test shipments from Washington to Atlanta, Georgia in May 2001. The shipments consisted of Reds, Goldens and Galas that we had evaluated here, again at arrival at the distribution centers and finally on arrival at the retail stores.

We also looked at temperatures every hour using data loggers placed in each truck and in several fruit. One of the three trucks took a week to drive from Wenatchee to Atlanta while the others took three days. The ambient temperatures in the trucks held between 37 and 45 °F. From distribution center to retail store the temperatures rose to between 40 and 68 °F, depending on the distribution system. However, the fruit were moved to the store rapidly and most of the apples sold with just a couple of days. We did not find that the apples deteriorated significantly in the short time frame except for those fruit that were loaded warm.

Some of the boxes of Gala and Reds were allowed to warm to 60 °F immediately prior to shipping to simulate the temperature of fruit shipped immediately off the packing line. By the time the apples arrived at retail the warm Galas lost 1 lbf more than the Galas that were loaded cold (loss of 1.8 vs. 0.8 lbf), while warm Reds lost 0.4 lbf more than cold Reds (0.3 vs. 0.7 lbf). This should serve as a reminder than apples should be cold when loaded into the trucks.

THE QUALITY OF WASHINGTON APPLES AT RETAIL

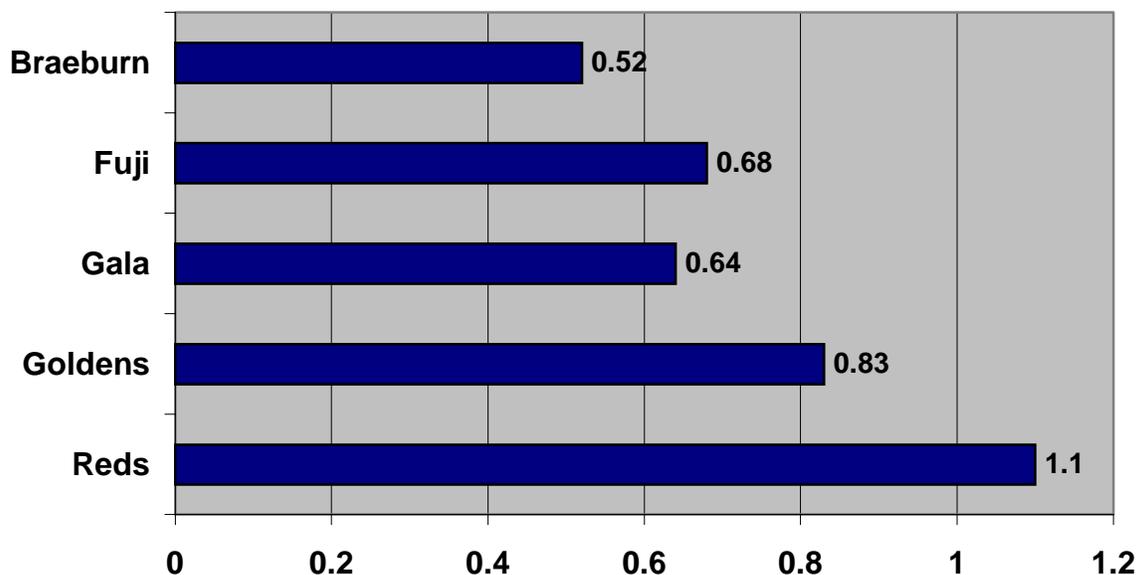
I enlisted the help of six applied postharvest scientists to survey the quality of Washington apples at locations across the United States at several times during the marketing season for the 2001 crop. The first sampling took place in January 2001.

The scientists purchased apples and evaluated them for quality and disorders. The Red Delicious apples were the least firm, the lowest in acidity and had the most bruising (Figures 6 and 7). Fruit firmness was generally very variable, especially in Golden Delicious.

The scientists have agreed to sample twice more this season and four times for next year’s crop.

	Firmness (lbf)	SS (%)	Acidity (%)
Reds	12.2 (7 to 18)	13.5 (12 to 15)	0.22 (.16 to .28)
Goldens	12.8 (8 to 18)	13.2 (10 to 15)	0.38 (.26 to .47)
Gala	13.8 (9 to 20)	13.2 (12 to 15)	0.31 (.24 to .36)
Fuji	14.9 (9 to 22)	14 (13 to 15)	0.29 (.20 to .37)
Braeburn	15.1 (10 to 22)	12.9 (12 to 14)	0.48 (.34 to .63)

Figure 6. Retail survey results, January 2001 (six locations across United States).



Average bruising on 0 to 2 scale:

0 = none, 1 = slight (total bruises < dime-sized), 2 = severe (total bruises > dime-sized)

Figure 7. Bruising at retail, January 2001 (six locations across United States).

SUMMARY AND CONCLUSION

The edible quality of Washington apples is too variable. While this is easy to rationalize (this is naturally produced crop, rather than a manufactured product), the consumer cannot be assured of buying a product of predictable quality. This range in quality varies from week to week, lot to lot and even within apples on the retail shelf. Some apple varieties are naturally more uniform, such as Red Delicious, while others are more variable such as Golden Delicious. However the Washington Apple Industry must seek to promote uniformity in the edible quality of our product as we have done in the visual quality. I think that the new instruments being developed to determine the sweetness and firmness on every apple nondestructively will provide opportunities for more uniformity.

One method of doing this would be to tighten the 'cold chain'. Apples are heated so they can accept the wax, but they may never be cooled if they are shipped too soon after packing. Our boxes have no vent holes so cooling is a challenge. Other apple industries, including New Zealand, California, South Africa have moved to vented boxes. There is a need to determine whether this system can work to the benefit of the Washington apple.

Other research is looking at the criteria consumers use when eating apples. It is very possible that Washington needs to tighten the criteria for shipment of apples. Raising the bar on firmness, sweetness and acidity may very well help the apples survive their journey through the distribution system to the consumer and may help make every apple an edible apple.