

# Apple Quality for Consumers



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There are difficult issues facing the Washington apple industry and, for that matter, many apple industries in the US and around the world, not the least of which are unhappy consumers and unprofitable returns. Many in the apple industry fail to recognize that we produce apples for just one group, the end user. The gap of understanding between producer and consumer is too wide. Often we fail to acknowledge that we knowingly follow practices along the growing and handling chain that reduce eating quality. In trying to understand the poor returns producers receive we are reluctant to accept the notion that consumers may be unhappy with our product. In psychological terms, we have been "in denial." We have not accepted the responsibility for enthusiastically promoting our wholesome product, believing that a healthy and nutritious apple should sell itself. However, with an understanding of consumer quality issues and a will to change some facets of the apple industry, we will meet the challenge of achieving happy consumers and improved returns.

The following topics are pertinent to the above issues: 1) consumer desires, 2) eating quality, 3) new variety development, 4) the discipline required to achieve high quality and 5) "variety management," a structure for change. The first two topics will be discussed in this article and will set the stage for the other topics to be addressed in a second article in this issue (pp. 57), "Apple Variety Management." The second article will focus on the changes needed to assure consumers that fruit quality will be high.

### CONSUMERS

When we refer to apple eaters as "the consumer," we imply that consumers are a homogeneous lot. However, it is clearly not true that "one apple fits all." Developing a variety for "the consumer" is as ridiculous as producing just one type of automobile for "the driver." Today consumers may prefer red, yellow, green or bicolor apples with flavors varying from sweet to tart. Any attempt to develop new apple varieties must take into account the diverse preferences of apple eaters. This is not only true in US markets but also in markets around the world. Today buyers of apples expect to have a choice and in most instances are willing to pay a premium for something new, different or unusual and, believe it or not, a premium for something enjoyable to eat.

Only recently have we read in popular tree fruit publications comments such as "Consumer is No. 1" (Floyd Zaiger, Zaiger Genetics, *Fruit Grower*, October 2000) and "Consumer confidence is everything" (Laurie Sanders, Editor, *Fruit Grower*, December 2000). Dr. Desmond O'Rourke notes that "... markets are people with money and desire" (*Deciduous Fruit Grower*, October 2000). For many, and perhaps most North American consumers, money (the price) is not the critical issue, it is their desire to purchase apples. For the people who purchase apples desire is first of all for a delightful eating experience but also desire for something healthy, something different and for a choice, a variety of varieties. Belatedly, the apple industry has come to appreciate the critical importance of consumers and their desires.

Orchardists try to produce the quality of fruit (large, red, tippy) the warehouse requests and is willing to pay for. The ware-

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house delivers the type of fruit the marketer requests. Marketers push the kind of fruit quality they believe the retailer wants. Along this path little attention has been given to what consumers want (crisp, juicy, flavorful). Is it not ironic that during the current crisis of profitability in the apple industry many orchardists believe that they are the only ones suffering, not consumers?

For decades satisfying consumers was not the number one priority. We know this because there are too many complaints about apples not being crisp, juicy, flavorful or fresh. We also know that consumers are not the number one concern because the rewards paid to orchardists are not based on what consumers want. We have a classic disconnect. There is a communication gap. Consumers are complaining but producers are too far removed from the end user, separated by the warehouse, the marketer and the retailer, to hear the concerns. Only on-farm retailers are close enough to consumers to listen and hear what they want and to react quickly through a change in their handling practices, product mix and fruit quality.

Everywhere we read about the current world apple crisis. There is no doubt that growers are not receiving a satisfactory income for their fruit. Many have suggested the reason for this crisis is that "we produce too many apples . . ." This is certainly not the whole problem and, in fact, it may not be the most important factor. What is perhaps more correct is that "we produce too many apples of the kind consumers do not want."

Dr. Desmond O'Rourke put it this way, "The demand for quality apples is still not being met" (*Fruit Grower*, November 2000). In terms of eating quality, we have often grown the wrong apple varieties or delivered apples of poor quality, or both. In Washington we have a wonderfully efficient production machine with ample water, abundant sunshine, fertile land and grower expertise. In spite of these blessings and advantages, we do not produce enough of what consumers want.

### EATING QUALITY

It is appropriate to ask what is apple fruit quality but perhaps unrealistic to expect a definitive answer. If asked to define fruit quality, a grower, warehouse manager, marketer or retailer will, based on his or her perspective, provide a different answer. Characteristics such as fruit color, size, shape, freedom from blemishes and firmness would be included in their definitions. Appearance features would predominate. But in reality it is only end users, consumers, who can really define fruit quality, which for them is eating quality. For the purposes of this discussion, the terms eating quality and consumer quality are synonymous. Consumers describe eating quality with adjectives such as **crisp, juicy, flavorful** and **fresh**. Consumer *eating quality* does not include color, size, shape or finish.

### FRUIT QUALITY DECLINE

From the time an apple is picked at the optimal stage of ripeness, its quality begins to decline. Eating quality is high when consumers are the harvesters and they immediately eat the product. However, this is not practical with hundreds of millions of boxes produced each year necessitating handling, long periods of storage and extended retailing.

Many factors can contribute to a decline in eating quality of apples. At each stage in the handling of fruit, from growing, warehousing, transporting and retailing, there is a possibility that eating quality will decline (Fig. 1). Fruit quality can begin to decline in the orchard if harvest maturity standards are not followed. When we use too much nitrogen to increase production, harvest too early to achieve higher prices and grow fruit in the shade (fruit of color sports turns red even in the shade), we knowingly make a significant contribution to the decline in fruit quality. In cold storage, particularly long-term CA, fruit firmness, flavor and freshness decline. Fruit quality declines in the hands of retailers and consumers if fruit is not refrigerated or handled with care. The slope and linear aspect of the decline line (Fig. 1) are clearly generalizations. The impact of each contributor (grower, warehouse, retailer, etc.) to the decline in eating quality is not equal and varies from one fruit lot to another. The quality decline occurs with all varieties although the rate or extent of decline, as

seen in Figure 1, is not the same with all varieties.

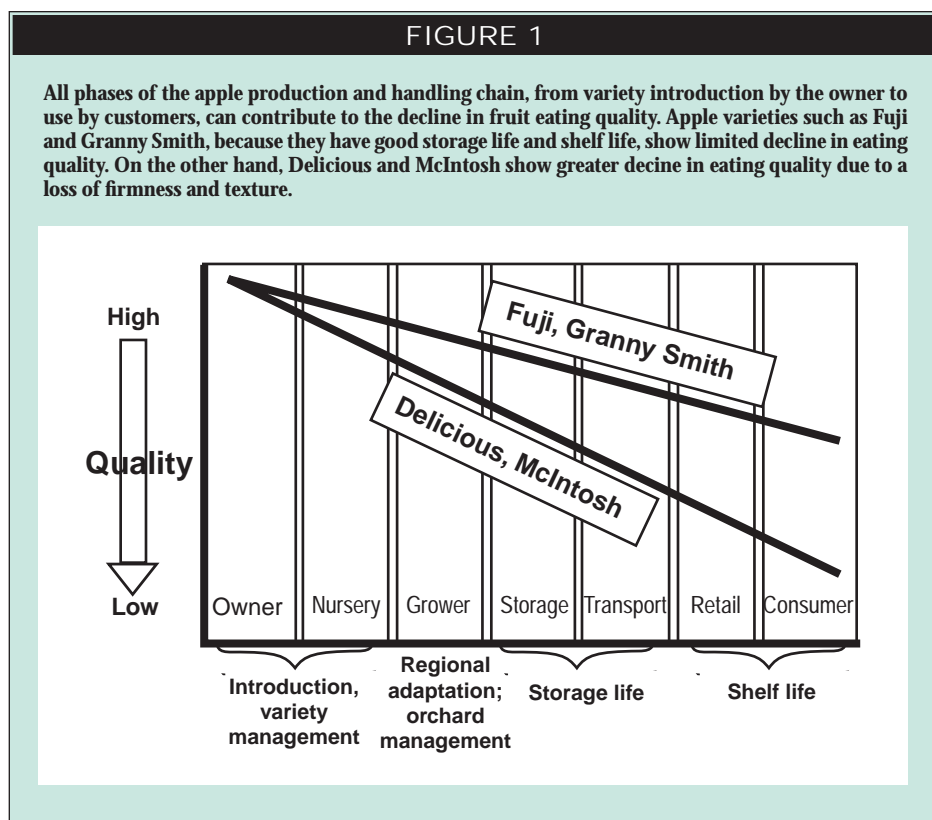
It takes discipline in the orchard, in the warehouse, at retail and knowledge by the purchaser to ensure that fruit quality declines as little as possible.

### FRUIT COLOR SPORTS

It may not be obvious but the owner of a variety and the nurseries who propagate and promote varieties and sports also make a significant impact on eating quality. The variety owner and nurseries influence consumer quality by having control over the introduction of sports, particularly fruit color sports. The discovery and propagation of limb sports (mutations), which involve a change in a single character (usually increased red color) while maintaining all the other characteristics of the original variety, have revolutionized the apple business.

In my view, a major factor in the decline in consumer (eating) quality has been the widespread planting of color sports. However, it is not a surprise that color sports have been widely adopted as they have benefited nurseries, packers, marketers and retailers as well as growers. Fruit color sports dramatically improve packouts and therefore returns to growers. It is ironic that almost everyone seems to benefit except consumers.

There are several ways in which fruit color sports have contributed to declining consumer quality. Fruit of color sports can



be fully red weeks before internal quality has reached optimal levels. With color sports fully colored fruit can be picked early before it has sufficient soluble solids, juiciness and overall eating quality. When this fruit is marketed to take advantage of high prices on the early season market, consumers are the losers. Fruit of color sports often develops full color in the shade zones of the canopy. Fruit grown in the shade is always less sweet. Fruit of color sports will achieve full color when grown at higher than normal nitrogen levels. High nitrogen levels contribute to high production but have a detrimental effect on eating quality. Fruit of color sports often can be harvested in a single picking. This contributes to variability in eating quality.

Color sports have been touted as having higher quality, perhaps referring to greater red color. I am not aware of a single case where the eating quality of newly released color sport was actually compared objectively with the eating quality of the original variety. Without regard for consumers, the owners of sports and nurseries have pushed color sports onto the market as rapidly as possible to provide new and unique products, to improve grower packouts and to please marketers.

There has not been an incentive to reject color sports. In fact, the incentive, price returned to the grower, has encouraged growers to plant color sports with little regard for eating quality. To resolve the color sport issue and to help refocus attention on consumer quality, a new paradigm “variety management” will become an important facet of the apple industry (see “Apple Variety Management” in this issue).

#### FRUIT QUALITY TRAITS

Varieties differ in their appeal to consumers. What are the characteristics of

some varieties that contribute to their superior eating quality? **Crispness** is the most sought after trait with apples. A crisp variety is one with firmness and a cracking texture. The flesh must crack easily when bitten into and, following chewing, the tissue must melt and disappear quickly. The opposite of crisp is tough and chewy. Apples that require endless chewing are unpleasant to eat. Better than average crispness can be found with optimally harvested Fuji and Honeycrisp. **Juiciness**, the second most important trait, is what one expects with a ripe peach or Asian pear and finds in some apples. A fully ripe Fuji with some watercore is juicy. The opposite of juicy is dry. **Apple flavor** has two aspects, the sweet/tart (Table 1) and the aromatic components.

Sweet apples high in soluble solids, for example Fuji, are preferred by some consumers but are considered to lack character by others. Tart apples, for example Granny Smith, Elstar and Braeburn, are preferred by some. Many consumers fall in the middle, preferring a sweet/tart balance, similar to that found in Golden Delicious, Jonagold and Gala. The aromatic aspect includes apple flavor or other fruit flavors. Most consumers, if the aromatic aspect is present, find it very pleasing. Without the aromatic flavor, apples are considered bland and without character. Taste preferences vary around the US and in foreign markets.

**Freshness** is the fourth aspect of consumer quality. Freshness decreases as the length of time from harvest to eating increases. The majority of consumers do not know how old an apple is when it is purchased. They do, however, equate a lack of freshness with soft texture, shriveling, dryness and a stale taste (absence of acidity and aromatic flavors and the presence of off flavors). Northern hemisphere consumers do not generally appreciate that from April through August apples imported from the southern hemisphere are 6 months fresher than apples produced in the northern hemisphere. As consumers learn this and supplies of southern hemisphere fruit increase, consumers will increasingly choose the fresher apples.

A second aspect of freshness is the browning of sliced apples. For apples to become a mainstay in fresh slice packaging (fresh cut), apples with nonbrowning characteristics will have a distinct advantage. They would require less treatment with nonbrowning agents such as ascorbic acid (Vitamin C). Not all varieties turn brown quickly and there are some varieties and selections that do not brown at all.

These will have an advantage in terms of developing a fresh cut industry for apples.

In describing consumer “eating quality” (crisp, juicy, flavorful, fresh), I did not include color, size, shape and finish. Although consumers may have a preference for a particular color, size or shape, this preference has little relationship to eating quality. Some appearance factors may be important to consumers, e.g., yellow background color that may be associated with ripeness (green with immaturity) or a striking red color appreciated for its beauty in a fruit basket. However, eye appeal factors are generally not associated with eating quality. More and more consumers are choosing apples on the basis of internal quality rather than appearance. The old adage that consumers “buy with their eyes” seems to be less true each day. When consumers make significant purchases of Braeburn and Fuji which, by most accounts, are not as pretty as other varieties, we can be certain that internal quality is becoming more important than appearance.

We know what consumers desire above all else, crisp, juicy, flavorful and fresh. However, along with these eating characteristics, they want the opportunity to select from a range of varieties with different characteristics.

To meet the needs of consumers we must first of all develop new varieties with the desired characteristics. We must also develop the discipline as an industry to prevent the fruit quality decline. Third, we must develop a scheme of “variety management” that will enforce discipline and ensure high fruit quality for consumers. These three topics will be the focus of a second article in this issue (pp. 57), “Apple Variety Management.”

TABLE 1

Typical soluble solids and acidity levels for fruit of 9 leading apple varieties grown in Washington.

Variety	Soluble solids (%)	Titrateable acidity (% malic)
Braeburn	12.5	.65
Delicious	11.0	.20
Fuji	14.5	.30
Gala	13.5	.35
Golden Delicious	13.5	.35
Granny Smith	13.0	.70
Jonagold	13.0	.50
Pacific Rose	14.5	.40
Pink Lady	14.5	.60