

Apple Variety Management



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Presented at the Washington State Horticultural Association conference, December 3-6, 2000.

In an earlier article in this issue (pp. 54), “Apple Quality for Consumers,” the fruit quality desires of consumers were discussed. To consumers, crisp, juicy, flavorful and fresh are the key eating quality traits. Unfortunately there can be a significant decline in eating quality from the time apples are harvested until the time they are eaten by consumers.

This article focuses on the changes needed in the apple industry to assure consumers that eating quality will be high and will be the number one priority of our industry. The first step will be to develop unique varieties with very high eating quality. The second step will be to understand that standards for fruit quality must be established and that discipline will be required to meet the standards. The third step will be to apply the discipline through a new paradigm “variety management.”

NEW VARIETY DEVELOPMENT

There will be incremental improvement in consumer eating quality as new varieties are developed. Improvements in consumer quality will be achieved in two ways: 1) with traditional apple breeding and 2) with genetic engineering. Traditional breeding, the hybridization of parents and the selection of promising seedlings, can produce distinctive and innovative varieties. On the other hand, genetic engineering generally produces a single change, caused by a single gene, in an existing variety. Improvements in eating quality will be achieved primarily through traditional breeding. Fruit quality traits such as juiciness, crispness and flavor are each controlled by many genes. With genetic engineering it is relatively easy to

transfer a single gene but very difficult to transform traits controlled by many genes. It is also easier to isolate single genes for transformation than to isolate the large number of genes that influence a fruit quality trait. It is therefore not likely in the near future that genetic engineering will play a major part in improving apple eating quality traits such as crispness, juiciness and flavor. However, the transfer of a gene for ethylene suppression and for nutritional factors could enhance consumer quality (see below).

Developing new apple varieties that are crisp, juicy and flavorful will not be enough. These traits must be combined with a storage life of at least 6 months and a shelf life of at least 10 days. It appears there will be less need for the up-to-12-months of long-term CA storage. In our markets from March through August, fruit from the southern hemisphere will be competing with northern hemisphere fruit. Consumers will develop a greater appreciation of freshness as they learn that southern hemisphere fruit is 6 months newer. CA storage still will be critical to the apple industry to retain firmness but the competitive advantage of long-term CA will decrease.

The decline in fruit quality from harvest by the grower to consumer’s kitchen counter is much more rapid with varieties such as Delicious and McIntosh than it is with Fuji, Granny Smith or Pink Lady®. The late Grady Auvil introduced Granny Smith and Fuji to the Washington industry. His explanation was characteristically Auvil—he knew consumers would enjoy eating them. Long before others in our industry, he appreciated that our products must provide a pleasing eating experience

Producers should be rewarded for eating quality factors such as soluble solids, crispness and juiciness.

over a long marketing period. Grady Auvil knew that out of storage both Fuji and Granny Smith retained their firmness and did not become soft and mealy like Delicious or McIntosh. He had no doubt consumers would appreciate varieties which had storage life and shelf life. His understanding of what consumers would enjoy was also evident when he introduced the Rainier cherry, a product that provides one

of the greatest fruit-eating experiences ever. Perhaps if our industry had the same appreciation for the interests of consumers, the current apple crisis would not exist. Grady Auvil stopped planting Red Delicious over two decades ago.

If we are to meet the desires of consumers, new introductions will need to be crisp, juicy and flavorful in addition to having storage life and shelf life.

APPLE GENETIC ENGINEERING

How important a role will genetic engineering play in the development of new apple varieties? There are more than 10 laboratories worldwide working to develop genetically engineered apple varieties. Attempts are being made to transfer genes into existing varieties for many traits including fire blight resistance, apple scab resistance, resistance to codling moth and other insects, stress tolerance, ethylene suppression, fruit nonbrowning and improved nutrition. The first four traits do not relate to fruit quality and therefore may be of little direct interest to the consumer. However, environmentalists and consumers concerned with food safety should be pleased as fewer chemicals will be required to control insects and diseases. Ethylene suppression similar to that in the Flavor-Saver tomato will have the effect of delaying fruit softening. The fruit nonbrowning characteristic will be of benefit for fresh-cut apples and improved nutrition, for example increasing levels of Vitamin C to those of oranges or strawberries, will benefit consumers. As mentioned earlier, improving fruit quality traits such as flavor, crispness and juiciness will be very difficult using genetic engineering.

There are significant challenges to developing genetically engineered apple varieties. It can take 10 years from initial transformation until testing is complete and commercialization is possible. Adding fire blight resistance to Gala or scab resistance to McIntosh will be significant improvements for producers. Will a variety like Gala, which is very popular today, still be as popular and profitable and widely planted 10 years from now? An additional concern with single gene disease resistance is the distinct possibility that resistance could break down in commercial orchards.

Another concern is whether the transformation occurs with a cell of the original variety or with a cell of a more recently discovered fruit color sport. With color sports the mutated tissue is usually a layer of outside cells surrounding the inside tissue of the original variety. The mutation does not

occur in all cells of the tree. A plant such as a fruit color sport with cells of more than one genetic type is called a chimera. The transformation process begins with a single cell and it is usually not possible to predict if the cell is of the original tissue or mutated tissue. Therefore, predicting whether the transformed variety will have the fruit color of the original variety or the color sport is not possible. Will a transformed fire blight resistant Gala, which has fruit color of the original Gala (light red striping over a yellow background), be able to compete with the currently grown fully red color sports? As long as growers are rewarded for fruit color, it is doubtful that apples with the original Gala color will be profitable.

Transformed apple varieties are restyled commodities, not unique products. Genetically engineered varieties are not distinctive. Consumers and, for that matter, marketers and retailers will not recognize them as new products. Only time will tell if a transformed commodity variety will be as profitable for growers as new unique varieties (niche products) from breeding programs.

A major concern with genetically engineered apples will be the acceptance by consumers of GMOs (genetically modified organisms). In Europe, 70 to 80% of consumers would not choose to purchase a genetically engineered food. Resistance to GMOs has increased in North America. Unless GMOs are shown to have improved quality, e.g., are more nutritious, or result in less pesticide use, and unless food producers are proactive in terms of educating the public, GMOs may not become widely accepted.

Genetic engineering of apples can be an expensive procedure. Costs include hiring the expertise, the acquisition of the genes and the up-to-10-year time period required to produce the transformed variety.

THE CHALLENGE

To achieve a variety's highest consumer quality, the sweetest, juiciest, most crisp and freshest possible, has always been a challenge for all segments of the apple industry. It has been challenging because there are so many players that contribute to consumer quality. The grower, warehouse and retailer all have an influence on eating quality. Getting these diverse groups all on the same page, that is to put consumers first, has been difficult. Achieving high consumer quality is the responsibility of many individuals and organizations in a complex industry. For a significant segment of our industry, it is not an exaggeration to say that achieving

a variety's highest consumer quality has proved elusive. It has proved elusive because of an industrywide discipline shortfall.

Not all fruit grown and packed in Washington has a fruit quality problem. In fact, the majority of fruit is of high quality when it reaches the consumer. However, there is enough fruit of poor quality presented to consumers that they have become wary and consider not purchasing a particular variety, not purchasing an apple from Washington or not purchasing apples at all.

DISCIPLINE SHORTFALL

For a large, diverse and complex industry it is a challenge to set up standards for fruit eating quality and to resolve to reach the standards. It is not surprising that there is a discipline shortfall in our industry. We have fallen short of satisfying consumers by: 1) the early marketing of unripe fruit; 2) picking fruit for long-term CA too early to achieve the highest consumer quality; 3) storing fruit too long; 4) shipping fruit that is too soft and too low in soluble solids; 5) planting color sports of unproven quality and 6) rewarding growers for appearance rather than internal quality of the fruit. If satisfying consumers is our number one concern, we will need industrywide discipline because each of the factors listed above can have a negative impact on crispness, juiciness, flavor and freshness.

One issue alone, grade standards, prevents the apple industry from providing what the consumer really wants, a pleasurable eating experience. Unfortunately it is not likely that growers will provide what consumers want as long as they are paid on the basis of red skin color and continue to plant the next redder sport (see earlier article, "Apple Quality for Consumers," pp. 54). Maintaining grade standards based on % red skin color is and has been a mistake, an idea whose time has passed if we wish to provide what consumers want. Producers should be rewarded for eating quality factors such as soluble solids, crispness and juiciness. With rewards to the orchardist based on eating quality, surely consumers will get what they want.

VARIETY MANAGEMENT

A new paradigm, *variety management*, will emerge. It will provide the discipline to achieve 1) controlled scarcity by limiting acreage and production and 2) global quality assurance to provide superior eating quality. In short, variety management is a scheme for controlling production and fruit quality. It will spread the risks and rewards

of producing, handling and selling apples among the variety owner, producer, marketer and retailer.

Who will be the manager? The owner of the variety will determine the appropriate management scheme. The owner may be a public or a private entity, and the owner may designate a management company.

How will the variety be managed? A franchise or a "club" will be established for each new variety or group of varieties. For growers and warehouses to join the club, there will be membership requirements. Growers and handlers must agree to production controls, specific orchard management practices, handling and storage techniques, marketing schemes and management fees. Membership requirements will constitute the **discipline** necessary to manage the variety so that all partners, owners, growers, warehouses and marketers, share the risks and profits. Today growers shoulder a disproportionately large share of the risks.

What will be involved in variety management? The owner will establish limits on acreage and production. Membership will be limited and acreage and production will not grow out of control. The owners will permit plantings only where the variety is adapted. For example, a late maturing variety would not be grown in the Okanogan Valley of Washington or in British Columbia where the growing season is not long enough for the variety to achieve its optimal quality. Cool season varieties will be grown only in the cooler districts where they will obtain their best quality. Variety managers will develop complementary northern and southern hemisphere production, assuring a higher level of freshness year-round. Fruit

will be marketed for a 6-month period, thus reducing the need for long-term CA storage and the reduction in eating quality associated with long-term storage. The owners of varieties will establish worldwide quality assurance programs for both growers and handlers of their varieties. Fertility levels, maturity indices and CA storage regimes will all be monitored and maintained within guidelines.

Owners will develop, introduce and manage unique niche varieties. They will be products, not commodities. Strong marketing programs will be developed to take advantage of the uniqueness of varieties. The marketing of these varieties may be limited to one or a very few marketing groups to reduce competition between marketers.

With variety management, owners will establish a system of production royalties. Owners must achieve a return on their investment for developing the new varieties and must also receive funding for future development of new varieties. Production royalties are directly related to the importance of the variety. Tree royalties, on the other hand, reflect only the interest in planting the variety and will not provide a return on investment proportional to the importance of the variety.

The owner of the variety also will own all mutations, termed "essentially derived" varieties, and in particular fruit color sports. By limiting the introduction of color sports the owner will have a significant positive impact on fruit quality. It will not be in the interest of the owner to produce fruit of inferior quality. In fact, color sports will detract from the original uniqueness of the variety and could fall

outside a trademark designation. Today's reasons for adopting color sports will be of little interest to the owner, grower, handler and marketer of new varieties.

An important requirement of the franchise or club concept of variety management is that the product must be unique and have high consumer quality. Mediocre varieties will not receive the returns necessary to compensate all players in the chain.

CHANGING OUR FOCUS

The Washington apple industry is not a leader in the development of new varieties or in variety management. Our industry must 1) become a leader with new products, that is, unique varieties, 2) develop the discipline to achieve high consumer quality and 3) adopt aggressive marketing practices with the unique products. If we are not active in these three areas, we will not be growing apples profitably. As Einstein noted, "The ultimate in insanity is to keep doing the same thing and expect different results."

SUMMARY

With new apple varieties, there will be incremental improvement in consumer quality, achieved primarily through traditional apple breeding. There will be a large number of unique niche varieties produced that will be products, not commodities. GMOs with improved fruit quality likely will not be commercialized in the next 8 or 10 years. "Variety management" will fundamentally change the varieties we grow and how we grow, handle and market them.