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New Diversity in Table Grapes: A Commercial Perspective

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There is a growing trend toward private cultivars and controlled release grape (*Vitis* spp.) cultivars. Growers find there is a competitive advantage over publicly available cultivars which rapidly become overplanted commodities after release. There are now at least six private grape breeding programs in California.

Table Grape Production Challenges

Production of seedless table grapes requires some of the most technically involved and labor intensive operations of any horticultural crop. Production costs, yields and prices are the factors that affect a grower's profitability. The objective of table grape breeding programs is to positively affect one or more of these variables. This can be done by producing new cultivars which reduce growing costs, have higher yields and have value-added traits such as special flavors, shapes or sizes which will command higher prices.

Typical cultural practices include dormant pruning, bloom thinning with gibberellic acid, berry size enhancement using additional gibberellic acid applications and girdling, shoot suckering to decrease the number of clusters and allow more light into the vine, cluster tipping to produce a better shaped bunch, cluster thinning to control crop load, removing leaves to allow sunlight into the canopy to enhance color and flower bud formation, Ethrel application on colored grapes to enhance color, and disease control, especially for mildew diseases. All of these cultural operations can be affected by breeding for traits influencing them.

Breeding Objectives

Production traits. Traits affecting production costs include berry size and uniformity, cluster tightness, bunch size, bunch shape, disease resistance and vine growth habit. All of these traits can be manipulated with varying difficulty. Open growth habit can be found in many of the interspecific French hybrids and in some pure *Vitis vinifera* L. cultivars. Deeply lobed leaves such as those of 'Ciotat' and some Asian species allow more light to penetrate into the canopy and may benefit color and flower bud formation.

The ability to set, size and mature a large crop is essential to the success of a new cultivar. Sources for yield ability include some French hybrids, and 'Christmas Rose', 'Flame Seedless', and 'Ruby Seedless'.

Fruit quality traits. Traits associated with fruit quality include berry size, skin color, firmness, skin texture, flavor, berry attachment to the rachis, and storage ability. Many older grape cultivars required application of $\geq$ 40 ppm gibberellic acid to increase berry size to commercially acceptable sizes. New selections with naturally large berries are now being released. These cultivars require little or no gibberellic acid. Consumers prefer crisp textured berries with fairly thin skins and unnoticeable seed traces. Many colored grapes will not properly color in hot weather. Such cultivars require application of Ethrel to enhance color. Treated fruit often suffer loss of firmness and reduced shelf life. One can select types that color well both in high temperatures and in low light. Cultivars with *labrusca* or muscat flavors combined with seedlessness, crisp textured flesh and thin skins have potential to expand the grape market.

Firmness is another important trait for all breeding programs. Seeded germplasm used for its very firm or crisp texture include

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'Christmas Rose', 'Flame Tokay', 'Hakiki', 'Itchkimar', 'Red Malaga' and 'Shtur Angur'. Seedless types used for firmness include 'Autumn Royal', 'Crimson', 'Flame Seedless', 'Princess' and 'Rocky'.

Seedless mutations have been found in a number of old landraces with 'Sultanina' ('Thompson Seedless') being the most widely planted. 'Sultanina' along with 'Beauty Seedless', 'Malta Seedless', 'Black Monukka', 'Kara Dzhighigi' and other 'Sultanina'-like cultivars have served as the germplasm for nearly all the seedless cultivars bred so far.

Market window. Early ripening is an important trait because the earliest fruit often brings premium prices. Many early ripening parents have served as parents to produce improved selections. A few notable seedless parents include 'Beauty Seedless', 'Flame Seedless', 'Perlette', 'Prime', and 'Sugraone'. Seeded parents include 'Cardinal', 'Kozma Pal Muscatoly', 'Tavria' and 'Volta' grapes. Late ripening types can also command premiums. 'Autumn Black', 'Barlinka', 'Calmeria', 'Emperor', 'Autumn Royal', 'Autumn Seedless' and 'Crimson' have been used as parents for late ripening types.

Unique shapes. Development of high quality very elongated ladyfinger grapes would provide consumers with a strong visual key to distinguish special flavors and superior quality cultivars. Ladyfingers can be developed by intercrossing elongated types and selecting more extreme forms. Most of the existing ladyfingers are older seeded cultivars such as 'Aurora', 'Baladi', 'Dias-El-Anz', 'Gungargoon', 'Itchkimar', and 'Olivette Blanc'. Eastern USA breeding programs have used 'Lady Patricia' successfully. These are crossed to fairly elongate seedless types like 'Crimson', 'Fantasy', and 'Centennial'.

Fruit size. Breeding for larger seedless types has long been a major goal of many breeding programs. Professor Olmo at Univ. of California (Davis) used 'Hunisa', 'Husseine', and 'Nocrea' and created 'Redglobe' which itself is being widely used to produce large offspring. The USDA in Fresno, Calif., produced 'Blackrose' and 'Autumn Royal' which have been crossed to seedless types to produce large seedless types such as 'Fantasy' and 'Princess'. Other programs have used large fruited seeded types like 'Ab Jusht', 'Khorestini', 'Monnaka', and 'Nimrang'.

Unique flavors. Muscat flavor is prized in some regions like Europe. Very few seedless muscats exist and they have serious deficiencies. A large crisp seedless muscat should have a good market. Seeded parents often used for muscat flavor include 'Italia', 'Iviar Oliver', 'Johanna Mathiasz', 'Kozma Pal Muscatoly', 'Muscat of Alexandria', 'Sauvis' and 'Victor'. Seedless types having some muscat flavor include 'Diamond Muscat', 'Mystery', 'Perlette', 'Princess' and 'Sugraone'.

Breeding for *labrusca* flavor has been conducted mainly in the Eastern USA, Japan, Korea and other regions where pure *vinifera* grapes are poorly adapted. There is a significant market for *labrusca* grapes in these regions. Existing cultivars are often seeded with slipskins and are quite acidic. Some seedless types have been released but they are small, often soft and have large seed traces. Recombining the 'Concord' type *labrusca* flavor from these grapes with the large crisp seedless *vinifera* cultivars promises to yield a whole new class of grape products. Sources of *labrusca* flavor include 'Jupiter', 'Neptune', NY 78.0804.01, 'Reliance', 'Seneca', 'Tomcord' and 'Venus'. Tetraploid *labrusca* types from Japan such as 'Kyoho' have also been used.

Disease resistance. Powdery and downy mildews are serious diseases in many regions. In dry climates like California only powdery mildew occurs. Many American and Chinese *Vitis* species exhibit a high degree of resistance to one or both of these diseases. Many of the French hybrids are quite tolerant and have much better fruit quality than the original species. Some parents that I have used include 'Galibert 256-28', 'Illinois 796.1', 'Plantet', 'Rosette', 'Verdelet', and

'Villard Blanc'.

Other germplasm widely used as parents especially in regions outside the USA includes 'Afus Ali' ('Zeni') ('Dattier'), 'Alphonse Lavalle' ('Ribier'), 'Bien Donne', 'Dabouki', 'Dauphine', 'Favorit', 'Jantar' ('Yantar'), 'Muscat Hamburg', and 'Super Ran Bulgar'. This is by no means a complete list and of course much other valuable germplasm has been used for specific traits like cold hardiness.

DO ANTS AFFECT THE COMMUNITY STRUCTURE OF APHIDS ON APPLE?

Minarro et al. conducted field surveys and one experiment to test the hypothesis that ants play a role in structuring the aphid community on apple. Ants tended rosy apple aphids and Aphis spp. but not woolly apple aphid colonies. In the field, rosy apple aphids performed better in the presence of ants, and no effect was observed in Aphis spp., but in the manipulative experiment, the reverse was true. Populations of woolly apple aphids were reduced in the presence of ants. Ants also had a significant negative effect on the abundance of natural enemies of aphids. Ants also seemed to benefit Aphis by reducing competition with other aphid species. Considering all the aphid species together, ants had a net positive effect on aphid abundance, which was consequently considered harmful for the plant. The authors note that their results give support to the observed pattern that ants can benefit tended aphids while simultaneously reducing the abundance of untended herbivores. Paraphrased from M. Minarro et al. 2010. Ecological Entomology 35(2):206-215.