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'Golden Delicious' Progeny: 21st Century Apples

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Abstract

There is no perfect apple cultivar for all consumers: 'Golden Delicious' and its progeny may be the closest to perfection. Over its modest history (less than 100 years) the 'Golden Delicious' apple has been recognized for its superior quality, good storage ability and ease of management. Apple breeders have used it in their programs over the past 70 years with modest success. However, in the last two decades, during what might be called a cultivar *"revolution"* most new accepted apple cultivars have 'Golden Delicious' as a parent. Included in this list are 'Crispin' from Japan, 'Gala' from New Zealand, 'Jonagold' from the United States and 'Elstar' from the Netherlands. In addition, many new disease resistant cultivars contain 'Golden Delicious'. The objective of this review is to briefly assess the contribution of 'Golden Delicious' to the apple cultivar revolution.

History

The precocious apple seedling with large yellow apples which became *"the mother of millions of such trees throughout the globe"* (3) was first observed by Anderson Mullins in Clay Country West Virginia in 1905. After nine years observation of his find Mullins sent the golden fruit, with a spicy flavor, to Stark Brothers Nursery who introduced it in 1914 as 'Golden Delicious' (3). It took only five years for the outstanding quality of this new cultivar, 'Golden Delicious,' to be recognized and to receive the Wilder medal from the American Pomological Society. Today it ranks first as the most widely planted apple in the main fruit growing areas of the world.

The Parent and the Progeny

Worldwide apple production of 'Golden Delicious' is about 39 million MT (1). Europe is the leading apple growing continent with 25% of world production and with France, Italy and Germany accounting for 75% of this production. Within Europe the main cultivar grown is 'Golden Delicious' comprising 33% of the crop (11). In the United States 'Golden Delicious' accounts for only 15% of total production ranking second to 'Delicious' with 43% (14). From the 1940's to the 1990's the marked increase of 'Golden Delicious' production plateaued in both Europe and the United States. In the coming decade increased production will be of 'Golden Delicious' types (Table 1) not only in Europe and the United States but in Japan (4, 10) and to a lesser extent in New Zealand (15). The need to reduce pesticides in apple production will be met by 'Golden Delicious' progeny with disease resistance (Table 1).

'Mutsu' (now known as 'Crispin') was the first major cultivar derived from a 'Golden Delicious' cross and was introduced from the Aomori breeding program (Japan) in 1949 (4 and Table 1). Kappel and Proctor (9) reviewed 'Crispin's' place in world apple production and predicted prominence for it. Since then Norton (10) and Bessho and Soejima (4) reported about 3% of Japanese apple production is 'Crispin.' 'Crispin' appears in pro-

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duction statistics as a minor cultivar in Michigan (8), New England (2) and New York (13). 'Crispin' represents the *"first generation"* of 'Golden Delicious' progeny but it may never gain the status of its renowned parent; this distinction may reside with the *"second generation"* which includes 'Gala,' 'Jonagold,' 'Tsugaru' and 'Elstar.'

Bessho and Soejima (4) listed 26 Japanese cultivars introduced between 1949 and 1991, nine of these have 'Golden Delicious' as a parent and include 'Orin,' 'Sekaiichi,' 'Tsugaru' and 'Yoko' (Table 1). Norton (10) estimated that 8 Japanese cultivars have commercial potential for North America and most of these are 'Golden Delicious' progeny.

The 'Golden Delicious' progeny that are likely to succeed in Europe are 'Jonagold,' 'Gala,' 'Elstar' and 'Arlet' (11 and Table 1). In 1988 'Jonagold' accounted for 7% of European production, 'Elstar' 2% and 'Gala' 2%. 'Jonagold' and its many strains have been accepted worldwide for their excellent eating quality, good storage and processing quality, and high yields (12, 16). 'Gala' has also received worldwide acceptance, or as stated by White (17), an "----- *apple taking the world by storm.*" Its success is attributed to its outstanding fruit characteristics of small to medium size, crisp, juicy flesh and spicy flavor. 'Elstar,' like 'Jonagold,' performs best in cool districts and its outstanding eating quality develops after harvest.

In addition to the cultivars discussed above there have been others which have either not been accepted, or it is too early to make a judgement. In the first category, 'Spencer' from the Canadian breeding program at Summerland (Table 1) is an excellent quality, red apple which has not been accepted, probably because of lack of promotion. In the latter category is the dark green 'Shamrock,' also from Canada, and the very good flavored 'Jonagold' look-alike, 'Falstaff' from England (Table 1).

With a few exceptions vegetative and sports of 'Golden Delicious' have not received acceptance like those of 'Red Delicious' (7). 'Smoothee,' a whole tree mutation of 'Golden Delicious', bears fruit that are nearly russet-free (6) and has been accepted by industry.

The most recent or *"third generation"* of 'Golden Delicious' progeny are the disease resistant types (5 and Table 1). This breeding work started approximately 50 years ago with the objective of producing scab resistant cultivars which should ultimately reduce fungicide use, fungicide resistance and production costs. Today there are 17 different programs around the world and since 1970, 48 scab-resistant cultivars have been released (5). These new cultivars include a range in fruit maturity, fruit size, crisp flesh, varying degrees of resistance to pests and diseases in addition to scab, and a wide range in flavour and skin color. 'Golden Delicious' has been used as a parent in these programs in the U.S., France, Czechoslovakia and Brazil (5). Introductions include 'Sir Prize,' 'Florina,' 'GoldRush' and others listed in Table 1.

'Sir Prize' has excellent fruit quality except that it bruises too easily and therefore will not gain commercial acceptance (5). Many of the others in Table 1 have great potential but have not been tested long enough for adaptation, evaluation and acceptance. Crosby et al. (5) have succinctly summarized the pest resistance breeding efforts over the last 50 years *"Despite all efforts on pest resistance it's clear that resistance must be combined with superior fruit quality for those improved genotypes to gain acceptance in the marketplace."* We would contend that this *"superior fruit quality"* resides in 'Golden Delicious' progeny.

The Future

'Golden Delicious' progeny will dominate the world apple cultivar scene in the next century because of the fore-

Table 1. Golden Delicious and some of its cultivars, sports and disease resistant types introduced in the last 50 years.

Cultivar	Year Introduced	Location	Breeder/Selector	Parentage	Season
Golden Delicious	1914	West Virginia, Missouri, U.S.A.	A. Mullins/ Stark Nurseries	Golden Reinette x Grimes Golden	
Mutsu (Crispin)	1949	Aomori, Japan	Aomori Apple Exp. Sta.	Golden Delicious x Indo	Same as Golden Delicious
Orin	1952	Fukushima, Japan	T. Otsuki	Golden Delicious x Indo	1 week before Fuji
Spencer	1959	Summerland, British Columbia, Canada	R. C. Palmer	McIntosh x Golden Delicious	3 weeks after McIntosh
Gala	1960	Greytown, New Zealand	J. H. Kidd	Kidd's Orange x Golden Delicious	Ripens with Cox's Orange Pippin
Maigold (Gold-N-Rose)	1964	Wadenswil, Switzerland	Swiss Fed. Agr. Res. Sta.	Franc-Roseau x Golden Delicious	Same as Winesap
Summerred	1964	Summerland, British Columbia, Canada	R. C. Palmer	McIntosh x Golden Delicious	3-4 weeks before McIntosh
Jonagold	1968	Geneva, New York	New York Agr. Exp. Sta., Geneva	Golden Delicious x Jonathan	2 days later than Delicious
Elstar	1972	Wageningen, Netherlands	T. Visser	Golden Delicious x Ingrid Marie	3.5 weeks before Golden Delicious
Sekaiichi	1074	Aomori, Japan	Aomori Apple Exp. Sta.	Delicious x Golden Delicious	Same a Delicious
Tsugaru	1975	Aomori, Japan	Aomori Apple Exp. Sta.	Golden Delicious open pollinated	3 weeks before Delicious
Sundowner	1979	Western Australia	Western Australia Dept. Agr.	Golden Delicious x Lady Williams	After Granny Smith
Kogetsu	1981	Aomori, Japan	S. Taniuchi	Golden Delicious x Jonathan	Same as Gala
Yoko	1981	Gunma, Japan	Gunma Agr. Res. Ctr.	Golden Delicious open pollinated	5 days after Mutsu
Swiss Gourmet (Arlet)	1984	Wadenswil, Switzerland	B. Krapf and C. Papperswill	Golden Delicious x Idared	10 days before Jonathan
Elan	1984	Wageningen, Netherlands	Inst. for Hort. Plant Breeding, Wageningen	Golden Delicious x James Grieve	5 days after Elstar
Shamrock	1986	Summerland, British Columbia, Canada	W. D. Lane and R. A. MacDonald/ K. Lapins	McIntosh 10C-8-43-1 (Irradiated spur type) x Starkspur Golden Delicious	3 days before McIntosh
New Gold	1987	New Brunswick, New Jersey	L. F. Hough	Golden Delicious x Malling 2439	After Golden Delicious
Falstaff	1989	East Malling, England	F. H. Alston	James Grieve x Golden Delicious	3 days before Cox's Orange Pippin
Pink Lady	1989	Western Australia	Western Australia Dept. Agr./J. Cripps	Golden Delicious x Lady Williams	Later than Granny Smith
Trajan	1989	East Malling Res. Sta., England	K. R. Tobutt	Golden Delicious x Wijcik McIntosh	Same as Cox's Orange Pippin
Big Time	1991	Perth, Australia	Western Australia, Dept. Agr.	Lady Williams x Golden Delicious	Very late

Table 1. Continued.

Disease Resistant Progeny					
Cultivar	Year Introduced	Location	Breeder/Selector	Parentage	Season
Prima	1970	West Lafayette, Indiana	D. F. Dayton, J. B. Mowry, L. F. Hough, C. H. Bailey, J. Janick and F. H. Emerson	Contains Golden Delicious	1 month before Delicious
Sir Prize	1975	West Lafayette, Indiana	E. B. Williams, J. Janick, F. H. Emerson, D. F. Dayton, J. B. Mowry, L. F. Hough and C. H. Bailey	Tetraploid Golden Delicious x PRI14-152	Same as Golden Delicious
Florina (Querina)	1977	Beaucouze, France	F. Y. Lespinasse, J. M. Oliver, J. Lespinasse and M. Le Lezec	612-1[14-126 (Golden Delicious x F2268292-2) x Simpson's Giant Starking] x Jonathan	2 weeks later than Golden Delicious
McShay	1981	West Lafayette, Indiana	S. A. Mehlenbacher, M. M. Thompson, J. Janick, E. B. Williams, F. H. Emerson, S. S. Korban, D. F. Dayton, and L. F. Hough	Consists of Starking x Golden Delicious and Rome Beauty x M. Floribunda 821 cross	2 weeks before Jonathan
Novaspy	1986	Kentville, Nova Scotia, Canada	A. D. Crowe	Nova Easy Grow x NY 444411-1 (Red Spy x Golden Delicious)	Between Delicious and Northern Spy
Primicia	1988	Santa Catarina, Brazil	F. Denardi, L. F. Hough and A. P. Camilo	Contains Golden Delicious	3 weeks before Gala
Princesa	1988	Santa Catarina, Brazil	F. Denardi, L. F. Hough and A. P. Camilo	Contains Golden Delicious	3 to 4 weeks after Anna
GoldRush	1993	West Lafayette, Indiana	Agr. Expt. Stations of Oregon, Purdue, Rutgers and Illinois	Golden Delicious x Co-op 17	After Rome

sight of apple breeders around the world meeting consumer demands for a diverse selection of high quality apples. Each progeny will complement the other because of the wide genetic diversity in each cultivar. Season of ripening, superior fruit quality and disease and insect resistance for sustainable production are a few of the many requirements that will be met in 'Golden Delicious' progeny.

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Wilder Medal Award Nomination
American Pomological Society

Date _____

Name _____ Date & place of birth _____

1. *Education:* Briefly cite home background, and work and educational experience through the high school and college period.

2. *Adult Work Experience:* Cite positions held and military experience.

3. *Horticultural Contributions:* These should be described briefly but in sufficient detail to serve as a basis for critical evaluation. In selecting Wilder Medal recipients, special attention will be given to the origination and introduction of meritorious varieties of fruit. Significant contributions to the science and practice of horticulture will also be considered. These may involve any important area of fruit production such as rootstock development and evaluation, anatomical or morphological studies, pollination requirements, mutation or bud sport segregation, isolation of virus free clones, or unusually noteworthy publications.

The significance of the contribution should be documented by a listing of fruit varieties which have been named and introduced, and the extent to which they have been planted. If the award is to be based on the science or practice of horticulture, evidence should be presented to indicate the importance of contribution, and its benefits to horticulture. The total number of publications issued should be indicated, but complete citations are needed only for those which make significant contributions in the area of activity for which the award is being made.

4. *Honors Received or Professional and Honarary Society Affiliation:* Cite any honors or society affiliations which attest to the eminence of the individual being nominated.

5. *Nominated by:* Record name and position of person, or persons, making the nomination.

Note: To expedite the evaluation of nominations for Wilder Medals, biographical material should be assembled and submitted in the above form. Please present brief but complete information.