

Apple Cultivars Bred in Canada: Selections from Controlled Crosses for Commercial Production

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Abstract

Apple breeding in Canada by controlled crosses for increased tree cold hardiness, fruit similar to 'McIntosh' and 'Northern Spy' and, more recently, for scab resistance, has produced few commercial cultivars. 'Spartan' has been the most important introduction. Mutation breeding in Canada has produced Wijcik, a compact or columnar mutant of 'McIntosh', and it, or similar types may prove important in intensive orchards.

Apple breeding utilizing controlled crosses began in Canada in 1894 at the Central Experimental Farm (C.E.F.) in Ottawa. The primary objective was increased tree cold hardiness. Secondary objectives of the program were to produce apples of 'Northern Spy' and 'McIntosh' types, but maturing earlier or later (7). Dr. W. Saunders, the first director of the C.E.F., initially made crosses between the Siberian Crab (*Malus baccata*) and commercial cultivars including 'McIntosh', 'Wealthy', 'Fameuse' and 'Tetofsky.' The resulting crosses yielded hardy crabs with much larger fruit than the Siberian Crab mother. In 1904 Saunders selected the most promising of the first crosses and crossed them with pollen from commercial cultivars. 'McIntosh,' a chance seedling discovered around 1811 in Dundela (60 km south of Ottawa), Ontario, was already a commercially important cultivar at that time and was used extensively as a parent in the breeding program (Table 1).

Breeding of apples was to occupy an important place in the activities of the C.E.F. and of branch farms as the growing of apples almost everywhere in Canada was a goal. However, it soon became apparent that the commercial production of apples offered possibilities mainly in Nova Scotia (N.S.), New Brunswick (N.B.), Prince Edward Island, Quebec, Ontario and British Columbia (B.C.). Thus, the experimental farms that first became involved in apple breeding were at Dentville, N.S., Fredericton, N.B., St-Jean, Quebec, Ottawa (C.E.F.), Vineyard, and Smithfield, Ontario, and Summerland, B.C. (7).

Prior to 1939 the C.E.F. named selections at the time they were distributed for testing (1). In 1923, Davis (4) commented that "we have too many varieties, and no new variety should be introduced unless it is going to replace some defective sort or is needed in some district to extend the season where hardiness has been a limiting factor." Hence, in the late 1930's stations adopted a more conservative policy subjecting their selections to more rigorous pre-introduction testing (1).

Table 1 lists apple cultivars bred (by controlled crosses) in Canada for commercial production; open pollinated cultivars, crabs, ornamentals, rootstocks and the many cultivars bred at research stations in the Prairie

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Table 1. Apple cultivars bred in Canada by means of controlled crosses, listed by year of introduction.

CULTIVAR	YEAR INTRODUCED	LOCATION	BREEDER	PARENTAGE	SEASON
Newtosh	1923	Ottawa	C.E.F.	McIntosh x Yellow Newtown	2 weeks after McIntosh ^z
Toskhee	1923	Ottawa	C.E.F.	McIntosh x Milwaukee	McIntosh season
Toshfor	1926	Ottawa	C.E.F.	McIntosh x Forest	McIntosh season
Piotet	early 1830's	Ottawa	S. Wheeler	Pioneer x Tetofsky	Late August
Lawfam	1835	Ottawa	C.E.F.	Lawver x Fameuse	2 weeks after McIntosh
Spartan	1836	Summerland	Bred: R.C. Palmer Selected: A.J. Mann	McIntosh x Yellow Newtown	2-3 weeks after McIntosh
Jubilee	1839	Summerland	R.C. Palmer	McIntosh x Grimes Golden	3 weeks after McIntosh
Spencer	1859	Summerland	Bred: R.C. Palmer Selected: A.J. Mann	McIntosh x Golden Delicious	3 weeks after McIntosh
Caravel (Portia)	1864	Ottawa	Selected: D.S. Blair Released: L.P.S. Spangelo	Melba x Crimson Beauty	5 weeks before McIntosh
Golden Nugget	1864	Kentville	C.J. Bishop	Golden Russet x Cox's Orange	1 week before McIntosh
Quinte	1864	Ottawa	Selected: L.P.S. Spangelo	Crimson Beauty x Red Melba	5-6 weeks before McIntosh
Ranger	1864	Ottawa	Selected: D.S. Blair	Crimson Beauty x Melba	5-6 weeks before McIntosh
Summerland	1869	Summerland	Introduced: L.P.S. Spangelo	McIntosh x Golden Delicious	3rd week of October in Summerland
Sinta	1870	Summerland	Bred: R.C. Palmer Selected: A.J. Mann	Golden Delicious x Grimes Golden	3 weeks before Golden Delicious
Lindel	1871	Smithfield	K.O. Lapins Selected: D.S. Blair Introduced: S.J. Leuty & H.B. Heeney	Richard Delicious x Linda	1 week after Delicious
Nova Easygro ^y	1971	Kentville	Bred: L.E. Alders Selected: A.D. Crowe	Spartan x Prog. 565	Ripens with Cortland
Blair	1973	Ottawa	Selected 1944: D.S. Blair & P. Roy	McIntosh x Fameuse	10 days prior to McIntosh

Table 1 (Cont.). Apple cultivars bred in Canada by means of controlled crosses, listed by year of introduction.

Macfree ^y	1974	Smithfield	Bred: L.P.S. Spangelo Introduced: S.J. Leuty, H.B. Heeney & L.L. Madderman	McIntosh x PRI 48-177		2nd week of October
Kestrel	1976	Kentville	Bred: C.J. Bishop Selected: R.P. Longley Introduced: A.D. Crowe	Macoun x N.Y. Red Spy	Early October	
Moira ^y	1978	Smithfield	Bred: L.P.S. Spangelo Introduced: H.B. Heeney	McIntosh x Dg 22-81	2nd-3rd week of October	
Trent ^y	1978	Smithfield	Bred: L.P.S. Spangelo Introduced: H.B. Heeney	McIntosh x R18T40	Very late	
Briggold ^y	1978	Smithfield	Bred: L.P.S. Spangelo Introduced: H.B. Heeney	Sandel x 0-522	Early October	
Murray ^y	1978	Smithfield	Bred: L.P.S. Spangelo Introduced: H.B. Heeney	McIntosh x 52-05-28	Last Week of August	
Novamac ^y	1978	Kentville	Bred: D.F. Dayton and E.B. Williams Selected: A.D. Crowe	McIntosh x TSR1T187	Same as McIntosh	
Sandel	1978	Smithfield	Bred: D.S. Blair Introduced: H.B. Heeney	Delicious x Sandow	Same as Delicious	
Loyalist	1979	Smithfield	Selected: D.S. Blair Introduced: H.B. Heeney	Linda x Yellow Newtown	7-10 days after Delicious	
Richelieu ^y	1983	St-Jean-sur Richelieu	Bred: L.P.S. Spangelo Selected: H.B. Heeney Introduced: G.I. Rouselle	Very complex	One week before McIntosh	
Rouville ^y	1983	St-Jean-sur Richelieu	Bred: L.P.S. Spangelo Selected: H.B. Heeney Introduced: G.I. Rouselle	52-05-312 [Red Melba (Melba (McIntosh o.p.) x 69-52 = R16T19 (Wolf River x <i>Malus astrosanguinea</i> 804)] x McIntosh	About 3 weeks before McIntosh	

^y McIntosh is harvested in Ontario about September 20.^y Scab resistant cultivars

Provinces (13) are not included. Prior to 1965, the C.E.F. introduced about 300 open pollinated cultivars such as 'Melba' and 'Lobo' which are grown commercially. In the Prairies climatic conditions make fruit growing difficult. The use of cultivars such as 'Melba' and 'Tetofsky' as the pollen parent has led to the development of many cultivars hardy for the area (15). However, commercial production in the Prairies is essentially non-existent and these cultivars are grown mainly in home gardens.

In the early breeding work, hardiness was the main selection criterion. Macoun (11) was being very optimistic in 1928, when stating that "the time should not be far distant when there will be varieties of apples originated in Canada suitable for all parts of Canada where there is settlement, in season throughout the year, and comparing favourably with those of any country." In the late 1930's and early 1940's, the scope of the breeding program broadened as the main criteria became the selection of hardy, late-keeping, preferably red, winter cultivars (6).

Disease resistance later became important and breeding apples for resistance to apple scab began at Ottawa in 1949 (14). This program primarily used *Malus floribunda* as a source of scab resistance and formed part of the Apple Breeders Co-operative program which also included Rutgers, Illinois, Purdue and Cornell Universities (7). Since establishment of the program at C.E.F. approximately 40,000 seedlings have been evaluated at Smithfield. From this material about 50 seedlings were selected for further testing. Only six were considered of sufficient promise to warrant evaluation by growers (8). 'McIntosh', the most important commercial cultivar in Canada, is highly susceptible to scab and, though some are less susceptible than others, all large-fruited commercial cultivars require spraying

for scab control. The first scab-resistant cultivar, 'Prima', was introduced in 1970 (5). Canada followed quickly with 'Nova Easygro' released by the Kentville Station in 1971. Smithfield has introduced five scab-resistant cultivars as well (Table 1). A major scab-resistance program for Canada, centered at the Research Station, St-Jean, Quebec (7), is at the seedling evaluation stage and further hybridization has been terminated.

Currently the ideotypic apple cultivar for Canada would be winter hardy, scab-resistant, and a consistent producer of high quality fruit, as determined by dessert, culinary, nutritive and shipping quality, and either early or late ripening. The fruit would have to be distinctive enough to be readily recognized, or be a 'McIntosh' or 'Delicious' type. 'McIntosh' types include 'Scotia', 'Kestrel' and 'Spartan'. 'Sinta' (Table 1) is a 'Golden Delicious' type fruit (3).

There are numerous problems that face the introduction of a new cultivar. The major problem is that apple breeding is a complex and lengthy process requiring a minimum of 8 years for the first evaluation of seedlings and another 8 years for secondary testing. Then the seedling must be mass propagated and introduced. By the time the cultivar is introduced the need for producing such an apple may have passed.

Choosing a proper name for a new cultivar is difficult. Often various combinations of the popular parent's name are chosen, but these are often harsh sounding and thus a poor choice. The name should not have any undesirable alternate meanings. For example, the name 'Sandel' may be associated with poor texture. Trade channels are often resistant to the introduction of a new cultivar; a good publicity campaign is required. Rapid commercialization of every cultivar with potential is not occurring because cultural requirements for fruit grow-

ing such as pruning, thinning, nutrition, etc., are becoming specialized for each cultivar (4).

Although an apple breeding program has existed in Canada since 1894, the number of introductions that have been of commercial value is small. Canada's major apple cultivar is still 'McIntosh,' a chance seedling discovered around 1811, although there is often a problem with producing high quality fruit. 'Spartan' (Table 1), a McIntosh-type fruit, is becoming increasingly important in Canada, particularly in B.C. (12). 'Delicious,' a seedling discovered in the United States (U.S.), is the second most important cultivar in Canada. 'Idared,' 'Empire' and 'Cortland' are all increasing in importance (12); these were bred in the U.S.

The cost and relative lack of success in apple breeding has led to the curtailment of many breeding programs and the discontinuation of further crossing in the program at St-Jean, Quebec. Perhaps the expectations of the breeding programs have been too high.

Since the 1950's mutation breeding in Canada by means of irradiation has given strains of 'Cortland' with increased color (2), and compact mutants (9). Intensive production systems for apple demand compact, precocious cultivars. A mutant 'McIntosh,' Wijcik, seems to be heterozygous for a dominant gene for compact or columnar habit (10) and forms the basis of the columnar apple breeding program at the East Malling Research Station in England (16). This example stresses that the success of apple breeding programs should not be judged solely on fruit characteristics. Growth habit, such as with the columnar types may prove extremely important in very intensive orchards in the near future.

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