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Apple cultivars for juice and cider production



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Apple cultivars for juice and cider production

W.P. MOHR
Smithfield Experimental Farm
Trenton, Ont.

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The dots on the map represent Agriculture
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SUMMARY

This publication summarizes our evaluation of apple cultivars for properties important in the commercial production of juice and cider. Named varieties and promising selections grown at the Smithfield Experimental Farm, Trenton, Ont., and at the Saint-Jean-sur-Richelieu Research Station, Que., up to and including the 1987 crop year, are included. Scab-resistant lines have been of particular interest because of their potential for reducing production costs. Several of these can be compared favorably with older standard cultivars in attributes of quality and other properties affecting general performance for juice and cider production.

INTRODUCTION

Apple cultivars grown at the Smithfield Experimental Farm have been evaluated yearly since 1959 for their commercial processing potential. Until the late 1970s, the emphasis was on their performance as sauce and sliced packs. In recent years, more attention has been given to their potential for juice production. During the 1970s, fruit grown in the apple breeding program at Saint-Jean, Que., was delivered to Smithfield for assessment of juice properties of interest to cider makers. Cultivars included in this publication are still grown at either or both of these locations. A few other cultivars grown elsewhere are also included. In each case, properties important in juice and cider production are reported. The cultivar's suitability for other markets is also briefly stated.

After they were picked, the apples grown at Smithfield were placed in refrigerated storage at 0°C. Samples were examined and tested periodically for firmness in order to assess storage properties. The fruit was processed when it reached a firmness index of 6.0-6.5 kg on a fruit pressure tester fitted with an 11-mm tip. Some of the fruit samples received from other locations were past optimum maturity when received and processed. Condition of the fruit at time of processing is indicated and should be considered when assessing various properties of the juice. Also, the number of years each cultivar was tested should be taken into account in assessing the reliability of our evaluation: some were tested for several years, others for only 1 or 2 years. The evaluations are based on results up to and including the 1987 crop year.

In making juice, the apples were chopped in a comminuting machine ("Fitzmill", model D, W.J. Fitzpatrick Company, Chicago, Ill.), mixed with a press aid, and pressed ("Willmes Presser", type 60, Josef Willmes,¹ Bensheim Hessen, Germany); the juice was clarified using pectolytic enzyme at 15°C. Since 1982 the press aid has been 3% (w/w) rice hulls, as currently used by the industry in Ontario. Before 1982 a mixture of 1.5% rice hulls and 0.5% shredded bleached paper was used, corresponding to popular industry practice at that time. No other pre-press treatments involving use of enzymes combined with heating and holding the mash to increase juice yields were employed. (For information on these special treatments to increase juice recovery, see W.P. Mohr and R.G. Adair 1979, Juice Extraction Studies With Apples, Agriculture Canada, Smithfield Experimental Farm, Technical Bulletin No. 1). The pressing cycle and all other steps in the pressing operation were carried out according to a standardized procedure. Details are given in the publication mentioned above.

The terms "low", "medium", "high", and "very high", describing the content of soluble solids, titratable acidity, and tannin are used to indicate the following levels.

¹ The use of trade names is for convenience only and does not imply an endorsement by Agriculture Canada.

Level	Soluble solids (%)	Titratable acid (%)	Tannin (g/L)
Low	<10.5	<0.4	<1.0
Medium	10.5-13.0	0.4-0.7	1.0- 2.0
High	13.0-14.5	0.7-0.9	2.0- 3.0
Very high	>14.5	>0.9	>3.0

For purposes of this report, a cultivar's juice or cider potential is probably best considered from the standpoint of its usefulness in blending with other available fruit, usually fresh-market types and culls containing lower than desirable levels of acid, tannin, and soluble solids. Therefore, cultivars high in these three properties are usually sought for upgrading blends. The individual levels of soluble solids, titratable acid, and tannin are important and must be assessed by processors for their own particular products. The sugar-to-acid ratio, which is also reported, would be of interest only if the product is made from a single cultivar. Desirable properties of flavor in the finished product usually correspond with a sugar-to-acid ratio of 25 ± 5 , assuming that the level of soluble solids is in an acceptable range.

Excellent, good, fair, and poor ratings are used throughout the report to assess the other juice properties of interest. These can be defined as follows.

Rating	Recovery (%, w/w)	Color	Flavor
Excellent	>75%	Bright intense yellow	Intense, normal
Good	70-75%	Yellow, light amber	Moderate, normal
Fair	65-70%	Lacking in color, dark amber	Mild, normal
Poor	<65%	Dull, dark, pink, orange	Flat, off, perfumy

CULTIVARS

0-521

Melba x R6T68 (includes Jonathan, Rome Beauty, and Malus floribunda 821). From Ottawa breeding program; selected at Smithfield. Scab-resistant.

Has been grown at Saint-Jean and Smithfield; currently grown at Smithfield. Tree produces heavily. Harvested late September. Fruit soft (pressure test sometimes less than 5.0 kg) when processed late November; should be processed in October. Tested 6 years for juice.

Good juice yield. Low to medium soluble solids. Medium to high titratable acid. Sugar-to-acid ratio 16. Low to medium tannin. Good to excellent color. Good flavor. Good overall juice rating.

Because of its high-acid tart flavor and other good properties, it is useful for upgrading more bland-tasting cultivars. For the same reason, it could be useful in sauce blends. Not suitable for sliced packs or the fresh market.

0-528

Melba x R6T68 (includes Jonathan, Rome Beauty, and Malus floribunda 821). From Ottawa breeding program; selected at Smithfield. Scab-resistant.

Has been grown at Saint-Jean and Smithfield; currently grown at Saint-Jean. Tree does not bear heavily. Harvested mid October. Fruit soft (pressure test less than 5.0 kg) when processed late November; should be processed no later than mid November. Limited juicing information obtained, 2 years.

Fair juice yield. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 18. Low tannin. Good color. Good flavor. Fair general rating for juice.

Because orchard yield and juice recovery are not high, its potential for juice is only fair. Limited potential for sauce and sliced packs, and not suitable for fresh market.

0-533

McIntosh x R14T60 (includes Wealthy and Malus pumila). From Ottawa breeding program; selected at Smithfield. Scab-resistant.

Has been grown at Saint-Jean and Smithfield; currently grown at Smithfield. At Saint-Jean, tree has yielded well on dwarfing rootstocks and is being considered for naming. Harvested mid September. Soft (pressure test 5.0 kg) when processed; should be processed no later than mid October. Tested 3 years for juice.

Fair juice yield. Low soluble solids. Medium titratable acid. Sugar-to-acid ratio 14. Low tannin. Good color. Good flavor.

Low potential for juice production as well as for sauce and sliced packs. Considered good for fresh market when grown at Saint-Jean but not at Smithfield.

0-544

McIntosh x Dg 20-9 (includes Jonathan, Rome Beauty, and Malus floribunda 821). From Ottawa breeding program; selected at Smithfield. Scab-resistant.

Has been grown at Saint-Jean and Smithfield; currently grown at Saint-Jean. Harvested late September to early October. Processed late November when its pressure test was 5.5 kg. Tested 1 year for juice.

Fair juice yield. High soluble solids. Low titratable acid. Sugar-to-acid ratio 27. Low tannin. Poor color. Poor to fair, sweet flavor.

Low potential for juice, sliced packs, and fresh market but acceptable for sauce.

0-546

McIntosh x Dg 22-81 (includes Rome Beauty, Jonathan, and Malus floribunda 821). From Ottawa breeding program; selected at Smithfield. Scab-resistant.

Grown at Saint-Jean and Smithfield. At Saint-Jean it was considered for introduction, but tree has poor shape, does not yield heavily, and picking season is too late under Quebec's conditions. Harvested late October. Processed December to mid January (pressure test 5.0 kg). Tested 2 years for juice.

Fair juice yield. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 19. Low tannin. Fair color. Fair flavor.

Low potential for juice production. Barely acceptable for sauce and sliced packs. Little value for fresh market.

0-5410

McIntosh x Dg 20-9 (includes Jonathan, Rome Beauty, and Malus floribunda 821). From Ottawa breeding program; selected at Smithfield. Scab-resistant.

Grown at Saint-Jean and Smithfield. Tree bears well. Harvested mid September. Processed early November when fruit pressure tested 5.4 kg. Tested 1 year for juice.

Fair juice yield. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 19. Low tannin. Good color. Good flavor.

Fair to good potential for juice but more than one season's results needed. Acceptable sauce and sliced packs. Of little value for fresh market.

0-5412

McIntosh x Dg 22-81 (includes Jonathan, Rome Beauty, and Malus floribunda 812). From Ottawa breeding program; selected at Ottawa. Scab-resistant.

Has been grown at Saint-Jean and Smithfield; currently grown at Smithfield. Tree bears well and is cold-hardy at Saint-Jean. Harvested late September to mid October. Processed late November to mid January (pressure test 6.5 kg throughout this period). Tested 3 years for juice.

Fair juice yield and pulp settling. Medium soluble solids. Low to medium titratable acid. Sugar-to-acid ratio 20. Medium tannin. Fair to good color. Fair flavor.

Fair potential for juice production. Acceptable for sauce. Barely acceptable for slices. Of little use for fresh market.

0-551

49-36-39 (includes Malus pumila) x McIntosh. From Ottawa breeding program; selected at Smithfield. Scab-resistant.

Grown at Saint-Jean and Smithfield but Smithfield plans to remove trees. Harvested mid to late September. Slightly soft (pressure test 4.9 kg) when processed; should be processed early November. Tested 1 year for juice.

Fair juice yield. Medium soluble solids. Medium titratable acid. Low to medium tannin. Fair color. Fair flavor.

Low potential for juice. Data on sauce and sliced pack not available. Not useful for fresh market.

0-564

McIntosh x 10-147 Dg 20-9 (includes Malus floribunda 821). From Ottawa breeding program; selected at Ottawa. Scab-resistant.

Grown at Smithfield; old trees removed but new trees have been budded in nursery. Harvested early October. Processed mid November when fruit condition was good (pressure test 6.0 kg). Tested 1 year for juice.

Fair juice yield. Excellent pulp settling property. Medium soluble solids. High titratable acid. Sugar-to-acid ratio 14. Good color. Fair flavor.

Fair to good potential for juice but more testing necessary. Low potential for sauce, slices, and fresh market.

0-591

49-121E (includes Malus floribunda 821) x McIntosh. From Ottawa breeding program; selected at Smithfield. Scab-resistant.

Grown at Saint-Jean and Smithfield. At Saint-Jean the tree is fairly productive but cold-tender and very sensitive to European canker. Harvested early October. Processed early November when fruit was in good condition (pressure test 5.5-6.0 kg). Tested 4 years for juice.

Good juice yield. Medium soluble solids. High titratable acid. Sugar-to-acid ratio 15. Good color. Good flavor.

Good potential for juice production, where its high acidity and other suitable qualities could be useful in blends. Acceptable sauce and sliced packs. Not useful for fresh market.

0-621

0-521 (includes Melba, Jonathan, Rome Beauty, and Malus floribunda 821) x McIntosh. From Ottawa breeding program; selected at Smithfield. Scab-resistant.

Grown at Saint-Jean and Smithfield. Harvested late September. Slightly soft (pressure test 5.0 kg) when processed; should be processed late November. Tested 4 years for juice.

Poor juice yield. Medium soluble solids. High titratable acid. Sugar-to-acid ratio 15. Low to medium tannin. Fair color. Good flavor. Aromatic.

Fair potential for juice. Limited usefulness for sauce, slices, or fresh market.

0-622

0-521 (includes Melba, Jonathan, Rome Beauty, and Malus floribunda 821) x

McIntosh. From Ottawa breeding program; selected at Smithfield.
Scab-resistant.

Grown at Saint-Jean and Smithfield. Harvested late September to early October. Fruit sometimes slightly soft (pressure test 4.5-6.0 kg) when processed throughout November; should be processed early November. Tested 6 years for juice.

Fair juice yield. Excellent pulp settling. Medium to high soluble solids. High titratable acid. Sugar-to-acid ratio 15. Low to medium tannin. Fair to good juice color. Good flavor.

Fair potential for juice. Limited potential for sauce. Not suitable for sliced pack or fresh market.

0-623

0-521 (includes Melba, Jonathan, Rome Beauty, and Malus floribunda 821) x McIntosh. From Ottawa breeding program; selected at Smithfield.
Scab-resistant.

Grown at Saint-Jean and Smithfield. Harvested late September. Slightly soft (pressure test 5.0 kg) when processed; best processed late November to late December. Tested 3 years for juice.

Fair juice yield. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 23. Low to medium tannin. Poor color. Good flavor. Aromatic.

Fair potential for juice. Low potential for sauce or slices. Not suitable for fresh market.

0-632

McIntosh x 0-525 (includes Melba, Jonathan, Rome Beauty, and Malus floribunda 821). From Ottawa breeding program; selected at Smithfield.
Scab-resistant.

Has been grown at Saint-Jean and Smithfield; currently grown at Smithfield. Harvested late September to early October. Fruit condition acceptable (pressure test 5.5 kg) when processed; best processed mid November. Tested 2 years for juice.

Fair to good juice yield. Excellent pulp settling. Medium to high soluble solids. High to very high titratable acid. Sugar-to-acid ratio 15. Poor color. Poor to fair flavor.

Except for lack of color, appears to have potential for juice. Canned juice appeared amber; a frozen unpasteurized sample turned pink, which was odd. Needs further testing. Potential for other markets not determined.

0-637

McIntosh x 0-525 (includes Melba, Jonathan, Rome Beauty, and Malus floribunda 821). From Ottawa breeding program; selected at Smithfield. Scab-resistant.

Grown at Saint-Jean and Smithfield. Harvested early October. Good fruit condition (pressure test 5.8 kg) when processed late November. Tested for juice 2 years.

Good juice yield. Good pulp settling. Medium soluble solids. High titratable acid. Sugar-to-acid ratio 14. Good color. Good flavor. Aromatic.

Good potential for juice. Fair potential for sauce and slices. Although quite acid, may have potential for fresh market.

0-6310

0-522 (includes Melba, Jonathan, Rome Beauty, and Malus floribunda 821) x McIntosh. From Ottawa breeding program; selected at Smithfield. Scab-resistant.

Grown at Saint-Jean and Smithfield. Harvested late September. Good fruit condition (pressure test 6.0 kg) when processed mid November. Tested 3 years for juice.

Fair juice yield. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 21. Good color. Good flavor.

Fair to good potential for juice. Data on sauce and slices not available. Limited value for fresh market.

0-641

0-527 (includes Melba, Jonathan, Rome Beauty, and Malus floribunda 821) x Lobo. From Ottawa breeding program; selected at Smithfield. Scab-resistant.

Grown at Saint-Jean and Smithfield. Tree is productive. Harvested late September. Fruit soft (pressure test 4.9 kg) when processed; should be processed early December. Tested 2 years for juice.

Fair to good juice yield. Good pulp settling. Medium soluble solids. Medium to high titratable acid. Sugar-to-acid ratio 18. Good color. Poor to good flavor.

May have good potential for juice but several properties must be checked in further tests. Not evaluated for sauce and sliced packs. Limited use for fresh market.

0-642

McIntosh x 0-522 (includes Melba, Jonathan, Rome Beauty, and Malus floribunda 821). From Ottawa breeding program; selected at Smithfield. Scab-resistant.

Grown at Saint-Jean and Smithfield. Tree is productive. Harvested early October. Good fruit condition (pressure test 6.0 kg) when processed early November. Tested 3 years for juice.

Good juice yield. Excellent pulp settling. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 17. Low tannin. Good color. Fair flavor.

Good potential for juice, but check flavor in further tests. Not evaluated for sauce and sliced packs. Not useful for fresh market.

0-6412

McIntosh x 0-522 (includes Melba, Jonathan, Rome Beauty, and Malus floribunda 821). From Ottawa breeding program; selected at Smithfield. Scab-resistant.

Grown at Saint-Jean and Smithfield. Harvested early October. Good fruit condition (pressure test 6.0 kg) when processed late November. Tested 1 year for juice.

Fair juice yield. Medium to high soluble solids. Medium titratable acid. Sugar-to-acid ratio 21. Good color. Fair flavor.

Fair potential for juice. Good to excellent sauce (bright intense yellow, grainy texture, excellent flavor) but poor for slices. Insufficient data on fresh market use.

0-6413

0-527 (includes Melba, Jonathan, Rome Beauty, and Malus floribunda 821) x Lobo. From Ottawa breeding program; selected at Smithfield. Scab-resistant.

Grown at Saint-Jean and Smithfield. Harvested early October. Slightly soft when processed; best processed late November. Tested 4 years for juice.

Fair juice yield. Good pulp settling. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 25. Good color. Fair flavor.

Fair to good potential for juice. Good for sauce and sliced packs. Limited use for fresh market.

0-6421

0-527 (includes Melba, Jonathan, Rome Beauty, and Malus floribunda 821) x Lobo. From Ottawa breeding program; selected at Smithfield. Scab-resistant.

Grown at Saint-Jean and Smithfield. Harvested early October. Good firm condition (pressure test 6.7 kg) when processed in October. Tested 1 year for juice.

Fair juice yield. Excellent pulp settling. Low soluble solids. Medium titratable acid. Sugar-to-acid ratio 15. Fair color. Poor flavor.

Fair potential for juice. No available information on suitability for sauce, slices, or fresh market.

0-6422

0-545 (includes McIntosh, Jonathan, Rome Beauty, and Malus floribunda 821) x Lobo. From Ottawa breeding program; selected at Smithfield. Scab-resistant.

Grown at Saint-Jean and Smithfield. Harvested early October. Good condition (pressure test 6.0 kg) when processed early December. Tested 4 years for juice.

Fair juice yield. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 23. Good color. Good flavor.

Fair potential for juice. Fair to good for sauce. Unsuitable for sliced pack (poor wholeness retention).

0-654

0-522 (includes Melba, Delicious, Jonathan, Rome Beauty, and Malus floribunda 821) x Sandel. From Ottawa breeding program; selected at Smithfield. Scab-resistant.

Grown at Saint-Jean and Smithfield. Harvested late September. Good condition (pressure test 6.0 kg) when processed in November. Stores well until January. Tested 1 year for juice.

Fair juice yield. Pulp settled well. Medium to high soluble solids. Medium titratable acid. Sugar-to-acid ratio 21. Good color. Fair flavor.

Fair to good potential for juice. Good for sauce. Fair sliced. May have limited fresh market potential as a yellow-skinned cultivar.

0-661

0-521 (includes Melba, Jonathan, Rome Beauty, and Malus floribunda 821) x Delicious. From Ottawa breeding program; selected at Smithfield. Scab-resistant.

Has been grown at the Saint-Jean and Smithfield; currently grown at Smithfield. Harvested early October. Good condition (pressure test 6.1 kg) when processed in October, soft (less than 5.0 kg pressure test) when processed in November. Tested 4 years for juice.

Good juice yield. Pulp settled well. Medium to high soluble solids. High titratable acid. Sugar-to-acid ratio 13. Fair to good color. Poor to fair flavor.

Juice potential is fair (flavor poor but other properties good). Fair for sauce and slices. High acidity limits usefulness for fresh market.

0-662

0-521 (includes Melba, Jonathan, Rome Beauty, and Malus floribunda 821) x Delicious. From Ottawa breeding program; selected at Smithfield. Scab-resistant.

Currently grown at Smithfield. Harvested early October. Fruit condition good (pressure test 6.0 kg) when processed in March. Tested 2 years for juice.

Good juice yield. Pulp settled well. High soluble solids. Low to medium titratable acid. Sugar-to-acid ratio 32. Good color. Fair flavor.

Fair potential for juice but needs further testing. Promising as a fall and winter fresh market apple.

0-663

0-521 x T3919. Parents include Melba, Jonathan, Rome Beauty, Delicious, McIntosh, and Malus floribunda 821. From Ottawa breeding program; selected at Smithfield. Scab-resistant.

Has been grown at Saint-Jean and Smithfield; currently grown at Smithfield. Harvested early October. Good condition (pressure test 5.8 kg) when processed late November. Tested 2 years for juice.

Fair juice yield. Pulp settled well. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 20. Good color. Poor to fair flavor.

Fair potential for juice. Fair for sauce and slices.

0-664

0-521 (includes Melba, Jonathan, Rome Beauty, and Malus floribunda 821) x Delicious. From Ottawa breeding program; selected at Smithfield. Scab-resistant.

Grown at Saint-Jean and Smithfield. Harvested early October. Good firm condition November to January (pressure test 6.5-7.6 kg).

Fair juice yield. Pulp settled well. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 22. Fair color. Fair flavor.

Fair potential for juice. Good for sauce, poor for slices. Limited use for fresh market.

0-665

0-522 (includes Melba, Jonathan, Rome Beauty, and Malus floribunda 821) x Delicious. From Ottawa breeding program; selected at Smithfield. Scab-resistant.

Grown at Saint-Jean and Smithfield. Harvested early October. Good condition (pressure test 6.3 kg) when processed late October. Tested 2 years for juice.

Good juice yield. Excellent pulp settling. Low soluble solids. Low to medium titratable acid. Sugar-to-acid ratio 26. Good color. Poor flavor.

Fair potential for juice (downgraded only because of flavor). Good for sauce and slices.

0-666

0-521 (includes Melba, Jonathan, Rome Beauty, and Malus floribunda 821) x Delicious. From Ottawa breeding program; selected at Smithfield. Scab-resistant.

Grown at Saint-Jean and Smithfield. Harvested early October. Processed when fruit in good firm condition (pressure test 6.9 kg); best processed late January. Tested 2 years for juice.

Good juice yield. Low to medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 19. Good color. Fair flavor.

Fair potential for juice. Information on other uses not yet available.

0-6610

0-521 (includes Melba, Jonathan, Rome Beauty, and Malus floribunda 821) x Delicious. From Ottawa breeding program; selected at Smithfield. Scab-resistant.

Has been grown at Saint-Jean and Smithfield; currently grown at Smithfield. Harvested early October. Good condition when processed January. Tested 2 years for juice.

Poor juice yield. High soluble solids. Medium titratable acid. Sugar-to-acid ratio 28. Good color. Good flavor.

Poor to fair potential for juice (downgraded because of low yield). No information available on sauce and slices. Not useful for fresh market.

0-6611

0-521 x T-3919. Parents include Delicious, Jonathan, Rome Beauty, McIntosh, Melba, and Malus floribunda 821. From Ottawa breeding program; selected at Smithfield. Scab-resistant.

Grown at Smithfield. Harvested late September. Good fruit condition (pressure test 5.9 kg) when processed mid November. Tested 2 years for juice.

Good juice yield. Pulp settles well. Medium soluble solids. Very high titratable acid. Sugar-to-acid ratio 12. Good color. Fair flavor.

Fair potential for juice. May have some use to upgrade acidity in blends. Poor potential for sauce and slices.

0-6616

0-521 x T-3919. Parents include Delicious, Jonathan, Rome Beauty, McIntosh, Melba, and Malus floribunda 821. From Ottawa breeding program; selected at Smithfield. Scab-resistant.

Grown at Smithfield. Harvested early October. Good condition (pressure test 6.5 kg) when processed mid December. Tested 1 year for juice.

Fair juice yield. Excellent pulp settling. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 20. Good color. Good flavor.

Fair potential for juice. No information available on sauce and slices. Not useful as a fresh market apple.

0-6617

0-521 x T-3919. Parents include Delicious, Jonathan, Rome Beauty, McIntosh, Melba, and Malus floribunda 821. From Ottawa breeding program; selected at Smithfield. Scab-resistant.

Grown at Smithfield. Harvested mid October. Good condition (pressure test 6.2 kg) when processed late December. Tested 2 years for juice.

Fair juice yield. Low to medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 22. Good color. Fair flavor.

Fair potential for juice. No information available on sauce and slices. Not useful as a fresh market apple.

0-6619

0-521 x T-3919. Parents include Delicious, Jonathan, Rome Beauty, McIntosh, Melba, and Malus floribunda 821. From Ottawa breeding program; selected at Smithfield. Scab-resistant.

Grown at Smithfield. Harvested early October. Good condition (pressure test 6.2 kg) when processed late January. Tested 2 years for juice.

Fair juice yield. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 19. Fair color. Poor flavor.

Poor to fair potential for juice. No information available on sauce or slices.

50-07-02

Antonovka x 262829-2-2 (includes Malus floribunda 821). Scab-resistant.

Grown at Saint-Jean. Upright vigorous tree, very productive. Harvested mid October. Good condition when processed in February. Tested 2 years for juice.

Fair juice yield. Low to medium soluble solids. Variable titratable acid: low one year, very high the other. Sugar-to-acid ratio was 23 and 10 in the 2 years tested. Low tannin. Good color. Poor flavor.

Low potential for juice. No information available on sauce and slices.

52-04-59

Melba x R6T68 (includes Malus floribunda 821). Scab-resistant.

Grown at Saint-Jean. Tree is sensitive to canker and mites and very sensitive to cold injury. Harvested early September. Fruit slightly soft (pressure test 4.9 kg) when processed in November; should be processed late October. Tested 1 year for juice.

Fair juice yield. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 27. Low tannin. Fair color. Fair flavor.

Fair juice potential. No information available on sauce and slices.

53-04-01A

McIntosh x R7T45 (includes Malus floribunda 821). Scab-resistant.

Grown at Saint-Jean. Harvested early September. Fruit soft (pressure test 4.3 kg) when processed in November; should be processed in October. Tested 1 year for juice.

Fair juice yield. Medium soluble solids. Low titratable acid. Sugar-to-acid ratio above 40 (our sample much higher because of past condition of fruit, resulting in low acidity). Medium tannin. Fair color. Poor flavor.

Low potential for juice. No information available for sauce and slices. Good for fresh market.

54-46A-11

McIntosh x R7T45 (includes Malus floribunda 821). Scab-resistant.

Grown at Saint-Jean. Tree is productive. Harvested mid October. Fruit in good condition when processed December and January. Tested 2 years for juice.

Fair juice yield. Medium soluble solids. Low to medium titratable acid. Sugar-to-acid ratio 26. Medium tannin. Poor to fair color. Good flavor.

Low potential for juice. No information available on sauce and slices. Excellent fresh market quality.

59-55-126

49-121E (includes Malus floribunda 821) x McIntosh. Scab-resistant.

Grown at Saint-Jean. Tree is cold-hardy. Harvested early October. Fruit stores well until April; in good condition when processed mid November. Tested 1 year for juice.

Fair juice yield. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 16. Low tannin. Good color. Very poor flavor.

No potential for juice. No information available for sauce and slices. Acceptable fresh market quality.

60-03-07

52-05-33 (includes Malus atrosanguinea 804) x McIntosh. Scab-resistant.

Grown at Saint-Jean. Tree is cold-hardy but a light bearer. Harvested mid September. Fruit soft when processed in November; should be processed in October. Tested 1 year for juice.

Fair juice yield. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 16. Low tannin. Good color. Good flavor.

Fair potential for juice. No information available for sauce and slices. Limited value for fresh market.

62-28-09

0-521 (includes Melba, Jonathan, Rome Beauty, and Malus floribunda 821) x McIntosh. Scab-resistant.

Grown at Saint-Jean. Tree moderately productive, sensitive to canker. Harvested early October. Short storage life. Fruit soft when processed early November; should be processed in October. Tested 1 year for juice.

Good juice yield. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 24. Low tannin. Fair color. Good flavor.

Fair potential for juice. No information available for sauce and slices. No fresh market potential (poor quality).

62-32-37

52-05-312 (includes Malus atrosanguinea 804) x McIntosh. Scab-resistant.

Grown at Saint-Jean. Tree is cold-hardy and productive. Harvested late August. Fruit soft when processed in September; should be processed August to early September. Tested 1 year for juice.

Fair juice yield. Pulp did not settle well. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 18. Low to medium tannin. Excellent color. Fair flavor.

Fair potential for juice. No information available for sauce and slices. Limited value for fresh market (quality just fair).

BC10C-6-12

Winesap x Golden Delicious. Summerland cross 1944, selected 1956.

Grown at Smithfield. Harvested mid October. Good fruit condition (pressure test 6.0 kg) when processed late November. Tested 3 years for juice.

Fair to good juice yield. High to very high soluble solids. Medium titratable acid. Sugar-to-acid ratio 29. Good color. Fair flavor.

Fair to good potential for juice. Good sauce and fair sliced packs. Limited fresh market use.

CBR1T29

From breeding program at Purdue University, Indiana. Parents include Malus floribunda 821. Scab-resistant.

Grown at Saint-Jean. Tree moderately productive. Harvested mid September. Soft when processed in November; should be processed in October. Tested 1 year for juice.

Fair juice yield. High soluble solids. High titratable acid. Sugar-to-acid ratio 16. Medium tannin. Fair color. Good flavor.

Fair potential for juice. No information available on sauce and slices. No fresh market potential.

CBR4T29

From breeding program at Purdue University, Indiana. Parents include Malus floribunda 821. Scab-resistant.

Grown at Saint-Jean. Tree a light bearer. Harvested mid October. Fruit very firm (pressure test 7.2 kg) when processed early February; could be processed throughout February and probably later. Tested 2 years for juice.

Fair juice yield. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 26. Low tannin. Fair color. Good flavor.

Fair potential for juice. No information available on sauce and slices. Good fresh market potential (excellent quality).

CCR4T20

From breeding program at Purdue University, Indiana. Parents include Antonovka. Scab-resistant.

Grown at Saint-Jean. Tree moderately productive. Harvested late August. Fruit firm (pressure test 6.8 kg) when processed late September; should be processed early October. Tested 1 year for juice.

Fair juice yield. Low to medium soluble solids. Very high titratable acid. Sugar-to-acid ratio 11. Low tannin. Fair color. Good flavor.

Fair potential for juice; might be useful where upgrading of acidity is needed in blends. No information available for sauce and slices. Not suitable for fresh market.

Co-op 1

Complex parentage including Starr, Wealthy, Melba, Red Rome, Jonathan, and Malus floribunda 821. From cooperative breeding programs at Indiana, Illinois, New Jersey, and United States Department of Agriculture experiment stations. Released 1967. Scab-resistant.

Grown at Smithfield. Harvested mid September. Fruit in good condition (6.2 kg pressure test) when processed late October; could be processed early November as well. Tested 3 years for juice.

Good juice yield. Excellent pulp settling. Medium soluble solids. High titratable acid. Sugar-to-acid ratio 14. Good to excellent color. Poor to fair flavor.

Good to excellent potential for juice (only flavor limiting). Fair for sauce. No information available on sliced pack. Not useful as a fresh market apple.

Co-op 7

Complex parentage including Starr, Wealthy, Melba, Red Rome, Jonathan, and Malus floribunda 821. From cooperative breeding programs at Indiana, Illinois, New Jersey, and United States Department of Agriculture experiment stations. Released 1972. Scab-resistant.

Has been grown at Saint-Jean and Smithfield; currently grown at Smithfield. Tree sensitive to cold injury. Harvested early September. Fruit in satisfactory condition (pressure test 5.4 kg) when processed late November. Tested 1 year for juice.

Fair juice yield. Low soluble solids. Very low titratable acid. Sugar-to-acid ratio 38. Low tannin. Good color. Good flavor. Aromatic.

Fair potential for juice. No information available for sauce and slices. Has potential as a fresh market apple.

Co-op 8

Complex parentage including Delicious, Jonathan, Golden Delicious, Red Gravenstein, Close, Edgewood, and Malus floribunda 821. From cooperative breeding programs at Indiana, Illinois, New Jersey, and United States Department of Agriculture experiment stations. Released around 1972. Scab-resistant.

Grown at Saint-Jean and Smithfield. Harvested early October. Fruit soft when processed late November; should be processed late October. Tested 1 year for juice.

Fair juice yield. Low to medium soluble solids. Very low titratable acid. Sugar-to-acid ratio 39. Low tannin. Good color. Fair flavor.

Fair potential for juice. No information available for sauce and slices. Limited fresh market potential.

P1673-1

From breeding program at Purdue University, Indiana.

Has been grown at Saint-Jean, but not currently. Probably available from Indiana. Tree bears heavily biennially. Harvested mid October. Satisfactory fruit condition (pressure test 5.3 kg) when processed early November. Tested 1 year for juice.

Good juice yield. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 19. Low tannin. Good color. Good flavor.

Good potential for juice. No information available for sauce and slices. Not useful for fresh market.

Bancroft

Forest x McIntosh. From Ottawa breeding program, named 1935.

Grown at Saint-Jean and Smithfield. Tree resembles McIntosh in habit, strong grower. As hardy as McIntosh, bears at a young age. Harvested mid to late October. Fruit stores well until March. Tested 1 year for juice.

Poor juice yield. High soluble solids. Medium titratable acid. Sugar-to-acid ratio 29. Low tannin.

Information on juice is too limited for a reliable assessment. Good for sauce, fair to good for slices. Acceptable for fresh market.

Britegold

0-522 (includes Melba, Jonathan, Rome Beauty, and Malus floribunda 821) x Sandel. Formerly 0-652. From Ottawa breeding program; selected and named at Smithfield in 1979. Scab-resistant.

Grown at Saint-Jean and Smithfield. Tree yields poorly. Harvested early October. Good fruit condition (pressure test 6.0 kg) when processed late October. Tested 1 year for juice.

Fair juice yield. High soluble solids. Very low (less than 0.1%) titratable acid. Sugar-to-acid ratio 119. Poor color. Poor flavor.

No potential for juice. Fair for sauce, good for slices. Fresh use limited to growing in home gardens as a sweet dessert apple.

Brown's Apple

A "sharp" cider apple from the United Kingdom.

Grown in the United Kingdom and at Saint-Jean. The fruit sample we processed was shipped by air from the United Kingdom. The fruit was small, slightly shrivelled, and unattractive when received. Processed early October (pressure test 5.3 kg). Tested 1 year for juice.

Fair juice yield. Medium soluble solids. High titratable acid. Sugar-to-acid ratio 13. Medium tannin. Poor color. Excellent flavor.

Low potential for juice but excellent for making cider; the fermented product has a distinctly clean flavor with no hint of the undesirable odd, ester-like flavors sometimes described as perfumy. Used to upgrade flavor, acidity, and tannin in cider blends. No information available for sauce and sliced pack.

Cortland

Ben Davis x McIntosh. From New York Agricultural Experiment Station; introduced 1915.

Grown at Saint-Jean and Smithfield. Heavy feeder, bears annually. Fruit ripens over a longer period than McIntosh. Harvested late September. Fruit soft when processed in November; should be processed mid to late October. Tested 4 years for juice.

Fair juice yield. Medium soluble solids. Low to medium titratable acid. Sugar-to-acid ratio 26. Medium tannin. Good color. Good flavor. Aromatic.

Fair to good potential for juice. In Ontario, poor to fair for sauce and sliced packs. Considered good for these packs in Quebec, where white packs are quite acceptable in the retail trade. Exceptionally slow to discolor on slicing and therefore useful in salads and other cold presentations.

Cox's Orange Pippin

From England, before 1857. Possibly a seedling of Ribston Pippin, which dates back to before 1700 in England; parentage unknown.

Currently grown at Smithfield. Harvested late September. Satisfactory fruit condition (pressure test 5.5 kg) when processed mid November. Tested 2 years for juice.

Good juice yield. Pulp settled well. Very high soluble solids. High titratable acid. Sugar-to-acid ratio 20. Good color. Good flavor. Aromatic.

Good potential for juice but further testing needed to verify. Not yet evaluated here for other packs. It is a well-known good-quality apple in the United Kingdom, used for various purposes.

Delicious, Golden C-449

Spur of Golden Delicious, a chance seedling from West Virginia, 1916.

Grown at Saint-Jean and Smithfield. Harvested mid October. Slightly soft when processed late December; could be processed earlier in December. Tendency to shrivel in storage. Tested 2 years for juice.

Fair juice yield. High soluble solids. Low to medium titratable acid. Sugar-to-acid ratio 30. Low tannin. Good to excellent color. Poor flavor. Aromatic.

Fair potential for juice; further tests are needed to determine why juice has poor flavor and other packs have very good flavor. Good to excellent for sauce and slices, where flavor and color are excellent. Limited fresh market use.

Delicious, Hardispur

Whole-tree bud mutation of Starking Delicious. From Washington, 1958.

Grown at Saint-Jean. Spur-type tree, cold-tender. Harvested mid October. Good fruit condition (pressure test 6.5 kg) when processed early February. Tested 1 year for juice.

Fair juice yield. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 23. Medium tannin. Fair color. Good flavor.

Fair potential for juice. No information available for sauce and slices. A fresh market variety.

Delicious, Miller Sturdeespur

Whole-tree mutation found in Starking Delicious orchard near Cumberland Maryland, about 1953.

Has been grown at Saint-Jean and Smithfield; currently grown at Smithfield. Spur-type tree. Harvested mid October. Good fruit condition (pressure test 5.6 kg) when processed in December. Tested 3 years for juice.

Fair to good juice yield. Pulp settled well. High soluble solids. Low titratable acid. Sugar-to-acid ratio 51. Poor to fair color. Fair flavor.

Poor to fair potential for juice. Good for sauce, fair to good for slices. A fresh market variety.

Delicious, Redspur

Whole tree mutation found in Starking Delicious orchard, Washington, 1954.

Grown at Saint-Jean and Smithfield. Spur-type tree. Harvested mid October. Good fruit condition (pressure test 5.8 kg) when processed early February. Tested 1 year for juice.

Fair juice yield. Medium soluble solids. Low titratable acid. Sugar-to-acid ratio 48. Low tannin. Poor color. Very poor flavor.

Low potential for juice. No information available for sauce and slices. A fresh market variety.

Delicious, Starkrimson

Whole tree variation of Red (Starking?) Delicious found in Oregon 1953, introduced 1956.

Grown at Saint-Jean and Smithfield. Spur-type tree. Harvested mid October. Good fruit condition (pressure test 6.0-7.0 kg) when processed in late January and in February. Tested 6 years for juice.

Fair to good juice yield. Pulp settled well. High soluble solids. Low titratable acid. Sugar-to-acid ratio 47. Low tannin. Fair color. Fair flavor.

Fair to good potential for juice. Fair to good for sauce, good for sliced pack. A fresh market variety.

Empire

McIntosh x Delicious. From Geneva, New York, named 1966.

Grown at Saint-Jean and Smithfield. Tree semi-spur type, upright spreading, hardy, productive annually. Rivals Spartan. Harvested mid October. Good fruit condition (pressure test 6.3 kg) when harvested late December. Tested 5 years for juice.

Fair to good juice yield. Pulp settled well. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 23. Good to excellent color. Good flavor. Slightly aromatic.

Good to excellent potential for juice. Good commercial processing potential for sauce and sliced packs. Good quality, much in favor currently for many uses.

Fameuse (Snow)

Parentage unknown. Thought to be Canadian; seed may have been brought from France by early settlers in the early 1700s; planted between the states of Vermont and New York.

Grown at Saint-Jean. Extremely sensitive to scab. Biennial bearer. Harvested late September. Soft when processed in November; should be processed mid October. Tested 4 years for juice.

Fair juice yield. Low soluble solids. Medium titratable acid. Sugar-to-acid ratio 21. Low tannin. Good color. Good flavor.

Poor potential for juice. Poor for sauce and slices. Considered good quality in Quebec.

Geneva (includes Mont Royal, an improved strain of Geneva)

Open-pollinated seedling of Malus pumila. Originated in Ottawa, selected in 1928, introduced in 1930 as a rosybloom crabapple. Fair immunity to scab and resistant to several insect pests.

Grown at Saint-Jean. Tree is oramental but less floriferous than other varieties of the rosybloom class. Hardy, yields well, early. Good pollinator for all-important McIntosh. Harvested late August. Good fruit condition processed September to October. Pressure tests on crabapples of doubtful value. Tested 1 year (three replications) for juice.

Fair to good juice yield. Pulp settled well. Low soluble solids. High to very high titratable acid. Sugar-to-acid ratio 10. High tannin. Orange to red color difficult to rate, depending on end use. Good flavor.

Probably no potential for juice but has some unique, interesting properties. Red-fleshed, it makes a pink-red juice and cider, which unfortunately turns an undesirable orange during later storage. This problem can be overcome by increasing the concentration of the red anthocyanin pigment in the form of a grape product to retain the pink-red color. Fermented cider had a good clean taste (not perfumy) and good astringency because of its high tannin. Excellent for jelly. Could be used for preparing attractive red apple rings, without added color, for salads or cocktails. Because of its rosy red flowers, the tree is used in ornamental plantings.

George

Open-pollinated seedling of McIntosh. Originated in Edmonton, introduced 1948.

Grown at Smithfield. Vigorous, hardy, well-formed tree. Harvested early October. Good fruit condition (pressure test 6.0 kg) when processed late November. Tested 1 year for juice.

Poor juice yield. Pulp settled well. Medium soluble solids. Low titratable acid. Sugar-to-acid ratio 40. Excellent color. Fair flavor.

Poor potential for juice based on the 1 year tested. Good for sauce and slices.

Golden Russet

Unknown parentage, England. Known as Reinette Grise in France.

Grown at Saint-Jean and Smithfield. Large tree, willowy branches, heavy feeder, long-lived, hardy. Harvested mid October. Good firm fruit (pressure test 8.0 kg) when processed late January; although pressure tests suggest it could be processed later than this, the fruit tends to shrivel excessively in storage. Tested 3 years for juice.

Poor to fair juice yield. Pulp did not settle well. Very high soluble solids. Medium titratable acid. Sugar-to-acid ratio 28. Low to medium tannin. Fair to good color. Fair flavor.

Potential for juice is only fair, but it has been highly rated by some Quebec cider makers for specialty-pack apple "champagne" because of the excellent flavor of the fermented product. Widely used in blends for this purpose in Quebec. Good to excellent for sauce, where its bright yellow color and very grainy texture are used to upgrade color and texture in blends. Fair for sliced packs.

Güttingen

Grown in Switzerland as a cider apple. Obtainable from Dr. Walter Müller or Mr. Klauss Gersback, Research Station Eidz Forschungsanstalt für Obst. Wein und Gartenbau, ch 8820 Wädenswil, Switzerland. Formerly grown at Saint-Jean. Harvested mid September. Good firm fruit (pressure test 6.9 kg) when processed late November; could probably be processed through December. Tested 1 year (two replications) for juice.

Fair juice yield. Medium soluble solids. Very high titratable acid. Sugar-to-acid ratio 12. Medium tannin. Excellent color. Good flavor.

Good potential for juice. Could be useful to upgrade color, acidity, tannin, and flavor. No information available for sauce and slices.

Honeygold

Golden Delicious x Haralson. From Minnesota, 1969.

Grown at Saint-Jean and Smithfield. Vigorous tree, upright spreading, productive annually, hardy. Harvested early October. Good fruit condition (pressure test 6.0 kg) when processed late November. Tested 2 years for juice.

Fair juice yield. Pulp settled well. High soluble solids. Low titratable acid. Sugar-to-acid ratio 38. Fair color. Fair flavor.

Fair potential for juice (low acidity detracts from its juice value). Good for sauce, excellent for slices. Fruit quality inferior to Golden Delicious as a yellow-skinned fresh market apple.

Idared

Jonathan x Wagener. From University of Idaho, named 1942.

Grown at Saint-Jean and Smithfield. Upright tree, productive, spurry, tends to be biennial, fruit shape affected by cold. Harvested mid October. Good firm fruit (pressure test 6.3 kg) when processed in January but can be processed December through June. Exceptionally long storage life and does not dehydrate noticeably. Tested 6 years for juice.

Fair to good juice yield. Medium to high soluble solids. Medium titratable acid. Sugar-to-acid ratio 21. Medium tannin. Good to excellent color. Good to excellent flavor.

Good potential for juice. Useful because of exceptional storage life and generally good qualities. Fair for sauce and slices.

Jerseymac

New Jersey 24 x Julyred. From New Jersey, introduced 1971.

Grown at Saint-Jean and Smithfield. Vigorous tree, upright spreading, precocious, hardy. Extremely sensitive to apple scab. Similar to McIntosh but a month earlier. Harvested mid August. Soft when processed in November; should be processed about late September. Tested 2 years for juice.

Good juice yield. Pulp settled well. Low to medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 17. Low to medium tannin. Excellent color. Fair to good flavor. Aromatic.

Good potential for juice. No information available for sauce and slices. A good summer eating apple.

Kestrel

Macoun x New York Red Spy. From Kentville, N.S., 1976.

Grown at Saint-Jean and Smithfield. Vigorous tree, upright spreading, somewhat spurry, fruit shape oblate and slightly rough. Harvested late September. Good fruit condition (pressure test 5.7 kg) when processed mid November. Tested 2 years for juice.

Good juice yield. Pulp settled well. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 21. Good color. Good flavor.

Good potential for juice; warrants further testing. Good for sauce and slices.

Lindel

Richared Delicious x Linda. Formerly T-397, from Agriculture Canada's Smithfield Experimental Farm program, 1971.

Grown at Saint-Jean and Smithfield. Vigorous tree, moderately upright growth habit, productive, cold-hardy. Harvested late October. Good firm fruit (pressure test 6.5 kg) when processed early December; in good condition for processing December and January. Tested 5 years for juice.

Fair juice yield. Pulp settled well. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 26. Low to medium tannin. Good color. Fair flavor.

Fair to good juice potential. Good for sauce and sliced packs. Useful as a fresh market apple (good flavor and general quality).

Lobo

Open-pollinated McIntosh. From Agriculture Canada's Central Experimental Farm, Ottawa, 1930.

Grown at Saint-Jean. Almost a spur type, usually bears annually. Fruit similar to McIntosh, but when picked on time keeps better than McIntosh. Extremely cold-hardy. Harvested mid to late September. Fruit soft when processed mid November (perhaps the result of picking too early; when optimally picked, should be in good condition for processing at least until McIntosh's processing period of late October to mid November). Tested 4 years for juice.

Fair juice yield. Low to medium soluble solids. Low to medium titratable acid. Sugar-to-acid ratio 18. Low tannin. Good color. Good flavor.

Fair potential for juice (more highly rated in Quebec where high yields of good-flavored juice have been reported). Poor for sauce and sliced packs.

Loyalist

Linda x Yellow Newtown. Formerly T-416, from Agriculture Canada's Smithfield Experimental Farm program, named in 1979.

Has been grown at Saint-Jean and Smithfield; currently grown at Smithfield. Harvested mid October. Good firm fruit (pressure test 6.0-7.0 kg) when processed November through February. Stores exceptionally well without losing quality. Tested 8 years for juice.

Fair to good juice yield. High soluble solids. Medium titratable acid. Sugar-to-acid ratio 25. Excellent color. Good flavor.

Good potential for juice. Good for sauce and sliced packs. Very useful cultivar, combining generally good qualities over a long storage period.

Macfree

McIntosh x R18T40 (includes Jonathan, Rome Beauty, and Malus floribunda 821). Formerly 0-532, from Ottawa breeding program, released 1974. Scab-resistant.

Grown at Saint-Jean and Smithfield. Vigorous tree, spreading, productive. Somewhat cold-tender but survives most Quebec winters. Harvested mid October. Soft (pressure test less than 5.0 kg) when processed in December; should be processed about mid November. Tested 3 years for juice.

Fair to good juice yield. Medium soluble solids. Low to medium titratable acid. Sugar-to-acid ratio 26. Low tannin. Fair to good color. Good flavor.

Fair to good potential for juice. Fair sauce, poor to fair slices. Acceptable fresh market quality, popular with some home gardeners.

Macspur

Compact spur mutant of McIntosh.

Grown at Saint-Jean and Smithfield. Spur-type tree. Harvested late September. Fruit soft when processed late November; probably should be processed mid October to early November. Tested 1 year for juice.

Poor juice yield. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 17. Fair to good color. Fair to good flavor. Aromatic.

Fair potential for juice. Fair sauce, poor slices.

McIntosh

McIntosh was found growing as a seedling in Dundas County, Ont., in 1796; possibly a seedling of Fameuse.

Grown at Saint-Jean and Smithfield. Vigorous tree, heavy cropper. Harvested late September. Good fruit condition when processed late October to mid November. Tested 7 years for juice.

Fair to good juice yield. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 20. Low tannin. Good color. Good flavor. Aromatic.

Good for juice production. Fair sauce, poor slices. A good-quality fresh market apple. Long-established popular cultivar.

Melba

Open-pollinated McIntosh seedling, about 1924.

Grown at Saint-Jean and Smithfield. Vigorous tree, early bearer, productive, biennial, hardy. Harvested late August. Good fruit condition when processed early September, soft if left to process late September. Tested 1 year (three replications) for juice.

Fair to good juice yield. Pulp settled well. Low soluble solids (increases somewhat if the fruit is picked on time). High titratable acid. Sugar-to-acid ratio 11. Medium tannin. Excellent color. Good to excellent flavor.

Good juice potential, useful for early production except for low soluble solids. Poor for sauce and slices based on the 1 year tested.

Moir

McIntosh x Dg 22-81 (includes Jonathan and Malus floribunda 821). Formerly 0-548, from Ottawa breeding program, named at Smithfield in 1979. Scab-resistant.

Grown at Saint-Jean and Smithfield. Vigorous tree, productive, cold-hardy. Harvested early October. Good fruit condition (pressure test 6.0 kg) when processed early November to early December. Tested 3 years for juice.

Good juice yield. Pulp settled well. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 21. Low tannin. Excellent color. Good flavor. Aromatic, slightly perfumy.

Good potential for juice. Poor to fair for sauce and slices, mainly because of lack of color (not a problem with juice). Although short storage life, useful as a fall fresh market apple.

Murray

McIntosh x 52-05-26 (includes Red Melba, Wolf River, and Malus atrosanguinea 804). Formerly 0-628, from Ottawa breeding program, named at Smithfield in 1979. Scab-resistant.

Grown at Saint-Jean and Smithfield. Productive tree, biennial-bearing, cold-hardy. Harvested late August to early September. Fruit firm (pressure test 6.5 kg) when processed early November but probably should have been

processed much earlier for better quality. (Notes by others evaluating fresh market quality mention a short storage life, 1-1.5 months.) Tested 1 year for juice.

Fair juice yield. Low soluble solids. Very low titratable acid. Sugar-to-acid ratio 36. Good color. Poor flavor.

Poor juice potential. Poor sauce and slices. A good-quality apple for the late August to early September fresh market.

Mutsu

A seedling of Golden Delicious x Indo. A triploid, from Japan, 1948. Known as Crispin in England.

Grown at Saint-Jean and Smithfield. Vigorous tree, upright spreading, spurry, lacks winterhardiness, very productive, very large fruit. Harvested late October. Good fruit condition (pressure test 6.0-6.5 kg) when processed mid January. Tested 3 years for juice.

Fair juice yield. Pulp settled well. Medium to high soluble solids. Medium titratable acid. Sugar-to-acid ratio 26. Good color. Fair to good flavor.

Fair to good potential for juice. Good to excellent sauce (bright yellow color a strong point), fair sliced packs.

Northern Spy

Parentage unknown. New York, about 1840.

Has been grown at Saint-Jean and Smithfield; currently grown at Smithfield. Vigorous tree, upright spreading, slow coming into bearing, late bloom, productive, somewhat biennial, generally considered hardy but tender in Quebec, weak crotches, somewhat resistant to scab, susceptible to bitter pit. Harvested late October. Good firm fruit when processed early January. Firmness holds well; usually have to press because of surface breakdown, not loss of firmness. Tested 9 years for juice.

Fair to good juice yield. Pulp settled well. High soluble solids. Medium titratable acid. Sugar-to-acid ratio 22. Low to medium tannin. Good color. Excellent flavor.

Good cultivar for high quality juice production; used to upgrade other cultivars in juice blends. Excellent sauce and sliced packs. Excellent for cooking in the home. As it was 20-30 years ago, Northern Spy remains a high-quality standard cultivar for multi-use processing.

Paulared

Unknown parentage. Michigan, 1967.

Grown at Saint-Jean and Smithfield. Upright tree, productive annually, hardy. Harvested late August. Good fruit condition (pressure test 6.5 kg) when processed early October; too soft when processed in November. Tested 2 years for juice.

Good juice yield. Excellent pulp settling. Medium soluble solids. High titratable acid. Sugar-to-acid ratio 14. Low tannin. Fair color. Good flavor.

Good potential for juice. Poor to fair sauce, poor slices. Exceptional storage life for an early apple, one of the better good-quality early-season fresh market cultivars.

Prima

Complex parentage including Rome Beauty, Golden Delicious, and Malus floribunda 821. Formerly Co-op 2, from cooperative breeding programs at Indiana, Illinois, New Jersey, and United States Department of Agriculture experiment stations. Released 1967, named 1970. Scab-resistant.

Has been grown at Saint-Jean and Smithfield; currently grown at Smithfield. Tree is not winter-hardy. Harvested mid September. Good fruit condition (pressure test over 6.0 kg) when processed early November. Tested 3 years for juice.

Fair juice yield. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 19. Low tannin. Good color. Fair flavor.

Fair to good potential for juice. Good for sauce and sliced packs. Winter injury to trees limits this cultivar's usefulness.

Primegold

Unknown parentage. Probably a chance seedling of Golden Delicious.

Grown at Smithfield. Harvested early October. Good fruit condition (pressure test above 6.0 kg) when processed mid December. Tested 2 years for juice.

Poor juice yield. Pulp settled well. High soluble solids. Low titratable acid. Sugar-to-acid ratio 37. Good color. Fair flavor.

Low potential for juice. No information available for sauce and sliced packs.

Quinte

Crimson Beauty x Red Melba. Released as T-441 in 1954 from Ottawa breeding program, selected at Smithfield, named 1964.

Grown at Saint-Jean and Smithfield. Susceptible to cedar apple rust. Tree is winter-hardy. Harvested early August. Soft when processed late August; should be processed early to mid August, soon after harvest. Tested 1 year for juice.

Fair juice yield. Pulp did not settle well. Very low soluble solids. Very high titratable acid. Sugar-to-acid ratio 9. Medium tannin. Excellent color. Good flavor.

Low potential for juice. Fair sauce and slices. Well known as one of the earliest apples but limited usefulness because of its short storage life and acid taste.

Richelieu

0-521 x 0-541. Parents include Melba, McIntosh, Jonathan, Rome Beauty, and Malus floribunda 821. Formerly 0-635, from Ottawa breeding program, selected at Smithfield, named at Saint-Jean 1983. Scab-resistant.

Grown at Saint-Jean and Smithfield. Tree is precocious, bears annually, and is hardy (survived the severe Quebec winter of 1980-1981). Harvested mid September. Fruit slightly soft (pressure test 5.0 kg) when processed mid November; should be processed early November. Tested 3 years for juice.

Fair juice yield. Pulp settled well. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 20. Good color. Good flavor. Aromatic.

Fair potential for juice. No information available for sauce and slices. Suitable for home gardener.

Rouville

52-05-312 (includes Red Melba, Wolf River, and Malus atrosanguinea 804) x McIntosh. Formerly 0-627, from Ottawa breeding program, selected at Smithfield 1972, named at Saint-Jean 1983. Scab-resistant.

Grown at Saint-Jean and Smithfield. Tree is precocious, semi-spreading, semi-spur type, annually productive, hardy (survived the severe Quebec winter of 1980-1981). Harvested late August. Soft when processed early September; should be processed soon after harvest. Tested 2 years for juice.

Good juice yield. Medium soluble solids. Low to medium titratable acid. Sugar-to-acid ratio 20. Low tannin. Excellent color. Fair flavor.

Fair potential for juice. No information available for sauce and slices.

Sandel

Delicious x Sandow. Formerly T-3916, from Ottawa breeding program, tested in advanced trials at Smithfield and released 1978.

Grown at Smithfield. Tree moderately vigorous, precocious, productive, moderately hardy. Harvested mid October. Good fruit condition (pressure test 6.3 kg) when processed mid to late January. Stores well. Tested 2 years for juice.

Fair juice yield. Pulp settled well. Medium soluble solids. Low titratable acid. Sugar-to-acid ratio 47. Fair color. Poor to fair flavor.

Poor to fair potential for juice. Good sauce and slices. Limited use for fresh market.

Sinta

Golden Delicious x Grimes Golden. From Summerland, named 1970.

Grown at Saint-Jean and Smithfield. Harvested early to mid October. Acceptable fruit condition (pressure test 5.0 kg) when processed late November; probably better if processed sooner. Tested 2 years for juice.

Good juice yield. Pulp settled well. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 25. Very good color. Fair flavor.

Good potential for juice. Good for sauce and slices.

Sir Prize

Complex parentage including Rome Beauty, Malus floribunda 821, Golden Delicious, and Tetraploid (2-4-4) Golden Delicious, Doud. From cooperative breeding programs at Indiana, Illinois, New Jersey, and United States Department of Agriculture experiment stations. Released 1975. Scab-resistant.

Grown at Saint-Jean and Smithfield. Vigorous tree, upright spreading, annually productive, triploid, cold-tender. Fruit has waxy skin, bruises easily; not for supermarket trade. Harvested mid October. Slightly soft (pressure test 5.0 kg) when processed early December; should be processed late November. Tested 4 years for juice.

Good juice yield. Pulp settled well. Medium to high soluble solids. High to very high titratable acid. Sugar-to-acid ratio 14. Low tannin. Good color. Fair flavor.

Fair to good potential for juice. High-acid tart flavor could be useful in blends with bland-tasting cultivars. Color and flavor have varied widely

from one year to another. Good sauce (bright yellow color a strong point). Fair sliced packs. Not suitable for fresh market.

Smoothee

A true Golden Delicious mutation.

Grown at Smithfield. Harvested mid October. Good fruit condition when processed mid December, although fruit surface tends to shrivel in the same way as Golden Delicious. Tested 2 years for juice.

Fair juice yield. Pulp settled well. High soluble solids. Medium titratable acid. Sugar-to-acid ratio 30. Good color. Fair flavor.

Fair to good potential for juice; high soluble solids desirable for upgrading other cultivars, but juice yield limiting. Good sauce, fair slices.

Spartan

McIntosh x Newtown. Summerland, 1936.

Grown at Saint-Jean and Smithfield. Vigorous tree, upright spreading, somewhat spurred, heavy cropper, usually annual, hardy, very sensitive to European canker. Harvested late September. Very good firm fruit (pressure test 6.0 to 6.3 kg) when processed late December; good for processing November to January. Tested 6 years for juice.

Fair to good juice yield. Pulp settled well. Medium to high soluble solids. Low to medium titratable acid. Sugar-to-acid ratio 28. Low tannin. Good to excellent color. Good flavor.

Good potential for juice, although some years acidity is low. Fair sauce, poor slices. Good fresh market apple.

Spigold

Red Spy x Golden Delicious. New York, 1962.

Has been grown at Saint-Jean and Smithfield; currently grown at Smithfield. Vigorous tree, upright spreading, annually productive, moderately tender. A triploid. Very large fruit size. Harvested late October. Good firm fruit (pressure test 6.5-7.0 kg) when processed mid December; probably best processed December to January. Tested 3 years for juice.

Good juice yield. Pulp settled well. High soluble solids. Medium titratable acid. Sugar-to-acid ratio 24. Good color. Excellent flavor.

Good potential for juice; soluble solids and flavor desirable for upgrading other cultivars while maintaining other properties at good levels. Good sauce. Excellent for sliced packs (bright intense yellow, excellent flavor, good wholeness retention, tender texture).

Spijon

Parents include Red Spy, Jonathan, and Rome. Geneva, New York, named 1968.

Has been grown at Saint-Jean and Smithfield; currently grown at Smithfield. Harvested late October. Good firm fruit (pressure test 6.4-7.0) when processed mid December; could be processed December to January. Tested 3 years for juice.

Fair juice yield. Pulp settled well. Medium soluble solids. Medium titratable acid. Sugar-to-acid ratio 19. Good to excellent color. Fair flavor.

Good potential for juice, although juice yield may be low some years. Good to excellent sauce, fair slices.

Stoke Red

A "bittersharp" cider apple from the United Kingdom.

Grown at Saint-Jean as well as in the United Kingdom. The fruit sample we processed was shipped by air from the United Kingdom; small fruit, slightly shriveled and unattractive when received. Processed early October, at which time the fruit, although slightly soft, had a pressure test of 6.0 kg. Tested 1 year for juice.

Fair to good juice yield. High soluble solids. High titratable acid. Sugar-to-acid ratio 19. Very high tannin. Poor color. Poor flavor.

Low potential for juice but excellent for making cider, the fermented product having a distinctly clean flavor with no hint of the undesirable, odd, ester-like flavors sometimes described as perfumy. Used to upgrade tannin, acidity, flavor, and soluble solids in cider blends. No information available for sauce and slices.

Summerred

Open-pollinated seedling of Summerland S-4-8 (McIntosh x Golden Delicious). Introduced 1964.

Grown at Saint-Jean and Smithfield. Vigorous tree, spreading, blooms early, bears early, tendency to biennial bearing. Harvested mid August.

Fruit very soft when processed early November; not a good test; should be processed sooner, about September. Tested 2 years for juice.

Poor juice yield. Medium to high soluble solids. Medium to high titratable acid. Sugar-to-acid ratio 15. Low tannin. Good color. Fair flavor.

Potentially a good cultivar for juice but more testing needed using fruit of proper maturity. No information available for sauce and slices. Good early fresh market apple.

Sungold

Parentage unknown. Introduced by A. Cuggiano, Bridgeton, N.J. in 1961.

Grown at Smithfield. Harvested mid October. Good fruit condition (pressure test 5.4 kg) when processed late November. Tested 1 year for juice.

Poor juice yield. Pulp settled well. High soluble solids. Low titratable acid. Sugar-to-acid ratio 34. Good color. Fair flavor.

Low potential for juice based on the one year tested. Good sauce, fair to good slices (color a strong point).

Tremlett's Bitter

A "bittersweet" cider apple from the United Kingdom.

Grown in the United Kingdom and at Saint-Jean, where the trees froze out. The fruit sample we processed was shipped by air from the United Kingdom; small fruit, shriveled and unattractive when received but gave a pressure test of 6.4 kg. Tested 1 year for juice.

Fair juice yield. High soluble solids. Low titratable acid. Sugar-to-acid ratio 47. Very high tannin. Poor color. Fair flavor.

Low potential for juice but excellent for making cider, the fermented product having a distinctly clean flavor with no hint of the undesirable, odd, ester-like flavors sometimes described as perfumy. Used to upgrade tannin, flavor, and soluble solids in cider blends. No information available for sauce and slices.

Trent

Parents include McIntosh, Jonathan, Rome Beauty, and Malus floribunda 821. Formerly 0-531, from Ottawa breeding program, introduced from Smithfield, named 1979. Scab-resistant.

Grown at Saint-Jean and Smithfield. Semi-spreading tree needing careful training to prevent upright growth, requires a long growing season, bears annually. Harvested mid to late October. Good firm fruit (pressure test 7.0 kg) when processed late January; could be processed even later. Stores well until April. Tested 4 years for juice.

Poor to fair juice yield. Pulp settled well. Medium high soluble solids. Medium titratable acid. Sugar-to-acid ratio 22. Low tannin. Good color. Fair flavor.

Fair potential for juice. Good sauce and slices. Also suitable as a fresh market apple.

Vista Bella

Parents include Julyred, Melba, Sonora, Williams, Starr, Petrel, and Early McIntosh. Formerly NJ36, introduced 1963 from New Jersey, named 1974.

Grown at Saint-Jean and Smithfield. Vigorous tree, more difficult to thin than other early apples, does not drop excessively. Harvested early August. Soft when processed late August; should be processed soon after harvest. Tested 1 year for juice.

Fair juice yield. Pulp settled poorly. Low soluble solids. Very high titratable acid. Sugar-to-acid ratio 10. Medium tannin. Excellent color. Good flavor.

Low potential for juice. Limited to very early season processing. No information available for sauce and slices.

West Virginia Red York

Bud mutation of York Imperial.

Grown at Smithfield. This very firm long-storing cultivar is grown commercially in the eastern United States for processing. Harvested late October. Fruit very firm (pressure test 7.0-9.0 kg) when processed late January. Despite the high pressure test in late January, its flavor was not that of immature fruit. Developed internal corky areas and had to be processed while still very firm. Tested 2 years for juice.

Poor juice yield. Pulp settled well. High soluble solids. Medium titratable acid. Sugar-to-acid ratio 28. Fair color. Good flavor.

Fair potential for juice. Good to excellent sauce and slices for which its color, texture, wholeness retention, and flavor properties are well suited. Not a fresh market apple.

Yarlington

A "bittersweet" cider apple from the United Kingdom. Can be obtained from Dr. R.R. Williams, University of Bristol, Long Ashton, Bristol, England. Formerly grown at Saint-Jean (survived the severe winter of 1980-1981). Good fruit condition (pressure test 5.5-6.0 kg) when processed mid November. Tested 1 year for juice.

Poor juice yield. High soluble solids. Low titratable acid. Sugar-to-acid ratio 48. Very high tannin. Very poor (orange) color. Poor flavor (very sweet and mild).

No potential for juice but good for making cider, where its high tannin and soluble solids are useful in fermented cider blends. No value for sauce, slices, or the fresh market.

SUMMARY OF PROMISING CULTIVARS TESTED

0-521	Scab-resistant. Good orchard and juice yields. High acidity, along with good color and flavor, permits upgrading of low-acid apples in blends.
0-5410	Scab-resistant, with other properties acceptable, based on 1 year's test.
0-564	Scab-resistant, with other properties acceptable, based on 1 year's test.
0-591	Scab-resistant. Good juice yield, color, and flavor, along with high acidity and medium soluble solids, permit upgrading in blends.
0-637	Scab-resistant. Good juice yield, color, and flavor, along with high acidity and medium soluble solids, permit upgrading in blends.
0-6310	Scab-resistant, with other properties acceptable.
0-642	Scab-resistant. Good orchard and juice yields. Other properties in medium or good range, although flavor only fair.
BC10C-6-12	High acidity and good color, with other properties acceptable, could be useful in blends. Good for sauce and sliced packs as well.
Co-op 1	Scab-resistant. Good juice yield, excellent color, high acidity, medium soluble solids. Only lacking in flavor.
Pl673-1	Good juice yield, color, and flavor, along with medium soluble solids and acidity, based on 1 year's test.

Brown's Apple	Not for juice but good for making cider, the fermented product being of high quality. Medium tannin and soluble solids, along with high acidity, are useful in blending with other cultivars for cider.
Cortland	Generally good properties except only fair juice yield. Popular cultivar in Quebec for other uses as well.
Cox's Orange Pippin	Very high soluble solids and high acidity. Good color, flavor, and juice yield.
Empire	One of the best prospects for juice: excellent color, good flavor, medium soluble solids and acidity, fair to good juice yield. Also good for sauce and sliced packs. Currently popular with growers.
Güttingen	Although juice yield only fair the 1 year tested, its high acidity, medium tannin, excellent color, good flavor, and medium soluble solids suggest its usefulness for upgrading in juice and cider blends.
Idared	Fruit has exceptionally long storage life. Good to excellent color and flavor, with soluble solids, acidity, tannin, and juice yield all in the medium range.
Jerseymac	Except for low to medium soluble solids and fair to good flavor, all juice properties were good the 2 years tested. May be useful for early juice production.
Kestrel	All juice properties rated good, with none outstanding.
Loyalist	Fruit stores exceptionally well without losing quality. Excellent juice color, good flavor, high soluble solids, medium acidity, and fair juice yield. Also good for sauce and sliced packs. Useful cultivar, combining generally good qualities over a long storage period.
Macfree	Scab-resistant, with other properties acceptable.
McIntosh	All juice properties acceptable, in the good or medium range. Popular cultivar with growers.
Melba	Useful for early juice production except for low soluble solids. Excellent color and flavor, medium tannin, high acidity, fair to good juice yield.
Moira	Scab-resistant. Good juice yield and flavor, excellent color, with medium soluble solids and acidity.
Mutsu	Although juice yield only fair, all other properties in the good or medium range. Excellent for sauce.

Northern Spy	Excellent flavor, high soluble solids, and good color upgrade these properties in blends while maintaining other properties. Popular high-quality versatile standard for juice, sauce, sliced packs, and cooking in the home.
Paulared	One of the better quality and longer storing early season apples. Good juice yield and flavor, high acidity, medium soluble solids.
Sinta	Very good juice color and good yield, with other properties in the medium range. Also good for sauce and sliced packs.
Sir Prize	Scab-resistant. High soluble solids and acidity along with good juice yield and color. Also makes good sauce.
Spartan	All juice properties acceptable, in the good or medium range. Popular fresh market variety.
Spigold	One of the best prospects. Excellent flavor and high soluble solids, along with good juice yield, good color, and medium acidity, make this cultivar useful for upgrading quality in blends. As well, excellent for sliced packs and good for sauce.
Stoke Red	Not for juice but good for making cider, the fermented product being of high quality. Very high tannin, high acidity, and high soluble solids are useful in upgrading these properties in blends with other cultivars for cider production.
Tremlett's Bitter	Not for juice but good for making cider, the fermented product being of high quality. Very high tannin and high soluble solids are useful in blends with other cultivars for cider.
Yarlington	Not for juice but good for making cider. Very high tannin and high soluble solids are useful properties in blends with other cultivars for cider.

