**'Providence' – A New Red-Fleshed Apple for the Cider and Processing Industry**

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The purpose of this article is to share information about a new apple cultivar developed and in the process of being released by the University of Guelph.

'Providence' was tested as 'B17Crab7' for nearly twenty years at the Simcoe Research Program. The apple has several unique features well suited for the apple cider industry and processing industries. The apple has a very crimson red flesh, that produced crimson coloured juice for cider, jams and jellies.

## Origin

'Providence' apple was bred and developed by Dr. John A. Cline at the Simcoe Research Station, Simcoe, ON, Canada. It originated from an open-pollinated cross conducted in 2000 between the variety 'Empire' as the female parent. Seeds from the offspring were germinated and the seedlings were transplanted to an orchard in 2002. One selection numbered 'B17Crab7' was selected for its fruit qualities and propagated onto clonal M.26 rootstock for further evaluation. Trees were then planted in a 2007 in replicated and randomized fashion of two trees per plot with other crab apple selections as well as the reference cultivars for further evaluation. Several trees have been grafted on dwarfing rootstock and are now in production at the Simcoe Research Station as of 2015. Some of the horticultural and juice metrics are indicated below.

## Tree

'Providence' is a relatively vigorous tree with spreading growth habit. It typically flowers in mid-May in Simcoe, Ontario with prolific deep pink inflorescences. Early in development, spur leaves are red in colour, which later, along with extension leaves, change to green with red veins and petiols. The bark of younger shoots also has red colouring.

## Fruit

What is unique about fruit from 'Providence' is their distinct red-purple skin, ellipsoid shape, and red flesh throughout the mesocarp. Fruit are plum shape (ellipsoid conical), have long pedicels, and range in size from 20-43 g when trees

are not thinned. Spurs regularly set 2 or 4 fruits per spur. Fruit mature in late August to early September in Simcoe. Juice from extracted fruit is crimson red and maintains this colour when fermented. When overmature, fruit may develop cracks on the surface exposed to the sun. Cracked fruit may be a source of wild yeast species for those fermenting the juice and are unlikely to be of concern when processed for jams and juices. Extracted juice is high in acidity, has soluble solids concentration around 12%, is high in polyphenols, and has an astringent and bitter flavour. The juice is classified as a 'bittersharp' using the Long-Ashton Research Station cider classification system.

## Potential Development

'Providence' has several potential uses. The most obvious is for producing red-fleshed juice (that has high acidity and tannins) for the cider industry. We have received positive comments from craftcider makers in Ontario who have created test-batches with 'Providence.

'Providence' has also been used experimentally to create juice products (nonalcoholic, e.g. sours) for the beverage industry. Also, 'Providence' makes an excellent tangy, crabapple jelly with bright clear colour.

'Providence' will also make an excellent tree for residential and commercial landscapes. Birds will be attracted to the fruit and the red colour of the leaves in spring and pink blossoms are spectacular.

By virtue of being a rich source of antioxidants (flavonoids, flavanols, and anthocyanins), 'Providence' has nutraceutical and human health benefits.

**Table 1. 'Providence' horticultural characteristics based on data collection at the Simcoe Research Station, University of Guelph.**

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|---|---|
| **Tree vigor** | High vigor when grafted on M.26 EMLA rootstock; trees grafted on M.9 rootstock would be smaller but would display in a category of high vigor in comparison with other fresh-market apples. |
| **Tree habit** | Spreading |
| **Precocity** | Good to Excellent |
| **Productivity** | Very productive and annual bearing when not thinned. Yields up to 100 kg per tree on 11-yr-old trees on M.26 rootstock. Crop load ranged from 16-32 fruits per $cm^2$ trunk cross-sectional area. |
| **Fruit maturity** | Late August to early September in Simcoe, ON |

| | |
|---|---|
| **Fruit Size** | Plum shape, ranging from approximately 20-43 g (when not thinned) |
| **Fruit colour** | The fruit are the most distinguishing feature of 'Providence'. The fruit are very distinct with reddish-purple skin colour and red flesh through the mesocarp, and crimson coloured juice when extracted. The tree has red leaves at bloom that turn dark green during development. Flowers are pink in colour when fully open. The shoots have a distinctive red colour which is clearly distinguishable from other crab apples and red-fleshed apples currently available. |
| **Fruit shape** | ellipsoid conical (ovoid) |
| **Fruit pedicel** | Long |
| **Other** | Fruit often develop longitudinal cracks, especially when over-mature |
| **Fruit colour** | Red-skin and red-flesh throughout mesocarp |
| **Uniformity and stability** | 'Providence' has been grown for over 10 years and provided very consistent results. The tree is consistent in size and growth habit, and the fruit has being consistent in size, shape, flavour and colour characteristics annually. No variants or off-types have been observed during the development of the variety. |
| **Soil Adaptability** | Unknown |
| **Cold Hardiness** | Hardy to at least Zone 6a (and likely colder) and has survived at the Horticulture Research Station, Simcoe for well over a 15 years without any notable winter injury. Based on the genetics, crab apples are generally considered very winter hardy. |

**Table 2. 'Providence' fruit juice characteristics. Data represent one growing season and likely to vary annually and with management practices.**

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|---|---|
| **Colour** | Crimson red |
| **Juice extraction efficiency** | 809 litres/tonne fruit |
| **BRIX %** | 12 % |
| **pH** | 3.0-3.5 |
| **Titratable acidity** | 6-12 g/L (Malic acid equivalent) |
| **Polyphenols** | 954 ug/ml gallic acid equivalent (high) |
| **Colour stability** | Red colour has been stable pre- and post-fermentation in limited trials |

**Table 3. Disease and pest status of 'Providence'. In Simcoe, 'Providence' has been grown in a conventionally managed orchard with no notable pest and disease susceptibilities)**

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|---|---|
| **Fireblight** | Unknown resistance (not evaluated to date) |
| **Apple Scab** | Unknown resistance (not evaluated to date) |
| **Wooly apple aphid** | Unknown resistance (not evaluated to date) |
| **Powdery mildew** | Unknown resistance (not evaluated to date) |

## Commercial availability

The University of Guelph is currently negotiating license with nurseries showing interest. Please contact Steve Dinka, Research Innovation Office, University of Guelph, 50 Stone Rd E Guelph, Ontario, Canada, N1G 2W1 Tel:(519) 824-4120, Ext. 58878. Email: sdinka@uoguelph.ca

## Plant Protection

Canadian Plant Breeders Rights were applied for in the summer of 2020.

The University of Guelph is the owner of this cultivar. Royalties are shared between the Ontario Ministry of Agriculture, Food and Rural Affairs and the University of Guelph.