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'September Sentinel' apple

Cheryl R. Hampson and Richard A. MacDonald*

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Abstract

'September Sentinel' is a new red apple cultivar for home gardeners. The tree has a classic columnar growth habit and is resistant to apple scab. Bloom is early in the apple blossom season, similar in timing to 'McIntosh'. Fruit size averages 184 g, with soluble solids of 12.6% and titratable acidity of 0.56%. Fruit flesh firmness is about 73 N at maturity, which occurs in the third week of September at Summerland, B.C., Canada. Cold storage life of the fruit is short.

'September Sentinel' is a new disease-resistant columnar apple from the apple breeding program at the Pacific Agri-Food Research Centre (PARC) at Summerland. B.C., Canada (Fig. 1). This apple is the third in the disease-resistant "Silhouette" series of columnar apples, following the release of 'Golden Sentinel' and 'Scarlett Sentinel' by Dr. H. Quamme in the late 1990s. Both earlier releases show strong field resistance to apple scab (Quamme et al., 2005), presumably inherited from the 'Discovery' parent. 'September Sentinel' matures on average about Sept. 22 in Summerland (lat. 49°33'N, long. 119°38'W, elevation 454 m), about the same time as 'McIntosh' and before 'Scarlett

Fig. 1. Trees of 'September Sentinel' in bloom (left) and at harvest (right).

Agriculture and Agri-Food Canada, Pacific Agri-Food Research Centre, P.O. Box 5000, Summerland, B.C., Canada V0H 1Z0

* Retired

Sentinel'. It is resistant to apple scab [*Venturia inaequalis* (Cke.) Wint.] and appears to show some resistance to powdery mildew [*Podosphaera leucotricha* (Ell. & Ev.) Salm.]. The cultivar is a dessert apple suitable for small home gardens or urban edible landscaping. The compact trees can also be maintained as potted plants if desired. 'September Sentinel' resembles 'McIntosh' in sugar and acid contents, but not in appearance or flavor. The flesh is firmer than 'McIntosh'. Its major advantage over 'McIntosh Wijcik' for home cultivation is its high level of disease resistance.

Origin

'September Sentinel' resulted from a controlled cross, made in 1989 by W. D. Lane and R. A. MacDonald, between a columnar PARC breeding selection (8H-09-01) and Co-op 27 (Fig. 2). The original source of the columnar habit was 'McIntosh Wijcik', which was found as a spontaneous shoot mutation on a tree in the Kelowna area of British Columbia in the late 1960s (Fisher, 1969). The seeds from the controlled cross were stratified, grown in the greenhouse, and then transplanted to the field nursery in May 1990. In 1992, the selection was budded in-place on M.26 rootstock as a single tree within a test block, to induce early bearing. It was selected in 1995 by R. MacDonald, H. Quamme and C. Hampson, on the basis of tree form, fruit taste, and fruit appearance, and given the breeder's name 11W-61-23. Multiple trees were re-propagated on M.26 rootstocks for second stage testing in 1996 and 1997 for further evaluation. Following multiple years of observations, the cultivar was named in 2008.

Materials and Methods

The following botanical description specifies the averages for measurements on 10 plant parts off four different trees unless otherwise noted. Royal Horticultural Society color designations are used (Royal Horticultural Society, 2001). Fruit description elements follow the conventions of Zielinski (1977). All trees were propagated on M.26 rootstock, and were supported with a post and wire trellis. Tree spacing was 0.6 m x 4.5 m. The fields were located at the Pacific Agri-Food Research Centre in Summerland, B.C., Canada. A weed-free strip was maintained under the tree row with herbicides. The soil was a sandy loam.

Harvest maturity for all cultivars was estimated by a combination of starch breakdown (Blanpied and Silsby, 1992), the change of ground color from green to pale green or yellowish green, and fruit taste and color. The goal was to collect fruit at "eating maturity" in accordance with the anticipated use of the fruit. A sample of 10 sound representative fruit (five fruit in 2000) was collected at harvest to determine mean fruit weight. On the same sample, flesh firmness was measured

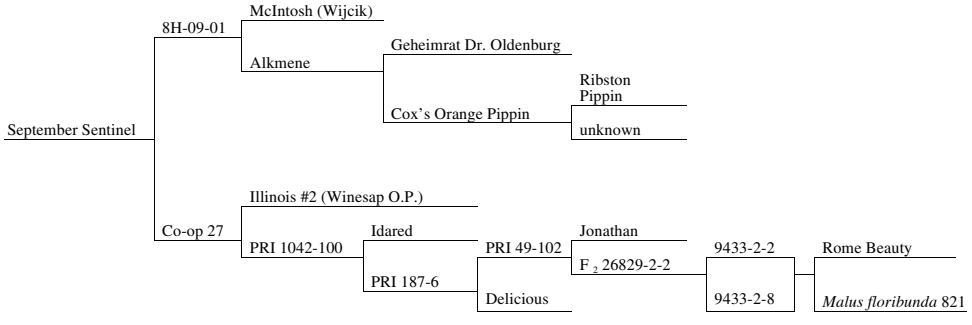

Fig. 2. Pedigree of 'September Sentinel'

with an EPT-1 penetrometer using an 11.25-mm probe (Lake City Technical, Kelowna, B.C.), on both sides of the fruit midway between the sun and shade sides. Sections from each fruit were cut from the cortex, and pooled for juicing and subsequent measure of soluble solids by refractometer (Mettler-Toledo Refracto 30 PX, Schwerzenbach, Switzerland) and titratable acidity of a 15 mL portion of juice using 0.1N NaOH (Metrohm 719 S Titrino, Herisau, Switzerland). Nine years of data were available for 'September Sentinel', but here we present data only for the years in which equivalent measurements were also available for both 'Scarlett Sentinel' and 'McIntosh' (Wijcik strain), namely 2000, 2006, 2007, 2011 and 2012.

Description

Tree

Trees of 'September Sentinel' have the columnar growth habit, in which lateral branching is very limited (Fig. 1); vigor is weak to moderate. When propagated on M.26 rootstocks, internode length averages 12.6 mm. Trees are hardy at least to zone 6A (minimum winter temperature of –23.3°C) in Summerland. Controlled freeze tests were not done, and the trees have not yet been tested in colder zones. The compact nature of the trees makes them suitable for small home gardens or even potted plants.

The bark of one-year-old wood is medium brown (RHS 200), densely pubescent on the distal half, and has many lenticels. Lenticels on older wood are numerous, prominent, oval or round, tan in color, about 1 mm long, raised, and roughened with russet.

The medium green leaves are held in outward orientation. Average leaf blade length is 10.1 cm and width is 6.5 cm. Leaf margins are biserrate. The petioles average 3.7 cm long. The abaxial side of the leaf blade has medium pubescence and the adaxial side is weakly glossy.

Productivity resembles that of other columnar trees. Fruit are borne only on spurs. In general, the number of fruit left after thinning depends on tree growth, which in turn depends on the rootstock used and the extent of spur pruning. Fruit set is heavy in some years, and thinning the clusters is recommended for adequate fruit size and return bloom. Thinning can easily be done by hand on the compact trees, especially at the blossom stage. Pre-harvest fruit drop is negligible, less than 'Golden Sentinel' and comparable to 'Scarlett Sentinel'. During the time observed, 'September Sentinel' showed some tendency towards alternate bearing, but it was less extreme than for 'McIntosh Wijcik' and some other columnar cultivars.

Molecular testing in 2003 using flanking PCR markers (Tartarini et al. 1999) indicated that 'September Sentinel' most likely carried the *Vf* gene (now called *Rvi6*, [Bus et al. 2011]) for resistance to apple scab (Hampson and O'Gorman, unpublished data). Resistance to leaf scab was confirmed in field trials. Trees propagated on M.26 rootstock were monitored for three years (2001-2003) in a dense, unsprayed planting under heavy infection pressure at Agassiz, BC (lat. 49°14'N, long. 121°45'W, elevation 15 m). The conditions of this test plot have previously been described in detail (Quamme et al., 2005). No leaf scab symptoms were detected on 'September Sentinel', whereas trees of 'McIntosh' in the same planting displayed sporulating lesions on 26% or more of leaves. During the test, it was observed that the leaves of 'September Sentinel' were also notably free of powdery mildew, unlike the 'Scarlett Sentinel' trees in the test plot.

Flower

The flower buds of 'September Sentinel' open early in the blossom season, about the same time as 'McIntosh', after 'Discovery' and before 'Golden Delicious'. Flowers are single and average 4.80 per cluster. The petal color of unopened flower buds is dark pink (RHS 63A). At balloon stage the petals are pink and white (70A/155D), later fading to white (155D) when fully open, with a little pink in the veins (Fig. 1). The petals are

Table 1. Fruit quality attributes of 'September Sentinel', 'McIntosh' (Wijcik strain), and 'Scarlett Sentinel' at harvest in Summerland, B.C., Canada.

Cultivar	Harvest date	Mean fruit weight (g)	Firmness (N)	Sugars (% soluble solids)	Titratable acidity (mg·100 mL^{-1})	Sugar: acid ratio
McIntosh (Wijcik)	Sept 25 ± 5 b	190 ± 2 b	64.3 ± 0.6 b	12.4 ± 0.2 a	0.71 ± 0.03 a	17.5 ± 0.9 b
Scarlett Sentinel	Oct 16 ± 4 a	230 ± 11 a	76.3 ± 2.5 a	13.3 ± 0.3 a	0.32 ± 0.04 b	42.9 ± 4.3 a
September Sentinel	Sept 22 ± 4 b	184 ± 15 b	73.0 ± 2.0 a	12.6 ± 0.7 a	0.56 ± 0.08 a	23.1 ± 2.5 b

[z] Data are the means (± SE) of 5 or 10-fruit samples in five harvest years. Means followed by the same letter are not significantly different, according to Tukey's HSD test at α=0.05.

ovate, overlapping but separated at the base. The diameter of the corolla is 5.1 cm, and the pedicels are 1.58 cm long and 1.50 mm wide. Blooms are faintly fragrant. The sepals have purple tips. The S-alleles have not been determined.

Fruit

The fruit of 'September Sentinel' ripens on average on Sept. 22 in Summerland (Table 1), about the same time as 'McIntosh (Wijcik)'. Fruit size is medium (184 g) when appropriately thinned. The fruits are round to round-conic, with a height to diameter ratio of about 0.9. Ribbing is weak or absent. The pale green ground color (RHS 154D/150B) is overlain with about 60% bright red blush (RHS 46B or 46A), with faint streaks visible on close inspection. Red color is limited at the stem end; the short peduncles cause the fruit to abut branches and spur leaves, limiting light exposure in that area. Lenticels are medium in density and not prominent. The skin is moderately thick with some bloom. When buffed, the fruit surface is moderately to highly glossy. The peduncle is short (1.0 cm) and thick (0.5 cm), sometimes slightly fleshy. The stem cavity is slightly variable in shape from acuminate to acute, medium in depth (13.5 mm) and medium in width (36.3 mm). The surface of the stem bowl is smooth and russet-free, usually green. The eye basin is shallow (5.1 mm) and medium in width (26.4 mm). Eye basin sides are flaring with a wavy surface and low crowning. The calyx is persistent, in erect orientation; the sepals average 5.1 mm and are separated at the base. The eye is partially closed. The calyx tube is urn-shaped and stamens are positioned basally. Core lines are indistinct in some fruit, and clasping. The core is in median position, medium in diameter, with open locules. The carpels are rounded, symmetrical, axile, and open with a smooth inner surface. There is a full complement of light brown seeds, which have acute tips.

The flesh color is pale cream when fully ripe. The flesh is tender, balanced sub-acid,

fine, firm, crisp and juicy. The firmness at harvest is 73 N on average, soluble solids average 12.6% and titratable acidity 0.6% (Table 1). It is similar to 'McIntosh' in sugar and acid content, but firmer and slightly sweeter in taste. The cut flesh browns more slowly than that of 'McIntosh'.

'September Sentinel' is suitable for dessert or culinary use, but is intended for immediate consumption from small backyard trees. The fruit's cold storage life is short, due to the softening of the flesh after harvest.

Availability

Re-propagated trees of 'September Sentinel' were tested at the Centre for Plant Health in Sidney, B.C. using woody and herbaceous host bioindicators, serological and molecular methods. The selection was found to harbour apple chlorotic leaf spot virus. It underwent successful heat therapy. Virus-indexed wood became available in limited quantities in 2012. 'September Sentinel' is protected in Canada (PBR certificate #33765, granted Feb. 15, 2010). Commercialization rights have been granted to the Okanagan Plant Improvement Corporation (PICO), 105 – 13677 Rosedale Ave., Summerland, BC, Canada, V0H 1Z0 (tel. 250-404-0088; www.picocorp.com). Information on the availability of propagation wood, and inquiries regarding licensing or acquisition of trees outside of Canada should be addressed to PICO.

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