'Laurel' Strawberry

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'Laurel', a short-day strawberry (*Fragaria ×ananassa* Duchesne ex Rozier), has been tested by growers in the Atlantic Provinces since 1999 and commercially introduced in Canada in 2012 by the Atlantic Food and Horticulture Research Center of Agriculture and Agri-Food Canada. 'Laurel' produces medium yields of large, aromatic, flavorful fruit ripening in the midseason, offering growers a cultivar especially suited to please pick-your-own and direct marketing customers. Plants of 'Laurel' are vigorous, resembling 'Cavendish' in habit, and they produce ample runners to establish matted rows. Plants are highly resistant to red stele root rot disease (incited by *Phytophthora fragariae* Hickman var. *fragariae*) and moderately resistant to several leaf diseases.

Origin

'Laurel' is a seedling of an 'Allstar' × 'Cavendish' cross made under the direction of A.R. Jamieson in 1991 at Kentville, Nova Scotia, Canada. 'Cavendish' is a large-fruited, early-midseason, winter-hardy cultivar, which has resistance to red stele root rot (Jamieson et al., 1991). 'Allstar', a highly successful cultivar of the USDA and Univ. of Maryland, is noted for its high yields of firm, bright red, sweet-tasting fruit and resistance to red stele root rot and several other diseases (Galletta et al., 1981). Seedlings of the cross

were screened for red stele resistance using the sand bench method of Scott et al. (1976) with six isolates of Canadian race 2 as inoculum. Race 2, equivalent to A-6, is the predominant type in eastern Canada (Nickerson and Jamieson, 1995) and is effective at selecting the *Rpfl* resistance allele (Van de Weg, 1997). Symptomless plants were moved to a poorly drained field infested with *P. fragariae* located at Sheffield Mills, Kings Co., Nova Scotia, Canada, in Spring 1992 and 'Laurel' was selected for its sweetness and aromatic strawberry flavor in 1993 by A.R. Jamieson. 'Laurel' was tested as selection K93-20.

Performance

'Laurel' has fruited at Kentville each year since 1995 in at least one 5-m matted row developed from 10 plants. In addition, 'Laurel' was tested in Atlantic Canada in regional trials planted in 1999 at three sites, in 2008 at two sites, and in 2010 at Kentville. These trials were grown as matted rows and harvested in the year after the planting year. Trial locations were Kentville, Nova Scotia, Canada (lat. 45°04' N, long. 64°29' W), Belleisle Creek, New Brunswick, Canada (lat. 45°45' N, long. 65°43' W), Charlottetown, Prince Edward Island, Canada (lat. 46°15' N, long. 63°08' W), and Harrington, Prince Edward Island, Canada (lat. 46°20' N, long. 63°10' W). Plants were arranged in a row-column design randomized across sites. Each site had three blocks except for the final single-site trial at Kentville, which had four blocks. Matted rows were developed from seven plants per plot spaced 0.5 m between plants within rows and 1.4 m between rows. To reduce the plot-end effects, the central 3 m of each plot was harvested. Fruit was harvested two times per week and sorted into marketable and unmarketable categories. The average fruit weight for the season was a weighted mean based on the mass of a randomly selected 25 marketable fruit subsample from each plot from each harvest and the yield for each harvest. Similarly, the average harvest date for the season was a weighted mean based on the dates of harvest and the yield for

each date. Data from the randomized block trials were subjected to analysis of variance (GenStat 11.1; VSN Intl. Ltd., Oxford, U.K.) and when F probabilities were significant, means were separated by least significant difference ($P \leq 0.05$).

Fruit firmness was determined in 2011 by penetration using an Imada Digital Force Gauge (Model DPS-4R; Imada, Northbrook, IL) with a 7.5-mm OD V-notched tip. The maximum force (Newtons) that occurred during insertion of the probe 6 mm into the side of each of 10 secondary fruit was recorded and averaged. These secondary fruit were picked at Kentville on 4 July ('Laurel'), 5 July ('Mira'), and 7 July ('Jewel') and were selected based on color as fully red but not overripe. The 10 measurements were used to calculate a cultivar mean and SD by Microsoft® Excel® Analysis ToolPak (Microsoft Corporation, Redmond, WA). Leaf and flower measurements, recorded on 1 June 2011 at Kentville in matted rows established the previous year, were based on 10 plant parts and the flowers selected were secondary flowers.

The mean harvest date of 'Laurel' was from 2 to 5 d later than the early-season cultivars Annapolis and Wendy (Tables 1 to 3) and from 1 to 4 d earlier than 'Jewel' (Tables 1 and 3). This places 'Laurel' in the middle of the harvest period of short-day cultivars. The marketable yield of 'Laurel' was greater at Kentville than at the other, more northerly sites in New Brunswick and Prince Edward Island (Tables 1 and 2). The low yield at Harrington in 2009 was the result of the lack of fruiting plants in matted rows attributable to plant death; the cause was undiagnosed. Yields at Kentville have been similar to 'Annapolis', a major commercial cultivar in eastern Canada, but usually less than the highly productive cultivars Kent, Mira, and Jewel. The fruit of 'Laurel' are well formed indicating a high achene set and the incidence of fruit rot is generally low, both factors contributing to low unmarketable yields (Tables 1 to 3). The seasonal mean berry weight of 'Laurel' is similar to standard cultivars Annapolis, Mira, and Jewel (Tables 1 to 3). In the Kentville trial in 2011, the first two harvests of 'Laurel' had a mean berry weight of $25.1 \text{ g} \pm 6.21$ (mean $\pm$ SD) compared with $21.9 \text{ g} \pm 1.79$ for 'Annapolis' and in the last two harvests, $7.0 \text{ g} \pm 0.45$ for 'Laurel' and $6.9 \text{ g} \pm 0.44$ for 'Annapolis' (data not shown). The early harvest data indicate a greater plot-to-plot variation in the berry weight of 'Laurel'. Growers in eastern Canada who have tested 'Laurel' have reported acceptable yields of large berries with excellent flavor that are appreciated by discerning customers.

Fruit Description

The flavor of 'Laurel' is frequently described as sweet and aromatic with notes of melon. When rated by the breeder on a flavor scale of 1 to 9 (where 9 is best) over 6 years with one rating per year of red-ripe fruit near peak harvest time, 'Laurel' scored 8.0 ± 0.32 (mean $\pm$ SD), 'Wendy' 7.5 ± 0.71 , 'Sable'

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7.5 ± 0.32, 'Brunswick' 6.8 ± 0.42, and 'Mira' 6.5 ± 0.45. 'Laurel' scores high for flavor every year, whereas 'Wendy' has more year-to-year variability as indicated by its higher sd. As reported by Jamieson et al. (2010) from samples drawn from the 2009 harvest, 'Laurel' had a soluble solids concentration (SSC) of 7.9 °Brix and a titratable

acidity (TA) of 0.90% citric acid, scores very similar to 'Bounty', a cultivar known for its excellent flavor. In this same study, when compared with 'Laurel', 'Mira' had lower SSC and higher TA and 'Wendy' had lower SSC and lower TA.

The red-ripe fruit of 'Laurel' are similar in firmness to 'Mira' and 'Jewel' as measured

by the force of penetration: 5.4 N ± 0.59 (mean ± sd), 5.0 N ± 0.32 and 4.4 N ± 0.74, respectively. The fresh fruit appearance ratings on a scale of 1 to 9 (where 9 is best) over 6 years for 'Laurel', 'Wendy', 'Sable', 'Brunswick', and 'Mira' were 7.6 ± 0.49 (mean ± sd), 7.6 ± 0.38, 7.8 ± 0.27, 7.6 ± 0.42, and 7.5 ± 0.45, respectively. These cultivars produce equally attractive berries. Primary and secondary fruit of 'Laurel' are cordate or short conic in shape, whereas tertiary fruit are short conic to globose (Fig. 1). Fruit of 'Laurel' are broader than long with a length to width ratio of 0.90 calculated from 10 secondary berries. Achenes of 'Laurel' are set just below the surface. Fruit exterior color is bright medium red (Red Group 45B; Royal Horticultural Society, 1986) and interior cortex and pith color is also 45B with a narrow band of light red vascular tissue surrounding the pith. 'Laurel' has a medium-sized calyx; the calyx diameter is smaller than the fruit diameter (Fig. 1).

Plant Description

Plants of 'Laurel' are vigorous; they runner freely producing sufficient daughter plants to establish matted rows. Plant size is medium to large with long leaves: 39.1 ± 1.99 cm (mean ± sd) as measured from the crown to the tip of the central leaflet. 'Laurel' leaf blades are medium-sized and the central leaflets are as long as broad (0.99 length-to-width ratio) with 28.1 ± 4.58 serrations. Leaflets have an obtuse base, are cupped, and have strong interveinal blistering. The upper surface of the leaflets is glossy and dark green (Green Group 137A; Royal Horticultural Society, 1986) and the undersurface is medium green (138B). Petioles are sparsely pubescent. The flower stalks of 'Laurel' are moderately erect, pubescent, and medium long (18.9 ± 3.14 cm), bearing eight to 12 (usually 10) perfect flowers, which produce ample pollen, and they open beneath the canopy. Flowers are white and medium in size with a diameter of 31.1 ± 2.69 mm; petals are longer (13.2 ± 1.23 mm) than they are wide (11.7 ± 1.06 mm).

Disease Response

'Laurel' is highly resistant to *P. fragariae* var. *fragariae* Canadian race 2, the predominant

Fig. 1. 'Laurel' strawberries from an early harvest.

Table 1. Fruit production² of 'Laurel' and standard cultivars for 2000 in Kentville, Nova Scotia, Charlottetown, Prince Edward Island, and Belleisle Creek, New Brunswick, Canada.

Cultivar	Yield (t·ha ⁻¹)		Wt/fruit* (g)	Mean harvest* (day of yr)
	Marketable	Unmarketable		
<i>Kentville, Nova Scotia</i>				
Annapolis	12.7 b ^y	0.9 a	12.5 b	187.0 c
Brunswick	17.7 a	1.1 a	14.8 a	191.6 b
Laurel	13.5 b	1.0 a	12.0 b	190.1 b
Jewel	18.0 a	1.0 a	12.4 b	193.7 a
Mira	20.4 a	1.1 a	12.3 b	193.6 a
<i>Belleisle Creek, New Brunswick</i>				
Annapolis	1.7 c	0.4 c	12.7 b	195.8 bc
Brunswick	7.1 b	1.2 b	17.0 a	194.9 c
Laurel	7.7 b	2.9 a	12.4 b	197.7 ab
Jewel	11.3 a	3.1 a	13.5 b	198.1 a
Mira	12.6 a	3.3 a	13.3 b	199.6 a
<i>Charlottetown, Prince Edward Island</i>				
Annapolis	6.0 b	0.2 a	10.4 b	195.5 b
Brunswick	14.5 a	0.5 a	12.6 a	199.4 a
Laurel	6.6 b	0.2 a	10.1 b	199.6 a
Jewel	16.6 a	0.3 a	12.0 a	201.4 a
Mira	14.5 a	0.4 a	12.2 a	200.5 a

²Data for 2000 from plots established in 1999. Data from entire trials, containing 15 cultivars or selections, were used in the analysis of variance in which sites were a source of variance in the model and considered random.

^yMean separation within columns and years by least significant difference test at $P \leq 0.05$.

^xSeasonally weighted means based on the dates of harvest and the yield for each date.

Table 2. Fruit production² of 'Laurel' and standard cultivars for 2009 in Kentville, Nova Scotia, and Harrington, Prince Edward Island, Canada.

Cultivar	Yield (t·ha ⁻¹)		Wt/fruit ^x (g)	Mean harvest ^x (day of yr)
	Marketable	Unmarketable		
<i>Kentville, Nova Scotia</i>				
Wendy	16.5 b ^y	2.3 a	15.3 a	181.3 c
Laurel	12.1 c	1.3 a	12.0 b	186.0 b
Kent	16.7 b	2.0 a	13.1 b	186.9 b
Mira	21.4 a	2.3 a	12.2 b	191.7 a
<i>Harrington, Prince Edward Island</i>				
Wendy	14.1 a	2.2 a	18.6 a	185.3 d
Laurel	2.7 c	0.7 b	10.7 c	188.4 c
Kent	8.6 b	1.8 a	14.1 b	190.1 b
Mira	5.4 c	1.0 b	12.1 bc	191.5 a

²Data for 2009 from plots established in 2008. Data from entire trials, containing nine cultivars or selections, were used in the analysis of variance in which sites were a source of variance in the model and considered random.

^yMean separation within columns and years by least significant difference test at $P \leq 0.05$.

^xSeasonally weighted means based on the dates of harvest and the yield for each date.

Table 3. Fruit production² of 'Laurel' and standard cultivars for 2011 in Kentville, Nova Scotia, Canada.

Cultivar	Yield (t·ha ⁻¹)		Wt/fruit ^x (g)	Mean harvest ^x (day of yr)
	Marketable	Unmarketable		
Wendy	13.5 b ^y	2.0 b	16.1 a	183.2 c
Annapolis	17.2 b	1.6 b	14.3 b	184.2 c
Laurel	15.0 b	1.6 b	15.2 ab	188.7 b
Jewel	22.8 a	3.1 a	13.9 b	192.7 a

²Data for 2011 from plots established in 2010. Data from entire trials, containing 15 cultivars or selections, were used in the analysis of variance.

^yMean separation within columns by least significant difference test at $P \leq 0.05$.

^xSeasonally weighted means based on the dates of harvest and the yield for each date.

Table 4. Reaction to inoculation with multiple races^z of *Phytophthora fragariae* Hickman var. *fragariae*, the cause of red stele root rot.

Cultivars	2007 ^y	2008 ^y	2009 ^y
Laurel	2.5	2.6 a ^x	2.7
Wendy	2.2	1.7 b	1.6
Mira	1.6	1.6 b	—
Ovation	2.0	1.4 bc	—
Annapolis	1.0	1.3 bc	1.2
Cavendish	1.2	1.2 c	—
Sable	1.2	1.1 c	1.4
Brunswick	1.0	1.1 c	—

^zThe inoculum was a mixture of Canadian races 1 to 7. Specific resistance among cultivars to races 1 and 5 is rare (Nickerson and Jamieson, 1995). Plant roots were rated on the following scale: 1 = 0% to 24% healthy; 2 = 25% to 49% healthy; 3 = 50% to 74% healthy; 4 = 75% to 99% healthy; and 5 = 100% healthy.

^yThe number of replications and plants inoculated per replication were: one replication with five plants/replication in 2007, four replications with four plants/replication in 2008, and two replications with four plants/replication in 2009.

^xMean separation within the 2008 column by least significant difference test at $P \leq 0.05$.

race in eastern Canada. In a severe, multiple-race screening test similar to Scott et al. (1976), including race A-5 to which specific resistance is rare, 'Laurel' demonstrated a higher level of resistance than many other cultivars known to have red stele resistance (Table 4). In field plots at Kentville, foliage of 'Laurel' is generally healthy; no significant foliar disease epidemics have occurred. 'Laurel' plants have

demonstrated moderate resistance to leaf scorch [caused by *Diplocarpon earliana* (Ellis & Everh.) F.A. Wolf], leaf spot [caused by *Mycosphaerella fragariae* (Tul.) Lindau], and to powdery mildew [caused by *Podosphaera aphanis* (Wallr)], although mildew has occasionally been observed on the fruit in years when environmental conditions are favorable. Virus diseases of strawberries are uncommon in Atlantic Canada; the virus tolerance of 'Laurel' is unknown. Green petal disease (caused by clover phyllody phytoplasma) is common, however, and plots of 'Laurel' have contained few plants with symptoms indicating a moderate level of resistance.

'Laurel' appears to be suited to production throughout the Canadian Atlantic Provinces and northeastern United States, and growers have had best test results in Nova Scotia and Maine. Several pick-your-own growers in Nova Scotia have been successfully growing 'Laurel' under its selection number K93-20 and have requested that it be named and formally introduced. It provides resistance to red stele root rot in a cultivar ripening between 'Brunswick' and 'Mira'. 'Laurel' will be of value as a midseason cultivar providing attractive, richly flavored berries for markets and customers seeking excellent fruit quality.

Availability

Certified 'Laurel' plants are being propagated by nurseries, the names of whom will

be supplied on request. The Atlantic Food and Horticulture Research Center has released 'Laurel' into the public domain without restriction. Nurseries interested in obtaining propagation material may contact A.R. Jamieson, Agriculture and Agri-Food Canada, Atlantic Food and Horticulture Research Center, 32 Main Street, Kentville, Nova Scotia, B4N 1J5, Canada, or Andrew.Jamieson@agr.gc.ca.

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