'Wendy' Strawberry

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'Wendy' strawberry (*Fragaria* × *ananassa* Duchesne) was commercially introduced in Canada in July 2006 by the Atlantic Food and Horticulture Research Center (AFHRC) of Agriculture and Agri-Food Canada. 'Wendy', a short-day cultivar, ripens in the early season, offering growers an alternative to 'Annapolis' with good fruit quality and yield. Plants of 'Wendy' are vigorous, resembling 'Evangeline' in habit, and they produce ample runners to establish matted rows. In greenhouse screening with multiple races of *Phytophthora fragariae* Hickman var. *fragariae*, 'Wendy' has demonstrated partial resistance.

Origin

'Wendy' is a seedling of a K96-5 × 'Evangeline' cross made under the direction of A.R. Jamieson in 1997 at Kentville, Nova Scotia (Fig. 1). 'Evangeline', introduced from the AFHRC in 1999, is an early-season cultivar that has uniform, attractive fruit but is only moderately productive (Jamieson

et al., 2004). K96-5 is an early-midseason genotype selected in the AFHRC breeding program in 1996, which was used in breeding as a source of resistance to *P. fragariae* var. *fragariae*, which causes red stele root rot. The cross was made in the winter of 1997 in a greenhouse and seeds were extracted from mature fruit and sowed in Spring 1997 and subsequently transplanted into the field at Sheffield Mills, Nova Scotia. 'Wendy', tested as K98-6, was selected for its high yield of large, firm, flavorful fruit in 1998 by A.R. Jamieson. The genetic background of 'Wendy' places it in the northeastern group of cultivars with influence from the northern group (Sjulin and Dale, 1987).

Performance

Fruit has been harvested from 'Wendy' at Kentville each year since 2000 in at least one 5-m matted row developed from 10 plants. In addition 'Wendy' was tested in Atlantic Canada in regional trials planted in Spring 2003, 2004, and 2007. Fruit of 'Wendy' was harvested from these replicated trials at three AAFC sites, Kentville, Nova Scotia, Bouctouche, New Brunswick, and Harrington, Prince Edward Island, and one grower site in Waterville, New Brunswick, from 2004 to 2008 (Table 1). Plants were arranged in latinized randomized block designs across sites. Each site had three blocks. Site was analyzed as a factor, not as a treatment, because the purpose was to test the average performance of cultivars in the Maritime Provinces, not to measure genotype × environment interaction. 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. Berries were considered unmarketable if they showed symptoms of disease, damage by pests, or were too small—less than the diameter of a Canadian dime (18 mm). 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 plot for each harvest (Moore, 1970). 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 field trials were subjected to analysis of variance (GenStat 11.1; VSN Intl. Ltd., Oxford, U.K.) and when F probabilities were significant, means (Table 1) were separated by least significant difference (LSD, $P \leq 0.05$).

Fruit firmness was determined in 2003 and 2004 by penetration using an Imada Digital Force Gauge (Model DPS-4R; Imada, Northbrook, IL) with a 7.5-mm o.d. V-notched tip. The maximum force (Newtons) that occurred during insertion of the probe 6 mm into both sides of each of 10 secondary fruit was recorded and averaged (Table 2). Secondary fruit picked at Kentville on 4 July 2003 and 6 July 2004, during the second week of harvest, were selected based on color as fully red but not overripe. The two measurements per fruit were averaged and the 10 means were used to calculate a cultivar mean and SE by Quattro[®] Pro (Corel Corporation, Ottawa, Canada).

In 2008, red ripe fruit samples were frozen and subsequently thawed and analyzed for soluble solids concentration (SSC), pH, and total acid. SSC was measured with a Reichert Mark II digital refractometer (Reichert Scientific Instruments, Buffalo, NY) and pH and titratable acidity with a Man-Tech automatic titrator (Model QC-Titrator[™]; Man-Tech Associates Inc., Guelph, Ontario, Canada). Three replications of 200-g fruit samples were harvested at each of three dates (30 June, 3 July, and 7 July) during the central part of the 2008 harvest season. Analysis of variance was performed and LSD ($P \leq 0.05$) values were calculated (Table 3).

The marketable yield of 'Wendy', when combined over sites, has been similar to or greater than the yield of other early-season cultivars in each of these trials (Table 1). Marketable yield data at individual sites follows this trend with the exception of Bouctouche in 2004, 2005, and 2006, in which the yield of 'Annapolis' exceeded 'Wendy' (data not shown). Variability in yields can result from many factors such as variability in runner production in the planting

Fig. 1. Pedigree of 'Wendy' strawberry.

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Table 1. Yield, fruit weight, and harvest season for ‘Wendy’ and standard early-season cultivars for 4 years averaged over various sites in Atlantic Canada.^z

	Cultivar	Yield (t·ha ⁻¹)		Wt/fruit (g)	Mean harvest (day of year)
		Marketable	Unmarketable		
2004 (Sites 1 and 2) ^y					
	Annapolis	12.9 ab [*]	1.7 a	14.3 a	193.8 a
	Evangeline	8.3 c	1.0 b	10.5 b	192.3 b
	Veestar	10.8 bc	1.9 a	9.8 b	191.3 c
	Wendy	14.7 a	1.9 a	15.2 a	193.0 b
	SEM (n = 6)	0.98	0.16	0.47	0.25
2005 (Sites 1, 2, and 3)					
	Annapolis	11.9 a	1.3 ab	14.7 a	189.9 a
	Evangeline	8.4 b	0.8 b	10.9 b	190.1 a
	Veestar	10.0 ab	1.7 a	9.6 c	189.4 a
	Wendy	11.6 a	1.1 b	15.1 a	189.8 a
	SEM (n = 9)	1.07	0.17	0.36	0.29
2006 (Sites 1 and 2)					
	Annapolis	14.2 a	2.2 a	14.1 a	181.1 a
	Evangeline	12.3 a	2.3 a	10.1 b	180.9 ab
	Veestar	12.8 a	3.0 a	8.9 c	180.3 b
	Wendy	15.6 a	3.0 a	14.0 a	180.8 ab
	SEM (n = 6)	1.20	0.32	0.31	0.27
2008 (Sites 1, 3, and 4)					
	Annapolis	6.4 b	1.5 a	11.4 b	187.9 a
	Wendy	9.6 a	1.7 a	13.7 a	187.6 a
	SEM (n = 9)	0.87	0.28	0.67	0.40

^zData for 2004 from plots established in 2003; data for 2005 and 2006 from plots established in 2004; data for 2008 for plots established in 2007. Data from entire trials, containing nine to 12 cultivars or selections, were used in the analysis of variance.

^yTrial locations: 1) Kentville, Nova Scotia; 2) Bouctouche, New Brunswick; 3) Harrington, Prince Edward Island; 4) Waterville, New Brunswick.

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

Table 2. Mean fruit firmness of ‘Wendy’, ‘Evangeline’, and ‘Sable’ harvested red-ripe.

Cultivar	Firmness ^z	
	(N)	SE
2003		
Evangeline	4.6	0.17
Sable	4.4	0.10
Wendy	4.8	0.15
2004		
Evangeline	4.4	0.22
Sable	3.8	0.15
Wendy	5.0	0.16

^zFruit firmness in Newtons as determined by penetration with a 7.5-mm o.d. V-notched tip.

year, cultivar reaction to root pathogens, herbicides, or frost injury to flowers. None of these trials were exceptionally productive; however, ‘Wendy’ reached 21.1 t·ha⁻¹ marketable yield at Kentville in 2004 and 19.4 t·ha⁻¹ at Harrington in 2005. ‘Wendy’ has performed very well in Maine where 26.7 t·ha⁻¹ was achieved in a second harvest year, the highest yield among 24 cultivars (David Handley, personal communication). The first harvest year yield for the Maine trial was intermediate (17.2 t·ha⁻¹), similar to ‘Honoe’. ‘Wendy’ has demonstrated its im-

proved yield over ‘Evangeline’ and potential to exceed ‘Annapolis’, the predominant early-season cultivar in eastern Canada. Plants of ‘Wendy’ have demonstrated adequate winter-hardiness when grown in matted rows, protected with straw mulch during winter, in plant hardiness zones 2b to 6a (McKenney et al., 2001) with the exception of a cold period with no snow cover during Jan. and Feb. 2007 in Grand Rapids, MN (Yao and Luby, 2008).

The harvest season of ‘Wendy’ was not different from ‘Annapolis’ in most trials (Table 1). The seasonal mean fruit weight of ‘Wendy’ equals or exceeds ‘Annapolis’ (Table 1), which is noted for its large fruit for an early-season variety (Jamieson, 2003). Fruit of ‘Wendy’ are usually slightly heavier than ‘Annapolis’ at the beginning of harvest and slightly lighter (smaller) at the end of harvest. The reduction in fruit weight during the season was calculated for the three maiden crops at Kentville (2004, 2005, and 2008) as the percent reduction from the mean of the first two harvests to the final two harvests. For the 3 years, the reduction for ‘Wendy’ was 64%, 50%, and 59% compared with 58%, 37%, and 48%, respectively, for

‘Annapolis’, indicating that fruit weight for ‘Wendy’ has a greater drop during the harvest season.

Fruit Description

The red-ripe fruit of ‘Wendy’ are substantially firmer than ‘Sable’ and slightly firmer than ‘Evangeline’ as measured by the force of penetration (Table 2). The flavor of ‘Wendy’ is frequently rated as very good, 8 on a scale of 1 to 9 compared with 7 to 8 for ‘Evangeline’ and 6 to 7 for ‘Annapolis’. The mean SSC of ‘Annapolis’ was 8.7%, ≈ 1 unit higher than for ‘Wendy’ and ‘Evangeline’ (Table 3). The titratable acidity (TA) was substantially lower for ‘Wendy’ than the other cultivars contributing to a much higher SSC:TA (Table 3), which is perceived as greater sweetness (Kader, 1991). ‘Wendy’ has a more intense strawberry flavor than ‘Annapolis’. Secondary fruit of ‘Wendy’ are usually conical, but less often they are cordate or wedged, whereas primary fruit are commonly wedge-shaped (Fig. 2). Seeds of ‘Wendy’ are even with the surface of the fruit, whereas seeds of ‘Evangeline’ are inserted below the surface. Fruit surface color of ‘Wendy’ is red (45A to 46A) and glossy, and interior color is 45A to 46B (Royal Horticultural Society, 1986). ‘Wendy’ has a large calyx; the calyx diameter is larger than the fruit diameter.

Plant Description

Plants of ‘Wendy’ are vigorous and they runner freely. Plant size is medium to large compared with ‘Evangeline’, which is small to medium. The leaf petioles of ‘Wendy’ are longer than for ‘Evangeline’. Leaves of ‘Wendy’ are cupped, weakly blistered, and the leaf color of the upper side is medium green (137A) and the underside is light green (137C) (Royal Horticultural Society, 1986). The average terminal leaflet’s length-to-width ratio (L/W) is 1.19 with an obtuse and slightly oblique shape of the leaf base. For comparison, leaves of ‘Evangeline’ are the same color only slightly cupped with an

Fig. 2. ‘Wendy’ strawberries in a 1.14-L (quart) box.

Table 3. Analysis of red-ripe fruit harvested in 2008 at Kentville, Nova Scotia.^z

Cultivar	Soluble solids concn (SSC)		Titratable acidity (TA)	
	(%)	pH	(% citric acid)	SSC:TA
Annapolis	8.7 a ^y	3.27 b	0.96 a	9.1 b
Evangeline	7.7 ab	3.26 b	0.98 a	7.8 c
Wendy	7.6 b	3.38 a	0.68 b	11.2 a

^zAnalysis of three replications of 200-g fruit samples harvested at each of three dates: 30 June, 3 July, and 7 July.

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

acute base and a mean L/W of 1.25. Leaf margin teeth are obtuse for 'Wendy' but more pointed (acute) for 'Evangeline'. The pose of the petiole hairs is outward for 'Wendy' and outward to upward (near the point of leaflet attachment) for 'Evangeline'. The flower stalks of 'Wendy' are longer than those of 'Evangeline' but less stiff, giving a semierect attitude at first picking. The outer calyx of 'Wendy' has a larger diameter than the inner calyx. Flowers of 'Wendy' are smaller and the calyx larger than for 'Evangeline'.

Disease Response

Reaction to specific races of *Phytophthora fragariae* Hickman var. *fragariae*, the cause of red stele root rot, has not been determined. However, in a severe screening test similar to Scott et al. (1976) with multiple races, including race A-5 to which specific resistance is rare, 'Wendy' demonstrated partial resistance. On a scale of 0 (dead plant) to 5 (no disease), 'Wendy' scored 1.7, significantly ($P \leq 0.05$) better than 'Annapolis' (1.3), 'Cavendish' (1.2), and 'Sable' (1.0), three cultivars with resistance to several races. In field plots at Kentville, 'Wendy' plants have demonstrated moderate resistance to leaf scorch [caused by *Diplocarpon earliana* (Ellis & Everh.) F.A. Wolf] and powdery mildew [caused by *Sphaerotheca*

macularis (Wallr.:Fr.) Jacz. f. sp. *fragariae*] but susceptibility to leaf spot [caused by *Mycosphaerella fragariae* (Tul.) Lindau]. Green petal disease (caused by clover phyllody phytoplasma) is common in Atlantic Canada; however, plots of 'Wendy' have contained few plants with symptoms indicating a moderate level of resistance.

'Wendy' appears to be well adapted throughout eastern Canada and the north-eastern United States. 'Wendy' will be of value as a firm-fruited alternative to other early-season cultivars providing attractive, richly flavored berries for local and regional markets.

Availability

Certified 'Wendy' plants are being propagated under royalty agreements with licensed nurseries, the names of whom will be supplied on request. The Atlantic Food and Horticulture Research Center has been granted Plant Breeder's Rights for 'Wendy' in Canada (Certificate No. 2467) and a U.S. Plant Patent has been awarded (USPP 18,340). Nurseries interested in securing a propagating license 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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