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Peter Wilcox: a New Purple-Skin, Yellow-Flesh Fresh Market Potato Cultivar with Moderate Resistance to Powdery Scab

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Abstract Peter Wilcox is a new, medium-maturing, purple-skinned, yellow-fleshed potato cultivar for the fresh market. Peter Wilcox also produces light-colored chips, although it is being released primarily as a fresh market potato because of its skin and flesh colors. Tubers are attractive, smooth, with dark purple-skin, oblong shape and moderate size. Yellow-flesh intensity is equal to or slightly darker than Yukon Gold. Marketable yields of Peter Wilcox have averaged 78–97 % of various standard cultivars in multiple years of testing. Specific gravity of Peter Wilcox was lower than Yukon Gold, but higher than standard red-skin cultivars it was compared to at numerous locations. Hollow heart and internal heat necrosis in Peter Wilcox tubers have generally been less than in standard cultivars; however, slight purple-streaks in the flesh have occasionally been reported in Maine. Peter Wilcox is moderately resistant to powdery scab. It is susceptible to late blight, early blight, potato virus Y, Verticillium wilt, and common scab. Peter Wilcox is a publicly released cultivar.

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Resumen Peter Wilcox es una nueva variedad de papa, de madurez intermedia, piel morada y pulpa amarilla, para mercado fresco. Esta variedad también produce hojuelas ligeramente con color, aunque esta siendo liberada primeramente como una papa de mercado fresco por sus colores de piel y pulpa. Los tubérculos son atractivos, suaves, con piel morada oscura, de forma oblonga y de tamaño moderado. La intensidad de lo amarillo de la pulpa es igual o ligeramente más oscura que Yukon Gold. Los rendimientos comerciales de Peter Wilcox han promediado 78-97% con respecto a diversas variedades estándar en múltiples años de pruebas. Su gravedad específica fue más baja que Yokon Gold, pero más alta que la de variedades comunes de piel roja cuando fue comparada en numerosas localidades. Corazón hueco y la necrosis interna por calor en los tubérculos de Peter Wilcox han sido generalmente menores que en las variedades estandar; no obstante, han sido reportadas ocasionalmente en Maine ligeras rayas moradas en la pulpa. Esta variedad es moderadamente resistente a la roña polvorienta. Es susceptible al tizón tardío, al tizón temprano, al virus Y de la papa, a la marchitez por Verticillium y a la roña común. Peter Wilcox es una variedad liberada públicamente.

Keywords *Solanum tuberosum* L · Fresh market potato · Niche market · Carotenoids

Introduction

General Cultivar Information Peter Wilcox is a dark purple-skinned, yellow-fleshed cultivar suitable for fresh market. It also chips well although it is not being released as a chipping cultivar. Tubers are oblong and have low to moderate specific gravity. The yellow-flesh of Peter Wilcox is slightly darker than Yukon Gold, hence the carotenoid content of Peter Wilcox is slightly higher than Yukon Gold. Peter Wilcox is named in honor of a Professor at Loyola University in Maryland.

Pedigree Information Peter Wilcox, evaluated under the pedigree B1816-5, was selected from a cross of B0810-1 (♀) x B0918-5 (♂) made in Beltsville, MD by K.G. Haynes (Fig. 1). B0810-1, the tan-skin female parent, was selected because of its good appearance and yellow-flesh. B0918-5, the purple-skin male parent, was selected because of its good appearance, high male fertility, and good general combining ability for color and appearance.

Cultivar Development Program Breeding and seedling tuber production of Peter Wilcox were done at the Beltsville Agricultural Research Center (BARC), Beltsville, MD, by K.G. Haynes. Seedlings were transplanted into 10.2 cm plastic pots in the greenhouse in Beltsville in the fall of 1995, and the largest mini-tuber from each pot was harvested and bulked by family. Mini-tubers were transplanted into the field on Chapman Farm, Presque Isle, ME in 1996, and B1816-5 was selected at harvest. Clonal selection and field performance evaluations were done on Chapman, Echo Lake, Lawrence Park, and Aroostook Farms in Presque Isle, Maine by K.G. Haynes. Foliar and soil-borne disease evaluations were conducted by K.G. Haynes, X.S. Qu, B.J. Christ, and S.H. Jansky. Preliminary evaluations were undertaken with cooperators in North Carolina, New Jersey, Pennsylvania, Maine, Florida, and New York beginning in 1998. Interregional performance trials through the NE-1014 Project began in 2005.

Release Peter Wilcox was released by The United States Department of Agriculture, the North Carolina Agricultural Research Service, the Agricultural Experiment Stations of New Jersey, Pennsylvania, Florida and New York, and the Maine Agricultural and Forest Experiment Station in 2007. Plant Variety Protection has not been requested for Peter Wilcox; it is a publicly released cultivar.

Cultivar Description

Plants Peter Wilcox has a semi-erect plant habit with intermediate (between stems clearly visible and stems hardly visible) foliage (Fig. 2a). Maturity is medium-early (about 100 days). Stems and petioles have medium-strong anthocyanin coloration. Stem wings are absent. Leaves are an olive-green (Royal Horticultural Society Color Chart, 2nd ed. - RHSCC 137B) with medium density and short pubescence. Leaf silhouette is open with an average of four primary leaflet pairs and seven secondary and tertiary leaflet pairs (Fig. 2b). The primary leaflets are medium sized with a medium ovate shape, a cuspidate leaflet tip shape, and a cordate leaflet base. The terminal leaflet is medium ovate, with a cuspidate leaflet tip, and a cordate leaflet base, with weak leaflet margin waviness. Stipule leaf size is small.

Flowers (Fig. 2c) The shape of Peter Wilcox's corolla is pentagonal and the color is blue-violet (RHSCC 91A) with a slightly lighter halo (RHSCC 91B-C). Average number of inflorescences per plant is 1.2 with a range of 1–2. Average number of florets per inflorescence is 5.3 with a range of 4–6. There is medium anthocyanin on the calyx. Anthers are yellow-orange (RHSCC 13A) and form a narrow cone. Pollen production is low to moderate and it has been successfully used as a male parent in hybridizations. Stigma color is yellow-green (RHSCC 147A) and the shape is clavate. Berry production in the field is moderate.

Tubers (Fig. 2d) Tubers of Peter Wilcox are smooth with a dark purple skin (RHSCC 79B). Secondary skin color (RHSCC 92C) is present around the eyes. Tuber flesh color is yellow (RHSCC 11B) usually with no secondary flesh color, although a few purple streaks have occasionally been found in tubers grown in Maine. Tubers are oval to oblong

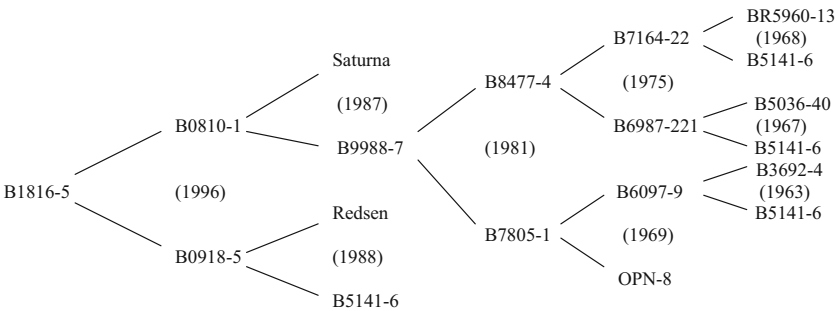

Fig. 1 Pedigree of Peter Wilcox (B1816-5). Dates in parentheses indicate year of first field generation (i.e., single hill generation)

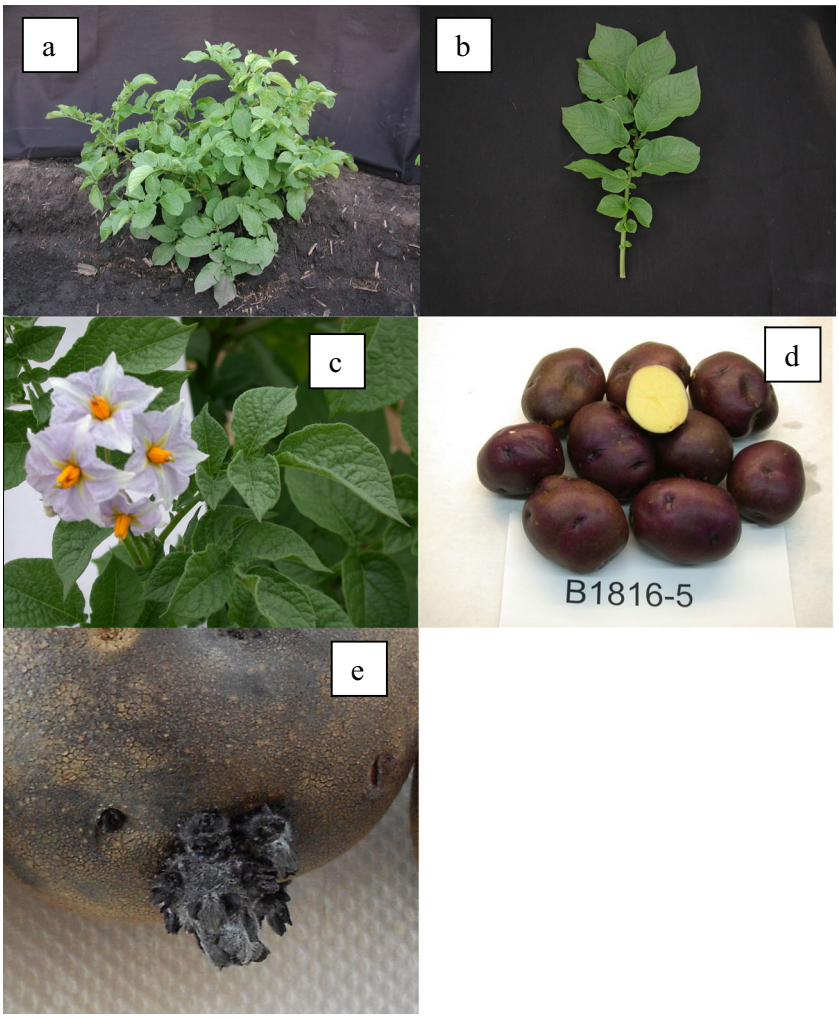

Fig. 2 Pictures of Peter Wilcox: **a** plant, **b** leaf, **c** flowers, **d** tubers, and **e** light sprouts

and medium thick. The average length is 85 mm (range 68–101, standard deviation=10.4), the average width is 68 mm (range 62–81, standard deviation=4.6), and the average thickness is 57 mm (range 49–67, standard deviation=4.9). Tuber eye depth is shallow and eyebrows have a slight prominence. Lateral eyes are shallow. Tubers have an average of 12.6 eyes (range 10–16). Distribution of eyes is predominantly apical. Tubers have a long dormancy (about 5 months).

Light Sprouts (Fig. 2e) Sprouts grown in the presence of light are ovoid with the tip closed. Short root initials are present on the sprout and there is medium pubescence on the sprout tip. The sprout tip is a strong blue-violet in color.

Agronomic Performance

Total marketable yields of U.S. No. 1 grade potatoes (United States Standards for Grades of Potatoes 1997) of Peter Wilcox in comparison to Atlantic have averaged 73 % in four trials, 81 % of Chieftain in 21 trials, 96 % of Dark Red Norland in 19 trials, 81 % of Red LaSoda in six trials, 92 % of Red Pontiac in two trials, 83 % of Superior in 12 trials, and 101 % of Yukon Gold in four trials (Table 1).

Tuber Quality Characteristics and Usage

Specific Gravity Across all 68 trials along the east coast, specific gravity in Peter Wilcox has averaged 0.005 lower than Atlantic, 0.007 higher than Chieftain, 0.014 higher than Dark Red Norland and Red Pontiac, 0.005 higher than Red LaSoda, 0.004 lower than Superior and Yukon Gold (Table 1).

Internal Defects Peter Wilcox has a low incidence of hollow heart and internal heat necrosis (Table 2) in comparison to standard cultivars. Purple-streaks have occasionally been observed. It is susceptible to blackspot bruising (Table 3).

Tuber Dormancy In 3 years of evaluation, tubers of Peter Wilcox (and Chieftain) started to sprout on average 164 days

Table 1 U.S. Number 1 yield and specific gravity of Peter Wilcox in comparison with standard cultivars at USDA/ARS[a] and cooperating state test plots from 2000 to 2006

Location (# Trials)	U.S. No. 1 Yield (MT ha^{-1})		Specific gravity	
	Peter Wilcox	Standard[b]	Peter Wilcox	Standard
USDA-ARS (4)	38.8	38.5 (YG)	1.085	1.089
USDA-ARS (2)	24.4	26.4 (RP)	1.079	1.065
USDA-ARS (1)	25.0	26.7 (DRN)	1.088	1.073
Maine (9)	29.7	31.3 (DRN)	1.082	1.069
North Carolina (12)	21.6	26.2 (CH)	1.066	1.058
North Carolina (2)	15.7	23.3 (AT)	1.066	1.069
New Jersey (12)	33.7	40.4 (SU)	1.068	1.072
Pennsylvania (9)	35.8	36.8 (DRN)	1.077	1.063
Florida (6)	31.3	38.6 (RLS)	1.069	1.064
Florida (2)	26.0	34.2 (AT)	1.072	1.079
Upstate NY (7)	27.9	33.3 (CH)	1.073	1.068
Long Island NY (2)	38.7	41.0 (CH)	1.071	1.062

[a] USDA-ARS test plots were located in Presque Isle, ME

[b] Standards: *AT* Atlantic; *CH* Chieftain; *DRN* Dark Red Norland; *RLS* Red LaSoda; *SU* Superior; *YG* Yukon Gold

after harvest, which is a longer dormancy period than Superior (140 days), Atlantic (135 days) and Dark Red Norland (129 days) (Table 4).

Table 2 Incidence of hollow heart and internal heat necrosis in Peter Wilcox in comparison to standard cultivars at USDA/ARS[a] and cooperating state test plots from 2000 to 2006

Location (# Trials)	% Hollow Heart		% Internal Heat Necrosis	
	Peter Wilcox	Standard[b]	Peter Wilcox	Standard
USDA-ARS (4)	0.8	10.3 (YG)	–	–
USDA-ARS (2)	1.5	1.5 (RP)	–	–
USDA-ARS (1)	0.0	3.0 (DRN)	–	–
Maine (9)	0.3	0.3 (DRN)	–	–
North Carolina (12)	0.0	0.0 (CH)	1.3	21.9
North Carolina (2)	0.0	4.0 (AT)	0.0	34.0
New Jersey (12)	0.8	2.6 (SU)	1.3	7.8
Pennsylvania (11)	0.8	0.7 (CH)	0.0	7.2
Florida (6)	0.7	0.5 (RLS)	0.7	0.0
Florida (2)	0.0	0.0 (AT)	0.0	0.0
Upstate NY (7)	6.4	0.0 (CH)	0.0	1.4
Long Island, NY (1)	0.0	0.0 (CH)	8.0	3.0
Long Island, NY (1)	3.0	0.0 (KAT)	3.0	5.0

[a] USDA-ARS test plots were located in Presque Isle, ME

[b] Standards: *AT* Atlantic; *CH* Chieftain; *DRN* Dark Red Norland; *RLS* Red LaSoda; *SU* Superior; *YG* Yukon Gold

Table 3 Bruise test scores of Peter Wilcox and some standard cultivars from Presque Isle, ME

Cultivar	Year	Skinning Index[a]	% Cracks[a]	Blackspot[b]
Superior	2005	1.35	74	1.88
Atlantic	2005	2.86	73	2.00
Chieftain	2005	2.60	57	2.15
Dark Red Norland	2005	1.42	74	1.65
Peter Wilcox	2005	1.98	56	1.85
Waller Duncan LSD				0.40
Superior	2006	2.23	49	2.60
Atlantic	2006	2.81	48	1.92
Chieftain	2006	3.61	29	2.15
Dark Red Norland	2006	3.35	46	2.20
Peter Wilcox	2006	2.85	36	1.88
Waller Duncan LSD				0.42
Superior	2007	1.03	3	3.00
Atlantic	2007	2.09	15	2.00
Chieftain	2007	1.82	29	2.62
Dark Red Norland	2007	1.61	54	2.80
Peter Wilcox	2007	2.11	54	3.36
Waller Duncan LSD				0.40

[a] Skinning and shatter bruise were measured using a bruise barrel shortly after harvest. Approximately 4.5 kg of tubers >4.8 cm in diameter were tumbled in a drum with three stones for 1 min at 15 rpm. Tubers were then rated for combined skinning and shatter bruise. Data presented represent indices where: 1=all tubers have 0 % surface affected and 9=all tubers have 100 % of surface affected. Percentage of tubers with air and/or thumbnail cracks is reported

[b] Blackspot test was conducted using the weight-drop method. The index presented indicates the severity of discoloration where: 1=no tubers show discoloration and 4=all tubers have severe discoloration

Weight Loss in Storage Peter Wilcox is less susceptible to weight loss in storage than standard commercial varieties (Table 4). In 3 years of evaluation, Peter Wilcox has averaged 5.6 % weight loss when stored at 3.3 °C for 6–7 months and 17.1 % weight loss when stored at 10 °C for a similar period. In contrast, Dark Red Norland has averaged 7.3 % weight loss when stored at 3.3 °C for 6–7 months and 43.2 % weight loss when stored at 10 °C for a similar period.

Chip Color Chip color has generally been satisfactory when processed from 10 or 7 °C in January (Table 5). However, it is being released primarily as a specialty, fresh market cultivar because of its skin and flesh colors.

Cooking Evaluations Boil, bake and microwave color scores of Peter Wilcox have been good with no discoloration observed due to cooking. Texture has ranged from dry to moist, but never soggy (Table 6).

Table 4 Weight loss in storage and days to sprouting for tubers grown in Presque Isle, ME

Cultivar	Year	Days to indicated Sprout length[a]		Storage weight loss (%)[b]	
		PIP[c]	2.25 cm	3.3 °C	10 °C
Superior	2005	142	186	9.0	19.2
Atlantic	2005	142	186	8.6	24.0
Chieftain	2005	179	221	6.1	24.1
Dark Red Norland	2005	142	172	8.4	39.4
Peter Wilcox	2005	165	200	6.0	19.1
Superior	2006	153	181	8.4	25.0
Atlantic	2006	153	181	6.6	28.1
Chieftain	2006	153	181	5.6	29.5
Dark Red Norland	2006	125	167	7.5	51.3
Peter Wilcox	2006	167	209	6.0	18.5
Superior	2007	124	152	3.9	15.6
Atlantic	2007	110	152	5.5	16.6
Chieftain	2007	161	203	3.8	16.4
Dark Red Norland	2007	119	154	6.0	38.9
Peter Wilcox	2007	161	196	4.8	13.7

[a] Tubers were stored at 7.2 °C and 85 % relative humidity

[b] Percentage sprout and weight loss following storage at indicated temperature from harvest until late March-early April

[c] Pip refers to first visible sign of sprouting

Table 5 Chip processing color of Peter Wilcox in comparison to Yukon Gold harvested in late September and stored at indicated temperature until processed in month indicated from USDA/ARS test plots from 2000–2006

Year	Temperature (°C)	Month	Chip Color[a]	
			Peter Wilcox	Yukon Gold
2000	10	Jan	7.3	9.1
	7	Jan	7.1	9.4
	4	Jan	9.9	9.9
2001	10	Jan	7.0	9.0
	7	Jan	7.1	9.0
	4	Jan	9.7	10.0
2002	10	Jan	7.3	8.7
	7	Jan	7.3	8.7
	4	Jan	10.0	10.0
2003	10	Jan	6.0	8.2
	7	Jan	7.0	8.9
	4	Jan	9.1	10.0
2004	10	Dec	6.5	8.9
2005	10	Jan	6.0	7.5
	7	Jan	6.0	7.7
	4	Jan	8.1	9.7
2006	10	Jan	7.0	8.4
	7	Jan	6.3	8.9
	4	Jan	8.7	10.0

USDA-ARS test plots were located in Presque Isle, ME

[a] Chip color rated on 1 (white) -10 (black) scale: ≤7.0 considered satisfactory

Disease Evaluations

Late Blight Peter Wilcox was evaluated for 4 years (2005–2008) and found to be susceptible to foliar late blight (Table 7). Experiments were planted in early to mid June each year at the Russell E. Larson Agricultural Research Center at Rock Springs, PA on a Hagerstown silty clay loam. The experimental design was a randomized complete block with four replications from 2005 to 2007 and three replications in 2008. Plots consisted of five hills per clone spaced at 23 cm with 122 cm between plots within the row. Each treatment row had one adjacent spreader row. Seven cultivars (Atlantic, Chieftain, Katahdin, Kennebec, Russet Burbank, Snowden, Superior) were included as checks, with Kennebec considered the moderately resistant check. Commercial rates of fertilizer were banded in the row at planting. At hilling, additional liquid N was applied at commercial rates. Spreader rows were inoculated with a mixture of several isolates of the US-8 genotype of *P. infestans* at a concentration of 4×10^4 sporangia ml^{-1} in mid-August to promote uniform spread of the pathogen to all treatment plots. Plants were evaluated for percent diseased foliage three to four times from late August to early September and from these ratings, area under the disease progress curve (AUDPC) was calculated (Shaner and Finney 1977). The mean AUDPC was calculated by clone. Mean AUDPCs were separated by Fisher's protected least significant difference test (P=0.05), where the letter 'a' indicates most susceptible. In 3 years of evaluation (2005–2007), Peter Wilcox was rated susceptible to late blight. In 2008, Peter Wilcox was rated as moderately susceptible (Table 7).

Early Blight Peter Wilcox was evaluated for 4 years (2005–2008) and found to be susceptible to foliar early blight (Table 8). Experiments were planted in May each year at the Russell E. Larson Agricultural Research Center at Rock Springs, PA on a Hagerstown silty clay loam. The experimental design was a randomized complete block with four replications from 2005 to 2007 and three replications in 2008. Plots consisted of five hills per clone spaced at 23 cm with 122 cm between plots within the row. Each treatment row had one adjacent spreader row of Norland (2005) or Dark Red Norland (2006–2008). Seven cultivars (Atlantic, Chieftain, Katahdin, Kennebec, Russet Burbank, Snowden, Superior) were included as checks, with Katahdin, Kennebec and Russet Burbank considered moderately resistant checks. Commercial rates of fertilizer were banded in the row at planting. Each year, natural infection with *Alternaria solani*

Table 6 Boil, bake and microwave cooking results of Peter Wilcox in comparison to some standard cultivars from Rock Springs, PA

		Boil		Bake		Microwave	
Cultivar	Year	Color[a]	Texture[b]	Color[a]	Texture[b]	Color[a]	Texture[b]
Yukon Gold	2000	3	2	3	2	3	3
	2001	3	3	3	3	3	2
	2002	3	3	3	4	3	3
	2003	3	1	3	2	3	1
	2004	3	3	3	2	3	3
	2005	3	1	3	2	3	1
	2006	3	2	3	2	3	2
	2007	3	2	3	1	3	2
	2008	3	3	3	2	3	1
Chieftain	2000	4	3	1	3	1	3
	2001	1	2	2	2	1	2
	2002	1	3	1	3	1	4
	2003	1	3	1	3	1	3
	2004	1	3	1	3	1	3
	2005	1	3	1	2	1	2
	2006	1	3	1	4	1	4
	2007	1	3	1	3	1	3
	2008	1	3	1	3	1	3
Peter Wilcox	2000	3	3	1	3	1	3
	2001	3	4	3	3	3	2
	2002	3	3	3	2	3	2
	2003	3	3	3	2	3	1
	2004	3	3	3	3	3	4
	2005	3	3	3	2	3	2
	2006	3	2	3	1	3	2
	2007	3	2	3	2	3	2
	2008	3	2	3	1	3	2

[a] 1=white, 2=slightly yellow, 3=yellow, 4=white with gray edges, 5=gray with dark edges

[b] 1=dry, 3=medium, 5=soggy

occurred in the spreader rows. Plants were evaluated for percent diseased foliage four times from late July to the end of August and from these ratings, area under the disease progress curve (AUDPC) was calculated (Shaner and Finney 1977). The mean AUDPC was calculated by clone. Mean AUDPCs were separated by Fisher's protected least significant difference test (P=0.05), where the letter 'a' indicates most susceptible. In 3 years of evaluation (2005–2007), Peter Wilcox was rated susceptible to early blight. In 2008, Peter Wilcox was rated as moderately susceptible.

Common Scab Peter Wilcox is susceptible to common scab. It was evaluated in 2005 in the National Common Scab Trials (Table 9; Haynes et al. 2010b). The experimental design was a randomized complete block at all locations. Three replications of five plants per clone were planted at each location. At harvest, all tubers were harvested and rated on a 0 to 6 scale for percent surface area covered with scab lesions (0=0 %; 1=<2 %; 2=2 % to <5 %; 3=5 % to <10 %; 4=10 % to <25 %; 5=25 % to <50 %; 6=>50 %) and rated on a 0 to 6 scale for type of lesion (0=none; 1=superficial, discrete; 2=superficial, coalescing; 3=raised, discrete; 4=raised, coalescing; 5=pitted, discrete; 6=pitted, coalescing). Three variables were analyzed: an area index (AI), a lesion index (LI), and the proportion of scabby tubers (PS). For each plot, AI and LI were calculated as the sum of all the individual tuber surface area ratings, or individual tuber lesion ratings, respectively, divided by six times the number of tubers. Thus, AI and LI could range from zero (no scab) to one (very severe scab). At

Table 7 Mean area under the disease progress curve (AUDPC) for foliar late blight of Peter Wilcox in comparison to seven cultivars evaluated at Rock Springs, PA from 2005 to 2008

	AUDPC			
Clone	2005[1]	2006	2007	2008
Peter Wilcox	608 a–b	988 a–b	889 a–f	718 c–h
Atlantic	531 b–f	963 a–e	863 b–f	536 k–m
Chieftain	525 b–g	962 a–e	901 a–f	681 f–i
Katahdin	380 j–k	899 b–g	692 h–j	624 h–k
Kennebec	203 m	620 m–n	256 l	334 p
Russet Burbank	316 k–l	716 l–m	479 k	483 l–n
Snowden	388 i–k	780 h–l	674 i–j	560 k–l
Superior	559 a–d	884 b–h	963 a–e	743 b–g

[1] Means followed by the same letter within a year are not significantly different based on Fisher's protected least significant difference test (P=0.05)

Table 8 Mean area under the disease progress curve (AUDPC) for foliar early blight of Peter Wilcox in comparison to seven cultivars evaluated at Rock Springs, PA from 2005 to 2008

	AUDPC			
Clone	2005[1]	2006	2007	2008
Peter Wilcox	742 b–d	741 b	1319 a	725 b–f
Atlantic	357 l–p	360 g–i	673 g–j	183 j–l
Chieftain	445 i–n	313 g–j	811 e–h	344 h–l
Katahdin	281 m–q	286 h–j	461 j–k	296 j–l
Kennebec	178 p–q	234 i–j	528 i–k	332 i–l
Russet Burbank	136 q	181 j	503 i–k	137 k–l
Snowden	226 o–q	366 g–i	641 h–j	238 j–l
Superior	441 i–n	451 d–g	1080 b–c	767 a–e

[1] Means followed by the same letter within a year are not significantly different based on Fisher's protected least significant difference test (P=0.05)

Table 9 Mean area index (AI), type lesion index (LI), and proportion scabby tubers (PS) for Peter Wilcox, two standard resistant cultivars (Russet Burbank, Superior) and two standard susceptible cultivars (Atlantic, Ranger Russet) evaluated for resistance to common scab in Idaho, Maine and Minnesota in 2005

Clone	Variable	ID	ME	MN	Mean
Atlantic	AI	0.29	0.70	0.25	0.41
	LI	0.60	0.46	0.47	0.51
	PS	0.68	0.99	0.50	0.72
Peter Wilcox	AI	0.36	0.61	0.37	0.45
	LI	0.71	0.64	0.71	0.69
	PS	0.84	0.92	0.86	0.87
Ranger Russet	AI	0.44	0.68	0.26	0.46
	LI	0.54	0.68	0.42	0.55
	PS	0.93	0.99	0.60	0.84
Russet Burbank	AI	0.25	0.42	0.19	0.29
	LI	0.28	0.67	0.36	0.43
	PS	0.46	0.96	0.31	0.58
Superior	AI	0.39	0.50	0.16	0.35
	LI	0.52	0.70	0.22	0.48
	PS	0.81	0.96	0.14	0.64
LSD (0.05)[a]	AI	0.09	0.09	0.06	
	LI	0.17	0.12	0.13	
	PS	0.21	0.07	0.20	

Mean area index (AI) and type lesion index (LI) ranges from 0 (no scab) to 1 (most severe; AI=all tubers completely covered with lesions, LI=all tubers with deeply pitted lesions)

[a] LSDs for comparisons within locations

all three locations, AI and LI of Peter Wilcox tubers were similar to the susceptible check cultivars Atlantic and Ranger Russet.

Powdery Scab Peter Wilcox was evaluated for 4 years (2005–2008) and found to be resistant to powdery scab (Table 10). Experiments were planted in late May each year in a naturally infested field in Potter County, PA. The experimental design was a randomized complete block with four replications from 2005 to 2007 and three replications in 2008. Plots consisted of 15 hills per clone spaced at 20 cm. Seven cultivars (Atlantic, Chieftain, Katahdin, Kennebec, Russet Burbank, Snowden, Superior) were included as checks, with Kennebec considered the susceptible check. Commercial rates of fertilizer were banded in the row at planting. At harvest, from late September to late October, the number of tubers with powdery scab was determined from the total number of tubers per plot. Clonal mean disease incidences were separated by Fisher's protected least significant difference test (P=0.05), where the letter 'a' indicates most susceptible. In all 4 years of evaluation Peter Wilcox was rated moderately resistant to powdery scab.

Table 10 Mean incidence of powdery scab on tubers of Peter Wilcox in comparison to seven cultivars evaluated at Rock Springs, PA from 2005 to 2008

	Incidence (%)			
Clone	2005[1]	2006[1]	2007[1]	2008[1]
Peter Wilcox	15 m–p	5 h–l	6 f–j	15 l
Atlantic	45 b–k	11 d–l	14 c–h	40 b–j
Chieftain	39 d–m	8 d–l	16 c–g	22 j–l
Katahdin	51 b–g	7 e–l	7 f–j	37 b–j
Kennebec	46 b–k	17 b–g	42 b	49 a–e
Russet Burbank	29 h–o	4 i–l	4 h–j	25 h–l
Snowden	41 c–m	5 g–l	1 i–j	61 a
Superior	40 c–m	7 e–l	11 d–j	49 a–f

[1] Means followed by the same letter within a year are not significantly different based on Fisher's protected least significant difference test (P=0.05)

Verticillium Wilt Peter Wilcox was evaluated in the National Verticillium Wilt Trial in 2007 and found to be highly susceptible to Verticillium wilt (Table 11). The experiment was planted on 3 May in an inoculated field near Hancock, Wisconsin. Plots consisted of four hills per clone spaced at 30.5 cm. Cultivars (Atlantic, Boulder, Dakota Diamond, Freedom Russet, MegaChip, Ranger Russet, Red Norland, Russet Norkotah, Stampede Russet, Superior, White Pearl, and Yukon Gem) were included as checks, with Russet Norkotah considered the most susceptible check and Ranger Russet the most resistant check. Visual wilt symptoms were rated three times during the growing season and from these

Table 11 Mean area under the disease progress curve (AUDPC) for foliar Verticillium wilt symptoms evaluated at Hancock, WI in 2007

Clone	AUDPC 2007[1]
Peter Wilcox	20379 a
Atlantic	6000 e–o
Boulder	3360 i–s
Dakota Diamond	2205 o–s
Freedom Russet	4440 f–s
MegaChip	2880 k–s
Ranger Russet	5970 e–o
Red Norland	14910 b
Russet Burbank	5400 e–q
Russet Norkotah	21984 a
Stampede Russet	9870 c–d
Superior	13230 b
White Pearl	8775 d–e
Yukon Gem	6450 d–l

[1] Means followed by the same letter are not significantly different based on Fisher's protected least significant difference test (P=0.05)

Table 12 Mean tuber carotenoid content of Peter Wilcox as compared to Yukon Gold grown in Presque Isle, ME and Hastings, FL in 2004–2005

		µg / 100 g FW					
Cultivar	Carotenoid	ME 2004	ME 2005	FL 2004	FL 2005	Mean	SE[a]
Peter Wilcox	Lutein	61	101	59	51	67	10.6
Yukon Gold		39	76	48	56	55	
Peter Wilcox	Zeaxanthin	116	128	88	101	105	18.2
Yukon Gold		135	42	56	71	75	
Peter Wilcox	Total[b]	356	648	422	439	461	46.6
Yukon Gold		276	415	251	358	332	

From Haynes et al. (2010a)

[a] Standard error for comparing cultivar means

[b] Total = antheraxanthin + lutein + neoxanthin + violaxanthin + zeaxanthin

ratings, area under the disease progress curve (AUDPC) was calculated (Shaner and Finney 1977). The mean AUDPC was calculated by clone. Mean AUDPCs were separated by Fisher's protected least significant difference test (P=0.05), where the letter 'a' indicates most susceptible. Peter Wilcox was as susceptible to Verticillium wilt as Russet Norkotah and more susceptible than Superior.

Viral Diseases Peter Wilcox was tested in the National PVY Trial in 2003 and PVY^{OC} was detected in infected plants (data not shown). Symptoms were readily visible. Peter Wilcox is also susceptible to PVS. It has not been evaluated for other viral diseases.

Tuber Chemistries

Carotenoids Tuber carotenoid concentrations of Peter Wilcox and Yukon Gold were evaluated 2 years (2004–2005) from field grown tubers in Hastings, Florida and Presque Isle, Maine (Haynes et al. 2010a). Peter Wilcox tubers were 22 % higher in lutein, 40 % higher in zeaxanthin, and 39 % higher in total carotenoids than Yukon Gold (Table 12).

Glycoalkaloids Total glycoalkaloid content of tubers averaged 11.99 mg per 100 g FW in 5 years of testing as compared to 7.22 mg for Red Pontiac (2 year average) and 7.58 mg for Yukon Gold (2 year average).

Cultivar Identification

DNA was assayed for SNP (single nucleotide polymorphism) marker genotyping based upon the SolCAP 8303 Infinium Potato SNP Array (Hirsch et al. 2013). For the similarity analysis, the samples were evaluated and compared based upon 3,702 SNPs with tetraploid (five cluster, dosage-specific) marker genotypes. The SNPs were filtered from the 3,763 reported by Hirsch et al. (2013) to 3,702 based on the new potato genome sequence pseudomolecule v. 4.03. The samples were compared in a pairwise fashion and with 221 different potato clones, including reference check varieties. Peter Wilcox was

Table 13 Percent similarity of pairwise SNP genotype comparisons of the most similar samples and two reference varieties to Peter Wilcox, sorted by percent similarity

		Percent similarity	Number of SNPs		
Sample1	Sample2	(%)	Match	Mismatch	Total Reads
'Peter Wilcox' and the five most similar samples:					
Peter Wilcox	Dakota Russet (ND8229-3)	45.3	1313	1587	2900
Peter Wilcox	Strawberry Paw (NY136)	45.2	1351	1640	2991
Peter Wilcox	Lenape	43.5	1327	1727	3054
Peter Wilcox	Superior	42.7	1302	1747	3049
Peter Wilcox	Nicolet (W2133-1)	42.6	1224	1649	2873
'Peter Wilcox' and two reference varieties:					
Peter Wilcox	Dark Red Norland	41.2	1219	1739	2958
Peter Wilcox	Yukon Gold	38.1	1157	1879	3036

Pairwise comparison of SNP similarity was based on 3,702 SNP genotype calls from Hirsch et al. 2013. SNPs that were 'No-Call' for either genotype were not included in the pairwise comparisons, which accounts for the variation in the total number of SNP reads for each comparison

not very similar to any of the varieties in the database: it most similar to Dakota Russet (45.3 %), Strawberry Paw (45.2 %), Lenape (43.5 %), Superior (42.7 %) and Nicolet (42.6 %) (Table 13).

Plant Variety Protection

Plant Variety Protection has not been requested for Peter Wilcox. It is a publicly released cultivar. As a result, it is sometimes marketed under the synonymous names 'Purple Sun' or 'Blue Gold'.

Seed Availability

Seed of Peter Wilcox is available from certified seed growers in Maine and New York. Tissue culture plantlets may be requested from Dr. Keith Perry, Cornell University. Small amounts of seed for research purposes may be requested from the senior author.

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