

'Potomac' Pear

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'Potomac' pear (*Pyrus communis* L.) combines superior resistance to fire blight [*Erwinia amylovora* (Burrill) Winslow et al.] with fruit of good quality. Fire blight is the most serious disease affecting pears in most production regions of the northern hemisphere. All cultivars of major commercial importance, as well as many of those available to home orchardists, are highly susceptible to this bacterial disease. Artificial inoculation of 'Potomac' in orchard tests confirm ratings of incidence and severity of natural fire blight. 'Potomac' was approved for release in 1993 as a fresh-market pear cultivar for commercial growers and for home orchards.

Origin

'Potomac' originated from a cross of 'Moonglow' x 'Beurre d'Anjou' made in 1961 by H.J. Brooks. The seedlings of the progeny were grown at the Beltsville Agricultural Research Center, Beltsville, Md. 'Potomac' was selected in 1968 and was tested under the original seedling number US 62537-048. The original source of resistance to fire blight is the American cultivar Seckel (Fig. 1). The parentage is entirely derived from *P. communis* L. germplasm. It has been tested as a clonal selection, budded on 'Bartlett' seedling rootstock, at the Beltsville Agricultural Research Center; the Appalachian Fruit Research Station, Kearneysville, W. Va.; the Ohio Agricultural Research and Development Center,

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the United States for range of adaptation and productivity under a variety of environmental conditions and management systems.

Description

The fruit of 'Potomac' is ovate-pyriform or obovate-obtuse pyriform in shape and is assigned an International Board for Plant Genetic Resources (IBPGR) shape rating of 1.3 (Thibault et al., 1983; Fig. 2). Symmetry is regular, with occasional slight bumpiness. The cavity is obtuse and occasionally lipped. The basin is open, narrow, medium in depth, with a convergent, persistent calyx. Fruit are moderate in size, averaging 68 mm in diameter (Table 1), with a mean fruit weight of 167 g. The core is small, averaging 21 mm in diameter. The skin color is light green and the finish is glossy with inconspicuous lenticels. In some years, light calyx-end russet can develop. Fruit sometimes have a light red blush on the sun-exposed side. The stem is moderate in length and thickness, flexible, and slightly oblique.

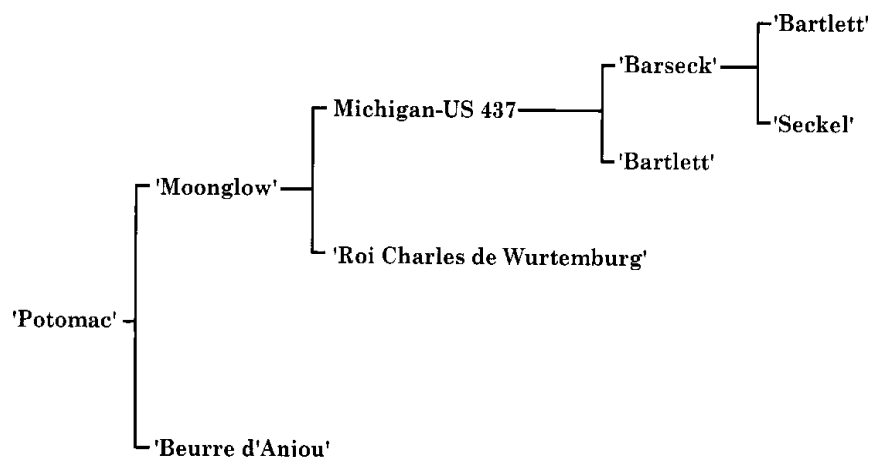


Fig. 1. Pedigree of 'Potomac' pear.



Fig. 2. Fruit of 'Potomac' pear. Ruler length is 12 mm.

Harvest maturity is 14 days after 'Bartlett'. The flesh is creamy white. The flesh texture is moderately fine, buttery, and juicy. Grit cells are small and confined to a thin layer under the skin. The flavor is subacid, with mild aroma, and similar to 'Beurre d'Anjou' in character. The fruit may be ripened after harvest without postharvest chilling, but is as susceptible to storage scald as 'Beurre d'Anjou' if stored for more than 2 months in air at -1 °C. It is, therefore, not suitable for long-term commercial storage without application of scald control measures.

The tree is moderately vigorous and spreading. Flowers have white petals, and the anthers are pink to red. Full bloom at Kearneysville occurs with 'Beurre d'Anjou', ≈2 to 4 days before 'Bartlett'. 'Potomac' is self-incompatible and reciprocally cross-compatible with 'Bartlett' and 'Beurre d'Anjou'. Fruit are borne on terminal flower buds of short lateral shoots and spurs in young trees, but production shifts almost exclusively to spurs as trees age. In a preliminary yield trial on 'Bartlett' seedling rootstock, 'Potomac' has been less precocious than 'Bartlett', and with lower yield until 6 years after planting (Table 2). Yield per tree rapidly surpassed 'Bartlett' after year 6, due in part to loss of bearing surface to fire blight in 'Bartlett' trees.

Natural infection in individual trees has been scored yearly for 8 to 16 years using the U.S. Dept. of Agriculture fire blight scoring system (van der Zwet et al., 1970). Fire blight resistance of 'Potomac' is much greater than that of either 'Bartlett' or 'Beurre d'Anjou', with infrequent natural infections rarely extending further than current-season's growth (Table 3). The worst score ever recorded was 6 (10 = no symptoms) for a single 7-year-old tree in Wooster, Ohio. Natural infections into 1-year-old wood or deeper (score of 8 or lower) have only been observed in four of 28 trees. Artificial inoculations of actively growing shoot tips were conducted in May 1986, 1987, and 1991 using a mixture of three virulent isolates (AFRS 259, 260, and 1112) suspended in phosphate buffer diluted to a concentration of 1×10^8 colony-forming units (cfu)/mL. A 26-gauge tuberculin syringe was used to inject 25 to 50 μL of the suspension into 10 or 20 shoots chosen from two to four trees of each cultivar per year. Lesion length and total shoot length were measured 8 weeks after inoculation when disease progress had ceased. In 1987, four open blossoms on each of 25 flower clusters also were inoculated when all trees were at full bloom. A 25-μL drop of the same isolate mixture, at 1×10^8 cfu/mL, was placed into the floral cup of each blossom using a micro-pipettor (Brinkmann Instruments, Westbury, N.Y.). In 1991, open blossoms of 20 clusters were spray-inoculated with the same isolate mixture. Frequency of infection (on the basis of blossoms in 1987 and clusters in 1991) was scored 2 weeks after inoculation, and severity of infection for each cluster, based on progression of symptoms, was scored at 8 weeks after inoculation.

The degree of resistance of shoots and blossoms to fire blight infection was high

Table 1. Harvest date and fruit characteristics^a of 'Potomac', 'Bartlett', and 'Beurre d'Anjou' pears.

Trait	Cultivar		
	Potomac	Bartlett	Beurre d'Anjou
No. years of data	17	17	5
Harvest date ^b	+ 14	0	+ 20
Size (mm)			
Diameter	68 ± 4	66 ± 5	54 ± 4
Length	76 ± 3	81 ± 5	64 ± 5
Core size (mm)	21 ± 3	23 ± 2	19 ± 3
Flavor ^c	6.8 ± 0.3	6.4 ± 0.3	5.1 ± 0.3
Grit ^c	7.5 ± 0.1	6.1 ± 0.3	7.3 ± 0.2
Texture ^c	6.9 ± 0.2	6.2 ± 0.2	6.6 ± 0.3
Appearance ^c	6.4 ± 0.3	5.8 ± 0.3	5.5 ± 0.3
Russet ^w	7.5 ± 0.3	5.6 ± 0.4	5.1 ± 0.4

^aFruit samples of six to 10 fruit were harvested at random from unthinned trees on one to three dates per year. Size data are based on all harvested fruit.

^bOptimum harvest date expressed in days after (+) 'Bartlett', which averages 20 Aug., 21 Aug., and 25 Aug. for Beltsville, Md.; Kearneysville, W.Va.; and Wooster, Ohio, respectively.

^cFlavor, grit, texture, and appearance scores are based on a 1 (poor) to 9 (excellent) scale in which a score of 6 is considered the threshold for acceptability; scores assigned to sample of six to 10 fruit; mean of evaluations of best harvest date sample per year, performed by trained evaluators at Beltsville, Kearneysville, and Wooster.

^wRusset scores are based on a percentage scale: 1 (100%) to 9 (0%).

Table 2. Fruit yield data of 'Potomac' and 'Bartlett' at Kearneysville, W.Va.^z

Year	Cultivar	No. trees ^y	Total yield (kg/tree)	Fruit wt (g/fruit)
1992	Potomac	10	4.2 a	209 a
	Bartlett	5	13.4 a	126 b
1993	Potomac	9	52.6 a	139 a
	Bartlett	6	19.5 b	117 a
1994	Potomac ^x	9	58.5	152

^zTen trees of each cultivar were propagated on 'Bartlett' seedling rootstock and planted as 1-year-old trees in Nov. 1986. Data are reported as mean of harvested trees. Separation of cultivar means within years by Fisher's protected *t* test, *P* ≤ 0.05.

^yNumber of trees without severe fire blight.

^xIn 1994, fire blight either killed or severely damaged all 'Bartlett' trees. No fruit were harvested.

Table 3. Fire blight development in response to epiphytic and artificial shoot and blossom inoculation of 'Potomac', 'Bartlett', and 'Beurre d'Anjou'.

Infection type	Cultivar					
	n	Potomac	n	Bartlett	n	Beurre d'Anjou
Epiphytic ^a						
Beltsville	6	9.7 ± 0.2	67	2.3 ± 0.3	10	1.2 ± 0.4
Wooster	8	8.5 ± 0.4	10	3.1 ± 0.3	4	4.5 ± 1.0
Kearneysville	14	9.3 ± 0.4	40	1.6 ± 0.2	10	2.4 ± 0.5
Shoot inoculation (%)						
Infected	40	35 a	40	73 b	20	90 b
Lesion length ^b	40	10.7 a	40	64.4 b	20	60.9 b
Blossom inoculation						
1987						
Infected blossoms ^c	100	12	100	92	100	79
Severity ^w	25	1.9 a	25	5.1 b	25	4.7 b
1991						
Infected clusters (%) ^b	20	45	20	100	---	---
Severity ^w	20	1.3 a	20	4.9 b	---	---

^aMean (+SE) lowest (most severe) USDA fire blight infection score per tree: 1 = dead to 10 = no symptoms (van der Zwet et al., 1970). n = number of trees. Data are based on 8 to 16 years after planting; exact number of years varied with cultivar and location.

^bMean lesion length as a percentage of current-season's shoot length, 8 weeks postinoculation. n = number of shoot tips inoculated. Mean of 3 years of data for 'Potomac' and 'Bartlett' and 2 years of data for 'Beurre d'Anjou' at Kearneysville, W.Va. Mean separation by Waller-Duncan *k* ratio *t* test, *P* ≤ 0.05, *k* = 100.

^cPercentage of infected blossoms, 2 weeks postinoculation; one year of data at Kearneysville.

^wMean severity score per cluster: 0 = no infection, 1 = floral cup, 2 = ovary, 3 = pedicel, 4 = basal tissue of cluster, 5 = spur or 1-year-old wood, 6 = 2-year or older wood; 8 weeks postinoculation. Mean separation by Waller-Duncan *k* ratio *t* test, *P* ≤ 0.05, *k* = 100.

^yPercentage of infected clusters, 2 weeks postinoculation; 1 year of data at Kearneysville.

(Table 3). The resistance is expressed in reduced frequency and severity of infections. The low blossom blight severity scores for 'Potomac' reflect the smaller percentage of infected blossoms or clusters and the reduced progression of infection through the spurs or

1-year-old terminal shoots into older wood. Inoculations with five individual isolates at three locations for 2 years have given similar results for shoot and blossom inoculations (Bell et al., 1990; Bell and van der Zwet, unpublished data).

'Potomac' is recommended for commercial trial and use as a home-orchard cultivar in areas where fire blight is a serious problem and susceptible cultivars cannot be grown successfully.

Potomac has been indexed for virus infection by the IR-2/NRSP5 program at Washington State Univ., Prosser, and has tested negative for apple stem grooving, apple stem pitting, apple chlorotic leafspot, and pear vein yellows viruses. Tests for stony pit have not been completed.

Availability

The budwood supply for this cultivar is limited and trees are not available from the authors. Interested nurseries and research personnel should send requests for noncertified budwood to R.L.B. Certified virus-free budwood is available from IR-2/NRSP5. Budwood of this release has been deposited in the National Plant Germplasm System, where it will be available for research purposes, including development and commercialization of new cultivars.

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