'SJM44' Apple Rootstock

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Origin

'SJM44' (St-Jean Morden 44) is a new dwarfing rootstock resulting from a cross made in 1960 between *Malus baccata* 'Nertchinsk' and 'M.9' ('Malling 9', clonal selection of Paradis jaune de Metz). It was developed at the Agriculture and Agri-Food Canada Horticulture Research and Development Center, St-Jean-sur-Richelieu, Quebec. It produces trees smaller than 'Malling 26' ('M.26') but larger than 'Malling 9' ('M.9') (Table 1). It was released because of its infrequent burr knots and freedom from root suckers compared with 'M.9' (Table 1), superior hardiness (Khanizadeh et al., 2000), ease of propagation, and better yield efficiency (Table 2).

'SJM44' was among 56 hybrid seedlings of 'Nertchinsk' × 'M.9' to which 'McIntosh VC309' was budded in 1971 and planted in 1974 at Frelighsburg, Quebec, where it was evaluated until 1984 for hardiness, tree size, and efficiency (Granger et al., 1991) along with other selected SJP84 and SJM series (Khanizadeh et al., 2005). 'SJM44' was planted in 1997 in replicated trials in several plots at the Frelighsburg, Quebec, and L'Acadie, Quebec, substations and also at a grower site at Mont-St-Grégoire, Quebec (Khanizadeh et al., 2005).

Description of Self-rooted Trees

Own-rooted trees of 'SJM44' are very prolific and began flowering in L'Acadie, Quebec, around 15 May compared with 'M.26', which begin flowering around 23 May based on average date during 1999 to 2004. The color of the buds in full balloon stage is white with medium pink along the petal outline; pedicels are green, and flowers are single with an average 5.7 cm diameter. Petals are large, overlapped, circular, and mainly white.

The mature leaves are fairly large with length between 7.8 and 9.2 cm, width

between 4.5 and 5.5 cm, and a length to width ratio of 1 : 7. The leaves are dark green, glossy on the upper side, and pubescent on the lower side with an outward orientation. Petioles are between 1.8 and 2.5 cm long, and the shape of the leaf apex is cuspidate with serrated margins.

The reddish brown dormant 1-year-old shoot is 6 mm thick, and the length of internodes (at the middle third of the shoot) is 13 mm based on averages of at least four replicates during the evaluation period. Shoots have moderate flexibility and numerous small lenticels.

Fruits are small (23 g) with 3.4 to 3.8 cm diameter, globose, symmetrical, and the ribbing is weak (Fig. 1). Fruit crowning is absent and the eye is large, closed, and the calyx is persistent with medium to long lobes. The stalk is very long (3.1 to 4.6 cm) and the stem cavity is shallow. The skin is smooth and partially (20% to 50%) covered with flecked, streaked, and faded pinkish red [Royal Horticultural Society (RHS) 50B] over a yellow ground color (RHS, 1995) with very little

russet around the stalk cavity. The lenticels are small and inconspicuous and the fruit flesh is yellowish.

Propagation (stool bed)

'SJM44' produces four to five shoots per plant and rooting efficiency (quantity produced) was better than O.3 but less than 'M.9'. Average shoot diameter was 5 to 6 mm and lengths of shoots were 62 cm. 'SJM44' produces an average of two to four thorns or secondary branches per shoot.

Diseases and Pests

'SJM44' is resistant to woolly apple aphid (*Erisoma lanigerum* Hausmann; based on visual observation since 1974 in stool bed). It has similar or lower susceptibility to two races of *Erwinia amylovora* (Burrill) than 'M.9' and 'M.26' and is more resistant to four races of *Phytophthora cactorum* (Leb. & Cohn) Schroet. than 'M.26' but less resistant than 'M.9' (Carisse and Khanizadeh, 2006) (Table 3) using the procedure used by Norelli et al. (2002).

Performance in the Orchard

The performance of 'SJM44' using 'McIntosh Summerland' as a scion has been monitored since 1997 in a commercial orchard located in Mont-St-Grégoire, Quebec. It produces trees larger than 'M.9' but smaller than 'M.26' (Table 1). The trees grafted on 'SJM44' have better yield efficiency and produce fewer burr knots and no suckers compared with 'M.9'.

Table 1. Burr knots, sucker number, trunk cross-sectional area (TCSA), height, spread, and vigor of McIntosh Summerland apple trees at Mont-St-Grégoire, Quebec, on 'SJM44' in comparison with 'M.9' and 'M.26' (1997 planting).

Genotype	Burr knots ^z 2004	Suckers (no.) 1999–2003	TCSA (cm ²) 2004	Ht (cm) 2004	Spread (cm) 2004	Relative vigor 2004 ^x
SJM44	0.5	0.0	29.8	350	360	128
M26	1.7	0.0	40.8	367	357	150
M9	2.0	2.3	18.2	267	283	100
LSD _{0.05}	1.5	5.8	11.0	65	75	17

^zBurr knots on a scale of 0 to 5: 0 = no burr knots; 5 = aerial section of rootstock is covered with burr knots.

^xCircumference (mm): 25 cm above the graft union.

^yRelative vigor to M9 (circ. 'SJM44'/circ. of 'M.9')*100.

LSD = least significant difference.

Table 2. Precocity, cumulative yield (1999–2004), yield efficiency, and average fruit size of McIntosh Summerland apple trees at Mont-St-Grégoire, Quebec, on 'SJM44' in comparison with 'M.9' and 'M.26' (1997 planting).

Genotype	Yield (kg) ^z							Yield efficiency ^y	Fruit size (g) 2004 ^x
	1999	2000	2001	2002	2003	2004	1999–2004		
SJM44	0.3	5.5	20.3	31.4	84.9	48.7	190.9	6.7	123
M26	0.6	3.8	12.1	32.1	44.8	44.7	138.1	3.3	146
M9	0.5	6.7	10.5	25.5	21.0	39.4	103.7	5.8	135
LSD _{0.05}	1.3	4.8	11.5	14.4	77.8	25.6	72.2	3.2	31

^zYield (kg) = includes weight of fallen, harvested, and sampled apples.

^yYield efficiency (kg·cm²) = (cumulative yield 1999 to 2004/trunk cross-sectional area 2004).

^xSize (g): average fruit size obtained from a randomly selected sample of 25 fruits.

LSD = least significant difference.

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Fig. 1. Fruit of 'SJM44' rootstocks (fruits are 3.4 to 3.8 cm in diameter).

Availability

A Canadian Plant Breeder's Right (PBR) has been issued (PBR certificate number 2906) and limited quantities of indexed budwood are available for research purposes (universities and research centers) from Canadian Food Inspection Agency, Shahrokh Khanizadeh (for North America) or Meiosis

Table 3. Relative susceptibility of 'SJM44' rootstock compared with 'M.26' and 'M.9' based the length of necrosis on excised apple rootstocks inoculated with four isolates of *Phytophthora cactorum* and two races of *Erwinia amylovora*.

Rootstocks	Race of <i>Phytophthora cactorum</i> ^z				Race of <i>Erwinia amylovora</i> ^y	
	PC04-01	PC04-02	PC04-03	PC04-04	ST998	ST1585
M.26	34.67	41.48	36.28	29.18	63.17	66.40
M.9	17.17	20.21	17.04	13.70	81.70	94.82
SJM44	25.70	29.70	28.24	22.72	76.40	60.00
LSD ^x	2.28	5.61	5.56	4.29	29.31	20.74

^zLength (mm) of necrosis induced by *Phytophthora cactorum* isolates.

^yPercentage of the shoot length with necrotic lesions after inoculation (Norelli et al., 2002).

^xLSD = least significant difference at the 0.05 level.

Data collected from Carisse and Khanizadeh (2006), and <http://www.cyberfruit.info/apple/apple-rootstocks/pdf/disease-susceptibility.pdf>.

(<http://www.meiosis.co.uk>) for Europe following a written request. Interested nurseries may inquire about "nonexclusive licenses" directly from Agriculture and Agri-Food Canada, office of technology transfer.

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