'O3A' Apple Rootstock

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'O3A' (Ottawa 3 Amélioré; in English, 'Ottawa 3 improved') is a new rootstock resulting from a mutation in the O.3 stool bed discovered at the Agriculture and Agri-Food Canada (AAFC) Research Station, St-Jean-sur-Richelieu, Quebec. It produces dwarf trees equal to 'Ottawa 3' (O.3) but with better precocity (early fruiting), higher yield efficiency (based on yield/trunk cross-sectional area), lower suckers, and wider branch angles. 'O3A' is similar to 'O.3' in susceptibility to two races of *Erwinia amylovora* and four isolates of *Phytophthora cactorum*. It was planted in 1997 in replicated trials in several plots at the Frelighsburg, Quebec, and L'Acadie, Quebec, substations and also at two grower sites along with SJM and SJP84 series rootstocks (Khanizadeh et al., 2000, 2003, 2005, 2007).

Description of Self-rooted Trees

Own-rooted trees are very prolific and begin flowering in L'Acadie, Quebec, on 15 May similar to 'O.3'. The color of the buds in full balloon stage is medium pink (RHS 58A) (Royal Horticultural Society, 1995) and the pedicels are green and flowers are single with an average of 5.1 cm diameter. When flowers are fully opened, the upper side of the petal is white and the lower side is white with pink blush (RHS 88A) with a circular to oblong shape and overlapped.

The mature leaves are medium size with length between 9.4 and 10.7 cm, width between 5.5 and 7.0 cm, and a mean length to width ratio of 1:5. The leaves are medium green and dull on the upper side and glabrous on the lower side with an outward to downward direction. Petioles range from 1.7 to 2.1 cm long. The shape of the lamina apex is cuspidate with serrated margins and the stipules are large.

The dormant 1-year-old shoot is 6 mm thick and the length of internodes (at the middle third of the shoot) is 22.1 mm with weak flexibility with a numerous number of medium-sized lenticels.

Fruit are very small to small (34 g) with 4.0 to 4.8 cm diameter, globose or oblong, symmetrical, and the ribbing is strong (Fig. 1). Fruit crowning is intermediate and the eye

Fig. 1. Fruit of 'O3A' rootstocks (fruits are 4.0 to 4.8 in diameter).

is large, half opened and the calyx is persistent, long, and overlapping at the base. The stalk is thin (1.5 to 2.1 mm), long (1.0 to 2.4 cm), and the cavity has a deep board (14 to 20 mm) depth. The skin is smooth and the ground color is yellow (RHS 8C) with an oversolid to washed vivid reddish pink (RHS 47A-B) with a very low amount of russet around the stalk cavity and eye basin. The lenticels are intermediate prominence on the overcolor and are small to medium size and the fruit flesh is creamy.

Propagation (Stool Bed)

'O3A' produces the same amount of shoots and root per stool bed as 'O.3'.

Diseases and Pests

'O3A' has similar susceptibility compared with 'O.3' to the two races of *Erwinia amylovora* compared and four races of *Phytophthora cactorum* (Leb. & Cohn) Schroet. (Carisse and Khanizadeh, 2006; <http://www.cyberfruit.info/apple/apple-rootstocks/pdf/disease-susceptibility.pdf>).

Performance in the Orchard

The performance of 'O3A' using 'McIntosh Summerland' as a scion has been monitored since 1997 in two commercial orchards located in Dunham and Mont-St-Grégoire, Quebec. Trees produced on 'O3A' were similar in size compared with 'O.3' (Table 1), but with better yield efficiency, cumulative yield (Table 2), and were more precocious. The 'O3A' had a similar number of burr knots compared with 'O.3' but lower than 'M.9' with wider branch angles (Khanizadeh et al., 2003, 2005). A higher number of suckers was

Table 1. Burr knots, sucker number, circumference, trunk cross-sectional area (TCSA), height, spread, and vigor of McIntosh Summerland averaged for two separate locations on O.3A in comparison with O.3 and M.9 planted in 1997 in Dunham and Mont-St-Grégoire, Quebec.

Genotype	Burr knots (0–5) ^z	Suckers (no.) 2003	Circ. (mm) ^y	TCSA (cm ²) ^x	Ht (cm)	Spread (cm)	Vigor relative 2004 ^w
O3A	0.8	2.3	168	22	257	307	140
O.3	0.8	1.3	180	26	237	303	132
M.9	1.5	1.4	134	15	233	254	100
LSD _{0.05}	1	2.9	25	6.9	68	60	24

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

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

^xTCSA cm²: [(radius mm*radius mm) 3.1416]/100.

^wRelative vigor = (circ.SJM15/circ.of M.9)*100.

Table 2. Precocity, cumulative (yield 99–2004), yield efficiency, and fruit size of McIntosh Summerland averaged for two separate locations on O3A in comparison with O.3 and M.9 planted in 1997 in Dunham and Mont-St-Grégoire, Quebec.

Genotype	Yield (kg) ^z							Yield eff. ^y (kg·cm ²)	Size 2004 ^x (g)
	1999	2000	2001	2002	2003	2004	1999–2004		
O3A	2.1	8.4	12.7	21.9	25.9	40.2	111.2	4.9	132
O.3	1	6.2	12.8	21.9	22.6	30.4	94.9	3.8	131
M.9	0.6	5	7	17.4	13.4	27.2	70.6	4.4	118
LSD _{0.05}	1.5	2.8	8.5	14.2	16.1	16.4	50.9	2.1	25

^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 fruit.

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observed on 'O3A', but it was not significantly different compared with 'O.3' and 'M.9'.

Availability

A Canadian Plant Breeder's Right has been issued and limited quantities of indexed budwood are available for research purposes (universities and research stations) from the Canadian Food Inspection Agency, Shahrokh Khanizadeh (North America), or from Meiosis (Europe) by written request. Interested nurseries may inquire about "nonexclusive licenses" directly from AAFC in Canada or

Meiosis in Europe (<http://www.meiosis.co.uk>).

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