

SJM - Winter Hardy Apple Rootstock Series

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Abstract

In 1960, a breeding program was initiated in Morden, Manitoba in order to develop winter hardy rootstocks for cold climates. The program was transferred to AAFC, HRDC, at St-Jean-sur-Richelieu, Quebec. Two hundred and nine seedlings were selected from the initial population and evaluated, since 1970, in Agriculture and Agri-Food Canada (AAFC), Horticultural Research and Development center (HRDC), Quebec, Canada. Some of these rootstocks, obtained from crossing 'Nertchinsk' with M.9 and M.26, were found to be winter hardy, disease resistant, dwarfing, having good yield efficiency, easier to propagate than O.3 and were tested further in several locations in Quebec. Excised shoot assay of the selected lines were also tested for four strains of crown rot (*Phytophthora cactorum* (Leb. & Cohn) Schroet). Most of the rootstocks were more susceptible to PC04-02 isolate followed by PC04-03 and PC04-01 and less susceptible to PC04-04. SJM189 was the least susceptible while SJM15, SJM188, MM.111, SJM127 and MM.106 were the most susceptible. SJM167, M.44, SJM150 and M.26 had low to moderate susceptibility to *P. cactorum*. O.3, SJM150, SJM167 and M9 were the most rootstocks susceptible to *Erwinia amylovora* (Burrill) Winslow while M.7, SJM189 and SJM188 were the least susceptible. Seven of SJM series rootstocks (SJM15, SJM44, SJM127, SJM150, SJM167, SJM188 and SJM189) were released for commercial evaluation and are presently available from Canadian Food Inspection Agency in BC or from Meiosis Inc. in UK. Interested nurseries may inquire about "non-exclusive licenses" directly from AAFC in Canada or Meiosis Inc. in Europe (<http://www.meiosis.co.uk>).

Materials and methods

A nursery was established, in 1970, in Freighsburg, Quebec, to evaluate the agronomic characteristics of 'McIntosh' grafted on 209 seedling rootstocks. From the 209 seedlings, 19 were selected for further evaluation due to their excellent resistance to low temperatures (survival at several locations after the winter testing of 1980/1981, 1986/1987 and 1993/1994), their disease resistance and yield efficiency. A stool bed was also established, in 1991, to examine rooting efficiency, number of commercial suckers and resistance to woolly apple aphids. Following further testing in stool-beds and tree performance in Freighsburg during 1991-1995, seven rootstocks (SJM127, SJM15, SJM150, SJM167, SJM188, SJM189 and SJM44) were obtained from Nertchinsk x M.9 and M.26 and were re-selected and planted in triplicated trials at AAFC and at two growers fields (Dunham, longitude 74.00 W; latitude 45.15 N and Mont St-Grégoire, longitude 73.10 W; latitude 45.20 N) using M.26, M.9, MM.111 and O.3 as controls. A completely randomized design was used and three trees per rootstock were randomized in each of the triplicates. 'McIntosh Summerland' was used as scion to compare the relative size, circumference, tree cross section area (TCSA), height, spread, yield efficiency, total yield, fruit number, average fruit weight as well as rating of Burr-knots and Suckers of SJM series compare to M.26, M.9, M.26, MM.111 and O.3. The relative size of the rootstocks was estimated compared to M.9 (Rootstocks circ * 100 / M9 circ.) and meanfruit weight (g) was calculated using 25 randomly selected fruits in each year. Circumference and TCSA measured at 25 cm above graft union. Burr-knots incidence were rated using a scale from 0 (no burr-knots) to 10 (completely covered the rootstocks) and number of suckers were counted annually. SJM44 and SJM127 were evaluated at only one orchard due to the insufficient number of rootstocks. No irrigation or thinning was done in both commercial sites during the evaluation. General linear model (GLM) procedure of SAS (8) was used to analyze the data and Least significant difference (LSD) was used for mean comparison.

Results and Discussion

Data and information presented here are from two replicated sites established in two orchards with some information that we collected from trees established at two research centers, L'Acadie (longitude 73.35 W; latitude 45.32 N) and Freighsburg, to evaluate the performance in stool bed. All the reported SJM passed several winter tests in Quebec including the harsh winters 1980/1981, 1986/1987 and 1993/1994. The relative size (vigor) of the SJM series rootstocks was estimated using circumference and was compared to M.9 using 2002 data. The data is presented for each site separately since there was a location x rootstock interaction for TCSA, Yield Efficiency and total Yield indicating the response of rootstocks were site dependent. M.9 were the least vigorous rootstocks in both commercial sites. SJM series rootstocks were relatively less vigorous than M.26 and O.3 in both sites, but the difference was not significant. SJM15, SJM150 and SJM167 were more precocious than other rootstocks. Total cumulative yield was lower in Dunham compare to Mont St-Grégoire. SJM15, SJM150 and M.9 had highest efficiencies in Mont St-Grégoire. O.3 produced the largest fruit followed by SJM150 and SJM15 in Dunham but less difference was observed between rootstocks in Mont St-Grégoire. The rootstocks susceptibility to burr-knot was very different in each site and also in our experimental farms. No significant differences were observed for burr-knot between rootstocks in Mont St-Grégoire but a higher level of burr-knot was observed on SJM150, SJM188 and SJM189 compared to the rest in Dunham. Cumulative number of suckers was also compared and no significant difference was observed between the tested rootstocks. SJM15 and SJM167 stand out compared to standard, based on the observation in 2 research centers and information collected in two replicated sites. The SJM series rootstocks are registered and non-exclusive multiplication licenses can be obtained from AAFC. European nurseries can obtain a multiplication license from Meiosis Ltd. (Bradbourne House, Stable Block, East Malling, Kent ME19 6DZ).

Performance of 7 SJM series and O.3A rootstocks using 'McIntosh Summerland' as scion compared to M.26, M.9, M.26, MM.111 and O.3 planted in 1995. (average of 3 trees per /replicates).

Rootstocks	Mont St-Grégoire Site 1		Verger Yvan Duchesne Site 2		
	Relative size ^z	Cum. yield 1999-2002 Efficiency	Relative size ^z	Cum. yield 1999-2002	Efficiency
SJM15	120	53.8 3.1	123	15.8	1.8
SJM44	135	57.3 2.8	-	-	-
SJM127	137	42.9 2.0	-	-	-
SJM150	134	68.9 3.2	156	23.4	1.6
SJM167	145	61.8 2.6	164	25.9	1.6
SJM188	129	40.4 2.1	137	12.8	1.1
SJM189	127	46.1 2.4	140	16.1	1.4
O.3A	116	59.1 3.8	160	31.2	2.0
M.26	151	48.6 1.9	173	22.2	1.3
M.9	100	43.2 3.8	100	10.3	1.8
MM.111	230	24.7 0.4	224	15.7	0.6
O.3	132	54.8 2.8	156	29.2	2.1
LSD ^v	28	21.9 0.8	34	9.9	0.9

