

SJP84 - Dwarf Winter Hardy Apple Rootstocks

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Abstract

In early 1970, a breeding program was initiated in Agriculture and Agri-Food Canada (AAFC), Quebec, to develop winter hardy rootstocks for cold climates. 1000 seedlings from controlled crosses between 'Malus robusta R-5' and 'M.26' or with 'Budagovsky 579490' were planted, in 1980, in a nursery using 'Spartan' as scion. 499 seedlings were retained for further evaluation and those with undesirable characteristics, e.g. lack of winter injury, disease susceptibility, and difficulty to propagate in stool bed or susceptibility to woolly aphids, were eliminated from the program. Some of promising rootstocks were further tested in vitro for four isolates of crown rot (*Phytophthora cactorum* (Leb. & Cohn) Schroet) and Fire blight (*Erwinia amylovora* (Burril) Winslow). Based on the overall evaluation of rootstocks in several locations in Quebec, nine of the SJP84 series rootstocks (SJP84-5218, SJP84-5217, SJP84-5230, SJP84-5198, SJP84-5162, SJP84-5231, SJP84-5174, SJP84-5189 and SJP84-5180) 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

Several crosses were performed in 1975 including 'Malus robusta R-5' with 'M.26' or 'Budagovsky 579490'. Some seeds were collected from open pollinated O3 and were then allowed to germinate under greenhouse conditions and planted in a nursery in 1980. Budding to 'Spartan' was carried out in 1982 and all trees were planted in 1984 (5.5 x 3.0m) at the experimental farm of AAFC, HRDC in Freilighsburg, Quebec. Standard orchard management practices were applied each year. 499 crosses were used for evaluation and the rest was eliminated, during the evaluation, from the program due to its lack of winter hardiness, disease susceptibility or any undesirable character like extreme difficulty to propagate in stool bed.

Trunk circumference was measured at 25 cm above the graft union and was used to calculate trunk cross-sectional area in 1990. Yield and incidence of root suckers were recorded annually from 1988-1990. Yield, fruit size, and the most important characteristics were collected only for those individuals, which also showed superior or equal agronomic characteristics in stool bed during 1988-1990. Tree height and spread were measured respectively, as well as the maximum vertical extension of the tree, and the maximum horizontal extension of the canopy along the rank. Two other parallel sites were also established to examine the ease of propagation and suitability of the rootstocks for commercial grafting compared to M26, M9 and O3 (data not shown).

'Summerland McIntosh' was used as scion for the most nine-winter hardy, easy to propagate, disease resistant promising rootstocks. They were planted in four selected locations including L'Acadie (AAFC, Experimental site) and tested under controlled conditions at two commercial grower sites, Dunham and Mont St-Grégoire (Verger Dupuis Inc., 587 Hudon, Dunham, Qc., Canada; Verger Ivan Duchesne Inc., 118 ch. Sous-Bois, Mont St-Grégoire, Qc., Canada), in 1997, using three trees per site/replicate. Several randomly commercially known cultivars (Gala, Spartan, McIntosh, Lobo) were also grafted and used as scion to test and evaluate the graft compatibility.

Results and Discussion

The majority of the retained rootstocks were derived from R5 x M26 crosses and only one (75-13-065) was retained from R5 x B57490. All the selected and reported rootstocks showed no degree of incompatibility against selected commonly commercial cultivar as scion. All rootstocks were either dwarf or semi-dwarf and comparable to M26 or M9, had equal or superior ease propagation and better efficiency than M26. The circumference of the trees in 2002 was compared to M9 (Rootstocks circ * 100 / M9 circ.) to estimate the vigor of the selected rootstocks before data analysis. There was a significant interaction between rootstocks and sites, which indicates there is a relationship between rootstocks performance and soil type.

In general, trees were more vigorous in Dunham compared to Mont St-Grégoire, the other commercially grown site, based on trunk circumference. SJP84-5230, M9 and M27 were the least vigorous rootstocks in Dunham and Mont St-Grégoire respectively, however there was not a significant difference between M27, SJP84-5230, SJP84-5231 and M9 in Mont St-Grégoire. MM111 was the most vigorous one in both sites.

In general, the trees were shorter in Dunham (sandy soil) compared to Mont St-Grégoire (silt loam). SJP84-5218 and SJP84-5217 were the most precocious rootstocks based on the yield data of 1999 and 2000, in both sites. MM111 was the least precocious. SJP84-5198, SJP84-5189, SJP84-5162 and SJP84-5217 had the highest total accumulative yield compared to M26, SJP84-5231, MM111, M9 and SJP84-5230, however only SJP84-5218 and SJP84-5217 were significantly different from MM111 and M27 in the 2nd site (Table 2). In general, except for SJP84-5231 and SJP84-5230, the accumulative yield of rootstocks was comparable to standard dwarf rootstocks. The most efficient rootstocks were SJP84-5198 in Dunham and SJP84-5218 and SJP84-5230 in Mont St-Grégoire. M111 and M26 had the lowest efficiency in both sites. Some variability was observed for burrknots development but it was not really different from standard, except for SJP84-5180 and SJP84-5218, which had the highest burrknots, but not significant from M26 and M9. The number of suckers was recorded only at one site. No sucker was observed for M26, M27, SJP84-5198, SJP84-5189, SJP84-5231, SJP84-5174 and SJP84-5230. The highest number of root suckers was observed on SJP84-5180 but was not significant from M9, O3 and MM111.

Based on the observations since 1984 in 6 orchards, nine of the SJP84 series will be released for commercial testing and evaluation. All the retained SJP84 series are winter hardy, easier or equal to propagate in stool bed compared to O3 and produce a thick and vertical growing sucker in stool bed. No sign of mildew, scab or woolly aphids was observed on these series since 1984. The scion of several known cultivars grafted on these rootstocks (single tree) showed no sign of incompatibility since 1995.

SJP84-5218 and SJP84-5198 stand up better than others, based on the visual tree observation (height, width, branch angle, fruit distribution, tree form and graft union, root suckers and burr knots) in 5 locations and their performance in stool beds. All these rootstocks are presently available for evaluation, however they might exhibit a different dwarfing effect depending on the cultivars used as scion, soil structure and quality and other environmental factors.

The SJP84 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).

Test code	Mont St-Grégoire Verger Yvan Duchesne				Dunham Verger Dupuis Inc.			
	Vigour	Cum. Yield 1999-2002	Efficiency (kg/cm ²)	Fruit weight (g)	Vigour	Cum. Yield 1999-2002	Efficiency (kg/cm ²)	Fruit weight ⁷ (g)
SJP84-5218	144	103.0	4.2	116	173	31.8	1.8	118
SJP84-5217	176	76.4	2.1	126	172	33.8	1.9	114
SJP84-5230	89	35.9	3.9	106	108	9.4	1.5	126
SJP84-5198	128	52.6	2.8	124	153	36.7	2.6	114
SJP84-5162	123	48.2	2.8	119	169	33.8	2.0	118
SJP84-5231	99	30.6	2.7	112	122	20.1	2.1	126
SJP84-5174	154	63.3	2.3	132	205	33.0	1.3	96
SJP84-5189	136	49.3	2.0	136	182	36.0	1.9	100
SJP84-5180	134	54.6	2.6	172	-	-	-	-
O3A	116	59.1	3.7	125	160	31.2	2.0	102
M-26	151	48.6	1.8	163	173	22.2	1.3	119
M-9	100	43.2	3.7	133	100	10.3	1.8	116
MM-111	230	25.0	0.4	133	224	15.6	0.6	130
O3	132	54.7	2.8	128	156	29.2	2.1	104
LSD	28	29.0	1.1	30	38	10.8	0.9	19

