Fruit Varieties Journal 45(3):185-187 1991

Promising Winter Hardy Apple Rootstocks from a Breeding Program at Morden, Manitoba

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Abstract

Apple rootstocks derived from crosses involving *Malus baccata* 'Nertchinsk,' M.9, M.26, Osman and Heyer 12 were evaluated for 10 years under Quebec growing conditions. The scion was 'McIntosh VC309,' all trees were evaluated for yield, trunk circumference and winter injury. Eighteen selections considered hardy, dwarfing and efficient were selected for further testing.

Introduction

Many of the apple rootstock breeding programs throughout the world emphasize winter hardiness, ease of propagation, and dwarfing (2). Resistance to fireblight, woolly aphid, collar rot and freedom from burrknots are also important. Winters in Quebec can be harsh and temperatures may dip to -30°C for extended periods. Spring frosts can also be very injurious particularily in trees on *Malus robusta* 5 (3) because this rootstock promotes early budbreak. A breeding program at Ottawa resulted in a series of rootstocks that were hardy for Canadian conditions and one, Ottawa 3, was also dwarfing (5, 6). None, however, have received wide acceptance and new rootstocks are still being sought by growers. The breeding program at Morden, Manitoba in the 1960's embarked upon development of hardy clonal dwarfing and vigorous rootstocks for areas in Canada with harsh winters. Crosses were made with *Malus baccata* 'Nertchinsk' (a hardy Manchurian crab), M.9, M.26, Osman and Heyer 12. Over 200 of the hybrids were evaluated ar Frelighsburg, Quebec. In this paper we report the results on hardiness, tree size, and tree efficiency of the most promising selections in the series.

Materials and Methods

The trial consisted of 56, 59 and 94 hybrid seedlings of 'Nertchinsk' x M.9, 'Osman' x Heyer 12, and 'Nertchinsk' x M.26, respectively. All were budded to 'McIntosh VC 309' in 1971, kept in the nursery for 2 years and then planted in the spring of 1974. Spacing was 1.2 x 4.6 m. Trees were trained as central leaders and normal orchard management was followed. Circumference at 25 cm above the graft union and fruit yield were recorded annually to 1985 except for circumference in 1976, 1977, 1980 and 1981. Tree hardiness was assessed in 1983 and 1984 on a scale of 1-9 where 1 = severe winter injury and 9 = no visible injury. Severe winter injury was present when nearly all of the limbs suffered extensive damage. Presence of cankers, particularly *Nectria galligena* Bres., was also considered in the latter assessment.

Seedlings that had a hardiness rating ≥ 6, production efficiency (cumulative yield/trunk cross-sectional area) ≥ 1.0 and trunk cross-sectional area < 65 cm^2 as of 1984 were deemed worthy of further testing.

Results and Discussion

Eighteen selections met the requirements for hardiness, production efficiency and tree size (Table 1). Two trees had production efficiencies ≥ 3.0 and several had efficiencies ≥ 2.0.

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Selections SJM-118 and SJM-180 were very small, producing trees comparable to those on M.27. The others were very dwarfing (VD), comparable to M.9, or dwarfing (D), comparable to M.26. Only 2 selections from the 'Osman' x Heyer 12 crosses satisfied the criteria but this was not surprising since both parents are standard-sized trees.

None of the selections have been tested for susceptibility to fireblight *Erwinia amylovora)*, collar rot *(Phytophthora cactorum)* or woolly aphid (*Eriosoma lanigerum* Hausm.). Virus status is unknown as is stool bed propagation of the selections.

The M.9 rootstock is sensitive to Quebec winters (4) but the 'Nertchinsk' x M.9 selections reported in this paper have survived temperatures of -30°C with little or no injury.

A comprehensive rootstock trial to evaluate further the 18 selections is planned for 1992. The selections are currently in the repository at Frelighsburg and limited supply of plant material is available to those wishing to establish trials in other areas.

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Table 1. Trunk cross-sectional area (TCSA), cumulative yield, efficiency and tree hardiness of McIntosh[1] on 18 selected rootstocks from 3 progenies during 1975-1984 (inclusive).

Selection	Type[2]	TCSA (cm^2)	Yield (kg)	Efficiency (kg/cm^2)	Hardiness (1-9)[3]
		'Nertchinsk' x M.9			
SJM-15	VD	21	73	3.5	8.5
SJM-44	VD	27	48	1.8	8.5
SJM-36	VD	28	33	1.2	8.0
SJM-27	VD	33	54	1.6	6.0
SJM-29	VD	35	61	1.7	7.5
SJM-12	VD	36	63	1.8	8.0
SJM-26	VD	37	77	2.1	6.5
SJM-50	VD	38	100	2.6	8.0
SJM-35	D	54	116	2.2	8.0
SJM-45	D	62	126	2.0	8.0
		'Nertchinsk' x M.26			
SJM-118	ED	16	35	2.2	8.5
SJM-180	ED	19	43	2.3	6.5
SJM-188	VD	26	78	3.0	7.5
SJM-150	VD	30	76	2.5	7.5
SJM-127	VD	38	69	1.8	8.0
SJM-199	D	45	91	2.0	6.5
SJM-189	D	51	68	1.3	7.0
SJM-167	D	61	123	2.0	9.0
		'Osman' x Heyer 12			
SJM-59	SD	62	69	1.1	7.0

[1]'McIntosh VC 309' as the scion. [2]ED = extreme dwarfing, VD = very dwarfing, D = dwarfing. [3]1 = severe injury, 9 = no visible injury.