1995 Massachusetts-Maine-Nova Scotia Scion/Rootstock Trial: Several Rootstocks Evaluated with McIntosh, Pioneer Mac, Cortland, and Macoun as Scions

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In 1995, a trial was established at three locations (Belchertown, MA, Monmouth, ME, and Kentville, NS) including Rogers Red McIntosh, Cortland, Macoun, and Pioneer Mac on 11 different rootstocks. Each site included seven replications of each combination of rootstock and variety. Only Massachusetts

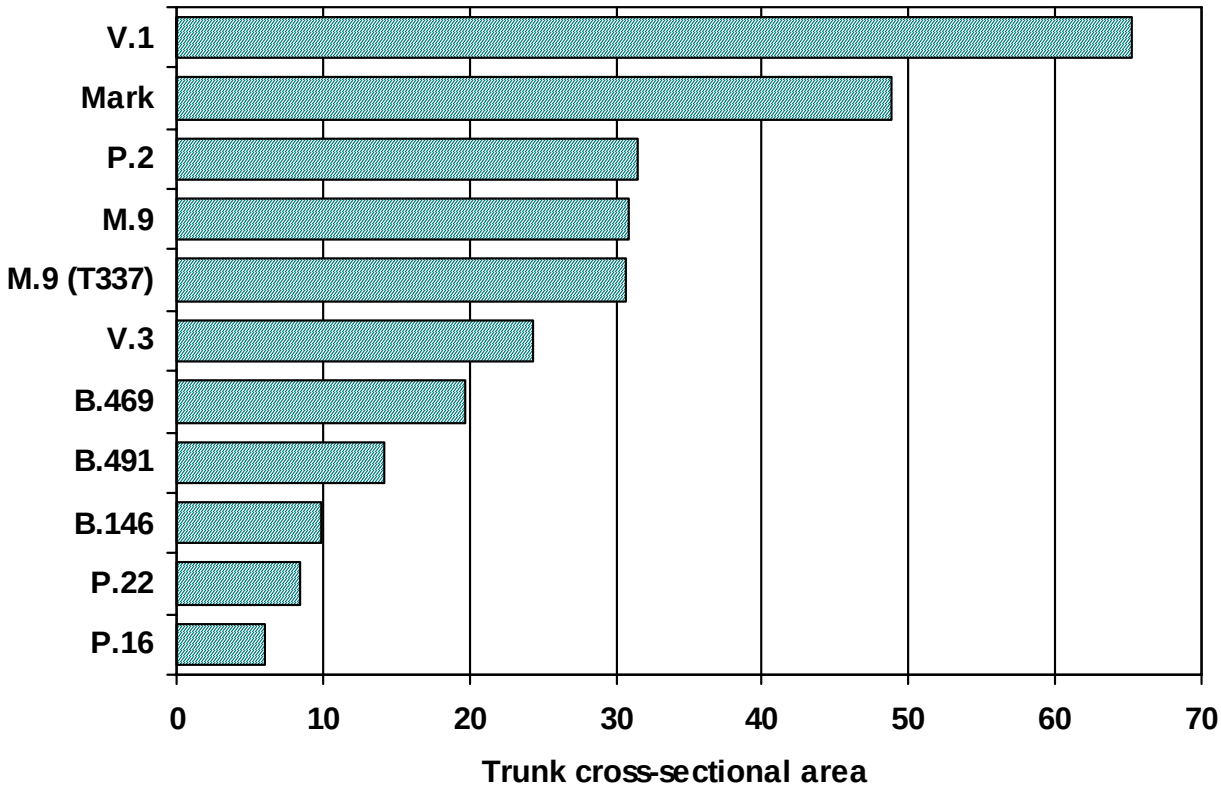

Figure 1. Trunk cross-sectional area after ten growing seasons of trees on various rootstocks planted in 1995.

data from 2004 (10th and last growing season) and on a cumulative basis are presented in this report.

The intent of this trial was to determine whether or not the relative effects of rootstocks varied among our common, New England/Atlantic Canada varieties. After 10 years of study, the rootstock effects were very consistent from variety to variety. This article, therefore, will focus only on the average rootstock effects. Rootstock data are included for each variety for completeness.

V.1 resulted in the largest trees in this trial, likely in the semidwarf category. Trees on Mark were about 20% smaller than those on V.1, and trees on the two M.9 strains and on P.2 were about half the size of those on V.1(Figure 1, Table 1). Trees on V.3 were numerically but not significantly smaller than those on M.9, M.9 NAKBT337, or P.2. Next in order of decreasing size were trees on B.469, B.491, and B.146. Trees on P.22 and P.16 were the smallest in the trial. The four most dwarfing rootstocks resulted in trees too weak in vigor to be of commercial potential.

Yield per tree in 2004 was affected by rootstock, but it is more interesting to look at cumulative yield (1997-2002) over the fruiting life of the planting (Table 2). Trees on V.1 and Mark yielded the most and similarly. Trees on M.9, M.9 NAKBT337, P.2, and V.3 were the next most yielding and also yielded similarly. Trees on B.469 and B.491 were similar and in the next lower group, and the lowest yielding trees were on B.146, P.16, and P.22.

As with yield per tree, yield efficiency in 2004 was affected by rootstock, but the cumulative yield efficiency is a more reliable way to study long-term rootstock effects (Table 3). Generally, the ultradwarf trees were the most cumulatively yield efficient (1997-2004), but as noted above, these trees are too small for commercial production. B.491, M.9, M.9 NAKBT337, P.2, and V.3 all produced similarly yield efficient trees. The least efficient trees were on V.1, and those on Mark were intermediate between the two groups.

Averaged across all fruiting years (1997-2004), rootstock affected fruit size (Table 4). V.1, M.9, and

Table 1. Trunk cross-sectional area in 2004 of Cortland, Rogers Red McIntosh, Macoun, and Pioneer Mac trees on several rootstocks planted in 1995.[z]

Rootstock	Cortland	Macoun	McIntosh	Pioneer Mac	Average
			Trunk cross-sectional area (cm^2)		
B.146	9.0	13.1	3.2	14.2	9.9 ef
B.469	19.6	18.1	20.6	20.4	19.7 de
B.491	12.5	15.7	15.0	13.2	14.1 ef
M.9	33.5	29.0	34.3	26.8	30.9 c
M.9 NAKBT337	28.3	23.1	32.9	38.5	30.7 c
Mark	49.9	51.5	43.4	50.8	48.9 b
P.2	31.8	32.0	26.3	36.1	31.5 c
P.16	4.2	6.3	4.7	8.7	6.0 f
P.22	7.4	11.0	8.1	7.2	8.4 f
V.1	56.3	67.2	67.4	69.9	65.2 a
V.3	23.7	23.9	23.3	26.8	24.4 cd
Average	25.1 a	26.4 a	25.4 a	28.4 a	

[z] Rootstock means within columns not followed by the same letter are significantly different at odds of 19 to 1, and overall cultivar means not followed by the same letter are different at odds of 19 to 1.

Table 2. Yield in 2004 and cumulative yield of Cortland, Rogers Red McIntosh, Macoun, and Pioneer Mac trees on several rootstocks planted in 1995.[z]

Rootstock	Cortland	Macoun	McIntosh	Pioneer Mac	Average
			Yield per tree (2004, kg)		
B.146	2.1 e	0.6 b	0.8 d	7.0 cde	2.4 d
B.469	10.9 cde	11.5 ab	16.7 bcd	15.6 bcd	13.6 bc
B.491	5.6 de	11.5 ab	13.2 cd	9.4 cde	9.8 cd
M.9	17.0 bc	15.8 ab	21.9 abc	20.5 b	18.8 b
M.9 NAKBT337	14.0 bcd	9.1 b	20.2 bc	19.6 bc	15.7 bc
Mark	28.9 a	14.9 ab	28.1 ab	31.7 a	26.0 a
P.2	14.9 bc	16.6 ab	14.0 cd	19.9 bc	16.3 b
P.16	3.9 e	1.3 b	2.7 d	5.5 de	3.3 d
P.22	4.0 e	2.1 b	5.7 d	4.5 e	4.4 d
V.1	22.9 ab	28.3 a	32.6 a	38.9 a	30.7 a
V.3	12.4 cde	9.5 b	21.1 abc	17.1 bc	15.0 bc
Average	12.4 ab	11.1 b	16.1 ab	17.2 a	
			Cumulative yield per tree (1997-2004, kg)		
B.146	19 d	26 d	10 f	29 de	21 d
B.469	59 cd	57 cd	65 cde	65 cd	61 c
B.491	39 d	74 cd	53 def	44 de	52 c
M.9	88 bc	97 bc	104 abc	86 c	94 b
M.9 NAKBT337	81 c	67 cd	93 abcd	95 bc	84 b
Mark	156 a	131 ab	129 a	122 ab	134 a
P.2	91 bc	96 bc	75 bcde	91 bc	88 b
P.16	26 d	29 d	27 ef	40 de	31 d
P.22	30 d	22 d	32 ef	28 e	28 d
V.1	116 b	159 a	117 ab	130 a	130 a
V.3	73 c	86 bc	94 abcd	79 c	83 b
Average	71 a	77 a	73 a	74 a	

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M.9 NAKBT337 resulted in the largest fruit. Mark, V.3, and P.2 also resulted in good fruit size. The ultradwarfs all resulted in small fruit size.

This trial showed that rootstocks were consistent from variety to variety. Across all varieties, B.491, B.146, P.22, and P.16 all produced very small trees (ultradwarfs), likely too small for commercial use. Trees tended to be yield efficient, but fruit size on average was small. P.2, M.9, M.9 NAKBT337, and V.3 produced trees of similar size (all moderate dwarfs) and yield efficiency. Among these four, however, the two M.9 strains resulted in larger fruit than did P.2,

with V.3 resulting in intermediate size. The largest trees in the trial were on Mark and V.1. It is uncertain why Mark resulted in trees as large as was observed, but it may be because of relatively high soil moisture in the site of this trial. It produced a large dwarf tree which was moderately yield efficient, with reasonable fruit size. V.1 produced a semidwarf tree. It had low efficiency relative to the other rootstocks in the trial but likely would compare favorably to other semidwarfs. Fruit size was large from trees on V.1. Overall, no rootstock in the trial provided a great advantage over M.9 or M.9 NAKBT337.

Table 3. Yield efficiency in 2004 and cumulative yield efficiency of Cortland, Rogers Red McIntosh, Macoun, and Pioneer Mac trees on several rootstocks planted in 1995.[z]

Rootstock	Cortland	Macoun	McIntosh	Pioneer Mac	Average
	Yield efficiency (2004, kg/cm^2 TCA)				
B.146	0.29	0.05	0.31	0.49	0.27 b
B.469	0.57	0.54	0.85	0.78	0.69 a
B.491	0.50	0.68	0.84	0.74	0.69 a
M.9	0.52	0.56	0.65	0.76	0.62 ab
M.9 NAKBT337	0.46	0.33	0.60	0.57	0.49 ab
Mark	0.60	0.34	0.65	0.62	0.55 ab
P.2	0.49	0.48	0.68	0.61	0.56 ab
P.16	0.86	0.27	0.42	0.50	0.51 ab
P.22	0.56	0.16	0.74	0.56	0.50 ab
V.1	0.43	0.41	0.50	0.55	0.47 ab
V.3	0.54	0.39	0.91	0.72	0.64 ab
Average	0.53 ab	0.38 b	0.65 a	0.62 a	
	Cumulative yield efficiency (1997-2004, kg/cm^2 TCA)				
B.146	2.25	2.01	2.54	2.14	2.23 cd
B.469	3.22	3.12	3.27	3.32	3.23 bc
B.491	3.58	4.45	3.54	3.45	3.75 b
M.9	2.76	3.42	3.04	3.32	3.14 bc
M.9 NAKBT337	2.76	3.30	3.06	2.79	2.97 bc
Mark	3.23	2.75	2.95	2.46	2.85 bcd
P.2	3.00	3.13	4.11	2.74	3.25 bc
P.16	5.38	5.31	5.26	4.68	5.16 a
P.22	4.18	2.93	4.14	3.80	3.76 b
V.1	2.13	2.43	1.74	1.87	2.04 d
V.3	3.15	3.60	4.09	3.12	3.49 bc
Average	3.24 a	3.31 a	3.43 a	3.06 a	

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Table 4. Fruit weight in 2004 and average fruit weight of Cortland, Rogers Red McIntosh, Macoun, and Pioneer Mac trees on several rootstocks planted in 1995.[z]

Rootstock	Cortland	Macoun	McIntosh	Pioneer Mac	Average
			Fruit weight (2004, g)		
B.146	214	119	113	131	144 f
B.469	243	152	176	155	182 de
B.491	231	156	175	147	177 def
M.9	277	205	186	177	211 ab
M.9 NAKBT337	241	177	183	175	194 bcd
Mark	269	200	191	166	206 abc
P.2	247	171	162	162	186 cde
P.16	246	114	167	144	168 ef
P.22	204	158	157	133	163 ef
V.1	290	218	196	197	225 a
V.3	257	164	187	161	192 bcd
Average	247 a	167 bc	172 b	159 c	
			Average fruit weight (1997-2004, g)		
B.146	169 e	122 c	120 d	139 de	137 e
B.469	200 cd	143 bc	160 ab	147 de	163 d
B.491	209 bcd	142 bc	163 ab	149 cde	165 cd
M.9	237 a	156 ab	177 a	166 abc	184 ab
M.9 NAKBT337	227 ab	159 ab	170 a	171 ab	182 ab
Mark	227 ab	155 ab	168 a	157 abcde	177 bc
P.2	225 abc	145 bc	159 abc	154 bcde	171 cd
P.16	195 de	130 c	136 cd	138 e	150 e
P.22	172 e	139 bc	146 bc	138 e	149 e
V.1	237 a	165 a	177 a	174 a	188 a
V.3	231 ab	149 ab	167 a	160 abcd	177 bc
Average	212 a	146 c	158 b	154 bc	

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