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Quote: . . . it is best to avoid the combination of Marshall McIntosh and M.7 EMLA.

An Update on the 1991 McIntosh Strain/Rootstock Trial

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As apple growers plan for future plantings, it is important to understand how different rootstocks and scions will perform. Much rootstock research in recent years has studied the interaction of scion and rootstock to allow for better choice of combinations for commercial orchards.

In 1991, a pair of plantings was established (one at the University of Massachusetts Horticultural Research Center in Belchertown and one at the University of Maine Highmoor Farm in Monmouth) to study effects of a combination of McIntosh strains plus one McIntosh seedling and four rootstocks. The original intent of this trial was to determine if differences in ripening caused by strain differences and those caused by rootstocks were additive. Secondarily, tree size and yield performance were studied. Because of some surprising results, the tree size and yield performance from the Massachusetts half of the trial are reported here.

MATERIALS AND METHODS

In the summer of 1988, scions of Pioneer Mac (a McIntosh seedling), Marshall McIntosh, Chic-A-Dee McIntosh, and Rogers Red McIntosh were budded onto Mark, M.7 EMLA, M.27 EMLA, and M.26 EMLA rootstocks at the University of Maine Highmoor Farm. Trees were allowed to grow through the following two seasons in the nursery. In April of 1991, seven replications of all combinations were planted at the University of Massachusetts Horticultural Research Center. Yield and tree size were assessed each year.

RESULTS AND DISCUSSION

Overall tree size at the end of the seventh growing season followed expected patterns, with trees on M.7 EMLA the largest and those on M.27 EMLA the smallest (Table 1). Further, Pioneer Mac and Marshall trees were significantly larger than Chic-A-Dee trees, and Rogers trees were intermediate. Interestingly, the relative differences among the four rootstocks were not similar

across the cultivars. With Marshall McIntosh, trees on M.7 EMLA were smaller than expected and similar to those on M.26 EMLA.

Cumulative yield generally was as expected, with trees on M.26 EMLA producing the most fruit and those on M.27 EMLA the least (Table 1). Pioneer Mac produced significantly more fruit than Chic-A-Dee or Rogers, and Marshall was intermediate; however, the relative differences among the rootstocks varied with cultivar. Cumulative yields of M.7 EMLA and M.26 EMLA were similar for Pioneer Mac, Chic-A-Dee, and Rogers, but Marshall/M.26 EMLA yielded more than double Marshall/M.7 EMLA. Rootstock effects on yield efficiency followed consistent trends among cultivars. Cumulatively, M.27 and Mark produced the most efficient trees, followed by M.26 EMLA, and M.7 EMLA produced the least efficient trees (Table 2). Cumulatively, Pioneer Mac and Chic-A-Dee were significantly more efficient than Marshall, with Rogers intermediate (Table 2).

Rootstock did not affect fruit weight in 1997, but Chic-A-Dee resulted in significantly larger fruit than Marshall or Pioneer Mac (Table 2).

These results lead to an interesting question: Why does Marshall McIntosh respond poorly to M.7 EMLA? One possibility is that M.7 EMLA is sensitive to a virus present in Marshall. Marshall is not a virus-free strain of McIntosh. It may explain some of the variable results with Marshall McIntosh in recent years, particularly reduced leaf quality, tree growth, and fruit size. If considering semi-dwarf McIntosh trees for future plantings, likely it is best to avoid the combination of Marshall McIntosh and M.7 EMLA.

Table 1. Trunk cross-sectional area and yield in 1997 of three strains of McIntosh and one McIntosh seedling on four rootstocks planted in 1991.

Rootstock	Pioneer Mac	Marshall McIntosh	Rogers Red McIntosh	Chic-A-Dee McIntosh	Average
Trunk cross-sectional area (cm ²) ^z					
M.27 EMLA	10.9 d	9.8 c	7.9 b	7.2 c	9.0 d
Mark	30.4 c	30.7 b	37.2 a	26.3 b	31.2 c
M.26 EMLA	41.8 b	54.3 a	37.0 a	29.1 b	40.6 b
M.7 EMLA	72.8 a	49.3 a	47.8 a	46.7 a	54.2 a
Average	39.0 A	36.0 A	32.4 AB	27.3 B	
Yield per tree (kg, 1997) ^z					
M.27 EMLA	10 c	9 b	9 b	8 b	9 c
Mark	23 b	26 a	20 a	18 a	22 ab
M.26 EMLA	32 a	31 a	12 ab	20 a	24 a
M.7 EMLA	24 ab	14 b	18 a	19 a	19 b
Average	23 A	20 AB	15 C	16 BC	
Cumulative yield per tree (kg, 1993-97) ^z					
M.27 EMLA	32 b	20 c	24 c	23 b	25 c
Mark	91 a	76 a	84 a	59 a	77 a
M.26 EMLA	106 a	93 a	65 b	70 a	83 a
M.7 EMLA	93 a	44 b	59 b	67 a	66 b
Average	80 A	58 B	58 B	55 B	

^zRootstock means within columns or overall cultivar means are significantly different at odds of 19:1 if not followed by the same letter.

Table 2. Yield efficiency and fruit weight in 1997 of three strains of McIntosh and one McIntosh seedling on four rootstocks planted in 1991.

Rootstock/cultivar	Yield efficiency (kg/cm ² trunk cross-sectional area) ^z		Mean fruit weight ^z (g)
	1997	Cumulative (1993-97)	
M.27 EMLA	1.04 a	2.81 a	146 a
Mark	0.77 b	2.60 a	157 a
M.26 EMLA	0.63 b	2.21 b	156 a
M.7 EMLA	0.35 c	1.19 c	157 a
Pioneer Mac	0.74 a	2.48 a	145 c
Marshall McIntosh	0.70 a	1.84 b	151 bc
Rogers Red McIntosh	0.59 a	2.09 ab	157 ab
Chic-A-Dee McIntosh	0.76 a	2.40 a	161 a

^zOverall rootstock means within columns or overall cultivar means within columns are significantly different at odds of 19:1 if not followed by the same letter.