

Performance of 'McIntosh' on 14 Rootstocks¹

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Abstract

'McIntosh' performance over 10 years on selected rootstocks from the Ottawa, Budagovski and Malling series are compared. All trees on KS23 died over several years exhibiting collar rot type symptoms. Trees on Ottawa 11 were the largest and had the lowest productive efficiency. Trees on Ottawa 8 were slightly larger than trees on M.26 and were more efficient than the other rootstocks producing semi-standard trees. Ottawa 3 resulted in small efficient trees similar to those on M.9 and M.26. Trees on Bud 490 were larger than on Ottawa 8, and smaller than on Ottawa 11 and were not as efficient as Ottawa 8 and the other more dwarfing rootstocks (M. 8, M.9, M.26, M.27, Ottawa 3).

Introduction

Although it has been shown that rootstocks have the potential to greatly increase tree and orchard efficiency (5), most of the commercially used rootstocks have significant deficiencies for some sites and conditions. Thus, the present study evaluates a series of candidate rootstocks previously untested in Ohio for their performance over 10 years.

Materials and Methods

In 1976 'McIntosh' apple trees on 14 different rootstocks were donated by Dr. James N. Cummins and the New York State Agricultural Experiment Station for our test. Since variable numbers of each combination existed, the trees were planted in a completely randomized design at a spacing of 3 m × 5.5 m. Yield and trunk circumference were recorded annually and following harvest in 1986, tree height and spread were measured.

Results and Discussion

Significant tree loss occurred on some of the rootstocks with all trees on KS 23 dying by the end of the eighth growing season (Table 1). Symptoms on KS 23 appeared very much like collar rot and the soil on this site was relatively heavy with imperfect drainage. 'McIntosh' on Ottawa 11 resulted in the largest trees with trees on Ottawa 4 and 5 being only slightly smaller. Trees on M.27 or M.27 interstems did not differ significantly in tree size from M.9 in this study.

The first significant yield on these trees occurred during the fourth growing season (1970) and due to great variability there were no significant differences among rootstocks (Table 2). Trees on Ottawa 3 were as productive as M.9 and M.26 during the early productive years with the other Ottawa clones much slower to begin significant production. After 1982, yield/tree appeared to follow tree size and several of the rootstocks that produced larger trees (Ottawa 5, Ottawa 8, Ottawa 11 and Bud 490) had the greatest accumulative yield/tree after 10 growing seasons.

Yield efficiency whether judged by yield per trunk cross-sectional area or yield/canopy size indicated that trees on some of the smaller rootstocks were the most efficient (M.9, M.26, M.27 and Ottawa 3). Ottawa 8 had slightly smaller tree size than Ottawa 4 and 5; and slightly larger than trees on M.26 and was more efficient than the larger

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Table 1. Influence of 14 apple rootstocks on tree size and yield efficiency on 'McIntosh.'

Rootstock	# Trees	% Loss	Tree Size (m)		Trunk Cross Sectional Area (cm ²)	Yield/TCA lbs/cm ²	Canopy Efficiency ^o
			Height	Spread			
Ottawa 3	6	66	3.1 bc	3.8 bc	80.9 cd	9.1 ab	66 ab
Ottawa 4	3	33	4.8 a	4.7 ab	257.9 b	2.8 de	32 de
Ottawa 5	6	33	4.8 a	4.6 b	268.7 b	3.8 cde	46 bcde
Ottawa 8	5	0	3.8 b	4.1 b	150.9 c	6.2 bc	60 abc
Ottawa 11	6	0	5.1 a	5.6 a	412.0 a	2.2 e	31 e
Bud 9	2	50	2.9 bc	3.0 bcd	52.5 cd	5.8 bcd	35 cde
Bud 490	6	0	4.8 a	4.7 b	273.2 b	3.0 de	35 cde
Bud 491	3	0	2.4 c	2.2 d	28.0 d	10.2 a	44 bcde
KS 23	6	100					
M.8	3	0	3.0 bc	3.6 bc	69.9 cd	6.8 bc	42 cde
M.9	2	50	2.6 bc	3.6 bcd	100.8 cd	7.4 abc	80 a
M.26	5	0	3.0 bc	3.5 bcd	90.3 cd	7.1 bc	61 abc
M.27	3	0	2.9 bc	3.4 bcd	98.3 cd	6.3 bc	54 abcd
M.27/Sdl.	4	50	2.2 c	2.5 cd	30.5 d	6.3 bc	34 de

^oCumulative Yield ÷ (Height × Spread).

trees. Trees on Ottawa 11 were the largest and also had the lowest efficiency rating by both methods of estimation. In a regional interstem trial, trees on Ottawa 11 were less efficient than trees on Antonovka and more efficient and larger than trees on MM.111 (2, 6). Although tree loss in the regional interstem trial was unacceptable on Ottawa 11 no loss of this rootstock occurred in the present trial. However, the trees were unacceptably large and their lack of efficiency would preclude Ottawa 11 as a promising rootstock for modern future orchards which agrees with results of Canadian trials (3).

Of all the Ottawa rootstock selections tested Ottawa 3 demonstrated the most dwarfing potential and excellent yield efficiency, however, some tree loss occurred in this planting and was also reported in the 27-site regional planting (4). The many desirable characteristics of Ottawa 3 in this and other trials (1, 3, 7) suggest continued testing for this stock. Of the Ottawa clones

producing semi-standard trees, Ottawa 8 appeared promising and this agrees with reports from other studies (1, 3).

Trees on Bud 490 have been reported to be similar in size to trees on MM.106 (1, 5) and tree growth in this trial would support those findings. Trees on Bud 490 began bearing early and produced consistently with good productive efficiency and no tree loss. Trees on Bud 491, although very efficient, may be too small for most present commercial plantings in the United States.

The number of trees of each combination were generally smaller than desirable and thus, predictions for broad adaptability of these rootstocks should not be made. However, the results over 10 years are useful as they support other findings for the promise of Ottawa 3, Ottawa 8 and Bud 490. It is also clear that excessive loss of KS 23 and large size and relative inefficiency of Ottawa 4, 5 and 11, generally preclude future consideration of these rootstocks.

Table 2. Influence of 14 apple rootstocks on yield per tree of 'McIntosh'.

Rootstock	Yield (lbs/tree)										Cumul.
	1979	1980	1981	1982	1983	1984	1985	1986			
Ottawa 3	20.8	61.6 a	88.7 ab	53.9 bcd	24.9 cd	43.2 cd	46.2 bcd	38.1 cd			377.6 cd
Ottawa 4	50.3	15.6 de	13.2 d	58.1 bcd	66.0 abcd	105.6 abcd	115.8 abc	71.8 bcd			496.5 bcd
Ottawa 5	36.8	3.2 e	39.6 cd	108.5 abc	101.9 abc	186.2 abc	156.2 a	153.2 abc			785.6 ab
Ottawa 8	28.6	20.9 cde	76.5 abc	93.0 abcd	153.1 a	190.0 abc	163.6 a	220.0 a			946.0 a
Ottawa 11	64.0	6.7 de	25.6 d	159.7 a	93.8 abc	226.6 a	159.8 a	176.0 ab			912.6 ab
Bud 9	2.7	17.2 cde	72.6 abcd	97.5 abcd	145.2 ab	30.8 d	24.2 bcd	26.4 cd			416.6 bcd
Bud 490	45.9	11.9 de	37.4 d	121.0 ab	93.1 abc	192.8 ab	166.4 a	154.0 abc			822.8 ab
Bud 491	14.0	27.6 bcde	26.4 d	26.9 cd	14.6 cd	35.2 a	63.0 abcd	27.8 cd			235.8 cd
KS 23	50.1	13.8 de	22.0 d	80.2 bcd	77.7 abcd	68.9 cd	---	---			312.9 cd
M.8	15.5	33.5 abcde	45.4 bcde	65.8 bcd	58.6 bcd	63.0 cd	123.2 abc	46.9 bcd			452.2 bcd
M.9	32.0	56.4 abc	72.6 abcd	99.6 abcd	92.0 abcd	37.4 cd	92.4 abcd	46.2 bcd			529.0 abcd
M.26	16.3	56.6 ab	99.4 a	98.7 abcd	97.6 abcd	73.0 cd	142.5 ab	62.4 bcd			646.9 abc
M.27	45.0	35.9 abcd	64.5 abcd	52.6 bcd	73.3 abcd	85.0 bcd	126.1 abc	97.0 bcd			597.6 abcd
M.27/Sdl.	31.4	29.6 bcde	27.5 d	8.3 d	4.4 d	13.2 c	13.2 cd	16.5 d			144.1 d
	NS										

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