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Western Iowa 1992 Apple Cultivar x Rootstock Trial

Paul A. Domoto
Iowa State University, domoto@iastate.edu

Barbara C. Smith
Iowa State University

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Abstract
To better serve the commercial apple industry in western Iowa, a cultivar by rootstock study was established at the Western Iowa Research Farm in 1992. The trail is evaluating the performance of three apple cultivars (Smoothee Golden Delicious, Empire, and Nured Jonathan) on seven commercially available rootstocks (seedling, MM.111, MM.106, M.7 EMLA, M.26 EMLA, M.9 EMLA, and Mark) trained to a central leader system. Due to the differences in size-control potential of the rootstocks, trees on seedling, MM.111 and MM.106 were planted at an in-row spacing of 16 ft and were not staked. Trees on M.7 EMLA, M.26 EMLA, M.9 EMLA, and Mark were spaced 12 ft apart in the rows and were supported with a wooden stake. Large and small trees were maintained in separate rows. Between-row spacing was established to allow for 8 ft of clearance between rows (24 ft between rows of large trees, 22 ft between large and small trees, and 20 ft between rows of small trees). Each cultivar/rootstock combination was replicated 10 times in a split-plot arrangement of randomized complete block design with cultivar whole-plots and rootstock sub-plots. Cultivar and rootstock performance has been reported in the 1994 through 1999 Annual Fruit and Vegetable Progress Reports. This report summarizes the tree growth and yield characteristics for the 2000 growing season by cultivar and rootstock main effects.

Keywords
Horticulture

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Paul Domoto, professor, horticulture
Barb Smith, agriculture specialist

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After nine growing seasons, differences in tree size remain evident (Table 1). By cultivar, based on trunk diameter, Golden Delicious trees were largest whereas Jonathan trees were the smallest. However, based on tree height and tree volume, there was no difference between Empire and Jonathan. No difference in tree spread existed between cultivars. By rootstock, based on trunk diameter, trees on seedling rootstock were the largest followed by MM.106 and MM.111, which were not different from each other. Trees on Mark were the smallest followed in order by trees on M.9 EMLA, M.26 EMLA, and M.7 EMLA. A similar relationship existed for tree height. However, based on tree spread, trees on MM.106 were wider than trees on MM.111 and were not different from trees on seedling rootstock. This was reflected in tree volume. No difference in suckering existed between cultivars. By rootstock, trees on M.7 EMLA and seedling followed by M.9 EMLA continue to produce the most suckers.

Due to heavy cropping in 1999, fruit yield in 2000 was low (Table 2). No difference existed between cultivars for fruit yield or yield efficiency. By rootstock, an inverse relationship existed between yield efficiency in 1999 and, 2000 yield per tree and yield efficiency with the most dwarfing rootstocks being the least productive. No difference in fruit size existed between cultivars or rootstocks in 2000. This was probably the result of light cropping because differences in fruit size have been observed in previous years. On a cumulative basis, the trend for the most dwarfing rootstock to be the most yield efficient continues to exist. However, trees on MM.106 were more efficient than trees on M.7 EMLA.

Table 1. Growth characteristics of three cultivars on seven rootstocks in the 1992 Western Iowa apple rootstock trial for 2000.

Treatment:	Trunk Dia. (in.)	Tree Height (ft)	Tree Spread (ft)	Tree Volume (cu ft)	Number of Suckers
Cultivar:					
Golden Delicious	4.9	13.6	13.3	917	3.4
Empire	4.5	11.7	13.2	785	2.9
Jonathan	4.1	11.6	13.5	790	2.7
LSD .05	.1	.5	ns	93	ns
Rootstock:					
Seedling	5.9	15.3	15.2	1,266	5.3
MM.106	5.3	14.6	15.5	1,243	1.1
MM.111	5.1	14.2	14.8	1,098	1.8
M.7 EMLA	4.7	12.8	13.8	856	6.9
M.26 EMLA	4.0	10.6	12.5	563	.7
M.9 EMLA	3.4	9.9	11.3	446	4.1
Mark	3.2	8.7	10.1	302	2.2
LSD .05	.2	.6	.5	86	2.9

Table 2. Fruit yield characteristics of three cultivars on seven rootstocks in the 1992 Western Iowa apple rootstock trial for 2000.

	1999	2000			Cumulative	
Treatment:	Yield Eff.[z]	Yield lb/tree	Yield Eff.[z]	Fruit wt. (oz)	Yield lb/tree	Yield Eff.[z]
Cultivar:						
Golden Delicious	.93	34.6	.11	5.3	275.5	1.09
Empire	.70	35.5	.13	5.1	186.7	.93
Jonathan	.82	24.9	.11	5.4	159.1	.88
LSD .05	.09	ns	ns	ns	20.7	.08
Rootstock:						
Seedling	.29	63.2	.17	5.1	164.5	.43
MM.106	.80	63.1	.19	5.3	316.9	1.00
MM.111	.58	34.1	.11	5.2	197.6	.66
M.7 EMLA	.76	32.3	.12	5.6	228.0	.88
M.26 EMLA	1.04	17.8	.10	4.9	194.7	1.10
M.9 EMLA	1.29	4.3	.03	5.2	179.6	1.32
Mark	.96	6.4	.06	5.2	166.1	1.39
LSD .05	.11	16.9	.06	ns	25.3	.09

[z]Yield efficiency reported in kilograms of fruit per cm^2 of the trunk cross-sectional area. Higher values indicate more productive trees.