

'FLORDAPRINCE' PEACH

age of 'Flordaprince' open-pollinated seedlings resemble the parent strikingly and 'Flordaprince' strongly transmits dark red fruit stripes to many of its hybrid progeny.

'Flordaprince' has high flavor for an early-ripening peach (about 85 days from bloom to ripe). The fruit are yellow-fleshed, firm, and round with a medium small stone. The tree tends to be upright but is easily spread by pruning. Flower buds are profuse and flowers are showy. Early thinning is required to obtain marketable size of 2 inch plus fruit diameter.

Research with 'Flordaprince' in the subtropics has contributed much to

current knowledge of peach growing in mild climates where growing seasons are long and little winter chilling occurs. These contributions include research areas such as dormancy, forced flowering and production (including out of season and biannual cropping), fruit set under high temperatures, and obvious nutritional, pests, and cultural uniqueness.

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Early Performance of Four Apple Cultivars on Mark and Other Rootstocks in Maine¹

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Abstract

In 1985, a study was established to compare the growth and fruiting of 'Cortland', 'Empire', 'Delicious' and 'McIntosh' apple (*Malus domestica* Borkh.) on Mark and MM.111 rootstocks. 'Delicious' and 'McIntosh' on M7A and M.26 were also included. Tree survival for the first six years was 90% or greater for all combinations except 'Empire'/MM.111, 30% of which died as a result of winter injury. Burrknobs occurred on all cultivar/rootstock combinations, with the fewest on 'McIntosh'/MM.111. Early flowering was greatest with 'Empire' and 'McIntosh' on Mark. M.26 also induced early flowering, while M.7A induced early flowering with 'Delicious' but not with 'McIntosh'. Cumulative yield was highest with 'McIntosh' on Mark and M.26 and with 'Cortland'/Mark. The lowest cumulative yields were recorded for 'Empire'/MM.111 and for 'Delicious' regardless of rootstock. Tree leaning was severe for trees on Mark or M.26, and growth proliferations at the soil line were observed on all cultivar Mark combinations.

Introduction

In 1979, Michigan State University released Mark (formerly MAC-9) root-

stock to nurseries as a potential new apple rootstock (1, 10). Mark is becoming widely propagated and planted throughout the apple industry. Most of the research on Mark has been with the 'Delicious' cultivar (1, 4, 5, 8, 9) and little is known about the performance of Mark with other cultivars. The objective of this study was to evaluate the performance of Mark in comparison with other rootstocks using cultivars of importance to northern New England.

Materials and Methods

In May 1985, trees each of the following cultivar/rootstock combinations were planted in a randomized complete block design with ten replications: 'Cortland' and 'Empire' on Mark and MM.111; 'Red Chief Delicious' (Campbell strain) on Mark, MM.111,

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M.7A and M.26; 'Nured McIntosh' (Summerland strain) on Mark, MM.111 and M.26; and 'Rogers McIntosh' on MM.111 and M.7A. The trees were planted at a 4.5 x 5.5 meter spacing in a Dixfield fine sandy loam coarse-loamy, mixed frigid, Typic Haplorthods), with 10 cm of the rootstock shank exposed and grown in a 2m wide herbicide strip. The trees were trained to a free standing central leader, using limb spreaders to obtain desirable limb angles. Yield and trunk circumference were recorded annually, and trunk cross-sectional area (TCSA) and yield efficiency were calculated. Flower clusters per tree were counted and removed in 1987. Beginning in 1988, the number of flower clusters and fruit set per tree were recorded

annually. Following harvest in 1990, the presence or absence of growth proliferations at the soil line was noted, burrknots and tree leaning were rated, and the number of root suckers were counted.

Results and Discussion

Since 'Rogers' and 'NuRed McIntosh'/MM.111 trees did not differ for any growth or fruiting measurement (data not shown), data for 'McIntosh' is presented with reference to strain. Tree loss was minimal, except for the combination of 'Empire'/MM.111, 30% of which died as a result of winter injury (Table 1). Occurrence of burrknots showed no clear trend among the rootstocks in this study (Table 1). All four rootstocks showed some burr-

Table 1. Tree characteristics of 'Delicious', 'McIntosh', 'Cortland' and 'Empire' apples on different rootstocks at six years of age.

Rootstock	% loss	Burknot rating ^z	Tree leaning rating ^y	Root suckers (No/tree)	1990 Trunk X-section area (cm ²)	Trunk X-section area increase 1985-1990 (cm ²)
'Redchief Delicious'						
Mark	0	2.6 abc ^x	1.9 a	1.3 abc	12.7 e	8.3 f
MM.111	10	1.5 cd	1.0 d	0.0 c	24.6 bc	20.3 bcd
M.7A	0	2.5 abc	1.3 cd	2.3 a	16.2 de	12.7 ef
M.26	0	2.1 abcd	1.2 cd	0.4 bc	15.0 de	11.6 ef
'McIntosh'						
Mark	0	2.9 ab	1.5 bc	2.0 ab	17.2 de	12.9 ef
MM.111	10	1.1 d	1.1 d	0.2 c	33.7 a	30.4 a
M.7A	0	2.4 abc	1.5 bc	1.9 ab	25.1 bc	21.0 bc
M.26	0	2.3 abcd	1.7 ab	1.3 abc	15.9 de	13.5 def
'Cortland'						
Mark	10	1.9 bcd	1.7 ab	0.4 bc	20.2 cd	16.3 cde
MM.111	10	2.4 abc	1.0 d	0.0 c	29.9 ab	26.2 ab
'Empire'						
Mark	10	2.2 abcd	1.8 ab	1.3 abc	13.3 de	8.5 f
MM.111	30	3.2 a	1.3 cd	1.4 abc	27.1 abc	23.1 bc

^z1 = none to 5 = 100% girdled by burrknots.

^y1 = no leaning, 2 = 20-40 degree lean, 3 = over 40 degree lean.

^xMean separation within columns by LSD, 5% level.

knot development after six seasons, supporting previous recommendations (7) that apple trees be planted with a minimum of the rootstock shank exposed.

MM.111 was the only rootstock in this trial that exhibited little or no tree leaning (Table 1). Mark was introduced as a free standing rootstock (1, 2, 3, 4), but this and other studies (6, 10) suggest that tree support is necessary to prevent tree leaning on Mark. Root suckers occurred on all cultivar/rootstock combinations except 'Delicious' and 'Cortland' on MM.111, but were not a serious problem in this planting. All trees on Mark had a gall-like growth proliferation (10, 11) at or just below the soil line, a condition that did not occur with the other rootstocks.

'Delicious' trees on Mark had similar TCSA to those on M.7A and M.26, while 'McIntosh' trees on Mark were smaller than those on M.7A and similar in size to those on M.26 (Table 2).

'Cortland'/Mark trees were significantly larger than 'Delicious'/Mark at the end of the 1990 growing season and, over the first 6 years, 'Cortland'/Mark trunk growth was twice that of 'Delicious' or 'Empire'/Mark. Differences in tree size were more pronounced with 'McIntosh' as a scion than with 'Delicious.' Likely this was due to the adaptation of 'McIntosh' to our region and the less vigorous spur-type 'Delicious' strain used. This suggests that rootstock trials should utilize vigorous scion cultivars adapted to the climate in the region where the information is to be utilized.

'Empire'/Mark were the only trees to flower (14 clusters/tree) in 1987. 'Empire' and 'McIntosh' on Mark produced the most bloom in 1988 and 1990, followed by 'Delicious'/Mark (Table 2). 'Cortland'/Mark trees produced few flowers in 1988, 1989 and 1990, but had the highest fruit set in these years. 'McIntosh'/M.7A produced

Table 2. Early flowering and fruit set of 'Delicious', 'McIntosh', 'Cortland' and 'Empire' apples trees on different rootstocks.

Rootstock	1988		1989		1990	
	Flower clusters /tree	% Fruit set	Flower clusters /tree	% Fruit set	Flower clusters /tree	% Fruit set
'Redchief Delicious'						
Mark	113 b ^z	47 b	22 c	64 b	175 bcd	29 def
MM.111	25 cd	27 cd	18 d	79 b	185 bc	12 g
M.7A	61 c	36 bc	9 d	42 b	207 b	25 efg
M.26	58 c	47 b	12 d	59 b	140 bcde	15 fg
'McIntosh'						
Mark	184 a	36 bc	49 bc	67 b	294 a	45 bcd
MM.111	3 d	10 e	54 b	33 b	159 bcde	60 ab
M.7A	6 d	12 de	91 a	30 b	191 b	54 bc
M.26	53 c	49 b	46 bc	37 b	172 bcd	53 bc
'Cortland'						
Mark	60 c	73 a	16 d	217 a	119 cde	72 a
MM.111	24 cd	48 b	28 bcd	62 b	101 e	39 cde
'Empire'						
Mark	217 a	36 bc	15 d	45 b	299 a	44 bc
MM.111	24 cd	39 bc	19 d	16 b	112 de	26 efg

^zMean separation within columns by LSD, 5% level.

Table 3. Yield and efficiency of 'Delicious', 'McIntosh', 'Cortland' and 'Empire' apples trees on different rootstocks at six years of age.

Rootstock	Yield (kg/tree)			Cumulative 1988-1990	1990 Yield effic. (kg./cm ² TCSA)
	1988	1989	1990		
'Redchief Delicious'					
Mark	3.0 abc ²	1.3 def	5.3 b	9.6 ef	0.43 de
MM.111	1.9 bcd	0.3 f	3.1 b	5.3 f	0.12 g
M.7A	4.0 ab	0.7 ef	5.3 b	10.0 ef	0.36 e
M.26	3.8 abc	0.9 def	6.0 b	10.7 def	0.39 ef
'McIntosh'					
Mark	5.1 a	5.6 a	14.2 a	24.9 a	0.82 ab
MM.111	0.2 d	1.4 def	11.2 a	12.9 cde	0.33 ef
M.7A	2.2 bcd	2.5 cde	12.9 a	17.6 bc	0.56 cd
M.26	3.0 abc	3.4 bc	12.8 a	19.1 ab	0.82 ab
'Cortland'					
Mark	3.7 abc	4.8 ab	13.1 a	21.6 ab	0.64 bc
MM.111	1.6 cd	2.7 cd	13.4 a	17.7 bc	0.43 de
'Empire'					
Mark	4.8 a	0.1 f	11.7 a	16.6 bcd	0.87 a
MM.111	2.2 bcd	0.4 f	4.1 b	6.8 f	0.17 fg

²Mean separation within columns by LSD, 5% level.

few flowers in 1988, in contrast with 'Delicious'/M.7A, but produced the heaviest bloom in 1989, a season when flower numbers were generally low.

Yield/tree was not different among rootstocks for 'Delicious' in the three years (Table 3). 'McIntosh'/Mark had higher yield than those on MM.111 or M.7A in 1988 and out-yielded all cultivar/rootstock combinations except 'Cortland'/Mark in 1989. Yield was not affected by rootstock in 1990, except with 'Empire' which had greater yield on Mark than on MM.111. 'McIntosh'/Mark produced greater cumulative yield over the first 3 harvests than all other cultivar/rootstock combinations except 'McIntosh'/M.26 and 'Cortland'/Mark. 'McIntosh' and 'Cortland' out-yielded and were more efficient than 'Delicious' on each respective rootstock.

Tree survival and compatibility of 'Delicious', 'McIntosh', 'Cortland' and 'Empire' on Mark has been good for the first six years of this trial. Mark has proven to be very precocious and

productive in the early years, as previously reported (5, 8). Trees on Mark as well as M.26 will set a crop of fruit before the framework of the tree is strong enough to support it, therefore trees on Mark, although reported to be well anchored (10), must be supported. The growth proliferations on Mark have not been a problem in this study to date; however, until the long term productivity of apple cultivars on Mark is known, it is recommended to be planted on a trial basis in Maine.

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The Influence of Nitrogen Fertilization, Season of Application, and Orchard Floor Management on Fruit Quality and Leaf Mineral Content of 'Golden Delicious' Apple Trees

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Abstract

'Golden Delicious' apple trees were grown under 3 orchard floor management systems (grass sod, vegetation control to July or vegetation control year-round) and 3 rates of nitrogen (30, 60 or 180 kg N ha^{-1}) applied in the spring (1980-83) or the fall (1984-87). Fruit at harvest from grassed plots tended to be firmer, lighter in color, higher in acidity, higher in K and slightly higher in Ca compared to those from non-grassed plots. Leaf N was lower and leaf K was higher from grassed plots than non-grassed plots. High rates of N tended to give greener fruit, higher leaf N and lower leaf K. A lower leaf N content was observed in 1985-87 than in 1981-83 and is assumed to be an effect of time of N application rather than one caused by tree factors.

Introduction

High rates of N fertilization increase leaf N (2, 6, 12, 13) and adversely affect quality of apples (3, 5, 12, 14) but Neilsen et al. (12), however, found a greater influence of orchard floor management on leaf N than rate of N application. Their study showed a lower leaf N content in trees grown on grassed than on non-grassed plots, a result also noted by Haynes (9). Little, however, is known about the effect of time of application of N fertilizer on leaf N and fruit quality. Magness et al. (11) found no difference in leaf N or

fruit color for 'York Imperial' and 'Delicious' fertilized in the late fall or early spring. The study by Neilsen et al. (12) involved annual applications of N fertilizer in early spring. A subsequent 4-year study (1984-87) was conducted with annual applications of fertilizer in the late fall. This paper attempts to address the effects of orchard floor management, rate of N application and time of N application on fruit quality and tree nutritional status.

Materials and Methods

The block of 'Golden Delicious' on MM.111 rootstock was planted in 1971 and spaced at 6.1 x 6.1 m. Soil type was a Rutland gravelly sandy loam (10). Three levels of N and 3 levels of orchard floor management were imposed on the block of trees. Each treatment (5 replicates) was represented by 2-tree plots. N fertilizer as NH_4NO_3 was broadcast uniformly in a 10 m^2 (3.0 x 3.35 m) area centered about each tree. The broadcast area approximated the drip-line of each tree within the tree row. Fertilizer was applied annually in mid-April (1980-83) or early November (1984-87) at

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