An Early Look at a Few of the Geneva Series Apple Rootstocks in Massachusetts

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The Cornell-Geneva Rootstock Breeding Program began in earnest in 1968 by Dr. Jim Cummins. Its goal was to produce rootstocks which resulted in a high degree of precocity, high productivity, size control, and resistance to pests. A particular focus of the program was to breed fireblight resistance into dwarfing rootstocks. Recent years have brought the release of a number of rootstocks from this program, but we have had very little experience with them in Massachusetts. The first significant trial including one of the recent releases was planted in 1998, and the next two were planted in 1999. This article will provide early results from these three trials. Please note that the first part of the rootstock name is "G" for those Cornell-Geneva rootstocks that have been commercially released. The names of those under trial but not yet released begin with "CG."

1998 NC-140 Apple Rootstock Trial

As part of the 1998 NC-140 Apple Rootstock Trial, a planting was established at the University of Massachusetts Cold Spring Orchard Research & Education Center, including Gala on M.9, M.9 EMLA, and G.16. Trees were staked and maintained as vertical axes. Trunk cross-sectional area, root suckering, yield, and fruit size were assessed annually.

After six growing seasons, trees on G.16 were larger than those on M.9 or M.9 EMLA (Table 1). Suckering has been low and comparable among the three rootstocks. Trees on G.16 yielded more cumulatively (1999-2003) than either strain of M.9, but yield efficiencies were similar. Average fruit size from 1999 through 2003 was smaller from trees on G.16 than from either M.9 strain.

Table 1. Trunk cross-sectional area, suckering, yield, yield efficiency, and fruit weight in 2003 of Gala trees on various rootstocks in the Massachusetts planting of the 1998 NC-140 Apple Rootstock Trial.[z]

Rootstock	Trunk cross-sectional area (cm^2)	Root suckers (no./tree, 1998-2003)	Yield per tree (kg)		Yield efficiency (kg/cm^2 TCA)		Fruit weight (g)	
			2003	Cumulative (1999-2003)	2003	Cumulative (1999-2003)	2003	Average (1999-2003)
G.16	17.8 a	0.4 a	15.7 a	40 a	0.97 a	2.26 a	131 a	104 b
M.9	11.7 b	0.3 a	6.5 a	24 b	0.56 a	2.05 a	162 a	132 a
M.9 EMLA	10.6 b	0.3 a	5.3 a	20 b	0.48 a	1.89 a	143 a	125 a

[z] Means within columns not followed by the same letter are significant at odds of 19:1.

Table 2. Trunk cross-sectional area, suckering, yield, yield efficiency, and fruit weight in 2003 of McIntosh trees on several rootstocks in the Massachusetts planting of the 1999 NC-140 Dwarf Apple Rootstock Trial.

Rootstock	Trunk cross-sectional area (cm^2)	Root suckers (no./tree, 1999-2003)	Yield per tree (kg)		Yield efficiency (kg/cm^2 TCA)		Fruit weight (g)	
			2003	Cumulative (2001-03)	2003	Cumulative (2001-03)	2003	Average (2001-03)
CG.3041	16.4 cd	1.2 a	23.4 bcd	35 bcd	1.42 ab	2.14 ab	162 a	155 ab
CG.4013	29.9 a	1.2 a	42.0 a	66 a	1.41 ab	2.19 a	164 a	160 ab
CG.5179	21.9 bc	0.7 a	30.5 ab	49 ab	1.40 ab	2.25 a	165 a	158 ab
CG.5202	25.2 ab	0.0 a	31.3 ab	49 ab	1.29 ab	2.01 ab	161 a	160 ab
G.16N	13.3 d	0.0 a	16.0 bcd	26 bcd	1.12 ab	1.82 ab	154 a	147 ab
G.16T	14.6 cd	0.2 a	17.6 bcd	28 bcd	1.22 ab	1.95 ab	145 a	144 ab
M.26 EMLA	16.5 cd	0.0 a	15.0 cd	20 cd	0.88 b	1.19 b	162 a	158 ab
M.9 NAKBT337	9.2 d	0.0 a	11.4 d	17 d	1.25 ab	1.89 ab	173 a	169 a
Supporter 1	11.8 d	0.0 a	19.5 bcd	30 bcd	1.63 a	2.42 a	145 a	139 ab
Supporter 2	15.3 cd	0.6 a	25.2 bcd	37 bcd	1.66 a	2.50 a	141 a	134 b
Supporter 3	16.3 cd	0.0 a	25.3 bc	41 bc	1.56 a	2.53 a	145 a	146 ab

[z] Means within columns not followed by the same letter are significant at odds of 19:1.

Table 3. Trunk cross-sectional area, suckering, yield, yield efficiency, and fruit weight in 2003 of McIntosh trees on several rootstocks in the Massachusetts planting of the 1999 NC-140 Semidwarf Apple Rootstock Trial.

Rootstock	Trunk cross-sectional area (cm^2)	Root suckers (no./tree, 1999-2003)	Yield per tree (kg)		Yield efficiency (kg/cm^2 TCA)		Fruit weight (g)	
			2003	Cumulative (2001-03)	2003	Cumulative (2001-03)	2003	Average (2001-03)
CG.4814	13.1 c	11.2 ab	24.3 ab	37 ab	1.87 a	2.82 a	175 a	154 a
CG.7707	16.8 c	3.5 bc	20.3 b	29 bc	1.20 ab	1.73 b	175 a	168 a
G.30N	31.5 a	0.5 bc	37.9 a	53 a	1.25 ab	1.71 b	175 a	169 a
M.26 EMLA	15.3 c	0.0 c	13.7 b	19 c	0.88 b	1.23 b	177 a	168 a
M.7 EMLA	30.6 ab	15.2 a	23.2 b	30 bc	0.75 b	0.96 b	153 a	163 a
Supporter 4	29.7 b	1.2 bc	22.6 b	32 bc	0.79 b	1.12 b	164 a	169 a

[z] Means within columns not followed by the same letter are significant at odds of 19:1.

1999 NC-140 Dwarf Apple Rootstock Trial

As part of the 1999 NC-140 Dwarf Apple Rootstock Trial, a planting was established at the University of Massachusetts Cold Spring Orchard Research & Education Center, including McIntosh on CG.3041, CG.4013, CG.5179, CG.5202, G.16 (both tissue cultured and stool bedded), M.26 EMLA, M.9 NAKBT337, Supporter 1, Supporter 2, and Supporter 3. Trees were individually staied and maintained as vertical axes. Trunk cross-sectional area, root suckering, yield, and fruit size were assessed annually.

After five growing seasons, trees on CG.4013 were the largest, followed by those on CG.5202 and CG.5179 (Table 2). The rest had statistically similar trunk cross-sectional areas. Cumulative yield (2001-03) was greatest for trees on CG.4013. Across all rootstocks, however, yield was roughly related to tree size. Cumulative yield efficiency (adjusting yield for tree size) was similar for all but trees on M.26 EMLA. Those trees were significantly less efficient than trees on CG.4013, CG.5179, or any of the Supporter rootstocks. Fruit size was not dramatically affected by rootstock. The only statistically significant difference was that fruit from trees on M.9 NAKBT337 were larger than those from trees on Supporter 2.

1999 NC-140 Semidwarf Apple Rootstock Trial

As part of the 1999 NC-140 Semidwarf Apple Rootstock Trial, a planting was established at the University of Massachusetts Cold Spring Orchard Research & Education Center, including McIntosh on CG.4814, CG.7707, G.30, M.26 EMLA, M.7 EMLA, and Supporter 4. Trees were maintained as free-standing central leaders. Trunk cross-sectional area, root suckering, yield, and fruit size were assessed annually.

After five growing seasons, trees on G.30 were significantly larger than all other except those on M.7 EMLA (Table 3). The smallest tree was on CG.4814, which was obviously misplaced in the semidwarf group. Its trunk cross-sectional area, yield, and yield efficiency were similar to the dwarf trees in the trial reported above. G.30 resulted in many fewer root suckers than did M.7 EMLA, and had significantly greater yield per tree (2001-03). Although the difference was not statistically significant, trees on G.30 were 75% more efficient than those on M.7 EMLA. Fruit size was apparently unaffected by rootstock.

Conclusions

It is much too early to make conclusions based on the data reported here. The variability that exists now will dissipate over the next few years and expose more statistically significant differences. That said, G.16 appears to be producing a tree somewhat larger than does M.9 but one that is comparably yield efficient. Fruit size from trees on G.16, however, bears watching. Trees on G.30 have performed very well for semidwarf trees, similar in size to those on M.7 EMLA, but without many root suckers and with apparently greater yield. The other Cornell-Geneva rootstocks in these trials (CG.3041, CG.4013, CG.4814, CG.5179, CG.5202, and CG.7707) all appear to be performing well but vary considerably in size, from full dwarf to semidwarf.

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