



5-Year Performance of Three Dwarf Apple Rootstocks with Cameo Apple

Jon M. Clements¹, Win Cowgill², Wesley R. Autio¹, and Daniel Ward³

¹University of Massachusetts Amherst, Dept. of Plant, Soil and Insect Sciences, Amherst, MA

²Professor and Area Fruit Agent, New Jersey Agricultural Experiment Station-Cooperative Extension

³Extension Specialist in Pomology, New Jersey Agricultural Experiment Station



ABSTRACT

Replicated apple rootstock research trials were planted in 2002 at the University of Massachusetts Cold Spring Orchard Research and Education Center in Belchertown, MA and at the Rutgers Snyder Research and Extension Farm in Pittstown, NJ. The objective of the experiment is to compare the growth and performance of three commonly planted commercial apple rootstocks (M.9-337, B.9, and G.16) with a single variety (Cameo® 'Caudle' cv.) as the scion over ten years in the orchard. After five years, in 2006, G.16 produced the largest trees and fruit, M.9 had the most root suckers, and B.9 was the most yield-efficient rootstock.

BACKGROUND

This trial was planted as part of the NC-140 Regional Rootstock Research Project, <http://www.nc140.org>.

NC-140 researchers plant replicated trials throughout North America with the main objective to evaluate the field performance of pome- and stone-fruit rootstocks in various environments and under different management systems.

MATERIALS AND METHODS

Cameo™ (Caudle cv.) apple trees on three dwarfing rootstocks – Geneva (G.) 16, M.9-NAKBT337 (M.9-337), and B.9 – were planted in a randomized complete block design with ten replications spaced at 1.2 m between trees by 3.6 m. (Massachusetts) and 2.4 m. (New Jersey) between rows. All trees are trickle irrigated and have been trained to the vertical axis system. Annual measurements of trunk circumference, tree height and spread (2006 only), suckering, fruit yield (beginning in 2003), and fruit size (NJ only 2004-05) have been made. Fruit yield and size are from whole-tree harvests. Data were analyzed using the GLM procedure of the SAS® System (SAS Institute, Cary, N.C., USA).



Table 1. Overall tree size, suckers, yield, and fruit size in 2006 of Cameo apple trees on three rootstocks in the 2002 MA/NJ NC-140 Cameo Dwarf Rootstock trial. All values are means or least-squares means adjusted for missing subclasses.^z

Rootstock	Trunk cross-sectional area (cm ²)	Tree height (m)	Tree spread (m)	No. root suckers	Yield per tree (kg)	Cum. yield (2003 - 06) per tree (kg)	Yield efficiency (kg/cm ² TCA)	Cum. yield efficiency (2003 -06) (kg/cm ² TCA)	Fruit weight (g)
G.16	26 a	3.1 a	2.5 a	0 b	13.1	41.2 a	0.6 b	2.1 b	215 b
M.9-337	20.8 b	3.1 a	2.3 b	0.7 a	11.1	32.2 b	0.5 b	1.9 b	242 a
B.9	14.9 c	2.6 b	2.1 c	0.2 b	13.9	35.5 b	0.9 a	2.8 a	229 ab

^z Mean separation within column by Duncan's NMRT ($P=0.05$)

Table 2. Tree size and suckers by state in 2006 of 'Cameo' apple trees on three rootstocks in the 2002 MA/NJ NC-140 Cameo Dwarf Rootstock trial. All values are means or least-squares means adjusted for missing subclasses.^z

Rootstock	Trunk cross-sectional area (cm ²)		Tree height (m)		Tree spread (m)		No. root suckers	
	Mass.	New Jersey	Mass.	New Jersey	Mass.	New Jersey	Mass.	New Jersey
G. 16	17.6 a	34.4 a	2.8 a	3.5 a	2.2 a	2.7 a	0 b	0
M.9-337	11.7 b	29.9 a	2.8 a	3.5 a	1.9 b	2.7 a	1.2 a	0.2
B.9	9.8 b	20 b	2.3 b	3 b	1.7 b	2.4 b	0 b	0.3

^z Mean separation within column by Duncan's NMRT ($P=0.05$)

Table 3. Yield and fruit size by state in 2006 of 'Cameo' apple trees on three rootstocks in the 2002 MA/NJ NC-140 Cameo Dwarf Rootstock trial. All values are means or least-squares means adjusted for missing subclasses.^z

Rootstock	Yield per tree (kg)		Cum. yield (2003 -06) per tree (kg)		Yield efficiency (kg/cm ² TCA)		Cum. yield efficiency (2003 -06) (kg/cm ² TCA)		Fruit weight (g)	
	Mass.	New Jersey	Mass.	New Jersey	Mass.	New Jersey	Mass.	New Jersey	Mass.	New Jersey
G. 16	12.7 a	13.5 b	32.4 a	49.9	0.7 a	0.4 b	2.6 a	1.5 b	200 b	230 b
M.9-337	5 b	17.3 ab	16.4 c	48.1	0.4 b	0.7 b	2.0 b	1.7 b	227 a	254 a
B.9	6.1 b	21.7 a	22.1 b	50.3	0.6 a	1.1 a	3.0 a	2.6 a	198 b	260 a

^z Mean separation within column by Duncan's NMRT ($P=0.05$)



CONCLUSIONS

- Over both states, G.16 produced the largest tree, followed by M.9 and B.9. (Table 1.) In Massachusetts, G.16 was larger than both M.9 and B.9 except in tree height. (Table 2.) In New Jersey, G.16 and M.9 are both larger than B.9.
- In Massachusetts and over both states, M.9 has the most root suckers. (Tables 1. and 2.) There was no difference in suckering between the rootstocks in New Jersey only. (Table 2.)
- In 2006 there was no overall difference in fruit yield per tree between the rootstocks, however, B.9 has the highest yield efficiency. (Table 1.) Cumulative yield is greatest for G.16 but B.9 again has the highest cumulative yield efficiency.
- In Massachusetts in 2006, G.16 yielded the most fruit compared to B.9 and M.9, while in New Jersey, B.9 out-produced G.16. M.9 was in the middle and did not differ from either of the other two. (Figure 1.) Cumulative yield (2003-06) of the three rootstocks was not different in New Jersey, whereas in Massachusetts G.16 out-yielded both B.9 and M.9 during the first four years of bearing.
- Yield efficiency in 2006 in Massachusetts was higher for G.16 and B.9 compared to M.9, while in New Jersey, B.9 was the most yield-efficient rootstock this year. Similarly, cumulative yield efficiency gives the edge to B.9 in both states although in New Jersey it did not differ from G.16.
- Across both states, fruit harvested in 2006 from M.9 were larger than those from G.16 while B.9 fruit were somewhere between. (Table 1.) Within states, fruit picked from M.9 trees in Massachusetts were significantly larger than both G.16 and B.9, while in New Jersey fruit picked from both M.9 and B.9 were larger than G.16. (Table 3.)

Acknowledgments: USDA, Massachusetts and New Jersey Agricultural Experiment Stations, UMass Extension, Hunterdon County Board of Chosen Freeholders, Rutgers Snyder Research and Extension Farm