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2002 NC-140 Apple

As part of the 2002 NC-140 Apple Rootstock Trial, a planting of Gala on 11 rootstocks was established at the University of Massachusetts Cold Spring Orchard Research & Education Center. Trees are growing well in this irrigated block, but fruit set was lighter than expected prior to 2007 (average yields in 2006 of only 3 kg per tree with 157-g average fruit size). In 2007, fruit set was good and the trees performed well (average yields in 2007 of 38 kg per tree with 186-g average fruit size). In 2008, fruit set was again less than expected (average yields in 2007 of 12 kg per tree with 175-g average fruit size). In 2009, trees performed well, with average yields of 57 kg per tree with 162-g average fruit size. In 2010, trees performed reasonably well, but with somewhat lower yields than in 2009. Average yield in 2010 was 28.4 kg/tree of 193g fruit. The planting includes seven replications in a

randomized-complete-block design. Means from 2010 (9th growing season) are included in Table 1.

After the 2010 growing season, trees with the largest TCA were on PiAu51-4, followed in decreasing size by those on P.14, PiAu51-11, M.26 NAKB, Supporter 4, M.26 EMLA, M.9 Burgmer 756, M.9 NAKBT337, M.9 Nic 29, B.9 (North America), and B.9 (Europe). Cumulative (2002-10) root suckering was significantly greater from M.9 Nic 29 than from all other rootstocks, more than twice the number from PiAu 51-4 and B.9 (Europe). Very low numbers of root suckers have originated from M.26 (both strains), Supporter 4, and P.14.

Greatest yields in 2010 and cumulatively (2004-10) were from trees on M.26 NAKB. The lowest yields in 2010 and cumulatively were from trees on the two strains of B.9.

Yield efficiency in 2010 and cumulatively (2004-10)

Table 1. Trunk cross-sectional area, suckering, yield, yield efficiency, and fruit weight in 2010 of Gala trees on several rootstocks in the Massachusetts planting of the 2002 NC-140 Apple Rootstock Trial. All values are least-squares means, adjusted for missing subclasses and also for crop load in the case of 2010 fruit weight.^z

Rootstock	Trunk cross-sectional area (cm ²)	Root suckers (no./tree, 2002-10)	Yield per tree (kg)		Yield efficiency (kg/cm ² TCA)		Fruit weight (g)	
			2010	Cumulative (2004-10)	2010	Cumulative (2004-10)	2010	Average (2004-10)
B.9 (Europe)	25.3 f	15.9 b	17 c	82 d	0.7 ab	3.3 ab	181 a	158 b
B.9 (North America)	30.3 ef	10.1 b	23 bc	104 cd	0.8 a	3.5 a	193 a	167 ab
M.26 EMLA	66.4 cd	2.9 b	29 abc	150 abc	0.4 bcd	2.2 cde	192 a	174 ab
M.26 NAKB	78.5 bcd	4.0 b	40 a	189 a	0.5 abc	2.5 cd	191 a	176 a
M.9 Burgmer 756	63.4 cd	12.1 b	29 abc	167 ab	0.5 abc	2.7 bcd	199 a	174 ab
M.9 Nic 29	53.1 de	40.1 a	25 abc	139 bc	0.5 abc	2.7 bcd	201 a	178 a
M.9 NAKBT337	53.6 de	14.0 b	30 abc	148 abc	0.6 abc	2.8 abc	204 a	182 a
P.14	99.7 b	5.1 b	34 ab	172 ab	0.3 cd	1.7 ef	194 a	177 a
PiAu51-11	91.9 bc	12.8 b	25 abc	131 bcd	0.3 cd	1.6 ef	183 a	173 ab
PiAu51-4	145.5 a	16.8 b	28 abc	180 ab	0.2 d	1.2 f	197 a	171 ab
Supporter 4	76.8 bcd	3.7 b	32 abc	143 abc	0.4 bcd	1.9 def	186 a	174 ab

^z Means were separated within columns by Tukey's HSD ($P = 0.05$).

Table 2. Trunk cross-sectional area, crop load, yield, yield efficiency, and fruit size in 2010 of Gibson Golden Delicious trees on three rootstocks in the Massachusetts planting of the 2003 NC-140 Apple Rootstock Physiology Trial. All values are least-squares means, adjusted for missing subclasses.^z

Rootstock	Trunk cross-sectional area (cm ²)	Root suckers (no., 2003-10)	Return bloom (2010, no. clusters/cm ² TCA)	Yield per tree (kg)		Yield efficiency (kg/cm ² TCA)		Fruit weight (g)	
				2010	Cumulative (2004-10)	2010	Cumulative (2004-10)	2010	Average (2004-10)
G.16	35.2 b	0.3 b	0.3 a	2.0 a	70 a	0.1 a	2.0 ab	171 a	147 a
M.26 EMLA	50.2 a	0.6 b	0.1 a	0.7 a	88 a	0.0 a	1.7 b	136 a	158 a
M.9 NAKBT337	29.1 b	4.4 a	1.2 a	5.0 a	68 a	0.2 a	2.4 a	173 a	164 a

^z Means were separated within columns by Tukey's HSD ($P = 0.05$).

was greatest for trees on the two strains of B.9 and least for trees on P.14, PiAu 51-11, and PiAu 51-4.

Fruit size in 2010 was good for trees on all rootstocks, averaging from 181 to 204g, with no significant differences among trees on the different rootstocks. Average fruit size over the fruiting life of the planting (2004-10) was largest from trees on M.9 NAKBT337, M.9 Nic 29, P.14, and M.26 NAKB and smallest from trees on B.9 (Europe).

2003 NC-140 Apple Physiology

As part of the 2003 NC-140 Apple Rootstock Physiology Trial, a planting of Gibson Golden Delicious on three rootstocks was established at the University of Massachusetts Cold Spring Orchard Research & Education Center. Trees in this trial grew very poorly during their first two seasons. They grew well in 2005, 2006, and 2007, but fruit set was very low in 2006. In 2007, trees were allowed to crop and crop load was adjusted per recommendations for the experiment. In 2008, return bloom was assessed, and crop load of all trees was reduced to no more than about 3 fruit per cm² trunk cross-sectional area (TCA). In 2009, crop load was again adjusted per the experimental protocol, and fruit characteristics were assessed at the end of the season. In 2010, return bloom was very low, even for trees which had a light crop load the previous year. Because of the light crop in 2010, crop load was not adjusted per experimental protocols. Means from 2010 (8th growing season) are included in Table 2.

At the end of the 2010 growing season, TCA of trees on M.26 EMLA was significantly greater than that of trees on G.16 and those on M.9 NAKBT337. Root suckering was greatest from trees on M.9 NAKBT337.

Bloom in 2010 was numerically, but not statistically, greater for trees on M.9 NAKBT337 than those on the other two rootstocks. Yield per tree (2010 or cumulatively) and yield efficiency in 2010 were not affected by rootstock. Trees on M.9 NAKBT337 were significantly more cumulatively (2004-10) yield efficient than those on M.26 EMLA. Fruit size in 2010 and on average (2006-

Table 3. Trunk size and root suckering in 2010 of Redhaven peach trees in the 2009 NC-140 Peach Rootstock Trial.^z

Rootstock	Trunk cross-sectional area (cm ²)	Root suckers (no./tree)
Atlas	30.5 abc	0.0 b
Brights Hybrid 5	29.4 abc	0.0 b
Controller 5	7.7 e	0.0 b
Guardian	36.1 a	0.0 b
HBOK 10	28.2 abc	0.0 b
HBOK 32	29.6 abc	0.0 b
KV010-123	26.5 bc	0.0 b
KV010-127	28.5 abc	0.0 b
Krymsk 1	17.3 d	0.0 b
Krymsk 86	28.4 abc	0.0 b
Lovell	31.8 ab	0.0 b
Mirobac	29.5 abc	0.0 b
<i>Prunus americana</i>	23.1 cd	0.9 a
Penta	32.5 ab	0.0 b
Viking	32.0 ab	0.0 b

^z Means were separated within columns by Tukey's HSD ($P = 0.05$).

10) were not different among rootstocks, but the experimental protocol established a great deal of variance if crop load is not accounted for in the analysis.

2009 NC-140 Peach

As part of the 2009 NC-140 Peach Rootstock Trial, a planting of Redhaven on 15 rootstocks was established at the University of Massachusetts Cold Spring Orchard Research & Education Center. Trees grew well in their first season. The planting includes eight replications in a randomized-complete-block design. Means from 2010 (2nd growing season) are included in Table 3.

At the end of the 2010 season, trees on Guardian, Penta, Viking, Lovell, and Atlas were the largest, and those on *Prunus americana*, Krymsk 1, and Controller 5 were the smallest. A small amount of root suckering has occurred from trees on *P. americana*.

2010 NC-140 Apple

As part of the 2010 NC-140 Apple Rootstock Trial, a planting of Honeycrisp on 31 rootstocks was established at the University of Massachusetts Cold Spring Orchard Research & Education Center. One tree on CG.2034 did not leaf out after planting. Otherwise, all trees are growing reasonably well in this irrigated block managed as tall spindles. The planting includes four replications in a randomized-complete-block design, with up to three trees of a single rootstock per replication.

Means from 2010 (1st growing season) are included in Table 4.

At the end of the 2010 growing season, largest trees were on PiAu 9-90. The next largest were on B.70-20-20, G.202 N, B.7-20-21, CG.3001, CG.5202, and G.935 TC. Smallest trees were on CG.2034, G.935 N, Supporter 3, CG.4013, and B.71-7-22. Differences in incremental trunk growth in 2010 were not significant. A few root suckers were produced in 2010, but differences among rootstocks were nonsignificant.

Table 4. Trunk cross-sectional area (planting and at the end of the 2010 growing season), trunk growth (in 2010), and root suckering of Honeycrisp trees on several rootstocks in the Massachusetts planting of the 2010 NC-140 Apple Rootstock Trial.^z

Rootstock	Trunk cross-sectional area (cm ²)		Trunk cross-sectional area incremental growth in 2010		Root suckers (no./tree)
	At planting	2010	(cm ²)	(%)	
B.9	1.3 f	1.3 e	0.0 a	2 a	0.1 a
B.10	1.7 cdef	1.9 cd	0.2 a	11 a	0.0 a
B.7-3-150	1.2 f	1.3 e	0.1 a	9 a	0.1 a
B.7-20-21	2.0 bcde	2.1 bc	0.1 a	6 a	0.1 a
B.64-194	1.7 cdef	1.8 cde	0.1 a	7 a	0.0 a
B.67-5-32	1.7 cdef	1.7 cde	0.0 a	2 a	0.0 a
B.70-6-8	1.8 cdef	1.8 cde	0.0 a	2 a	0.1 a
B.70-20-20	2.4 b	2.6 b	0.2 a	7 a	0.0 a
B.71-7-22	0.5 f	0.5 f	0.0 a	6 a	0.5 a
CG.2034	1.0 f	1.1 ef	0.1 a	6 a	0.0 a
CG.3001	1.9 bcde	2.1 bc	0.2 a	11 a	0.0 a
CG.4003	1.2 f	1.3 e	0.1 a	7 a	0.0 a
CG.4004	1.9 bcde	1.9 cd	0.1 a	2 a	0.7 a
CG.4013	1.0 f	1.0 ef	0.0 a	0 a	0.0 a
CG.4214	1.4 f	1.5 de	0.1 a	5 a	0.0 a
CG.4814	1.7 cdef	1.8 cde	0.1 a	6 a	0.0 a
CG.5087	1.4 f	1.6 cde	0.1 a	9 a	0.0 a
CG.5202	2.0 bcde	2.1 bc	0.1 a	3 a	0.1 a
G.11	1.4 f	1.4 de	0.1 a	6 a	0.0 a
G.202 N	2.4 b	2.6 b	0.2 a	8 a	0.3 a
G.202 TC	1.7 cdef	1.9 cd	0.2 a	11 a	0.0 a
G.41 N	1.2 f	1.3 e	0.1 a	8 a	0.0 a
G.41 TC	1.1 f	1.2 ef	0.1 a	9 a	0.0 a
G.935 N	1.1 f	1.1 ef	0.1 a	8 a	0.1 a
G.935 TC	2.0 bcde	2.1 bc	0.2 a	7 a	1.0 a
PiAu 9-90	3.1 a	3.2 a	0.1 a	2 a	0.0 a
PiAu 51-11	2.0 bcde	2.0 c	0.1 a	2 a	0.0 a
Supporter 3	1.1 f	1.1 ef	0.0 a	0 a	0.0 a
M.9 NAKBT337	1.6 def	1.7 cde	0.0 a	1 a	0.0 a
M.9 Pajam 2	1.5 ef	1.5 de	0.0 a	1 a	0.4 a
M.26 EMLA	1.3 f	1.4 de	0.1 a	6 a	0.2 a

^z Means were separated within columns by Tukey's HSD ($P = 0.05$).

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