



# Massachusetts Agricultural Experiment Station

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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 of 38 kg per tree with 186-g average fruit size). In 2008, fruit set was again less than expected (average yields 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, with average yields of 28 kg/tree with 193-g average fruit size. Average yields in 2011 were 38 kg/tree with 202-g average fruit size. The planting includes seven replications in a randomized-complete-block design. Means from 2011 (10<sup>th</sup> and final growing season) are included in Tables 1 and 2.

After the 2011 growing season, largest trees were on PiAu51-4, followed in decreasing size by those on P.14, PiAu51-11, Supporter 4, M.26 NAKB, M.26 EMLA, M.9 Burgmer 756, M.9 Nic 29, M.9 NAKBT337, M.9 Nic 29, B.9 (North America), and B.9 (Europe) (Table 1).

Cumulative (2002-11) root suckering was significantly greater from M.9 Nic 29 than from all other rootstocks, more than twice the number resulting from PiAu

51-4, B.9 (Europe), and M.9 NAKBT337 (Table 1). Very low numbers of root suckers have originated from M.26 (both strains), Supporter 4, and P.14.

Greatest yields in 2011 were from trees on PiAu 51-4, M.26 NAKB, and M.26 EMLA, and lowest yields were from B.9 (Europe) (Table 2). Cumulatively (2004-11), greatest yields were from trees on PiAu 51-4 and M.26 NAKB. The lowest cumulative yields were from trees on B.9 (Europe).

Yield efficiency in 2011 was highest for trees on B.9 (both strains) and M.9 Nic 29 (Table 2). Cumulatively, (2004-11) Trees on the two strains of B.9 and the three strains of M.9 were the most yield efficient. Trees on P.14, PiAu 51-11, and PiAu 51-4 were the least efficient.

Table 1. Trunk cross-sectional area, tree height, canopy spread and root suckering in 2011 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.<sup>2</sup>

Rootstock	Trunk cross-sectional area (cm <sup>2</sup> )	Tree height (m)	Canopy spread (m)	Root suckers (no./tree, 2002-11)
B.9 (Europe)	30.4 f	3.4 d	2.5 d	22.4 b
B.9 (North America)	37.8 ef	3.8 cd	3.0 cd	15.7 b
M.26 EMLA	75.6 cd	4.3 bcd	3.7 abc	3.6 b
M.26 NAKB	93.2 bcd	4.6 bcd	4.0 ab	5.1 b
M.9 Burgmer 756	75.4 d	4.9 bc	3.6 bc	17.0 b
M.9 Nic 29	61.3 de	4.2 bcd	3.4 bc	53.9 a
M.9 NAKBT337	64.1 de	4.3 bcd	3.4 bc	21.4 b
P.14	122.2 b	5.4 ab	4.2 ab	8.4 b
PiAu51-11	112.9 bc	5.3 ab	4.0 ab	18.4 b
PiAu51-4	174.5 a	6.4 a	4.6 a	24.8 b
Supporter 4	93.2 bcd	5.4 ab	4.1 ab	5.9 b

<sup>2</sup> Means were separated within columns by Tukey's HSD ( $P = 0.05$ ).

Table 2. Yield per tree, yield efficiency, and fruit weight in 2011 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 2011 fruit weight.<sup>z</sup>

Rootstock	Yield per tree (kg)		Yield efficiency (kg/cm <sup>2</sup> TCA)		Fruit weight (g)	
	2011	Cumulative (2004-11)	2011	Cumulative (2004-11)	2011	Average (2004-11)
B.9 (Europe)	7.3 c	90 d	0.27 d	3.0 a	207 ab	161 b
B.9 (North America)	10.4 bc	114 cd	0.29 cd	3.2 a	196 ab	169 ab
M.26 EMLA	48.3 a	199 ab	0.63 ab	2.6 ab	195 ab	178 ab
M.26 NAKB	52.8 a	242 a	0.54 abcd	2.6 ab	194 ab	177 ab
M.9 Burgmer 756	40.0 abc	207 ab	0.56 abc	2.8 a	211 ab	180 ab
M.9 Nic 29	45.5 ab	184 abc	0.70 a	3.0 a	217 a	185 a
M.9 NAKBT337	34.6 abc	183 abc	0.55 abcd	2.9 a	206 ab	185 a
P.14	44.6 ab	216 ab	0.35 bcd	1.8 c	208 ab	182 ab
PiAu51-11	31.5 abc	162 bcd	0.33 bcd	1.6 c	195 ab	176 ab
PiAu51-4	65.3 a	245 a	0.37 bcd	1.4 c	188 b	173 ab
Supporter 4	38.6 abc	182 abc	0.42 abcd	2.0 bc	202 ab	179 ab

<sup>z</sup> Means were separated within columns by Tukey's HSD ( $P = 0.05$ ).

Table 3. Trunk size, root suckering, yield, yield efficiency, and fruit size in 2011 of Redhaven peach trees in the 2009 NC-140 Peach Rootstock Trial. All values are least-squares means, adjusted for missing subclasses and for crop load in the case of fruit weight.<sup>z</sup>

Rootstock	Trunk cross-sectional area (cm <sup>2</sup> )	Root suckers (no./tree, 2009-11)	Yield per tree (kg)	Yield efficiency (kg/cm <sup>2</sup> )	Fruit weight (g)
Atlas	75.3 ab	0.0 b	20.7 ab	0.28 cde	161 c
Brights Hybrid 5	66.6 abc	0.0 b	17.8 b	0.27 cde	159 c
Controller 5	17.7 f	0.0 b	4.0 c	0.23 e	172 abc
Guardian	83.0 a	0.0 b	21.1 ab	0.26 cde	176 abc
HBOK 10	60.0 bc	0.0 b	24.7 ab	0.43 bcd	180 abc
HBOK 32	60.3 bc	0.0 b	23.0 ab	0.39 bcde	171 abc
KV010-123	57.4 cd	0.0 b	24.7 ab	0.44 bc	178 abc
KV010-127	66.4 abc	0.0 b	23.8 ab	0.36 cde	169 bc
Krymsk 1	36.5 e	0.0 b	20.0 ab	0.55 ab	192 ab
Krymsk 86	64.7 bc	0.0 b	19.0 b	0.31 cde	163 c
Lovell	74.1 abc	0.0 b	21.1 ab	0.30 cde	174 abc
Mirobac	56.9 cd	0.5 b	20.6 ab	0.36 cde	176 abc
<i>Prunus americana</i>	42.3 de	3.0 a	29.7 a	0.72 a	200 a
Penta	69.2 abc	0.0 b	16.0 b	0.25 de	160 c
Viking	66.4 abc	0.0 b	24.2 ab	0.38 bcde	166 c

<sup>z</sup> Means were separated within columns by Tukey's HSD ( $P = 0.05$ ).

Table 4. Trunk cross-sectional area, trunk cross-sectional area increase, and cumulative root sucker number in 2011 of Honeycrisp apple trees on various rootstocks in the 2010 NC-140 Honeycrisp Apple Rootstock Trial.<sup>z</sup>

Rootstock	Trunk cross-sectional area (2011, cm <sup>2</sup> )	Trunk cross-sectional area increase (2011, cm <sup>2</sup> )	Trunk cross-sectional area increase (2011, %)	Cumulative root suckers (no.)
B.9	2.4 ef	1.1 d	82 bc	0.7 ab
B.10	3.8 cd	2.0 bcd	107 bc	0.0 b
B.7-3-150	3.7 cde	2.3 bc	179 ab	0.1 ab
B.7-20-21	5.0 bc	3.0 b	146 bc	0.2 ab
B.64-194	5.0 bc	3.2 b	187 ab	0.0 b
B.67-5-32	4.4 cd	2.8 bc	163 abc	0.0 b
B.70-6-8	4.7 c	2.9 bc	162 bc	0.2 ab
B.70-20-20	8.0 a	5.4 a	218 a	0.3 ab
B.71-7-22	0.9 f	0.3 d	63 c	0.5 ab
G.11	3.0 def	1.6 cd	115 bc	0.7 ab
G.41N	3.0 def	1.7 cd	137 bc	0.1 ab
G.41TC	2.7 def	1.6 cd	132 bc	1.0 ab
G.202N	5.4 bc	2.8 bc	117 bc	2.8 a
G.202TC	4.9 bc	3.1 b	169 ab	0.3 ab
G.935N	4.5 cd	2.4 bc	121 bc	0.5 ab
G.935TC	3.4 cde	2.2 bcd	189 ab	3.5 a
CG.2034	2.5 def	1.4 cd	118 bc	0.2 ab
CG.3001	5.5 bc	3.4 b	166 abc	0.0 b
CG.4003	2.7 def	1.4 cd	116 bc	0.0 b
CG.4004	4.7 c	2.8 bc	155 bc	2.5 ab
CG.4013	3.3 cdef	2.3 bc	205 ab	0.0 b
CG.4214	3.4 cde	1.9 bcd	129 bc	1.1 ab
CG.4814	3.8 cd	1.9 bcd	111 bc	2.0 ab
CG.5087	3.6 cde	2.0 bcd	113 bc	0.6 ab
CG.5222	4.9 bc	2.9 bc	140 bc	1.5 ab
Supp.3	3.1 cdef	2.0 bcd	175 ab	0.1 ab
PiAu 9-90	6.4 b	3.3 b	109 bc	0.0 b
PiAu 51-11	5.2 bc	3.2 b	161 bc	0.0 b
M.9 NAKBT337	3.8 cd	2.2 bcd	134 bc	1.3 ab
M.9 Pajam 2	3.4 cde	1.8 cd	118 bc	2.9 a
M.26 EMLA	3.4 cde	2.0 bcd	149 bc	0.8 ab

<sup>z</sup> Least-squares mean separation within column by Tukey's HSD ( $P = 0.05$ ).

Fruit size in 2011 was good for trees on all rootstocks, averaging from 188 to 217g, M.9 Nic 29 resulting in the largest fruit and PiAu 51-4 resulting in the smallest (Table 2). Average fruit size over the fruiting life of the planting (2004-11) was largest from trees on M.9 NAKBT337 and M.9 Nic 29 and smallest from trees on B.9 (Europe).

### 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 three seasons. The planting includes eight replications in a randomized-complete-block design. Means from 2011 (3<sup>rd</sup> growing season) are included in Table 3.

At the end of the 2011 season, largest trees were on Guardian, and smallest trees were on *Prunus americana*, Krymsk 1, and Controller 5 (Table 3). A small amount of root suckering has occurred from trees on *P. americana*

(Table 3).

Yield was assessed in 2011 (Table 3). Greatest yields were harvested from trees on *P. americana*, and the lowest yields were harvested from those on Controller 5. The most yield efficient trees were on *P. americana*, and the least efficient were on Controller 5. Fruit size was largest also for trees on *P. americana* (Table 3). Smallest fruit were harvested from trees on Viking, Krymsk 86, Atlas, Penta, and Brights Hybrid 5.

### **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. In 2010, trees in this planting grew relatively little, but much more growth occurred in 2011. The planting includes four replications in a randomized-complete-block design, with up to three trees of a single rootstock per replication. Means from 2011 (2<sup>nd</sup> growing season) are included in Table 4.

At the end of the 2011 growing season, largest trees were on B.70-20-20 and on PiAu 9-90. Smallest trees were on B.71-7-22 and B.9 (Table 4). Differences in incremental trunk growth in 2011 varied from 0.3 cm<sup>2</sup> (63%) for B.71-7-22 to 5.4 cm<sup>2</sup> (218%) for B.70-20-20 (Table 4). The largest number of root suckers were produced by CG.935TC, M.9 Pajam 2, and G.202N (Table 4).

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