



Massachusetts Agricultural Experiment Station

November, 2014 -- Clemson, SC

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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 six seasons. It is important to note that these trees experienced a heavy snowstorm at the end of October 2011. Leaves were still present, and some scaffold breakage occurred. Where possible, scaffolds were pulled back and bolted into place. The longevity of some of these trees may be reduced. The planting includes eight

replications in a randomized-complete-block design. Means from 2014 (6th growing season) are included in Tables 1 and 2.

At the end of the 2014 season, largest trees were on Guardian, Lovell, Atlas, and Krymsk 86, and smallest trees were on Krymsk 1, *Prunus americana*, and Controller 5 (Table 1). Significantly more suckering occurred from trees on *P. americana* than from any other rootstock (Table 1).

Greatest yields in 2014 were harvested from trees on HBOK 32, Guardian, *P. americana*, and KC010-127, and the lowest yields were harvested from those on Controller

Table 1. Trunk size, root suckering, yield, yield efficiency, and fruit size in 2014 of Redhaven peach trees in the 2009 NC-140 Peach Rootstock Trial at the UMass Cold Spring Orchard Research & Education Center, Belchertown, MA. All values are least-squares means, adjusted for missing subclasses and for crop load in the case fruit weight.²

Rootstock	Trunk cross-sectional area (cm ²)	Root suckers (no./tree, 2009-14)	Yield per tree (kg)	Yield efficiency (kg/cm ²)	Fruit weight (g)	Fruit ripening (Julian date, 10%)
Atlas	158 abc	0.0 b	20 ab	0.13 cd	225 a	222.5 abc
Brights Hybrid 5	141 bc	0.0 b	17 ab	0.12 cd	220 a	221.0 abc
Controller 5	46 d	0.0 b	12 b	0.24 abc	222 a	220.5 c
Guardian	185 a	0.1 b	25 a	0.14 bcd	222 a	223.0 ab
HBOK 10	128 c	0.0 b	23 ab	0.19 bcd	201 a	223.1 a
HBOK 32	126 c	0.0 b	26 a	0.20 bcd	209 a	222.4 abc
KV010-123	132 bc	0.5 b	22 ab	0.17 bcd	213 a	222.5 abc
KV010-127	146 bc	0.1 b	24 a	0.17 bcd	221 a	222.6 abc
Krymsk 1	76 d	2.3 b	20 ab	0.28 ab	230 a	220.6 c
Krymsk 86	151 abc	0.0 b	15 ab	0.10 d	199 a	222.4 abc
Lovell	163 ab	0.0 b	23 ab	0.14 bcd	218 a	223.0 ab
Mirobac	129 bc	2.9 b	18 ab	0.16 bcd	225 a	221.8 abc
<i>Prunus americana</i>	75 d	87.6 a	25 a	0.35 a	232 a	221.9 abc
Penta	139 bc	4.9 b	15 ab	0.11 d	228 a	220.7 bc
Viking	147 bc	0.0 b	20 ab	0.14 bcd	217 a	221.5 abc

² Means were separated within columns by Tukey=s HSD (P = 0.05).

Table 2. Cumulative yield and yield efficiency and average fruit size and ripening date in for the fruiting life of Redhaven peach trees in the 2009 NC-140 Peach Rootstock Trial at the UMass Cold Spring Orchard Research & Education Center, Belchertown, MA. All values are least-squares means, adjusted for missing subclasses.²

Rootstock	Cumulative yield per tree (2011-14, kg)	Cumulative yield efficiency (2011-14, kg/cm ²)	Average fruit weight (2011-14, g)	Average fruit ripening (2012-14, Julian date, 10%)
Atlas	92 a	0.60 d	193 a	216.8 ab
Brights Hybrid 5	90 a	0.64 d	182 a	215.6 ab
Controller 5	46 b	1.00 bc	173 a	215.8 ab
Guardian	104 a	0.57 d	192 a	217.1 ab
HBOK 10	99 a	0.83 cd	183 a	218.0 a
HBOK 32	98 a	0.78 cd	183 a	217.7 ab
KV010-123	99 a	0.76 cd	182 a	217.0 ab
KV010-127	103 a	0.71 cd	186 a	217.2 ab
Krymsk 1	91 a	1.27 ab	186 a	215.5 b
Krymsk 86	84 a	0.58 d	181 a	217.1 ab
Lovell	103 a	0.63 d	188 a	217.8 ab
Mirobac	91 a	0.73 cd	180 a	217.0 ab
<i>Prunus americana</i>	106 a	1.48 a	191 a	215.8 ab
Penta	80 a	0.58 d	188 a	215.6 ab
Viking	103 a	0.73 cd	183 a	216.0 ab

² Means were separated within columns by Tukey=s HSD (P = 0.05).

5 (Table 1). On a cumulative basis (2011-14), yield was similar among most trees, except that yield from trees on Controller 5 was significantly lower than all others (Table 2). The most yield efficient trees in 2014 were on *P. americana*, and the least efficient trees were on Penta and Krymsk 86 (Table 1). Cumulatively (2011-14), yield efficiency was greatest for trees on *P. americana* and lowest for trees on Brights Hybrid 5, Lovell, Atlas, Krymsk 86, Penta, and Guardian (Table 2). Fruit size in 2014 and on average (2011-14) were not different among rootstocks (Tables 1 and 2). There was a modest advancement of ripening in 2013 of fruit from trees on Controller 5 and Krymsk 1 and a possible delay in ripening of fruit from trees on HBOK 10 (Table 1). Averaged over the 2012, 2013, and 2014 seasons, ripening of fruit from trees on HBOK 10 was 2.5 days later than that of fruit from trees on Krymsk 1 (Table 2).

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 growth has been good in the last three seasons. The planting includes four replications in a randomized-complete-block design, with up to three trees of a single rootstock per replication. Means from 2014 (5th growing season) are included in Table 3.

At the end of the 2014 growing season, largest trees were on B.70-20-20, and smallest trees were on B.71-7-22 (Table 3). The largest number of root suckers were produced (cumulatively, 2010-14) by G.202N (Table 3). The greatest portion of the canopy affected by Honeycrisp zonal chlorosis was for trees on G.935TC and PiAu 9-90, and the lowest amount was assessed for trees on B.70-20-20, B.64-5-32, CG.4004, and CG.4003 (Table 3).

In 2014, yield was greatest from trees on G.935N and least from trees on PiAu 9-90 (Table 3). Cumulatively (2013-14), greatest yields were harvested from trees on CG.3001, and lowest yields were from trees on B.71-7-22 (Table 3). The most yield efficient trees in 2014 and cumulatively (2013-14) were on G.11, and the least were on PiAu 9-90 (Table 3). The largest fruit in 2014 and on

Table 3. Trunk cross-sectional area, cumulative root sucker number, zonal chlorosis, yield per tree, yield efficiency, fruit weight, and horticultural rating in 2014 of Honeycrisp apple trees on various rootstocks in the 2010 NC-140 Honeycrisp Apple Rootstock Trial.²

Rootstock	Trunk cross-sectional area (2014, cm ²)	Tree height (2014, cm)	Canopy width (2014, cm)	Cumulative root suckers (2010-14, no.)	Zonal chlorosis (2014, % canopy affected)	Yield per tree (2014, kg)	Cumulative yield per tree (2013-14, kg)	Yield efficiency (2014, kg/cm ² TCA)	Cumulative yield efficiency (2013-14, kg/cm ² TCA)	Fruit weight (2014, g)	Average fruit weight (2013-14, g)	Clements tall-spindle index (2014, 0=poor, 3=excellent)
B.9	6.3	238	128	4.8	24	6.3	13.4	1.05	2.10	240	229	0.8
B.10	10.4	281	175	0.0	24	7.0	22.8	0.71	2.20	247	215	1.9
B.7-3-150	18.1	344	194	0.9	20	9.9	20.8	0.56	1.17	281	256	1.7
B.7-20-21	17.3	306	185	2.8	48	8.5	25.7	0.45	1.46	219	224	1.9
B.64-194	21.3	366	200	0.0	16	5.6	21.4	0.25	0.94	244	228	0.7
B.67-5-32	19.6	337	182	1.2	21	5.8	18.2	0.31	0.97	248	234	1.0
B.70-6-8	19.9	348	188	0.5	20	7.9	25.2	0.40	1.28	242	233	1.3
B.70-20-20	34.7	388	245	8.8	12	6.2	23.4	0.18	0.67	257	236	0.0
B.71-7-22	2.0	143	71	3.2	57	1.2	2.9	0.64	1.58	164	179	0.0
G.11	8.7	290	190	8.4	33	14.1	28.8	1.60	3.30	269	246	2.0
G.41N	9.3	278	172	0.4	14	12.3	26.7	1.35	2.84	263	244	1.8
G.41TC	8.6	259	170	8.8	34	10.0	18.1	1.08	2.00	259	241	1.5
G.202N	19.8	353	232	24.5	24	12.2	50.3	1.10	2.54	239	246	2.4
G.202TC	12.6	292	215	14.8	38	13.2	34.0	1.03	2.69	218	205	2.1
G.935N	12.7	322	213	9.9	44	17.6	42.2	1.36	3.26	229	221	2.4
G.935TC	9.2	255	178	12.4	83	3.1	18.2	0.40	2.04	206	201	1.5
CG.2034	9.7	255	142	0.2	59	7.0	14.0	1.09	1.96	247	231	0.7
CG.3001	20.7	320	265	1.3	64	10.8	52.9	0.53	2.53	248	224	2.0
CG.4003	7.6	293	159	1.9	19	12.0	25.6	1.57	3.29	188	209	1.6
CG.4004	16.9	337	230	9.3	16	13.5	40.1	0.77	2.35	248	232	1.6
CG.4013	12.0	349	230	15.4	52	6.4	29.4	0.54	2.36	206	210	1.9
CG.4214	13.8	327	200	20.3	58	11.0	26.7	0.77	1.93	234	238	2.3
CG.4814	12.7	297	204	16.6	72	10.5	31.0	0.83	2.46	212	213	2.0
CG.5087	12.4	294	206	4.3	53	6.4	28.9	0.52	2.09	259	234	1.6
CG.5222	15.6	300	204	13.9	47	6.7	21.9	0.44	1.42	205	206	1.7
Supp.3	8.2	282	168	2.3	63	6.4	18.3	0.73	2.21	223	214	1.5
PiAu 9-90	16.0	282	178	0.0	81	0.7	9.7	0.06	0.56	125	129	0.1
PiAu 51-11	15.4	315	194	4.5	44	5.7	19.7	0.34	1.27	249	238	1.7
M.9 NAKBT337	10.0	290	175	10.2	33	13.6	24.3	1.35	2.41	242	235	2.1
M.9 Pajam 2	9.2	249	159	16.1	39	6.0	17.7	0.60	1.92	222	211	1.1
M.26 EMLA	9.8	282	185	7.7	30	9.4	18.5	0.94	1.88	226	221	1.7
HSD (<i>P</i> = 0.05)	7.6	74	56	19.3	45	10.4	17.5	0.88	1.1	88	57	1.6

² Least-squares mean separation within column by Tukey's HSD (*P* = 0.05).

average (2013-14) were harvested in from trees on B.7-20-21, and the smallest were harvested from those on PiAu 9-90 (Table 3).

2014 NC-140 Apple

The 2014 NC-140 Vineland and Geneva apple rootstock planting was planted 29-April, 2014 at the UMass Cold Spring Orchard, Belchertown, MA. Fourteen rootstocks, including four Vineland rootstocks (V.1, V.5, V.6, and V.7), seven Cornell-Geneva rootstocks (G.11, G.202, G.4214, G.30, G.5890, G.935, and G.969), and two commercial 'standard' rootstocks (M.26 and M.9 T337) were planted with Honeycrisp as the scion. (B.10 unfortunately was not available and therefore not included in the planting.) Tree spacing is 1 x 4 m.

The experimental design at this site is a randomized complete block. Trees were trained and supported as a tall-spindle-apple with trickle irrigation. Tree growth was generally very good and only one tree (G.41) was lost to mechanical injury.

Shortly after planting in May, measurements were made of: trunk diameter at 30 cm above the graft union; number of side branches >10 cm. long; and tree height. In October after tree growth had ceased, measurements were made of: trunk circumference at 30 cm above the graft union; height of graft union above soil; number of side branches >10 cm. long; tree height; and tall-spindle-apple (TSA) suitability rating.

Results are presented in Tables 4-6. Most all the Vineland rootstocks were in the top 50% of rootstocks in trunk cross-sectional area (TCA), tree height, and feathering when planted and at the end of the growing season. (Tables 4-6) V.6 and V.7, however, were shorter than the top 50% of rootstocks at planting (Table 5), but they also were among the best growth-in-height from May-October. G.30, G.5890, G.4214, and G.969 were the best trees amongst the Geneva rootstocks at planting and at the end of the growing season in TCA, tree height, and feathering, with G.30 and G.5890 standouts. G.41, G.11, and G.202 were among the smallest trees, weakest growers with low number of feathers, however,

the commercial standard rootstock M.9 and M.26 were similar to these low Geneva performers.

It should be noted that tree size at planting pretty much follows-through during the growing season, which shows that bigger trees at planting will grow better during the 1st-leaf and be bigger (and better) trees at the end

of the growing season which should result in a crop in the 2nd-leaf. Tree size at planting is likely indicative of overall rootstock vigor, and will probably reflect in tree size (and productivity?) during the life of the orchard (to be determined).

Table 4 - Trunk Cross-sectional Area (cm)

Rootstock	TCA (cm) May	TCA (cm) October	TCA gain May to October
G.30	2.44 a	3.78 a	1.34
G.5890	2.33 ab	3.83 a	1.5
V.6	2.03 bc	3.8 a	1.77
V.1	1.96 c	3.24 ab	1.28
G.4214	1.6 d	2.34 cd	0.74
V.5	1.59 d	2.99 b	1.4
V.7	1.47 de	2.83 bc	1.36
G.969	1.26 ef	2.19 cd	0.93
M.26	1.19 efg	2.03 de	0.84
M.9 T337	1.16 efg	1.89 de	0.73
G.935	1.02 fg	2.04 de	1.02
G.41	0.94 gh	1.82 de	0.88
G.11	0.93 gh	1.55 ef	0.62
G.202	0.69 h	1.12 f	0.43

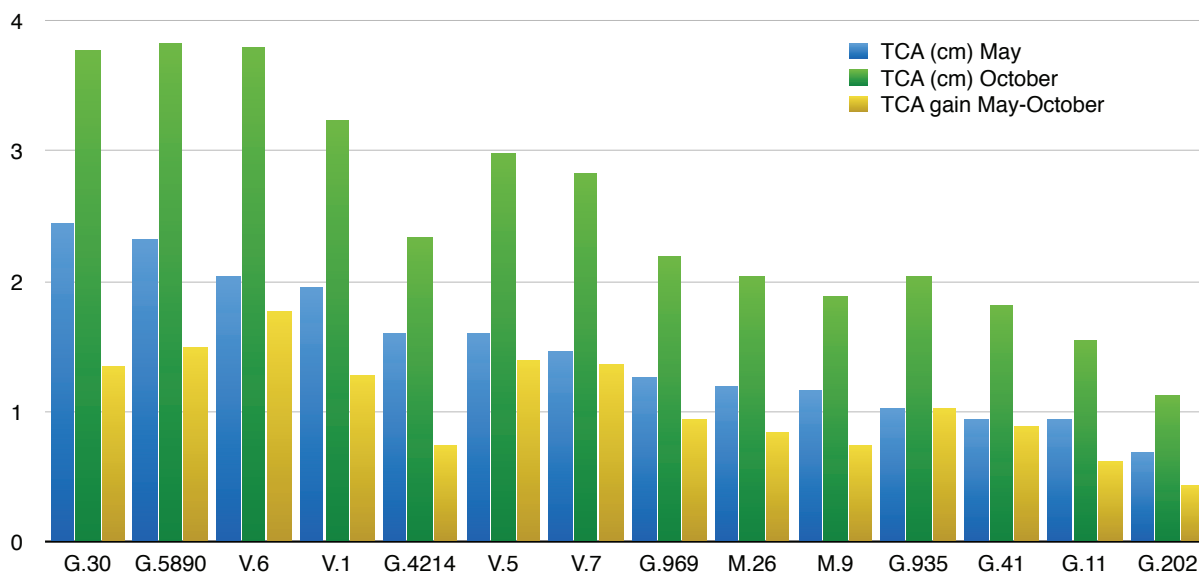


Table 5 - Tree height (m)

Rootstock	Tree height (m) May	Tree height (m) October	Tree height gain May to October
G.30	2.06 a	2.51 a	0.45
G.5890	2.01 ab	2.39 abc	0.38
G.935	1.95 ab	2.45 ab	0.5
G.4214	1.93 abc	2.26 bcd	0.33
V.1	1.89 bcd	2.35 abc	0.46
G.969	1.76 cde	2.25 bcd	0.49
V.5	1.75 def	2.26 bcd	0.51
G.41	1.74 def	2.18 cde	0.44
V.6	1.72 def	2.27 bcd	0.55
G.11	1.7 ef	2.11 def	0.41
V.7	1.66 ef	2.17 cde	0.51
M.9 T337	1.63 ef	2.00 ef	0.37
G.202	1.58 fg	1.98 ef	0.4
M.26 EMLA	1.45 g	1.91 f	0.46

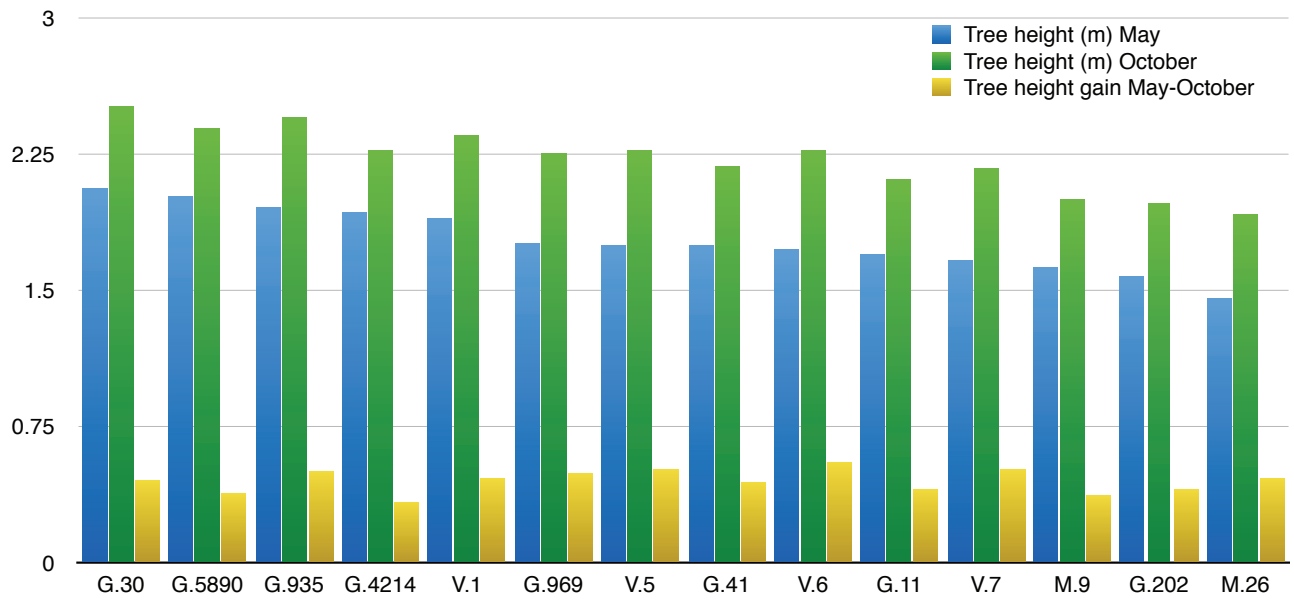


Table 6 - Number feathers > 10 cm.

Rootstock	No. feathers > 10 cm May 2014	No. feathers > 10 cm October 2014
G.5890	14 a	19 a
G.30	12 ab	16 ab
V.6	11 abc	15 bc
G.4214	10 bc	14 bcd
V.7	8 cd	11 cdef
G.969	6 de	11 def
V.5	6 de	12 cde
V.1	6 de	11 def
M.26	5 ef	8 fgh
M.9	4 efg	8 fgh
G.41	4 efg	7 gh
G.935	4 efg	10 efg
G.11	2 fg	6 gh
G.202	1 g	6 h

