

Table 1. Rootstock means for trunk cross-sectional area, root suckers, yield per tree, yield efficiency, and fruit size of Fuji apple trees in the 2010 NC-140 Fuji Apple Rootstock Trial. Means are based on data from ID, KY, NC, NY, and UT. All values are least-squares means, adjusted for missing subclasses.<sup>2</sup>

Rootstock	Survival (2010-17, %)	Trunk cross- sectional area (2017, cm <sup>2</sup> )	Tree height (2017, cm)	Canopy width (2017, cm)	Cumulative root suckers (2010-17, no./tree)	Yield per tree (2017, kg)	Cumulative yield per tree (2011-17, kg)	Yield efficiency (2017, kg/cm <sup>2</sup> TCA)	Cumulative yield efficiency (2011-17, kg/cm <sup>2</sup> TCA)	Fruit weight (2017, g)	Average Fruit weight (2012-17, g)
B.9	97	17.9	280	153	14.0	9.3	58.9	0.59	3.23	169	167
B.10	91	37.6	372	205	2.8	19.0	93.8	0.59	2.66	199	199
B.7-3-150	100	83.0	487	261	3.4	21.3	108.7	0.31	1.55	196	200
B.7-20-21	82	7.9	167	89	2.1	2.1	9.8	0.30	1.45	114	130
B.64-194	94	84.9	480	258	13.4	21.9	106.1	0.32	1.42	194	208
B.67-5-32	98	82.3	462	245	5.9	20.0	108.1	0.29	1.43	196	200
B.70-6-8	100	88.3	493	262	2.2	18.7	112.7	0.23	1.48	198	199
B.71-7-22	81	11.0	242	153	7.6	5.5	31.7	0.66	3.44	174	175
G.11	97	41.5	391	225	4.1	13.0	105.2	0.38	2.83	208	205
G.41N	101	48.1	420	235	3.5	15.7	122.6	0.42	2.49	204	211
G.41TC	99	42.9	422	238	10.4	26.2	103.2	0.59	2.33	210	205
G.202N	96	54.8	439	236	13.2	21.9	116.3	0.47	2.33	197	196
G.202TC	100	36.9	371	206	17.8	18.0	97.8	0.55	2.82	191	180
G.935N	94	47.2	420	236	11.2	30.5	142.8	0.74	3.35	201	198
G.935TC	95	48.9	388	222	30.2	21.3	110.8	0.61	2.81	185	200
CG.2034	88	20.7	302	169	9.4	11.6	68.2	0.61	3.30	219	189
CG.3001	100	63.7	463	249	8.3	24.4	134.5	0.48	2.20	184	207
CG.4003	100	23.2	322	181	3.5	9.9	67.1	0.47	3.11	174	163
CG.4004	100	59.9	453	248	13.4	22.6	149.0	0.47	2.63	221	214
CG.4214	100	32.5	373	212	14.1	19.5	92.7	0.73	3.17	194	193
CG.4814	95	47.7	396	233	20.2	21.1	110.8	0.47	2.61	183	187
CG.5222	100	60.6	463	254	19.5	21.9	124.1	0.42	2.14	196	201
Supp.3	78	37.6	343	199	3.8	20.9	77.3	0.62	2.20	164	174
PiAu 9-90	100	89.7	387	240	19.6	13.1	61.5	0.25	1.16	174	181
PiAu 51-11	94	88.7	481	258	3.9	18.3	104.5	0.25	1.39	210	214
M.9 NAKBT337	79	39.4	381	213	15.0	17.5	100.5	0.55	2.89	200	195
M.9 Pajam 2	81	46.2	400	204	29.7	16.0	107.6	0.41	2.48	191	195
M.26 EMLA	84	72.5	476	249	1.9	14.7	113.2	0.22	1.68	214	210
Estimated HSD	21	14.6	43	31	16.2	12.8	23.7	0.35	0.63	37	19

<sup>2</sup>Mean separation in columns by Tukey's HSD ( $P = 0.05$ ). HSD was calculated based on the average number of observations per mean.

Table 2. Site means for trunk cross-sectional area, root suckers, yield per tree, yield efficiency, and fruit size of Fuji apple trees in the 2010 NC-140 Fuji Apple Rootstock Trial. Means are based on data from ID, KY, NC, NY, PA, and UT. All values are least-squares means, adjusted for missing subclasses.<sup>2</sup>

Rootstock	Survival (2010-17, %)	Trunk cross- sectional area (2017, cm <sup>2</sup> )	Tree height (2017, cm)	Canopy width (2017, cm)	Cumulative root suckers (2010-17, no./tree)	Yield per tree (2017, kg)	Cumulative yield per tree (2011-17, kg)	Yield efficiency (2017, kg/cm <sup>2</sup> TCA)	Cumulative yield efficiency (2011-17, kg/cm <sup>2</sup> TCA)	Fruit weight (2017, g)	Average Fruit weight (2012-17, g)
ID	100	46.8	355	169	0.5	16.7	157.9	0.42	3.60	184	226
KY	85	64.4	355	235	21.6	13.2	67.9	0.26	1.28	175	161
NC	89	46.2	361	272	8.2	23.9	62.0	0.64	1.73	196	200
NY	98	36.3	520	175	3.7	27.8	115.4	0.88	3.62	187	170
UT	97	59.1	387	244	20.3	7.0	86.0	0.12	1.65	215	206
Estimated HSD	9	9.9	25	16	3.2	4.5	8.4	0.14	0.24	29	11

<sup>2</sup>Mean separation in columns by Tukey's HSD ( $P = 0.05$ ). HSD was calculated based on the average number of observations per mean.

Table 3. Survival (2010-17, %) of Fuji apple trees at individual planting locations in the 2010 NC-140 Fuji Rootstock Trial. All values are least-squares means, adjusted for missing subclasses.<sup>2</sup>

Rootstock	CH	ID	KY	NC	NY	PA	UT
B.9	100	100	92	92	100	100	100
B.10	100	100	92	70	100	100	92
B.7-3-150	100	100	100	100	100	100	100
B.7-20-21	75	100	100	55	58	40	100
B.64-194	100	100	71	100	100	100	100
B.67-5-32	100	100	92	100	100	100	100
B.70-6-8	100	100	100	100	100	92	100
B.71-7-22	100	100	70	56	89	100	90
G.11	100	100	88	100	100	100	100
G.41N	---	100	100	100	100	50	100
G.41TC	100	100	100	100	100	---	100
G.202N	100	100	100	100	80	50	100
G.202TC	100	100	100	100	100	100	100
G.935N	100	100	90	90	100	88	90
G.935TC	100	100	75	100	100	75	100
CG.2034	---	100	50	100	100	100	100
CG.3001	0	100	100	100	100	100	100
CG.4003	100	100	100	100	100	100	100
CG.4004	67	100	100	100	100	---	100
CG.4013	---	---	100	67	100	67	100
CG.4214	100	100	100	100	100	100	100
CG.4814	40	100	100	100	100	33	75
CG.5087	100	100	100	100	---	---	50
CG.5222	100	100	100	100	100	100	100
Supp.3	75	100	40	67	100	67	83
PiAu 9-90	100	100	100	100	100	67	100
PiAu 51-11	100	100	91	80	100	75	100
M.9 NAKBT337	75	100	33	60	100	90	100
M.9 Pajam 2	100	100	44	63	100	100	100
M.26 EMLA	100	100	45	83	100	100	92
Estimated HSD	45	---	63	75	41	70	46

<sup>2</sup>Mean separation in columns by Tukey's HSD ( $P = 0.05$ ). HSD was calculated based on the average number of observations per mean.

Table 4. Trunk cross-sectional area (2017, cm<sup>2</sup>) of Fuji apple trees at individual planting locations in the 2010 NC-140 Fuji Rootstock Trial. All values are least-squares means, adjusted for missing subclasses.<sup>2</sup>

Rootstock	CH	ID	KY	NC	NY	PA	UT
B.9	10.6	27.2	17.0	10.2	12.9	22.1	22.2
B.10	22.4	41.2	46.2	29.5	25.3	48.7	45.5
B.7-3-150	36.5	57.2	118.1	79.9	65.1	97.1	94.9
B.7-20-21	3.8	5.6	16.6	2.4	3.5	7.3	11.1
B.64-194	33.6	81.3	107.4	88.0	52.6	95.7	95.1
B.67-5-32	25.3	82.6	97.3	82.0	55.3	84.2	94.1
B.70-6-8	29.7	62.8	113.5	101.4	74.4	109.1	89.3
B.71-7-22	4.9	10.6	11.6	9.1	6.1	10.1	17.4
G.11	22.7	36.1	56.9	33.7	29.6	31.6	51.3
G.41N	---	72.0	33.3	45.3	38.5	88.2	51.6
G.41TC	24.3	49.4	39.5	37.6	39.2	---	48.8
G.202N	28.4	49.1	80.6	39.1	54.6	59.5	50.6
G.202TC	25.2	38.7	53.9	27.7	30.8	36.0	33.2
G.935N	16.1	42.6	63.0	36.7	35.0	46.0	58.4
G.935TC	20.5	37.0	81.8	31.4	30.0	42.9	64.1
CG.2034	---	18.3	22.1	16.3	16.0	14.8	30.8
CG.3001	---	72.5	65.1	55.3	48.9	41.7	76.5
CG.4003	14.3	14.8	31.5	20.0	21.9	20.1	27.8
CG.4004	19.4	71.5	57.4	41.4	45.6	---	83.8
CG.4013	---	---	44.1	35.4	16.1	33.8	40.3
CG.4214	11.1	31.5	48.4	22.4	23.3	22.0	36.7
CG.4814	11.5	41.1	65.2	54.7	32.3	42.5	45.3
CG.5087	12.5	27.6	45.9	7.3	---	---	50.0
CG.5222	25.3	68.8	73.7	49.6	46.1	50.1	64.6
Supp.3	19.7	29.9	45.1	36.7	26.4	39.8	49.5
PiAu 9-90	53.4	49.4	137.3	115.5	16.3	59.6	130.0
PiAu 51-11	25.7	71.3	106.2	103.3	58.8	100.9	103.8
M.9 NAKBT337	13.7	33.4	57.0	32.6	31.1	44.7	43.2
M.9 Pajam 2	14.4	47.2	62.6	27.7	36.8	47.6	57.0
M.26 EMLA	25.1	67.5	93.4	64.4	59.5	74.2	77.8
Estimated HSD	17.2	29.7	49.3	40.9	19.3	30.1	32.0

<sup>2</sup>Mean separation in columns by Tukey's HSD ( $P = 0.05$ ). HSD was calculated based on the average number of observations per mean.

Table 5. Cumulative yield per tree (2011-17, kg) of Fuji apple trees at individual planting locations in the 2010 NC-140 Fuji Rootstock Trial. All values are least-squares means, adjusted for missing subclasses.<sup>z</sup>

Rootstock	CH	ID	KY	NC	NY	PA	UT
B.9	16.4	128.0	33.7	30.0	55.3	46.1	47.3
B.10	26.3	151.9	71.9	51.4	108.1	88.6	85.5
B.7-3-150	37.6	163.7	80.0	55.0	144.1	103.8	100.8
B.7-20-21	2.0	6.5	14.2	7.2	8.8	2.7	12.3
B.64-194	27.2	179.3	63.4	57.3	125.0	109.6	105.7
B.67-5-32	26.4	183.0	68.6	64.3	117.1	123.4	107.6
B.70-6-8	33.1	184.5	66.2	63.7	142.8	127.6	106.2
B.71-7-22	8.9	45.7	21.4	17.9	41.1	20.7	32.8
G.11	37.0	156.6	68.7	72.7	126.5	111.3	101.6
G.41N	---	252.1	76.2	75.3	119.5	98.8	90.1
G.41TC	28.2	191.2	76.6	51.4	124.7	---	72.6
G.202N	36.7	188.0	78.9	79.2	144.5	177.6	90.8
G.202TC	34.3	154.2	78.1	61.5	119.0	81.8	76.0
G.935N	19.5	230.6	103.2	93.3	156.5	135.6	130.3
G.935TC	29.3	152.9	72.7	72.6	147.6	96.2	108.6
CG.2034	---	102.2	46.2	37.5	81.8	49.3	73.8
CG.3001	---	252.8	55.3	84.4	174.2	121.4	105.4
CG.4003	20.0	67.0	56.9	56.2	97.5	47.2	58.1
CG.4004	28.1	255.5	105.9	105.7	173.2	---	105.0
CG.4013	---	---	70.4	55.2	99.4	56.4	58.8
CG.4214	15.6	161.5	68.3	48.8	120.6	57.2	64.2
CG.4814	22.3	182.4	90.0	66.7	130.2	94.9	84.8
CG.5087	30.4	120.5	81.1	33.8	---	---	94.2
CG.5222	41.6	207.2	81.6	90.3	137.0	113.0	104.7
Supp.3	24.5	87.9	68.7	58.4	93.9	86.8	77.6
PiAu 9-90	22.2	71.3	63.3	39.0	42.1	71.1	91.2
PiAu 51-11	28.4	170.5	72.2	65.2	128.3	96.3	86.2
M.9 NAKBT337	16.0	149.7	71.4	75.4	123.0	112.7	82.8
M.9 Pajam 2	12.8	163.8	77.6	72.5	119.4	120.4	105.0
M.26 EMLA	30.6	182.1	71.4	83.9	126.8	125.0	101.9
Estimated HSD	16.6	79.8	45.3	47.1	47.9	82.4	47.6

<sup>z</sup>Mean separation in columns by Tukey's HSD ( $P = 0.05$ ). HSD was calculated based on the average number of observations per mean.

Table 6. Cumulative yield efficiency (2011-17, kg/cm<sup>2</sup> trunk cross-sectional area) of Fuji apple trees at individual planting locations in the 2010 NC-140 Fuji Rootstock Trial. All values are least-squares means, adjusted for missing subclasses.<sup>z</sup>

Rootstock	CH	ID	KY	NC	NY	PA	UT
B.9	1.54	4.90	2.10	2.78	4.25	2.07	2.13
B.10	1.16	3.80	1.55	1.67	4.38	1.83	1.91
B.7-3-150	1.07	2.99	0.72	0.73	2.24	1.11	1.07
B.7-20-21	0.58	1.26	0.85	1.61	2.48	0.79	1.03
B.64-194	0.81	2.23	0.61	0.70	2.42	1.22	1.15
B.67-5-32	1.11	2.29	0.77	0.80	2.14	1.48	1.17
B.70-6-8	1.19	2.99	0.63	0.62	1.97	1.21	1.21
B.71-7-22	1.87	4.42	1.81	1.79	7.22	2.20	1.94
G.11	1.78	4.36	1.28	2.21	4.30	3.51	1.99
G.41N	---	3.42	2.09	1.92	3.26	1.20	1.79
G.41TC	1.09	3.76	1.75	1.43	3.29	---	1.47
G.202N	1.41	3.82	1.08	2.11	2.70	2.99	1.95
G.202TC	1.42	4.10	1.50	2.22	3.97	2.25	2.30
G.935N	1.27	5.53	1.69	2.64	4.67	3.11	2.23
G.935TC	1.42	3.94	0.97	2.39	4.99	2.18	1.78
CG.2034	---	5.51	1.63	1.98	4.94	2.78	2.46
CG.3001	---	3.53	0.88	1.52	3.68	3.06	1.37
CG.4003	1.60	4.40	1.80	2.72	4.51	2.14	2.12
CG.4004	1.43	3.63	1.86	2.56	3.85	---	1.23
CG.4013	---	---	1.55	1.82	6.24	1.65	1.43
CG.4214	1.47	5.06	1.37	2.21	5.31	2.67	1.89
CG.4814	2.02	4.41	1.40	1.25	3.99	2.11	2.01
CG.5087	2.68	4.34	1.76	2.86	---	---	1.86
CG.5222	1.67	3.00	1.14	1.83	3.01	2.24	1.71
Supp.3	1.31	2.97	1.48	1.59	3.40	2.11	1.58
PiAu 9-90	0.39	1.39	0.61	0.47	2.57	1.04	0.73
PiAu 51-11	1.14	2.39	0.75	0.75	2.21	0.95	0.85
M.9 NAKBT337	1.13	4.52	1.55	2.41	4.12	2.57	1.84
M.9 Pajam 2	0.86	3.50	1.37	2.39	3.28	2.52	1.89
M.26 EMLA	1.23	2.79	0.78	1.32	2.18	1.70	1.32
Estimated HSD	0.85	1.64	1.07	1.20	2.25	1.44	0.73

<sup>z</sup>Mean separation in columns by Tukey's HSD ( $P = 0.05$ ). HSD was calculated based on the average number of observations per mean.

Table 7. Average fruit size (2011-17, g) of Fuji apple trees at individual planting locations in the 2010 NC-140 Fuji Rootstock Trial. All values are least-squares means, adjusted for missing subclasses.<sup>z</sup>

Rootstock	CH	ID	KY	NC	NY	PA	UT
B.9	148	208	130	181	148	194	168
B.10	136	223	168	213	179	223	211
B.7-3-150	127	228	167	201	191	223	212
B.7-20-21	146	100	128	142	98	89	181
B.64-194	131	241	170	207	199	216	222
B.67-5-32	139	245	166	203	175	215	211
B.70-6-8	129	230	169	202	179	219	214
B.71-7-22	153	173	163	176	158	183	203
G.11	129	236	168	226	177	209	220
G.41N	---	294	155	216	178	218	213
G.41TC	135	243	160	233	182	---	209
G.202N	124	241	164	202	167	211	209
G.202TC	129	202	153	194	170	191	179
G.935N	145	235	167	210	170	216	208
G.935TC	139	210	181	221	177	213	211
CG.2034	---	210	158	208	164	194	205
CG.3001	---	270	171	205	176	224	211
CG.4003	144	148	144	191	157	151	172
CG.4004	128	277	172	202	186	---	231
CG.4013	---	---	154	186	283	195	194
CG.4214	139	221	164	211	171	184	201
CG.4814	158	221	152	201	171	200	192
CG.5087	137	271	164	196	---	---	191
CG.5222	122	267	159	204	177	205	200
Supp.3	130	212	145	175	136	155	202
PiAu 9-90	123	211	163	179	125	187	224
PiAu 51-11	130	265	167	199	199	236	241
M.9 NAKBT337	142	222	168	214	176	219	198
M.9 Pajam 2	135	240	155	190	177	207	215
M.26 EMLA	125	253	184	210	182	227	219
Estimated HSD	28	59	34	35	53	38	43

<sup>z</sup>Mean separation in columns by Tukey's HSD ( $P = 0.05$ ). HSD was calculated based on the average number of observations per mean.

Table 8. Rootstocks were distributed among seven vigor classes. Distribution among categories were made relative to the trunk cross-sectional area of trees on M.9 NAKBT337: 0-40% sub-dwarf, 40-80% small dwarf, 80-110% moderate dwarf, 110-130% large dwarf, 130-150% small semi-dwarf, 150-200% moderate semidwarf, and 200+% large semidwarf. Within class, rootstocks are ordered highest to lowest based on cumulative (2011-17) yield efficiency. These 2010 NC-140 Fuji Apple Rootstock Trial data are from ID, KY, NC, NY, and UT. All values are least-squares means, adjusted for missing subclasses.<sup>2</sup>

Vigor class	Rootstock	Trunk cross-sectional area (2017, cm <sup>2</sup> )	Cumulative yield efficiency (2011-17, kg/cm <sup>2</sup> TCA)
Large semi-dwarf	B.7-3-150	83.0	1.55
	B.70-6-8	88.3	1.48
	B.67-5-32	82.3	1.43
	B.64-194	84.9	1.42
	PiAu 51-11	88.7	1.39
	PiAu 9-90	89.7	1.16
Moderate semi-dwarf	CG.4004	59.9	2.63
	CG.3001	63.7	2.20
	CG.5222	60.6	2.14
	M.26 EMLA	72.5	1.68
Small semi-dwarf	G.202N	54.8	2.33
Large dwarf	G.935N	47.2	3.35
	G.935TC	48.9	2.81
	CG.4814	47.7	2.61
	G.41N	48.1	2.49
	M.9 Pajam 2	46.2	2.48
Moderate dwarf	CG.4214	32.5	3.17
	M.9 NAKBT337	39.4	2.89
	G.11	41.5	2.83
	G.202TC	36.9	2.82
	B.10	37.6	2.66
	G.41TC	42.9	2.33
	Supp.3	37.6	2.20
Small dwarf	CG.2034	20.7	3.30
	B.9	17.9	3.23
	CG.4003	23.2	3.11
Sub-dwarf	B.71-7-22	11.0	3.44
	B.7-20-21	7.9	1.45
Estimated HSD		14.6	0.63

<sup>2</sup>Mean separation in columns by Tukey's HSD ( $P = 0.05$ ). HSD was calculated based on the average number of observations per mean.



