

ANNUAL REPORT TO NC-140

2015 Organic Apple Rootstock Trial

November, 2016 -- University Park, PA

Wesley R. Autio



This year was the second season of the 2015 NC-140 Organic Apple Rootstock Trials.

I hope that tree management was reasonably easy. Data collection should have occurred per the protocol distributed last November. For submission of those data, **everyone is encouraged to review their data and make sure that all measurements are the unit requested. Further, include only those data requested in the protocol, with the same columns in the spreadsheet, and in the same order.** All data should be submitted in the format and units requested and by the submission deadline.

The data to be submitted and the format of the data submission are presented in the Data Submission Protocol on Page 3. Submit these data in Excel spreadsheet format, using the rootstock codes described in the protocol, by **January 15, 2017.**

In 2017, follow the Pruning and Training Plan (Page 2) and the Trial Protocol for 2017 (Page 2).

To avoid problems during the compilation of the data, please pay particular attention to the following points:

1. Submit **only the data requested.**
2. Use the **correct units.**
3. **Columns must be consistent with the protocol.**
3. **Make sure that all data make sense -- proofread your data set.**
4. For rootstock and replication designations, **follow the protocol exactly -- rootstock names should appear as they are listed in the Data Submission Protocol (Page 3) -- please note that there are no spaces in any of these names.**

Rootstocks, cultivars, and locations involved in the 2015 NC-140 Organic Apple Rootstock Trial. Modi trees are spaced 1x3.5m, and all trees are trained to the Tall Spindle System. Each site includes 12 replications in a randomized, complete-block design, with a single tree of each rootstock treatment per replication. Liberty/G.935 is included as a pollinizer.

Rootstocks	Sites
G.11	CA
G.16	CO
G.30	IA
G.41	ID
G.202	MA
G.214	MI
G.222	NJ
G.890	NM
G.935	NS
G.969	NY - Ithaca
M.9 NAKBT337	NY - Geneva
	VT
	WI

Send 2015 data via email to Wes Autio (autio@umass.edu) by

January 15, 2017

Trial Protocol for 2017

Tree management.

- A. Trees must be supported and trained as Tall Spindles (see Pruning & Training Plan for the Tall Spindle System).
- B. Thin fruit as described in Pruning and Training Plan for the Tall Spindle System.
- B. Manage pests, nutrients, and water per local organic recommendations.

Collect the follow data for each tree in 2017.

- A. Root suckers: the number removed and counted, August.
- B. Yield: count all fruit per tree and weigh (to the nearest 0.1 kg).
- C. Trunk size: trunk circumference 30 cm above the graft union (mm), October.
- D. Status: 0=dead, 1=alive, and 2=missing data, October.

Pruning and Training Plan for the Tall Spindle System

<i>3rd Leaf</i>	Dormant	Do not head the leader. Using a bevel cut, remove any overly vigorous limbs that are more than ½ the diameter of the leader.
	Late May	Hand thin to appropriate levels to ensure regular annual cropping and adequate fruit size (target = 30-40 fruit per tree).
	June	Tie the developing leader to the support system with a permanent tie.
<i>4th Leaf</i>	Dormant	Do not head the leader. Using a bevel cut, remove any overly vigorous limbs that are more than ½ the diameter of the leader.
	Late May	Chemically thin with lime sulfur and fish oil, and then follow up with hand thinning to appropriate levels to ensure regular annual cropping and adequate fruit size (target = 80 fruit per tree).
	June	Tie the developing leader to the support system with a permanent tie.
<i>Mature Tree</i>	Dormant	<ol style="list-style-type: none"> 1. Limit tree height to 11.5' (3.6m) by annually cutting leader back to a weak fruitful side branch. 2. Annually, remove at least 2 limbs, including lower tier scaffolds, that are more than ¾" in diameter using a bevel cut. 3. Simplify each remaining branch on the tree so that it is columnar with no major side branches. 4. Shorten branches that extend into the row to facilitate movement of equipment and preserve fruit quality on the lower limbs.
	Late May	Chemically thin with 2 applications of lime sulfur and fish oil during bloom (30% and 60%), and then follow up with hand thinning to appropriate levels to ensure regular annual cropping and adequate fruit size (target = 120 fruit per tree).
	August	Lightly summer prune to encourage light penetration and maintain pyramidal tree shape.

Data Submission Protocol

Submit data via email (autio@umass.edu) by **January 15, 2017**.

STATE 2015 Organic Apple Rootstock Trial DATA FOR 2016

Location	ROOT	REP	2015 STATUS (see below)	Trunk circumference at planting (mm)	Side branches (>10cm) after pruning (no.)	Height of the graft union above the soil at planting (mm)	Fall trunk circumference 2015 (mm)	Comments regarding trees which died during 2015 (those with status = 0)	2016 STATUS	2016 Root	2016 Trunk circumference	2016 Yield	2016 Yield	Comments regarding trees which died during 2016 (those with status = 0)
									(0=dead, 1=alive, 2=missing data)	(no./ sucker)	(mm)	(no./ tree)	(kg/ tree)	
IA	G.11	1	1	X	X	X	X		1	X	X	X	X	
IA	G.11	2	0	X	X	X	.	fireblight	0	.	.	.	.
IA	G.11	3	1	X	X	X	X		1	X	X	X	X	
.	
.	
IA	M.9T337	10	1	X	X	X	X		0	.	.	.	.	fireblight
IA	M.9T337	11	3	X	X	X	.		3	.	.	.	.
IA	M.9T337	12	4	X	X	X	.		4	.	.	.	.

Special requirements for 2015 status assessment:

- 0 = died after it was clearly growing well
- 1 = alive
- 2 = considered to be a non-data tree because of human error (like tractor blight)
- 3 = planted but broke at the union before it was fully supported
- 4 = leafed out but quickly shut down
- 5 = never leafed out and began to grow

Status assessment for 2016 and later years:

- 0 = died during the season
- 1 = alive
- 2 = considered to be a non-data tree because of human error

When a data point is missing, insert a period in that cell, but do not replace zeros with periods.

REQUIRED DATA FORMAT: Excel

Appropriate Rootstock Codes: (do not include spaces in the rootstock name)

G.11	G.41	G.222	G.969
G.16	G.202	G.890	M.9T337
G.30	G.214	G.935	

Table 1. At-planting characteristics and fall trunk cross-sectional area of Modi trees in the 2015 NC-140 Organic Apple Rootstock Trial. Only data from MA, MI, NJ, NY (Geneva), NY (Ithaca), VT, and WI were used for these analyses. All data are least-squares means adjusted for missing subclasses.

Rootstock	Trunk cross-sectional area at planting (cm ²)	Branches at planting after initial pruning (no.)	Graft union height (cm)	Trunk cross-sectional area (2015, cm ²)
G.11	1.5	1.4	13.2	2.0
G.16	0.1	0.0	14.0	0.5
G.30	1.3	0.8	12.5	1.9
G.41	1.8	1.1	13.5	2.6
G.202	1.8	1.3	13.8	2.5
G.214	1.0	0.3	12.9	1.4
G.222	0.2	0.1	13.5	0.6
G.890	2.0	1.5	12.9	3.0
G.935	1.7	1.1	13.5	2.3
G.969	1.3	0.5	12.6	1.8
M.9 NAKBT337	1.3	1.0	12.3	1.9
HSD	0.1	0.5	1.5	0.2

Mean separation within columns by Tukey's HSD ($P = 0.05$).

Table 2. At-planting characteristics and fall trunk cross-sectional area by planting location of Modi trees in the 2015 NC-140 Organic Apple Rootstock Trial. All data are least-squares means adjusted for missing subclasses.

Rootstock	MA	MI	NJ	NY Geneva	NY Ithaca	VT	WI
Trunk cross-sectional area at planting (cm²)							
G.11	1.3	1.3	1.6	1.6	1.4	1.6	1.4
G.16	0.2	0.2	0.2	0.2	0.3	0.3	0.4
G.30	0.9	1.3	1.5	2.1	1.1	1.0	1.2
G.41	1.9	1.4	1.6	2.1	1.8	1.9	2.0
G.202	1.9	2.0	1.7	1.6	1.6	1.9	1.9
G.214	1.0	0.7	0.9	0.9	1.0	1.1	1.0
G.222	0.4	0.1	0.2	0.2	0.3	0.3	0.4
G.890	2.1	1.7	1.8	2.1	2.0	2.1	2.0
G.935	1.7	1.5	1.7	1.9	1.8	1.8	1.3
G.969	1.4	0.9	1.3	1.5	1.2	1.3	1.3
M.9 NAKBT33;	1.5	1.3	1.5	1.2	1.1	1.3	1.0
HSD	0.3	0.2	0.3	1.0	0.3	1.4	0.3
Branches per tree at planting after initial pruning (no.)							
G.11	0.0	1.1	6.3	---	0.3	0.3	0.4
G.16	0.0	0.0	0.0	---	0.0	0.0	0.0
G.30	0.0	0.1	4.2	---	0.0	0.0	0.3
G.41	0.0	0.1	5.2	---	0.5	0.4	0.4
G.202	0.0	0.4	6.1	---	0.0	0.3	0.8
G.214	0.0	0.2	1.6	---	0.1	0.1	0.1
G.222	0.0	0.0	1.0	---	0.1	0.0	0.0
G.890	0.0	0.7	6.0	---	1.0	0.7	0.5
G.935	0.0	0.3	5.5	---	0.3	0.4	0.1
G.969	0.0	0.0	3.0	---	0.0	0.0	0.0
M.9 NAKBT33;	0.0	0.7	4.6	---	0.5	0.3	0.0
HSD	---	0.8	2.4	---	0.9	0.8	0.8
Graft union height (cm)							
G.11	10.8	7.7	14.6	---	16.7	10.6	19.1
G.16	14.5	9.0	20.8	---	7.5	11.8	20.5
G.30	10.7	6.8	13.6	---	14.7	9.3	19.8
G.41	11.2	7.3	13.4	---	19.0	9.9	20.1
G.202	9.9	8.8	14.3	---	20.7	9.6	19.8
G.214	11.7	7.2	13.9	---	15.0	10.7	19.3
G.222	15.6	8.5	15.7	---	7.7	11.6	21.9
G.890	9.2	6.3	12.6	---	20.8	10.1	18.5
G.935	10.0	6.7	13.2	---	20.5	10.5	20.3
G.969	9.1	7.1	14.3	---	14.9	9.9	20.1
M.9 NAKBT33;	9.9	7.1	14.1	---	14.3	9.4	19.2
HSD	3.9	3.4	5.5	---	2.8	2.6	3.6
Trunk cross-sectional area in October (cm²)							
G.11	1.7	1.8	1.9	1.6	1.8	2.2	3.0
G.16	0.5	0.5	0.2	0.3	0.4	0.5	1.1
G.30	1.4	1.9	1.9	2.3	1.5	1.7	2.5
G.41	2.6	2.3	2.3	2.0	2.5	2.8	3.9
G.202	2.5	2.6	2.1	1.9	2.2	2.5	3.8
G.214	1.5	1.0	1.1	1.1	1.3	1.7	2.0
G.222	0.8	0.4	0.6	0.4	0.4	0.7	1.2
G.890	2.8	3.1	2.4	2.5	2.6	3.0	4.4
G.935	2.1	2.1	2.2	2.0	2.4	2.6	2.7
G.969	1.8	1.3	1.6	1.6	1.6	1.8	2.7
M.9 NAKBT33;	2.0	1.8	2.0	1.4	1.6	2.0	2.4
HSD	0.4	0.5	0.6	0.3	0.5	0.5	0.7

Mean separation within column and parameter by Tukey's HSD ($P = 0.05$).