ANNUAL REPORT TO NC-140

2002 Apple Rootstock Trial

November, 2004 -- Byron, GA

Wesley R. Autio

Data Collection & Transmission

Data were submitted for 9 out of 11 sites this year (Table 1). All were sent via email, and all were translated easily. There are increasing numbers of problems, however, with the format of the data. All cooperators are strongly encouraged to follow the printed protocol for data format and submission (Table 3). See below for additional information on submission of 2004 data. Characteristics of this trial are given in Table 2.

Data submitted for 2004 should include the number of flower clusters per tree, the number of root sucker per tree, trunk circumference in October, and tree status in October. Please see Table 3 for the protocol for data submission. Record all data as described in this table, and send it to Wes Autio on disk or via email (preferred) in spreadsheet format by January 15, 2004. To avoid problems during the compilation of the data, please pay paticular attention to the following points:

Table 1. Cooperating sites in the 2002 NC-140 Apple Rootstock Trial.

Arkansas
British Columbia
Chihuahua
Illinois
Indiana
Kentucky
Massachusetts
Michigan
New Jersey
New York – no 2003 data submitted
Ohio – no 2003 data submitted

1. ***Collect the data requested. <u>Additional data should not be submitted.</u>***
2. ***<u>Use the correct units.</u>***
3. ***Makes sure that all data make sense. <u>Proofread your data set.</u>***
4. ***For rootstock and replication designations, follow the protocol exactly. <u>Rootstock names should appear as they are listed in the protocol</u> (the bottom of Table 3). Please note that there are no spaces in these names.***

Table 2. Characteristics of the 2002 NC-140 Apple Rootstock Trial. All trees are spaced 2.5 x 4.5m, supported, and trained to a vertical axis system.

Rootstock	Number of sites
B.9 Europe	11
B.9 Treco	11
CG.3007	2
CG.3041	2
CG.5935	2
G.11	1
JM.1	3
JM.2	3
JM.7	3
M.9 Burgmer 756	10
M.9 Nic 29	10
M.9 NAKBT337	11
M.26 EMLA	10
M.26 NAKB	10
PiAu 36-2	1
PiAu 51-4	5
PiAu 51-11	5
PiAu 56-83	1
P.14	11
Supporter 4	10

For 2005, please follow the protocol on page 2 for tree management and data collection.

Send 2004 data via email by January 15, 2005 to:

Wesley R. Autio (autio@pssci.umass.edu)

Protocol for 2005

Tree management.

A. Trees must be supported and trained as vertical axes.
B. Hand thin fruit as necessary.
C. Manage pests, nutrients, and water per local recommendations. Pay attention to weed control in this trial.

Collect the follow data for each tree in 2005.

A. Bloom: the number of flower clusters per tree.
B. Root suckers: the number removed and counted, August.
C. Yield: weight (0.1 kg) of all fruit per tree at harvest.
D. Fruit weight: estimate average fruit weight (g) with a sample of at least 50 fruit (if available).
E. Tree size: trunk circumference 25 cm above the graft union (mm), October.
F. Status: 0=dead, 1=alive, and 2=missing data, October.

Table 3. Protocol for the submission of data collected in 2004. Submit data on disk (Wesley Autio, Department of Plant, Soil, & Insect Sciences, 205 Bowditch Hall, University of Massachusetts, Amherst, MA 01003-9294) or via email (preferred) (autio@pssci.umass.edu) by January 15, 2005.

STATE 2002 Apple Rootstock Trial DATA FOR 2004

ROOT	REP	STATUS 2=MISS DATA* 1=ALIVE 0=DEAD	NUMBER OF FLOWER CLUSTERS PER TREE	NUMBER OF ROOT SUCKERS	YIELD PER TREE (kg)	AVERAGE FRUIT WEIGHT (g)	FALL TRUNK CIRC (mm)
B.9Europe	1	X	X	X	X	X	X
B.9Europe	2	X	X	X	X	X	X
B.9Europe	3	X	X	X	X	X	X
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
Supp.4	4	X	X	X	X	X	X
Supp.4	5	X	X	X	X	X	X
Supp.4	6	X	X	X	X	X	X

* If the initial quality of a tree was very low and it should not be considered a data tree, record a 2 in this column. Do not record a 0 in this column unless the tree dies during the year. Once a data cell is recorded as 2 or 0, continue to record a 2 or 0, respectively, in the row for the remainder of the experiment.

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

REQUIRED DATA FORMAT: Lotus 1-2-3, Excel, or Quatro Pro

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

B.9Europe	G.11	M.9Nic29	PiAu51-4
B.9Treco	JM.1	M.9T337	PiAu51-11
CG.3007	JM.2	M.26EMLA	PiAu56-83
CG.3041	JM.7	M.26NAKB	P.14
CG.5935	M.9B756	PiAu36-2	Supp.4

Table 4. Number of trees in 2003 distributed across rootstock and site in the 2002 NC-140 Apple Rootstock Trial. Framed area represents the consistent core of rootstocks and sites. These (except for NY) were used for the overall analyses presented in this report.

Rootstock	AR	BC	IL	IN	KY	MA	MI	NJ	NY	MX	OH
B.9 Europe	6	7	7	7	7	7	7	7	7	6	6
B.9 Treco	7	7	7	7	7	7	7	7	7	5	7
M.9 Burgmer 756	7	7	7	7	6	7	7	7	7	4	
M.9 Nic 29	6	7	7	7	7	7	7	7	7	6	
M.9 NAKBT337	7	6	7	7	7	7	7	7	7	5	6
M.26 EMLA	7	6	7	7	6	6	7	7	7	4	
M.26 NAKB	7	6	7	7	7	7	7	7	7	5	
P.14	7	4	7	7	7	7	7	7	7		7
Supporter 4	4	5	7	7	7	7	7	7	7	2	
CG.3007									7	3	
CG.3041									7	4	
CG.5935									5	6	
G.11										5	
JM.1		2							6		5
JM.2		4							6		7
JM.7		3							6		6
PiAu 36-2									2		
PiAu 51-4				6		6	6	6	4		
PiAu 51-11				5		5	6	6	6		
PiAu 56-83									6		

Table 5. **Trunk cross-sectional area** (cm^2) of trees at the end of the 2003 growing season in the 2002 NC-140 Apple Rootstock Trial. All values are least-squares means, adjusted for missing observations.[z]

Rootstock	AR	BC	IL	KY	MA	MI	NJ	MX	Mean[y]
B.9 Europe	6.2 b	5.7 bc	4.6 b	6.2 c	3.8 b	5.9 d	6.4 f	5.8 ab	5.6 f
B.9 Treco	6.9 ab	5.9 bc	5.2 b	7.9 bc	4.0 b	6.5 cd	7.9 ef	7.2 ab	6.3 ef
M.9 Burgmer 756	8.1 ab	5.0 c	5.1 b	8.5 bc	4.5 ab	6.4 cd	9.2 de	8.2 ab	6.7 de
M.9 Nic 29	9.2 a	7.0 bc	6.2 ab	8.8 bc	4.6 ab	8.4 bcd	9.6 cde	6.5 ab	7.7 bc
M.9 NAKBT337	7.6 ab	5.8 bc	4.6 b	9.0 bc	3.5 b	6.6 cd	8.4 ef	5.0 b	6.5 e
M.26 EMLA	8.6 ab	7.9 ab	6.4 ab	12.1 a	5.4 ab	8.7 bc	10.0 bcde	9.2 ab	8.4 ab
M.26 NAKB	8.0 ab	7.5 ab	8.0 a	12.2 a	6.5 a	10.5 ab	11.5 abc	9.2 ab	9.2 a
P.14	7.7 ab	7.4 abc	6.4 ab	12.4 a	4.5 ab	8.5 bcd	12.2 ab		8.4 ab
Supporter 4	7.0 ab	6.4 bc	5.5 ab	9.9 ab	3.8 b	8.8 bc	10.7 bcd	9.7 ab	7.4 cd
CG.3007								10.3 a	
CG.3041								6.5 ab	
CG.5935								5.2 b	
G.11								7.8 ab	
JM.1		4.8 c							
JM.2		9.7 a							
JM.7		4.7 c							
PiAu 51-4					5.7 ab	11.6 a	13.8 a		
PiAu 51-11					3.5 b	7.5 cd	9.4 cde		
Mean[y]	7.7 bc	6.5 cd	5.8 d	9.7 a	4.5 e	7.8 b	9.5 a		

[z]Mean separation among rootstock means, among site means, and among rootstock means within site by Tukey's HSD ($P = 0.05$).

[y]Row means were calculated for sites to the left of the vertical dotted line, and column means were calculated for rootstocks above the dotted horizontal line. The interaction of rootstock and site (to the left of the vertical line and above the horizontal line) was significant.

Location, Rootstocks, and Tree Numbers

The 2002 NC-140 Apple Rootstock Trial includes 20 rootstocks and 11 sites. Nine of the rootstocks are planted at 9 sites, forming the core of the trial and a complete matrix of data (Table 4). Additional rootstocks occur at 8 sites (MX and OH have only partial sets of rootstocks). Trunk cross-sectional area, bloom, and root suckering were analyzed for 2003. The overall analysis included only the core data, and additional analyses were performed on all rootstocks by site.

Overall Rootstock Effects

This report presents data from the 2003 (second) growing season of this trial. Over all sites in the core data set, rootstock significantly affected trunk cross-sectional area after two season (Table 5). Specifically, across the core sites, M.26 NAKB resulted in the largest trees, followed by M.26 EMLA and P.14. The smallest trees were on B.9 Europe, B.9 Treco, M.9 NAKBT337, and M.9 Burgmer 756.

After two seasons, M.26 NAKB and M.26 EMLA resulted in similar TCA, and B.9 Europe and B.9 Treco resulted in similar TCA. Of the M.9 strains, trees on M.9 Nic 29 were significantly larger than those on either M.9 NAKBT337 or M.9 Burgmer 756.

Cumulative root suckering (2002-03) was affected by rootstock only in IL (Table 6), where Supporter 4 resulted in greater root suckering than did B.9 Treco, M.9 Burgmer 756, M.9 Nic 29, M.26 EMLA, M.26 NAKB, or P.14. This difference, however, was inconsequential. No rootstock in this trial is as yet demonstrating any trend toward significant root suckering.

Bloom density in 2003 was assessed in only three

Table 6. **Cumulative root suckering** (number per tree, 2002-03) of trees in the 2002 NC-140 Apple Rootstock Trial. All values are least-squares means, adjusted for missing observations.[z]

Rootstock	AR	BC	IL	KY	MA	NJ	MX	Mean[y]
B.9 Europe	0.7 a	0.3 a	0.6 ab	0.9 a	0.0 a	1.3 a	0.2 a	0.6 a
B.9 Treco	1.3 a	0.0 a	0.0 b	0.0 a	0.0 a	0.0 a	0.0 a	0.2 a
M.9 Burgmer 756	1.0 a	0.3 a	0.0 b	0.2 a	0.1 a	0.1 a	1.0 a	0.3 a
M.9 Nic 29	0.0 a	1.9 a	0.0 b	2.1 a	1.0 a	0.3 a	0.8 a	0.9 a
M.9 NAKBT337	0.6 a	0.7 a	0.4 ab	0.4 a	0.0 a	0.0 a	0.0 a	0.4 a
M.26 EMLA	0.6 a	0.0 a	0.0 b	0.4 a	0.0 a	0.0 a	0.5 a	0.2 a
M.26 NAKB	0.6 a	0.0 a	0.0 b	0.1 a	0.0 a	0.1 a	0.5 a	0.1 a
P.14	2.1 a	0.0 a	0.0 b	0.0 a	0.1 a	0.0 a		0.4 a
Supporter 4	1.0 a	0.0 a	1.3 a	1.3 a	0.0 a	1.0 a	0.0 a	0.8 a
CG.3007							0.0 a	
CG.3041							0.0 a	
CG.5935							0.0 a	
G.11							0.0 a	
JM.1		0.5 a						
JM.2		0.0 a						
JM.7		0.0 a						
PiAu 51-4					0.0 a	0.0 a		
PiAu 51-11					0.2 a	0.2 a		
Mean[y]	0.9 a	0.3 ab	0.3 ab	0.6 ab	0.1 b	0.3 ab		

[z]Mean separation among rootstock means, among site means, and among rootstock means within site by Tukey's HSD ($P = 0.05$).

[y]Row means were calculated for sites to the left of the vertical dotted line, and column means were calculated for rootstocks above the dotted horizontal line. The interaction of rootstock and site (to the left of the vertical line and above the horizontal line) was nonsignificant.

locations, two of which were part of the core trial. Overall, B.9 Europe resulted in greater bloom density than did M.9 Burgmer 756, M.9 Nic 29, M.26 EMLA, P.14, or Supporter 4. Among the extra rootstocks, JM.7 resulted in the greatest bloom density in BC. Bloom density did not differ among rootstocks in MX.

Table 7. **Bloom density** (number per cm^2 trunk cross-sectional area) in 2003 of trees in the 2002 NC-140 Apple Rootstock Trial. All values are least-squares means, adjusted for missing observations.[z]

Rootstock	BC	KY	MX	Mean[y]
B.9 Europe	6.0 ab	10.9 a	1.9 a	8.4 a
B.9 Treco	2.6 ab	7.7 ab	2.5 a	5.1 ab
M.9 Burgmer 756	1.5 b	4.5 b	0.9 a	3.0 b
M.9 Nic 29	2.1 ab	6.5 ab	1.6 a	4.3 b
M.9 NAKBT337	3.3 ab	6.4 ab	1.6 a	4.8 ab
M.26 EMLA	0.8 b	7.2 ab	0.8 a	4.0 b
M.26 NAKB	1.9 ab	7.9 ab	1.4 a	4.9 ab
P.14	0.4 b	2.1 b		1.3 b
Supporter 4	1.6 ab	4.4 b	0.0 a	3.0 b
CG.3007			1.1 a	
CG.3041			0.6 a	
CG.5935			2.0 a	
G.11			0.2 a	
JM.1	3.2 ab			
JM.2	1.6 ab			
JM.7	6.6 a			
Mean[y]	2.2 b	6.4 a		

[z]Mean separation among rootstock means, among site means, and among rootstock means within site by Tukey's HSD ($P = 0.05$).

[y]Row means were calculated for sites to the left of the vertical dotted line, and column means were calculated for rootstocks above the dotted horizontal line. The interaction of rootstock and site (to the left of the vertical line and above the horizontal line) was nonsignificant.