

Minutes of Annual Meeting – NC-140, 2003

Project Number: NC-140

Project Title: Rootstock and interstem effects on pome and stone fruit trees

Period Covered: October 1, 2002 – September 30, 2003.

Date: November 10, 2003, Atlantic Food and Horticulture Research Centre,
Kentville, Nova Scotia, Canada

Presiding: Dr. Wes Autio, University of Massachusetts.

Meeting convened 8.00 am, November 7, 2003.

Meeting host Charlie Embree welcomed the group to Nova Scotia and introduced Dr. Roy Bush, acting director of the Atlantic Food and Horticulture Research Centre.

The minutes from last years meeting had previously been approved electronically and there was no further discussion of the minutes.

Future meeting sites

2004: Georgia, Kathy Taylor, host and chair

2005: Indiana, Peter Hirst, host and chair

2006: New Jersey, Win Cowgill, host and chair

Report from Administrative Advisor

Dr. Gray complimented the group on the high level of attendance at the meeting and also complimented Wes Autio for his fine job in preparing an impact statement for the group. NC-140 was chosen as a representative multi-state research group to be asked to prepare a statement of the impact of agricultural research and extension, and the statement Wes prepared was chosen as a model for the other 9 groups selected. We are in the second year of a 5 year period and next year we will be up for our mid-term review. Dr. Gray suggested this should be straight forward and the impact statement would help with this process. Both the meeting minutes and annual report are due within 60 days of the meeting and both have a 3 page limit. Ian also reported on the state of federal funding and NRI.

Reports on Current Plantings

1988 Pear Planting

Gene Mielke is sorting through the data but has incomplete data from some sites. He asked that cooperators send in all data. Data from WA and MEX appear to be missing.

1990/91 Plum Planting

Joe Masabni distributed a report presenting data summaries. He has only partial data from some sites. Data from 1990 and 1991 plantings will be reported in separate papers.

1994 Gala Dwarf and Semi-dwarf Plantings

Rich Marini appealed for data to be submitted in the correct format. 2003 is the last year for data collection. Height and spread measurements to be collected, in addition to

burrknot data. Rich will send out a protocol for burrknot measurements. Weather data is no longer being collected since there was no clear direction on the usefulness of these data. With the conclusion of the collection of coordinated data, trees can now be used for other purposes. Other studies suggested were: G.30 graft union strength (Robinson), blackheart injury (Domoto), and rootstock effects on fruit size (Hirst). Protocols to be posted on the website and/or listserv and those interested in participating to contact coordinator.

A discussion of which probability level is most appropriate ensued. A motion that $p=0.10$ should be used in all future NC-140 publications was passed unanimously.

1994 Peach Planting

Greg Reighard has prepared a draft paper and circulated this to cooperators. This will be published in the journal of APS and Greg hopes to have it submitted by December. Crassweller said that APS will send out bills for page charges pro-rated for each cooperating state.

1998 Apple Planting

Terence Robinson handed out a pruning/training protocol, which also included instructions for thinning. He asked that cooperators send in previous years' data.

1999 Apple Planting

Wes Autio handed out a summary of the data and a protocol for data collection and submission. Wes is preparing a 5 year summary and asked for complete data to be submitted. Height and spread to be measured after the 2003 growing season.

2001 Peach Planting

Greg Reighard appealed for complete data submission.

2002 Peach Planting

Scott Johnson reported on 2 plantings, one rootstock and one physiology (study of fruit size potential and harvest date prediction). Same protocol as for the 2001 peach planting.

2002 Apple Planting

Coordinator Wes Autio distributed a report on this planting. In 2004, bloom data is to be collected. A discussion of tree status followed. It was agreed that 0=dead (due to "treatment" effects, that is, rootstock related), 1=alive, 2=dead or missing, not treatment related (eg, missing from start, tractor).

2002 Pear Planting

Gene Mielke said that his report on this planting is included in his state report.

2003 Apple Planting

Rich Marini handed out a protocol, which will also be posted on the website. Tree shipping costs exceeded IDFTA grant by \$2000. T. Robinson will request additional

funding from IDFTA and if this is not successful he will send pro-rated invoices to cooperators.

Planning Committee Reports

Apple: Planning has begun for a 2007 planting with approximately 15 rootstocks. The possibility of a planting to examine rootstock performance in replant sites was discussed.

Cherry: Coordinators not present. Ron Perry offered to ask Greg Lang to assemble information on rootstocks that should be tested.

Peach: Greg Reighard mentioned new peach rootstocks that haven't been widely tested. No new planting planned immediately.

Pear: Gene Mielke reported that the 2002 planting is in, and 2005 and 2006 plantings are planned.

Plum: Jay Freer reported that a cultivar rootstock trial was planted at Cornell only in 2002. No plantings planned.

Publications

Presentation of NC-140 work at the ISHS rootstock meeting (Budapest, Hungary, June 2004) was discussed. Possible presentations are 1994 peach (Reighard), 1999 apple (Autio), 1994 apple (Ferree or Hirst).

Publications being prepared are:

- Masabni – 1990 and 1991 plum
- Reighard 1994 peach
- Robinson and Cowgill – summary paper of recent results for J. APS.
- Marini 1994 apple (dwarf and semi-dwarf)

Appendix I

In attendance:

W. Autio	Univ. Massachusetts	P. Hirst	Purdue Univ.
D. Bedford	Univ. Minnesota	S. Johnson	U.C. Davis
R. Belding	Rutgers Univ.	S. Khanizadeh	Ag. Canada, Quebec
J. Clements	Univ. Massachusetts	K. Kosola	Univ. Wisconsin
J. Cline	Univ. Guelph	M. Kushad	Univ. Illinois
W. Cowgill	Rutgers Univ.	T. Lindstrom	Utah State Univ.
R. Crassweller	Pennsylvania State Univ.	R. Marini	Virginia Tech.
P. Domoto	Iowa State Univ.	R. Moran	Univ. Maine
C. Embree	Ag. Canada, Nova Scotia	J. Masabni	Univ. Kentucky
G. Fazio	Cornell Univ.	E. Mielke	Oregon State Univ.
D. Ferree	Ohio State Univ.	M. Newell	Univ. Maryland
J. Freer	Cornell Univ.	M. Parker	N.C. State Univ.
K. Fuller	Ag. Canada, Nova Scotia	R. Perry	Michigan State Univ.
E. Garcia	Univ. Vermont	J. Prive	AAFC, New Brunswick
R. Godin	Colorado State Univ.	G. Reighard	Clemson Univ.
I. Gray	Michigan State Univ.	T. Robinson	Cornell Univ.
G. Greene	Pennsylvania State Univ.	K. Taylor	Univ. Georgia
C. Hampson	Ag. Canada, BC.		

Appendix II

State/province reports

British Columbia

- Nearly all of the subclones of M9 resemble the M9 EMLA standard in performance, but the most vigorous subclones produce significantly larger trees than the least vigorous ones. I.e. the M9EMLA is in the middle of the pack. Pajam 2 is slightly more vigorous than M9EMLA but is similar in other respects. Any would be a good choice for BC producers.
- Rootstocks in the M27EMLA size range are not vigorous enough for optimum production in this region, and their fruit size tends to be small.
- Mark rootstock has runted out and has small fruit size even when crop loads are similar. Mark does not appear to be a good rootstock in coarse-textured soil even if the plot is irrigated, as it is here. This “runting out” did not appear until the second half of the trial, which argues for keeping trials in for longer than 5 years.
- V1 is not a dwarf rootstock in our conditions.
- G30 is larger than M.26EMLA but is a good performer
- Scions on G16 in the Summerland trial are much more vigorous than on M9EMLA but are similar in CYE and fruit size. Some trees on G16 are producing more suckers than is desirable. The G16s in this trial derived from tissue culture and may have been re-invigorated by the pass through tissue culture.

- It is too early for any conclusions from the 2002 or 2003 plantings.

Illinois: The apple growing season in Illinois was dismal. Cool and wet mid to late April, 2003 when Gala was in full bloom kept bees in their hives. Consequently fruit set was very poor. Trees on six of the sixteen rootstocks in the 1994 Gala on dwarf rootstocks trial produced less than one-half bushel per tree, while the most productive trees on Budagovsky-469 produced less than 1.5 bushels. Yield was not much better in the 1994 Gala on semi-dwarf trial. Yield was about 1.5 bushels per tree, except in Poland-1 which continued to lag far behind in yield. Fruit size was also small compared to previous years. Borers entry into the tree through burrknots resulted in girdling of two additional trees on Budagovsky 491. Clonal rootstocks prone to burrknot should be considered with caution especially in areas with heavy borers. Fireblight is another problem that has plagued the 1994 and 2003 trial. Attempts to control blight with antibiotics have produced minimal control. We suspect that a resistant strain of the bacterium is present in the orchard. Further evaluation of the 2002 Buckeye Gala on nine rootstocks for fireblight will be done 2004.

Indiana. 2003 presented a reasonable season with most trees growing well. This was the last year of data collection for the 1994 Gala planting – tree losses in the dwarf planting have been minimal but in the semi dwarf planting high losses were suffered on G.30 and M.26 rootstock. Data is no longer being collected from the 1999 planting due to excessive tree mortality at planting (low temperatures during shipping). Other plantings are young and are developing satisfactorily.

Iowa

- CG.156 and CG.202 rootstocks do not induce early acclimation.
- Rootstocks have segregated out into four size groups with no differences in production efficiency within the two larger groups. Within the moderately small group, P.16 has been the most yield efficient, and within the smallest group, B.491 has been the most yield efficient.
- Trees on CG.30 continue to be the most productive.
- P.1 is not a productive rootstock.
- JM.7 rootstock appears to have a low tolerance to wet soil conditions.

Kentucky. All of the NC-140 trials in Kentucky are located at the Research and Education Center in Princeton, KY. In the 1994 semi-dwarf apple planting, trees on CG.30 and V.605-2 are still the most productive ones in this planting. Kentucky also has the 1999 dwarf and semi-dwarf apple plantings. Among the dwarf rootstocks, trees on CG.4013 and CG.3041 have yielded the most fruit, while trees on G.30N have yielded the most fruit among the semi-dwarf trees. The 2002 apple rootstock planting consists of ‘Buckeye Gala’ on 9 rootstocks, including M.9, B.9, M.26, P.14, and Supporter 4. Trunk cross-sectional area is highest for M.26 followed by P.14. Except for one tree on M.9 Burg 756, all trees are alive and trunk cross-sectional area increased from 0.5 in² to 1.5 in² in one calendar year. Both an apple rootstock trial and a physiology trial were planted

in the spring of 2003. All trees in these two plantings are doing well with terminal buds growing about 1-3 ft in length.

Maine: Maine has three rootstock planting, 1) 1994 Gala Apple, 2) 1995 Cultivar /Rootstock, and 3) 2003 Golden Delicious. Data was collected according to protocol and will be submitted to the project coordinator. Growers prefer winter hardy, precocious rootstocks in the same size class as M26. Three rootstocks, V1, V2 and G30, in the 1994 planting with this size class had similar or greater productivity as M26.

Massachusetts: In 2003 in the 1994 NC-140 Dwarf Apple Trial, largest trees were on V.1 and M.26EMLA, and the smallest trees were on P.22. Cumulatively (1996-2003), the greatest yields came from trees on V.1, and the least came from trees on P.22. Cumulatively (1996-2003), the least efficient were on M.26EMLA. Average fruit weight (1996-2003) was greatest for trees on V.1 and M.26 EMLA and smallest for trees on P.22. Significant differences among the M.9 strains were noted with respects to tree vigor and root suckering, but all resulted in similar yield efficiency and fruit size. In 2003 in the 1998 NC-140 Apple trial, largest trees with the greatest cumulative yield (1999-2003) and smallest average fruit size (1999-2003) were on G.16. Efficiency was similar among trees on G.16, M.9, and M.9 EMLA. In the 1999 NC-140 Dwarf Apple Trial in 2003, largest trees were on CG.4013 and the smallest were on M.9 NAKBT337. Cumulative yield (2001-03) was greatest from trees on CG.4013 and smallest from trees on M.9 NAKBT337. Cumulative yield efficiency was least for trees on M.26 EMLA. Average fruit size (2001-03) was greatest for trees on M.9 NAKBT337 and least for trees on Supporter 2. In the 1999 NC-140 Semidwarf Apple Trial in 2003, largest trees were on G.30N and the smallest were on M.26 EMLA. Cumulative yield (2001-03) was greatest from trees on G.30N and smallest from trees on M.26 EMLA. Cumulative yield efficiency was greatest for trees on CG.4814. Average fruit size (2001-03) was unaffected by rootstock. In 1995, a trial was established including McIntosh, Cortland, Macoun, and Pioneer Mac on 12 rootstocks. In 2003, the largest trees were on V.1, and the smallest were on P.16. Cumulatively (1997-2003), Mark and V.1 trees yielded the most, and trees on P.22, P.16, and B.491 yielded the least. Cumulatively, the most yield efficient trees were on P.16, and the least efficient were on V.1. Average (1997-2003) fruit weight was largest for trees on V.1 and smallest for trees on B.146. In 1996, a trial was established including McIntosh on 6 rootstock. In 2003, trees on V.4 were the largest and had the greatest cumulative (1998-2001) yield. Trees on V.3 were the most yield efficient, cumulatively. Average fruit size (1998-2003) was not affected by rootstock. In 2002, a trial was established including Cameo on 3 rootstocks. In 2003, trees on G.16 were larger than those on B.9 or M.9 NAKBT337. Trees on B.9 were most yield efficient in 2003, and fruit were larger.

New Brunswick. The 2003 apple growing season could be considered cool and wet as temperature was below and precipitation was above average. Trees are now in a biennial cycle with 2003 being an off year. In both the 1994 Gala dwarf and semi-dwarf plantings, no major differences between other years were found. In the dwarf planting, the M.9 clones, RN29 and Pajam 2 continue to be more vigorous and higher yielding than the M.9emla. Other dwarfing rootstocks worthy in this trial include V.1, Pajam 1 and

B.9. Although fruit size was slightly better in 2003 because of the lighter crop loads, pack out of extra fancy Gala apples remains small in New Brunswick. In the semi-dwarf planting, G.30 continues to be the best yielding and most yield efficient of the pack. Cold hardiness testing of the Cornell Geneva and other new promising rootstocks will continue this winter and an apple rootstock factsheet identifying tree, flower and fruit characteristics has been updated for publication on the internet (http://res2.agr.ca/kentville/pubs/fact01-01/index_e.htm).

North Carolina: North Carolina has five of the NC-140 cooperative apple plantings. The trials that are currently under investigation in North Carolina are the 1994 gala dwarf and semi-dwarf trials, the 1998 gala planting, and both the 1999 fuji dwarf and semi-dwarf plantings. A cold snap shortly after bloom (28.5 F) did not seriously affect crop load in the gala planting, but did reduce the crop load in the fuji plantings. In the dwarf gala planting, the trees with the largest crop were on the rootstocks of M.26, O.3, V.1, and P.2 and those with the smallest crop were on M.27, B.491, P.16, and P.22. In the semi-dwarf planting, trees on G.30 and V.2 had a larger crop load than trees on M.26 and P.1. In the 1998 gala planting the TCSA of trees on G.16 is significantly larger than trees on M.9NAKBT337 and the trees on the two M.9 selections are similar in TCSA. Trees on G.16 had the largest crop load and yield efficiency compared to the two M.9 selections. In the dwarf fuji planting, trees on CG.4013 had the largest TCSA and trees on M.9 NAKBT337, Supporter1, 2, and 3 the smallest. The trees on G.16 and CG.5935 had the greatest yield. Trees on Supporter 1, 2, and 3 had the lowest yield. In the semi-dwarf planting, there were no significant differences in survival, TCSA, yield or yield efficiency. Although trees on G.30 T and N both had greater cumulative yields than M.7 EMLA.

Oregon: Hard to propagate rootstocks, when used as interstems, provided for a decrease in tree size, and an increase in yield and fruit size through ten years. Cherry trees performed well in Oregon's Willamette Valley conditions. In spite of cool, wet spring weather, crops have been consistently heavy. Trees on Gisela 6 rootstock produced the highest sweet cherry yields, while Mazzard trees produced the least. CG30 rootstock has produced the highest yields with some of the largest fruit for the past 3 years.

South Carolina. In the 2001 Peach trial, SC-17 continued to be the most vigorous rootstock. Julior, Jaspi, K146-43, and VVA-1 were the least vigorous. There was a 2.5-day range in bloom date and a 3-day range in maturity date. SLAP, SC-17, Bailey, and Pumiselect had the highest fruit yields; whereas Julior, Jaspi, and VVA-1 had the lowest. In the 2002 Peach trial, Cadaman and Lovell were the most vigorous rootstocks, and Adesoto 101, VSV-1, and VSA-1 were the least vigorous. Three trees died in 2003 due to *Armillaria tabescens* or *Phytophthora spp.* In the 1998 Cherry trial, little or no leaf spot occurred in 2003 despite a very wet summer, and bacterial canker was not as severe. Mazzard and Weiroot 10 were the most vigorous rootstocks, and GI 148-2 and GI 209-1 were the least vigorous. There were 2-day bloom date and 10-day maturity date differences among rootstocks. Hedelfingen on GI 148-8, Edabriz, Weiroot 13, Weiroot 158, and Weiroot 72 rootstocks had estimated crop loads of 59% or greater. Fruit was largest for Edabriz and Weiroot 158 rootstocks and smallest for Mahaleb. Significant

fruit cracking/splitting occurred due to several rain events during harvest. In the 1994 Gala dwarf apple trial, M.9 clones, M.26 EMLA, O.3, and V.1 continued to be the most vigorous and highest yielding rootstocks. Mean fruit weight was negatively affected by M.27 EMLA, B.9, P.16 and MARK. Fireblight strikes were minimal throughout 2003. In the 1994 Gala semi-dwarf apple trial, P.1 and M.26 EMLA were the most vigorous rootstocks. Yield and fruit size were similar. Considering survival, tree size, fruit size and yield data collectively, V.1, V.2 and G.30 look promising as replacements for M.9 and M.26. In the 1999 Fuji apple trial, Fuji on CG.179 had the highest yield efficiency; whereas Supporter #4, M.26, and 16N had the lowest. Fuji on CG.814 had the highest yields, and Supporter #1 had the lowest. Fruit size was largest on Supporter #4 and smallest on Supporter #2.

Utah. The 2003 growing season was hot and dry. Yields were generally light to moderate in the NC-140 trials. In the 1994 Dwarf Apple Trial, M.9RN29 is the highest yielding M.9 clone. Mahaleb remains the highest yielding rootstock in the 1998 Tart Cherry Trial. Cumulative yield of trees on CG.4013 24% greater than those on Supporter 3 in the 1999 Dwarf Trial. Trees growing on Cornell-Geneva rootstocks have higher yield efficiencies than trees growing on M.26EMLA and M.7EMLA in the 1999 Semi-Dwarf Trial. Yield and yield efficiency was highest of trees growing on Bailey rootstock in the 2001 Peach Rootstock Trial. Trees growing on Pumiselect rootstock have poor anchorage in the 2002 Peach Rootstock Trial. Five of eight reps blew over in August 2003 due to microburst winds.

Vermont: The performance of the rootstocks following the severe winter temperatures we experienced this year will give us a better understanding of the adaptability of these rootstocks to our climate. This information would not be applicable to Vermont growers if this project were not being conducted under our climatic conditions.

Virginia: In Virginia G.30 has outperformed M.26 and G.30 is being recommended for trial as a semi-dwarf rootstock. Growers are being cautioned that adequate tree support involving 2 wires is needed, especially for brittle cultivars. There is a wide range of vigor among the M.9 clones. Pajam2 is being recommended for trial where trees slightly less vigorous than on M.26 are desired because tree survival and production have been superior to trees on M.26. V.1 may be an alternative as a semi-dwarfing rootstock. Compared to M.26, trees survival is better, trees are slightly larger and productivity is better.

Wisconsin: In the 1994 dwarf planting, Pajam 2, EMLA 9, and M9 (Nic29) had the highest cumulative yield; yield efficiency was high in these rootstocks. In the 1994 semi-dwarf planting, CG30 had the highest yield and yield efficiency. The 1990 cherry rootstock planting is well established. Gisela 6 was the highest yielding cherry rootstock this year; Edabriz had the highest yield efficiency. W 53 is showing signs of incompatibility.