Multistate Research Activity Accomplishments Reported

Project Number: NC-140

Project Title: Rootstock and Interstem Effects on Pome- and Stone-Fruit Trees

Period Covered: October 1, 2004- September 30, 2005

Date of This Report: January 28, 2006

Annual Meeting Dates: November 14-15, 2005

Participants: Please see annual meeting minutes, available on the NC-140 web-site: http://www. nc140.org. The address of the listserv for participants is nc140@virtualorchard.net

Summary of Minutes: Please see annual meeting minutes, available on the NC-140 web-site: http://www. nc140.org/

Accomplishments and Impacts:
Objective 1: Evaluate the performance of pome-and stone-fruit rootstocks in various environments under different management regimes.

To evaluate the performance of rootstock material in different climatic and edaphic environments, replicated, uniform trials were planned, conducted, and coordinated by NC-140 (see http://www.nc140.org/plantings.html for more details on planting design, rootstocks and locations). Several widely planted trials have been concluded in the last few years, and data from these plantings have either been published or are being prepared for publication. Currently there are 11 multi-state coordinated plantings from which data are being collected. These comprise six apple, three peach and two cherry plantings. A brief summary of each as follows:

1999 Dwarf and Semi-dwarf Fuji/McIntosh Apple (coordinated by W. Autio, MA). 1999-Apple- discussion on how to tell when a tree is sick enough/dead and there fore not to take data. If it's a general trend across the rootstock take data. Important thing is to take annual antidotal data and put in annual state reports. Need to know why trees die.

2001 Redtop/Redhaven Peach Rootstock (coordinated by G. Reighard, SC). Fourteen *Prunus* rootstock cultivars and selections were budded with 'Redhaven', 'Cresthaven', and 'Redtop'. Vigorous rootstocks included 'BH-4' and 'SLAP' (peach x almond hybrids), as well as 'Cadaman' and peach seedling SC-17. Standard sized rootstocks were Lovell and Bailey seedlings. Semi-dwarfing rootstocks included 'Jaspi', 'Pumiselect', 'Hiawatha', 'Julior', 'P30-135', 'K146-43', 'K146-44', and 'VVA-1'. 'Redhaven' was planted in Indiana, Missouri, New Jersey, Ontario, and Utah; 'Cresthaven' in Colorado, Texas, and Washington; and 'Redtop' in California, Georgia, Maryland, and South Carolina. For Colorado, Washington, and probably Texas, 'Redhaven', not 'Cresthaven', is the cultivar budded on 'Jaspi'. Tree spacing was 5.0 m within rows and 6.0 m between rows.

Fourth year data were summarized for 11 of the 12 locations. The largest trees continue to be those in California, Georgia, Maryland, and South Carolina (Table 1). 'BH-4', 'SLAP', SC-17, Lovell, and 'Cadaman' were the most vigorous rootstocks overall. Several rootstocks were significantly more vigorous than Lovell at a few sites, including 'Cadaman' rootstocks in New Jersey, Ontario, Utah, and California. 'Jaspi', 'K146-43', 'K146-44', and 'VVA-1' continued to be the least vigorous, with trunk circumferences 30-40% less than those of Lovell. Overall, survival was lowest with 'Pumiselect' and 'VVA-1'. No rootstock had a significantly higher survival rate than Lovell at any location.

2002 Cresthaven/Redhaven Peach Rootstock (coordinated by S. Johnson, CA).
The largest trees are consistently on Cadaman rootstock. These trees had the highest yield and survival rate. Trees growing on VVA-1 was the smallest tree and had small fruit, also had the largest number of root suckers. Pumiselect was the poorest performer, smallest fruit weight and poorest tree survival. Adesoto 101 had the largest fruit weight.

2002 Cresthaven Peach Physiology (coordinated by S. Johnson, CA). Uniform plantings have been established and are ready for treatments to be applied. 2006 Plans – To test a fruit growth potential hypothesis and harvest prediction model. Fruit weight and soluble solids were influenced by average temperatures. Plans are to continue this trial to continue one more year.

2002 Buckeye Gala Apple (coordinated by W. Autio, MA).
This report presents data from the 2004 (third) growing season of this trial. Over all sites in the core data set (Arkansas, British Columbia, Kentucky, Massachusetts, Michigan, New Jersey, and New York), rootstock significantly affected trunk cross-sectional area after three seasons. Specifically, P.14 resulted in the largest trees, followed by M.26 NAKB. The smallest trees were on B.9 Europe and B.9 Treco. After three seasons, trees on M.26 NAKB and M.26 EMLA had similar trunk cross-sectional area. Trees on the two B.9 strains likewise had similar trunk cross-sectional area. The three M.9 strains resulted in trees of similar trunk cross-sectional area. Yield efficiency was highest for the two B.9 strains and lowest for P.14 and Supporter 4. Fruit weight was not affected by rootstock in 2004. Of particular interest are the JM, the PiAu, and the CG rootstocks. After three seasons, CG.3041, CG.5935, JM.1, JM.7, and PiAu 51-11 appear to be in the M.9-size category; whereas, CG.3007, JM.2, PiAu 51-4, and PiAu 56-83 appear to be in the M.26 or larger category. 2006 season will be fifth growing season, height and width to be taken at the end of the season

2003 Golden Delicious Physiology (coordinated by R. Marini, VA). Orchards have been established and are growing well. Few rootstock differences have been observed to date, and trees are nearing the point where treatments can be imposed in 2006.

2003 Dwarf Apple Rootstock (coordinated by R. Marini, VA. Data were analyzed as a repeated generalized randomized block design with SAS's Mixed Procedure. Block and tree (tree within a block) were designated as random effects. The site*rootstock interaction was significant for tree survival and for TCA. The Slice Option was used to test the hypothesis that rootstocks within each site were equal. All locations except CA and BC had good tree survival. The three rootstocks with the poorest survival included G.16, JM.1 and JM.7. Terrence Robinson led a

discussion on the protocol for 2006. Focusing on having a rage of crop loads in 2006. We may do a study of final fruit cell count per treatment.

2004-2005 Pear Trials-T. Robinson reported-Gene Milke set up the trial but has retired. It was was established at limited sites. Oregon has assigned Steve Castognoli to take over pears in OR. T. Robinson will meet with him. The Fall back is to have Wes Autio to coordinate.

Objective 2: To assess and improve asexual propagation techniques of pome and stone fruit rootstocks.
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New York State in cooperation with the USDA is working on techniques for the improved propagation of apple. Genero will survey nursery industry on their needs for rootstock propagation. Genero will meet informally with nurserymen at the IFTA at the February 2006 meeting in Hershey. Then we will have time to frame objective 2 for the rewrite.

NJ was to investigate improving softwood and hardwood tissue cutting techniques (contact Joe Gofredda)

Charlie Embry-Nova Scotia-reported on tissue culture with CG30 apple rootsotck-Genero has data summary to report, will forward to Win Cowgill

Objective 3: To improve the ability to identify pome and stone fruit rootstocks through morphological, biochemical and genetic differences.
Efforts are continuing to confirm the identity of Cornell-Geneva series rootstocks around the world through molecular methods (NY).

Objective 4: To develop new and better pome and stone fruit roostocks through breeding and genetic engineering.
Programs are underway in AR, CA, NY, OH and Ontario:

-The Vineland series of apple rootstocks together with several standard rootstocks are under evaluation for fire blight resistance in Ontario, Canada. The results indicate that wide differences in rootstock susceptibility exist.

-An ongoing breeding program in Arkansas is testing twelve new apple and 44 new peach rootstock selections.

Geneva has released three M9 clones:

G16-susceptable to latent viruses, vigorous early, settles down by year 6, grows late, may have winter freeze issues, but survived better than B9 in midwinter freeze

G11-M9 size, excellent productivity, excellent in Europe, not immune from fire blight, but rather resistant.

G41-one of the tops in yield efficiency, not a great rooter in stool bed, the solution is tissue culture.

Program Presented at the Annual Meeting

David Dowd- presented a great talk on history of the fruit growing history of the Dowd Farm. Ben Davis apple was a major player. An excellent view of historic pesticide use, spraying equipment and packing equipment. First Malling trees propagated and planted. Dowds were nurseryman. Mainstay of the IN apple industry is direct marketing. They have diversified into Asian pears (Korean Giant) and strawberries.

Committee Reports

Rewrite Committee- Current project to expire September 2007. Wes Autio to Chair. Objectives and Justification due to NIMMS website by September 2006.

Time line- by email the committee will flesh out the objectives by March 1. Then by April 1, generate the justification and objectives for NIMS.

Objective 2-aquire and obtain new rootstocks

Objective 3-add back in biotic stress, break out physiology into separate objective….

Report the replant and fire blight work under objective 3.

Administrative Advisor Report

Dr. Wendy Weatherspoon-administrator advisor reported to the group via telephone conference.

Reported on four items:
1-Rewrite
2-Impact Statement-review NIMS website for how to write impacts
3-Midterm Review-report we have never seen it, she will send it out.
4-Name Change- suggested in the midterm review:

"Economic and Environmental Sustainability and Fruit Tree Production" or
"Rootstocks Improve Tree Fruit Production Sustainability"

The Rewrite Committee will review these suggestions.

Future Plans

WORK PLANNED FOR NEXT YEAR

Existing plantings will be maintained and data collection will continue according to protocols developed by the respective technical committees. Planting coordinators will analyze and summarize data from the various sites for each coordinated planting, and will lead in writing 5 year progress reports and 10 year final reports for publication. Technical committees will develop schedules of new promising rootstocks that merit broad testing, then prepare for trees to be propagated for future plantings.

Apple Planting Committee Report
Plans under way for 2009 major uniform planting of apple stocks from Russia, Quebec, Cornell and East Malling, UK programs.

Cherry Committee Report
Three trials are planned for 2008-
Sweet Cherry Fresh Market Trial-OR, WA, MI, MA, Ontario
Processing Trial-mechanically harvested
Tart Cherry Fresh Market Trial-MI, WA, NY, CO, MI, CO?

Peach Committee Report
Planning on establishing a 2009 planting-most materials will be clonal stocks, many from European Programs

Pear, Plum and Apricot Committees- did not meet, looking for a new cooperators to take the lead.

USEFULNESS OF FINDING AND IMPACT OF COOPERATIVE RESEARCH PROJECTS
From uniform trials planted across sites in North America that differ greatly in terms of environmental conditions and biotic and abiotic stresses, unbiased data is gathered to quickly assess new rootstocks in a timely fashion. These rootstocks are compared with industry standards, and from these comparisons, recommendations to growers can be made that are independent and backed by solid data. In developing such recommendations, consideration is given to not only productivity, but also to survival, cold tolerance, disease resistance, graft union integrity, and ease of management. The NC-140 project is recognized internationally as a leading source of comprehensive, unbiased data on field performance of tree fruit rootstocks.

Website
We continue to maintain our Internet registration for our website at http://www.NC14.org/. The web site was hosted and maintained by Jon Clements, UMASS and Win Cowgill, NJAES/Rutgers. An online Filemaker database that is self-editing contains the cooperator contact information. Requirements for web page design for regional projects have been met as outlined by the Cooperative State Research, Education, and Extension Service (CSREES) and the North Central Regional Association of Agricultural Experiment Station Directors (NCRA). Articles, photographs and reports were archived throughout the year. Abstracts and Publications from refereed journal articles are available online at the NC140 website. Most full journal articles are available for a fee on line from the publisher, accessed the abstract links.

E-Mail Distribution List
The projects Email distribution list is maintained by Win Cowgill, NJ and Jon Clements, UMASS. The posting e-mail address is <nc140@virtualorchard.net>

Extension Out-Reach

Web Based-The NC140 website has become a significant tool for extension outreach and dissemination of research results. In 2005 over 31,800 page hits were received averaging 87 per day. Visitors from over 81 countries were logged. 47% of page hits originated in the US. The 2004 annual report and meeting minutes accounted for over 20% of the page hits followed by the MA sate report at 8% and the rewrite proposal at 7%.

PUBLICATIONS

Journal articles

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Autio, W.R. "Current rootstock research – 1999 NC-140 Dwarf & Semidwarf Apple Rootstock Trials." July 14, 2004, Belchertown, MA. 110 in attendance.

Autio, W.R. "Current rootstock research – 1995 Massachusetts/Maine/Nova Scotia Cultivar-Rootstock Trial." July 14, 2004, Belchertown, MA. 110 in attendance.

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Cowgill, W.P. 2005. NC-140 Rootstock Trial Results. North Jersey Fruit Meeting, March 2005; Broadway, NJ, 85 attendees, growers

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Cowgill, W.P. 2005. Observations of Fruit of NC-140 Rootstock Trials. North Jersey Horticultural Research Twilight Mtg., September, 2005; Snyder Farm, Pittstown, NJ, 82 attendees, organic and conventional growers

Domoto, P. Iowa Fruit and Vegetable Growers Association Field Day, 12 July 2004, ISU Horticulture Farm, Ames, IA. Grower attendance 90.

Ferree, D. 2004. Performance of NC-140 rootstock trials in Ohio. Winter meetings Ohio Fruit Growers Society.

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