

ANNUAL REPORT OF COOPERATIVE REGIONAL PROJECT
NE-183 Multi disciplinary Evaluation of New Apple Cultivars
 Supported by Allotments of the Regional Research Fund
 Hatch Act, as Amended August 11, 1955
 January 1 to December 31, 2003

COOPERATING AGENCIES AND REPRESENTATIVES:

State/Province	Cooperators ²				Plantings ¹	
					1995	1999
AL					-	H
AR	Curt Rom*	Donn Johnson	Ron McNew	Pat Fenn	-	-
CT-NH	Victoria L. Smith*				P	P
GA	Dan Horton*	Kathryn Taylor			H,P	-
ID	Esmacil Fallahi*	Krishna Mohan			-	P
IN	Peter Hirst*	Rick Foster	Paul Pecknold		-	H
KY	Joseph Masabni					
MA	Duane Greene*	Wes Autio	Jon Clements	Dan Cooley	H	H,P
ME	Renaë Moran*				H	-
MI	George Sundin*	Phil Schwallier	R. Beaudry	Greg Lang	H,P	H,P,P
MO	W. Hal Schaffer*	M. Warmund			H	H
NC	Dick Unrath*	J. Obermiller	M. Parker		-	H
NH	William Lord*				H	H
NJ	Win Cowgill*	Bob Belding	Joe Goffreda	Dean Polk	-	H
		Bill Tietjen				
NY-I	Ian Merwin*	M. Brown	R. Reisinger		H	H
NY-G, HV	D. Roseberger*	Susan Brown	D. Straub	Jim Schupp	-	H,P
		K. Maloney				
OH	Diane Miller *	David Ferree	Mike Ellis		H	H
OR	Anita Azarenko*	S. Mehlenbacher			H	H
PA	Rob Crassweller*	George Greene	Jayson Harper	K. Hickey	2 x H	2 x H
		L. Hull	J. Travis			
UT	Schuyler Seely*	T. Lindstrom			-	H
VA	Keith Yoder*	Ross Byers			P	P
VT	M. Elena Garcia*	Lorraine Berkett			-	H
WA	Bruce Barritt*				H	H
WI	Teryl Roper*	Kevin Kosola			H	H
WV		Alan Biggs	H. Hogmire		-	-
USDA/ARS	Stephen Miller*				H,P	H
British Columbia	Cheryl Hampson	Harvey Quamme			-	H
Ontario	John Cline				H	H
Nova Scotia	Charlie Embree	Robert Prange	D. Davidson		-	H
Administrative Advisor	Robert Seem					

¹ H - designates horticultural planting (objective 1) , P- designates Pest Management Planting (objective 2)

² *- designates a voting member for participating state/institution

Objectives:

- I. Evaluate horticultural qualities and pest susceptibilities of new apple cultivars, strains, and advanced selections at numerous locations throughout the United States to determine both the limitations and the positive attributes of these cultivars.
- II. Develop horticultural and pest management strategies for new cultivars or cultivar strains that are emerging as commercially accepted cultivars.
- III. Compare the costs of production and profitability of new apple cultivars.

Progress of the Work and Principal Accomplishments

Project objectives are being met by 24 states and 3 Canadian provinces consisting of two uniform trials of new promising cultivars and advanced selections. The first uniform test orchard of 26 cultivar scion/rootstock combinations was planted in 1995 in 28 different sites. Officially this study has concluded, however some plantings are being maintained. A second trial of 20 cultivars encompassing 29 sites was planted in the spring of 1999. Locations where both horticulture and pest susceptibility studies are established include CT, ID, MA, MI, NY and VA. Several cooperators have additional cultivar test orchards from which corroborating data to support observations in the uniform test orchard can be obtained or from which additional data may be generated. Upon completion of each study, final results, conclusions and recommendations are made available on the website: www.ne183.org. The NE-183 listserv continues to be effective communication tool for cooperators to share results, facilitate committee business, and plan future meetings (ne183@virtualorchard.net).

Objective 1. Evaluate horticultural qualities and pest susceptibilities of new apple cultivars, strains, and advanced selections at numerous locations throughout the United States to determine both the limitations and the positive attributes of these cultivars.

The first uniform test planting for the project was planted at multiple locations in 1995 with 2-5 single-tree replications of 21 cultivars and one numbered selection. These are Arlet, Braeburn, Cameo, Creston, Enterprise, Fuji (BC Type II), Gala Supreme, Ginger Gold, Golden Delicious (Gibson strain), Golden Supreme, GoldRush, Honeycrisp, Fortune, NY 75414-1, Orin, Pristine, Sansa, Shizuka, Suncrisp, Sunrise and Yataka. In the pest management trials, Senshu and Pioneer Mac were also included. Separate “horticultural” and “pest study” trials were planted and maintained at some sites. At other sites, both horticultural and pest susceptibility characteristics were studied in the same plots. The horticultural sub-committee developed a core data set for tree growth measurements and flowering, fruiting and fruit quality. A pest control sub-committee developed guidelines for pest management and for uniform assessment of pest and disease observations in the pest plantings. Data from each site was submitted to the project coordinators and to the statistician.

The following manuscripts are currently being prepared or are in print: Introduction and Background, Tree Growth and Yield, Fruit Quality and Sensory Evaluation, Flowering and Biennial Bearing, Disease Susceptibility, Pest Problems, Rootstocks, Nutrition, Climate and Weather, and Tree Death. One to two cooperators have been selected to draft each paper. In addition, popular press articles will be written upon completion of technical manuscripts.

A second uniform planting of new promising apple cultivars and advanced selections was planted in the spring of 1999. This second planting also has a primary designation of either horticultural or pest susceptibility studies. Plantings for horticulture are located in GA, ID, IN, MA, MI (two locations), MO, NH, NJ, NY (two locations) NC, OH, OR, PA (two locations), UT, VT, WA, WI, WV, Nova Scotia, Ontario, and British Columbia. Plantings for pest susceptibility studies will be located in CT, MA, MI, NY, and VA. Cultivars included are Golden Delicious (Gibson strain), McIntosh (Rogers strain), Ambrosia, Delblush, Hampshire, September Wonder Fuji, Pinova, Cripp's Pink (Pink Lady), Runkel, Autumn Gold, Chinook (BC 8S-27-51), Silken (BC 8S-04-33), Sundance (Coop 29), Scarlet O'Hara (Coop 25), Crimson Crisp (Coop 39) and Zestar!TM. Numbered selections included are BC 8S-26-50, CRQ10T17, CQR12T750, NJ 90, NJ 109, NY 79507-72, NY 79507-49, and NY 65707-19. At the annual meeting, there was a roundtable discussion of selections and cultivars with cooperators site reporting what they have learned, so far. An account of this is available in the meeting minutes.

Horticultural Characteristics: In the 1999 planting, the trees continue to grow well in most locations and have developed a good canopy. One site reported slow tree growth due to drought and others have reported a few tree losses due to fire blight or deer feeding. Cultivars varied in tree size (height, spread and TCSA), bloom date, maturity date, yield and preharvest drop. Most cultivars bloomed and fruited at all sites.

Fruit Quality Characteristics: Most sites had sufficient cropload to take measurements of fruit quality. Fruit size, color, soluble solids content and acidity varied significantly among the cultivars. Sensory evaluation indicated differences in preference and results were reported by cultivar in the meeting minutes. Building a photography database for the website was added to the protocol. To do this, each site was encouraged to take three photos of each cultivar or selection.

Disease and Pest Susceptibility Characteristics: Five sites reported conducting tests on foliar susceptibility to cedar apple rust, apple scab and powdery mildew. Cultivars were also evaluated for fruit susceptibility to apple scab, rust, bitter rot, black rot, and moldy core. In CT, there was very little scab, powdery mildew, or bitter rot, but rust was prevalent. Rust was low on PioneerMac and heavy on Braeburn and Goldrush. Fruit inoculations with bitter rot indicated the lowest lesion growth on Suncrisp and most rapid growth on Gingergold. In NY cedar apple rust, was prevalent, with Ambrosia, BC 8S-26-50, Chinook, Coop 39, CQR 10T17, Mutsu, NJ109, Scarlet O'Hara and Golden Delicious being most susceptible. In VA, COOP29, NY 65707-19 and NY 79507-72 appear to have some resistance to scab and the rusts, and NY 79507-49 resistance to scab and cedar apple rust, but not to quince rust. Hampshire, NJ90, Runkel, and Zestar!TM also appear to have resistance to cedar apple rust. Under heavy pressure, Ambrosia, Hampshire, Jubilee Fuji, NY 85707-19, and Zestar!TM had considerable resistance to powdery mildew. Susceptibility to sooty blotch, flyspeck, Brooks spot and other rots was also evaluated. In WV, studies were conducted on cultivar susceptibility to bitter rot and black rot. In MA, McIntosh, Hampshire and Silken had significantly more leaf scab than

all other cultivars. Silken and CQR 12T50 and NY 65707-19 had the most frog-eye leaf spot. All cultivars exhibited foliar mildew symptoms although CQR 10T17 (Princess), NJ90, Sundance and Scarlet O'Hara had the most. Incidence of sooty blotch, flyspeck and summer rots was minimal for all cultivar at harvest.

One site, WV, reported results on pest susceptibility. A study on the presence of fruit/foliar injury by 10 different insect pests was continued. Low aphid and mite populations occurred, so no data was recorded for these pests. Pest injury continues to be higher for trees on M.9 rootstock compared to Mark.

Objective 2. Develop horticultural and pest management strategies for new cultivars or cultivar strains that are emerging as commercially accepted cultivars.

NY and MN, fifty strains of Honeycrisp with potentially better color have been planted and will be evaluated for improved color, but similar fruit quality as the original strain.

In NY, two studies have been initiated with the cultivar, Honeycrisp. Results of the chemical thinning trial indicate that Honeycrisp is very sensitive to Accel (Valent Biosciences), and this should not be used to thin this cultivar. All chemical thinners tested provided thinning activity. Results of the bitter pit control study indicate calcium sprays during summer substantially reduce bitter pit, but did not completely prevent it.

Objective 3. Compare the costs of production and profitability of new apple cultivars

No report was presented.

Usefulness of Findings

This project provides an objective evaluation of new apple cultivars and selections. Results of these studies enable growers determine which new cultivars are suitable for their climate and their market so that they can make informed choices for new apple plantings. The 1995 trial has provided useful findings on bloom and harvest dates, fruit appearance and eating quality within each site. These results are used by growers to understand the potential cultivar performance and determine management practices needed to maximize yield and fruit quality. As data is gathered and analyzed from the 1999 planting, differences in cultivar performance are becoming apparent.

Information on the foliar pest and disease susceptibility has now been observed for cultivars in the 1995 planting. The multiple year observations allow study of genotype by environment interactions for the pest or disease susceptibility. The pest and disease susceptibility information will be useful for making recommendations for controlling potential problems, and for growers to anticipate possible crop damage and implement appropriate avoidance or protection strategies. Furthermore, the information on both foliar and fruit damage obtained from the trial (Objective I) will aid in developing decision-making protocols for insects and diseases (Objective II). The information of fruit yield potential, fruit quality and pest susceptibility observed in the uniform test (Objective I) will assist in development of production cost and profitability models for the new cultivars (Objective III).

The plantings at the various sites have been used extensively for grower demonstrations and field visits. Apple growers use the results of this research to find out

potential strengths and weaknesses of particular cultivars before planting them. Growers can also be better prepared to manage the different problems associated with growing a particular cultivar. Therefore, these plantings are a valuable resource for extension/outreach and the apple industry, in addition to their research function.

Work Planned for Next Year

The current project will continue through 2004. Cooperators will apply for a one-year extension by Sept. 1, 2003, in order to complete the necessary data collection and publishing. A committee was formed to discuss the need for a future rewrite or the possibility of beginning as a new project with different objectives. A subset of possible objectives was drafted and subcommittees formed to focus on the potential rewrite.

Trees in the 1999 multi-state uniform trials will be maintained according to protocols developed by the technical committee. Each site is requested to collect the core data set and individual sites indicated additional studies of fruit quality, storage potential, and composition may be conducted. It is the decision of the individual cooperator to maintain and collect data from 1995 planting.

Publications

Refereed

- Autio, W.R., J.R. Schupp, C.G. Embree, and R.E. Moran. 2003. Early performance of Cortland, Macoun, McIntosh, and Pioneer Mac Apple Trees on Various Rootstocks in Maine, Massachusetts, and Nova Scotia. *J. Amer. Pomol. Soc.* 57(1):7-14
- Crassweller, R. M. and D. E. Smith. 2003. Apple cultivar sensitivity to azoxystrobin fungicide. *J. Amer. Pomological Society.* 57:166-168
- Greene, D.W. and S.A. Weis. 2003. Apple varieties with a future. *Compact Fruit Tree* 36(2):55-56.
- Merwin, I.A., Byard, R.B., and Pomper, K. (2003) Survival, Growth and Establishment of Grafted Pawpaws in Upstate New York. *HortTechnology* 13(3):421-422.
- Wargo, J.M., I.A. Merwin, and C.B. Watkins. (2003). Fruit size, yield and market value of 'Goldrush' apple are affected by amount, timing and method of nitrogen fertilization. *HortTechnology* 13(1):153-161

Refereed in Press

- Biggs, A.R. and S.S. Miller. 2003. Relative susceptibility of selected apple cultivars to *Botryosphaeria obtusa*". (accepted for publication, *HortScience*).
- Ferree, D.C. and J.C Schmid. 2003. Spur and flower characteristics of cultivars in the 1995 NE-183 trial. *J. Amer. Pom. Soc.:* accepted for publication.
- Hampson, C., Quamme, H.A., Kappel, F. and Brownlee, R.T. 2003. Varying density with constant rectangularity. 1. Effects on apple tree growth and light interception in three training systems over ten years. *HortScience*, *in press*.
- Hampson, C., Quamme, H.A., Kappel, F. and Brownlee, R.T. 2003. Varying density with constant rectangularity. 2. Effects on Apple Tree Yield, Fruit Size and Fruit Color Development in Three Training Systems Over Ten Years. *HortScience*, *in press*.

- Nichols, D., C. Embree, J. Cline, and H. Ju. 2003. Bloom and Fruitlet thinners affect Crop-Load, Fruit Weight, Seed Number and Return Bloom of Northern Spy Apple. HortSci. (In Press)
- Prive', J.-P., J. Cline, C. Embree, E. Fava and D. Nichols. 2002. Physiology and efficacy of apple trees treated with Prohexadione-calcium in three Canadian Provinces. Acta Hort. (In Press)
- Quamme, H.A., Hampson, C.R., Hall, J.W., Sholberg, P.L., Bedford, K.E. and Randall, P. Inheritance of apple scab resistance from polygenic sources based on greenhouse and field evaluation. Acta Hort. 622, *in press*.

Extension Publications and Presentations

- Adaptive nitrogen management in New York apple orchards, invited seminar at Lincoln University in Lincoln, New Zealand. March 6, 2003
- Barritt, B. 2002. The apple in the world of 2002. Obstbau Weinbau 39(10):263-264.
- Barritt, B.H. 2002. Rewarding growers for quality. Good Fruit Grower 53(17):43.
- Bittner, K. and Ian Merwin. 2003. Development and testing of a shrouded flame weeder for non-chemical weed control. NY Fruit Quarterly 11(1):23-25.
- Cowgill, W.J., Jr., J. Compton 2002. 'North Jersey Tree Fruit Annual Report'-Rutgers Cooperative Extension Bulletin E0020
- Hampson, C. 2003. Apple breeding at Summerland. Fresh From the Cider Press 6(1):17-19.
- Hampson, C. 2003. Snappy new apple coming soon. Orchard & Vine 44(2): 14.
- Hampson, C. 2003. Subclones of M.9 rootstock: are they any different? The Orchardist 1(1): 20,24.
- Miller, D.D. 2003. Evaluation of *M. sieversii* seedlings from Kazakhstan in Ohio for disease resistance and time of leafing. Abstract. Eucarpia Symposium on Fruit Breeding and Genetics, 1-5 September, Angers, France.
- Miller, D.D. 2003. Evaluation of blossom frost hardiness in a diverse collection of *Malus* germplasm. Abstract and poster. Eucarpia Symposium on Fruit Breeding and Genetics, 1-5 September, Angers, France.
- Miller, S.S. 2002. Horticultural performance of apple cultivars in the NE-183 planting in West Virginia. Proceedings: 78th Proc. Cumberland-Shenandoah Fruit Workers Conf., pp.189-202.
- Moran, R. 6 October 2003. Harvest date and storage temperature affect softscald occurrence and fruit quality of 'Honeycrisp' apples. ASHS Annual Conference. Providence RI. Postharvest researchers. Attendance 25.
- Moran, R.E. 5 March 2003. Performance of new apple varieties. Northeast Apple Society annual meeting. Sugarloaf, ME. Grower audience. Attendance 35.
- Moran, R.E. February, 2003. Commercial apple varieties for Maine. Workshop - commercial fruit growing for beginners. Monmouth, ME. Grower audience. Attendance 25.
- Three invited lectures at a symposium in La Universidad Catolica de Valparaiso, Chile, on the sustainability of fruit-growing systems. Sept 22-24, 2003
- Yoder, K. S. 2003. Controlling diseases in home apple plantings in Virginia. Grandiflora 9:17-26.

Book Chapters

- Hampson, C.R. and Kemp, H. 2003. Characteristics of important commercial apple cultivars. Pp. 61-89. In: D.C. Ferree and I.J. Warrington, eds. Apples: Botany, Production and Uses. CABI Publishing, Wallingford, UK. 660 pp.
- Merwin, I.A. (2003) Orchard Floor Management. Pp. 195-202 in: Concise Encyclopedia of Temperate Tree Fruits (T Baugher and S. Singha, eds.) Haworth Press, Binghampton, New York
- Merwin, I.A. (2003). Orchard-Floor Management Systems. Pp. 303-318 in: Apples: Botany, Production and Uses (D.C. Ferree and I. Warrington, eds.) CABI Publ., Wallingford, England.

APPROVED

<u>Renaë Moran</u>	<u>2003</u>
Chair, Technical Committee	Date

<u>Robert Seem</u>	<u>2003</u>
Administrative Advisor	Date