NEW ENGLAND FRUIT MEETINGS December 2003

PROCEEDINGS

ONE HUNDRED AND TENTH
ANNUAL MEETING
MASSACHUSETTS FRUIT GROWERS'
ASSOCIATION, INC.

December 17, 2003

Volume 110

Published by the
MASSACHUSETTS FRUIT GROWERS' ASSOCIATION, INC.
P.O. Box 9632, North Amherst, MA 01059-9632

New England Fruit Meetings

Massachusetts Fruit Growers' Association, Inc.
in cooperation with the
New England University Cooperative Extensions

Center of New Hampshire Holiday Inn, Manchester, NH

December 17, 2003

Cooperating Groups:

Connecticut Pomological Society
Maine State Pomological Society
Massachusetts Fruit Growers' Association
New Hampshire Fruit Growers Association
Rhode Island Fruit Growers' Association
Vermont Tree Fruit Growers' Association

Massachusetts Fruit Growers' Association, Inc.
P.O. Box 9632
North Amherst, MA 01059-9632

Table of Contents

BY-LAWS (as modified January 8, 2003)
Massachusetts Fruit Growers' Association, Inc.

Article I - Name

The name of the organization shall be the Massachusetts Fruit Growers' Association, Incorporated.

Article II - Object

The object of the Association shall be to encourage the growing and marketing of fruits adapted to this climate and all pertaining thereto.

Article III - Membership

Section 1. Any person interested in fruit growing in Massachusetts may become an active member of the Association by paying the annual dues, due January 1st, for the ensuing calendar year.

Members of the professional staff of the University of Massachusetts and any other public servants of the fruit industry may become members of the Massachusetts Fruit Growers' Association in good standing without payment of dues by vote of the Board of Directors.

Section 2. Any association or society of fruit growers, in Massachusetts may affiliate not less than a majority of its members into active voting membership in the Massachusetts Fruit Growers' Association by paying such dues as the Board of Directors may designate. Such payment shall be due January 1st for the ensuing calendar year.

Section 3. Any member may be elected to honorary life-membership in the Association by vote of the Board of Directors. Honorary life-members shall be entitled to all privileges of membership and shall be exempt from payment of dues.

Section 4. Members in good standing shall receive a copy of the Association's annual report.

Section 5. Any individual interested in fruit growing in Massachusetts alternatively may become an associate member of the Association by paying annual dues, due January 1st, for the ensuing calendar year. The amount of these dues will be set by the Board of Directors at their Annual Fall Meeting, and shall be lower than the dues for active membership. Associate members shall receive a copy of the Association's annual report, but shall not have voting privileges at business meetings of the Association.

Article IV - Meetings

Section 1. The Association shall hold its annual meeting for the election of officers and the transaction of business at a time and place to be determined by the Board of Directors.

Section 2. The order of business to be observed at the annual meeting shall be as follows:

1. Determination of quorum.
2. Call to order and reading of minutes of previous meetings.
3. Reports of officers.
4. Reports of committees.

5. Unfinished business.
6. New business.
7. Election of officers.

Section 3. Other meetings may be held at the direction of the President or the Executive Committee.

Section 4. Notice of the time and place of each meeting of the Association shall be mailed to every member, postage prepaid, at his last known address at least ten days before the date of such meeting.

Section 5. Twenty-five members shall constitute a quorum for the transaction of business at any meeting of the Association, but a lesser number may meet, call to order and adjourn.

Article V - Officers

Section 1. The officers of the Association shall be a President, three Vice-Presidents, Secretary, Treasurer, Auditor and Board of Directors.

The President shall be chairman of the Board of Directors and of the Executive Committee.

The offices of Secretary and Treasurer may be held by one and the same person. With the approval of the Executive Committee, the Secretary may appoint or employ such assistants as are needed to conduct the affairs of the Secretary's Office.

The Secretary, Treasurer and all assistants appointed or employed by the Secretary shall receive such salary and reimbursement for expenses as may be determined by the Executive Committee.

The Treasurer shall be under bond in such sum as the Executive Committee may determine.

The President and Secretary shall be ex-officio members of all committees.

Section 2. Each year the President of the Association shall appoint a nominating committee, which shall submit to the Secretary on or before December 1st nominations for President, Vice-Presidents, Secretary, Treasurer, and Auditor, to serve for a term of one year.

Section 3. The Board of Directors shall consist of the President, Vice-Presidents, Secretary, Treasurer, Auditor, last ex-president of the Association, Chairman of the Horticultural Research Fund, and Presidents of affiliated organizations, ex-officio, and twelve Directors at large nominated in the following manner:

Each year the Nominating Committee shall submit to the Secretary on or before December 1st a list of six candidates for Directors at Large for a term of three years. The six candidates for Directors at Large so nominated shall be fruit growers. The Directors shall be nominated with due regard for the various kinds of fruit grown by the membership and the geographical distribution of fruit production within the state.

The President and Secretary, acting for the Board of Directors, may invite one member of the fruit growers' association from each of other five New England States, the Extension Fruit Specialists and the other members of the professional staff of the University of Massachusetts,

the Massachusetts Department of Agriculture, and the County Extension Services to attend the meetings of the Board of Directors and take part in its deliberations.

Section 4. Before each annual meeting the Secretary of the Association shall prepare ballots containing the names of all persons nominated for office by the Nominating Committee, with additional space in each category for writing in the names of any members of the Association nominated from the floor preceding the voting. Said ballots shall be used by the members in electing the officers, and shall carry directions for voting in the different categories and instructing the members to vote for not more than four names for Directors at Large for a three-year term, the four candidates for Directors at Large receiving the greatest number of votes to be declared elected.

Article VI - Finance Committee

The President, immediate past-President, Treasurer and one Director or former Director appointed by the President shall constitute the Finance Committee. The President will serve as Chairman of the Finance Committee.

Article VII - Executive Committee

The President, Vice-Presidents, Secretary, Treasurer and Auditor shall constitute the Executive Committee.

Article VIII - Duties of Officers

Section 1. The Presidents shall:

(a) Preside over all meetings of the Association, Board of Directors and Executive Committee.
(b) Appoint committees for various purposes.
(c) Perform all other duties pertaining to the office.

Section 2. In the absence of the President one of the Vice-Presidents shall perform the duties of that office.

Section 3. The Secretary shall:

(a) Keep a record of all meetings of the Association, Board of Directors and Executive Committee.
(b) Serve all notices required by the by-laws of the Association.
(c) Conduct correspondence.
(d) Keep a list of members of the Association.
(e) Collect dues and turn them over to the Treasurer.

Section 4. The Treasurer shall:

(a) Have charge of all moneys of the Association.
(b) Pay out money on bills approved by the President and Secretary.
(c) Make a written report of the Association's finances at the meetings of the Board of Directors and at the annual meeting of the Association.
(d) At the close of this term of office turn over all funds and records in his possession to his successor.

Section 5. The Auditor shall be entitled to examine all books, papers and vouchers at

any time, and shall make a written report at the annual meeting of the Association.

Section 6. The Board of Directors shall:

(a) Outline the policies and direct the work of the Association.
(b) Endeavor to increase the membership of the association.
(c) Meet twice a year, in the spring and fall, at the call of the President, for the purpose of planning the program for the annual meeting, preparing the annual report, and taking action on any other business or referring it to a meeting of the Association.
(d) Set the amount of the annual dues at its fall meeting.
(e) Special meetings of the Board may be called by the President.
(f) Twelve members shall constitute a quorum at any meeting of the Board.

Article IX - Duties of Finance Committee

The Finance Committee shall formulate a financial policy for the Association and draw up a budget of expenditures for consideration by the Board of Directors.

Article X - Duties of Executive Committee

The Executive committee shall:

(a) Represent and act for the Board of Directors when it is not in session.
(b) Fill vacancies in office occurring between annual meetings.
(c) Perform all other duties revolving upon it under these by-laws.

Article XI - Reserve Fund

The association shall maintain a reserve fund, which shall consist of such of the Association's funds as the Board of Directors may designate. Principal and income from said fund may be expended by vote of the Board of Directors.

Article XII - Fiscal Year

The fiscal year of the Association shall commence December 1st and end on the 30th day of the following November.

Article XIII - Amendments

These by-laws may be amended at any meeting of the Association by two-thirds vote of the members present and voting, notice of the proposed amendment having been included in the call for such meeting.

Officers and Directors for 2004

Massachusetts Fruit Growers' Association, Inc.

PRESIDENT

Ken Nicewicz	Bolton

VICE PRESIDENTS

Steve Ware	Bolton
Gordon Kimball	Lunenburg
William Fitzgerald	Methuen

SECRETARY/TREASURER

Wesley Autio	Pelham

AUDITOR

Robert Davis	Bolton

PAST PRESIDENT

Timothy Smith	Shelburne

DIRECTORS REPRESENTING LOCAL ASSOCIATIONS

Essex County Fruit Growers Association

James O'Brien, Jr.	Peabody

DIRECTORS AT LARGE

Term expires in 2005	David Chandler	Sterling
	Robert Tuttle	Warren
	Richard Bartlett	Richmond
	Mario Lanni	Lunenburg
Term expires in 2006	Gerard Bierne	Berlin
	Franklyn Carlson	Harvard
	Hamilton Lincoln, Jr.	North Brookfield
	Maurice Tougas	Northborough
Term expires in 2007	David Bishop	Shelburne
	William Broderick	Sterling
	Thomas Clark	Deerfield
	Alex Dowse	Sherborn

Massachusetts Fruit Growers' Association, Inc.
Committees – 2004

Executive:	K. Nicewicz(chair), S. Ware, G. Kimball, W. Fitzgerald, R. Davis, W. Autio, and T. Smith
Program:	D. Greene (chair), executive committee
Legislative:	A. Dowse (chair), K. Nicewicz, M. Tougas, and D. Bishop
Finance:	K. Nicewicz(chair), S. Ware, G. Kimball, W. Fitzgerald, R. Davis, W. Autio, and T. Smith
Cider:	S. Ware (chair), T. Clark, D. Shearer, R. Bartlett, and F. Carlson
UMass Fruit Advisory:	F. Carlson (chair), R. Davis, J. D. Greene, and T. Smith
Nominations:	D. Chandler (chair), M. Lanni, and R. Tuttle
Harvest Labor:	R. Davis (chair), F. Carlson, W. Broderick, G. Bierne, and G. Kimball
Annual Meeting Facililties:	R. Smiley (chair)
Marketing, Publicity, & Promotion:	K Nicewicz (chair), H. Lincoln, Jr., R. Tuttle, W. Fitzgerald, and T. Clark

Minutes
Meeting of the Board of Directors
Massachusetts Fruit Growers' Association, Inc.
Old Mill Restaurant, Westminster, Massachusetts
February 13, 2003

The meeting was called to order by President Smith at 2:00 PM. Individuals present were Wes Autio, Rick Bartlett, Gerry Beirne, Frank Carlson, Tom Clark, Jon Clements, Bob Davis, Alex Dowse, Bill Fitzgerald, Duane Greene, Mario Lanni, Tony Lincoln, Ken Nicewicz, Bob Smiley, Tim Smith, Mo Tougas, and Steve Ware. Smith gave words of welcome.

Secretary's Report

Autio presented the minutes of the November 20, 2002 Directors' Meeting. It was moved, seconded, and passed to accept the minutes as presented.

Treasurer's Report

The General Fund began the year with a balance of $73,816.82. Receipts to date totaled $29,954.04, and disbursements totaled $24,948.38. The balance on February 13, 2003 was $78,822.48. The Horticultural Research Fund began the year with a balance of $360,625.01. A total of $211.10 in receipts and $2,006.00 in expenses have occurred to date. The balance on February 13, 2003 was $347,297.42. So far in 2003, the Horticultural Research Fund has lost 3.2% of its value. The Treasurer's Report was moved, seconded and passed.

Committee Reports

Trustees of the Horticultural Research Fund, Annual Meeting Facilities, Legislative, Cider, UMass Fruit Advisory, Harvest Labor, and Marketing committees reported. Much discussion ensued.

Old Business

Clements updated the group on the progress of the Specialty Crops Grant for marketing. Significant moneys remain to be expended. The consensus was to continue the advertising cost-share program in 2003.

Smiley reported that the 2003/04 New England Fruit Meetings will be held in conjunction with the New England Vegetable and Berry Convention in Manchester, NH on December 17, 2003. A Stone Fruit School will be held on December 16, and a Pumpkin School will occur on December 18.

New Business

On behalf of the Finance Committee, Autio presented the following budget for 2003.

General Fund Budget -- 2003

		Budget 2002	Actual 2002	Budget 2003
Beginning balance		$14,354.52	$14,354.52	$17,636.01
Receipts				
	Interest	$500.00	$313.15	$300.00
	Membership	$11,000.00	$12,875.00	$12,000.00
	Fruit Meetings (net income)	$15,300.00	$15,226.49	$11,725.00
	Apple Market Report	$350.00	$308.50	$350.00
	Cider	$500.00	$390.00	$500.00
	Summer Meeting	$400.00	$640.00	$0.00
	Total	$28,050.00	$29,753.14	$24,875.00
Disbursements				
	Administration	$2,600.00	$2,044.39	$2,600.00
	Proceedings	$2,000.00	$0.00	$2,000.00
	Secretary/Treasurer salary	$2,600.00	$2,600.00	$2,600.00
	Affiliation	$400.00	$450.00	$450.00
	Apple Market Report	$350.00	$308.50	$350.00
	Horticultural Research Fund	$5,000.00	$5,000.00	$2,500.00
	Cider	$3,500.00	$3,592.76	$500.00
	U.S. Apple Association	$8,092.00	$8,092.00	$8,204.00
	N.E. Tree Fruit Research Committee	$2,500.00	$2,500.00	$0.00
	Summer Meeting	$400.00	$1,134.00	$0.00
	Web page	$1,640.00	$500.00	$1,140.00
	Miscellaneous	$1,000.00	$250.00	$1,000.00
	Total	$(30,082.00)	$(26,471.65)	$(21,344.00)
Ending Balance		$12,322.52	$17,636.01	$21,167.01

The budget was moved, seconded, and passed unanimously.

Autio provided a list of Life and Courtesy Members. Discussion ensued, and the following list of Life Members was approved: John V. Blanchard, William J. Bramlage, William J. Lord, Dominic A. Marini, Jesse L. Rice, Anthony W. Rossi, and G. Everett Wilder. The following list of Courtesy Members was approved: Wesley R. Autio, Jon M. Clements, William M. Coli, Daniel R. Cooley, Stephen J. Demski, Douglas P. Gillespie, Steven D. Goodwin, Kip Graham, Duane W. Greene, James S. Krupa, Ronald J. Prokopy, Sonia G. Schloemann, Joseph E. Sincuk, Petrus L. Veneman, Sarah A. Weis, and Cleve E. Willis.

The meeting was adjourned at 3:35 PM.

Respectfully submitted by
Wesley R. Autio, *Secretary*

Minutes
Meeting of the Board of Directors
Massachusetts Fruit Growers' Association, Inc.
Old Mill Restaurant, Westminster, Massachusetts
December 3, 2003

The meeting was called to order by President Smith at 2:10 PM. Individuals present were Wes Autio, Rick Bartlett, Bill Broderick, Rich Bonanno, Frank Carlson, Tom Clark, Jon Clements, Bob Davis, Alex Dowse, Paul Fisher, Bill Fitzgerald, Kip Graham, Tony Lincoln, Ken Nicewicz, Bob Smiley, Tim Smith, Mo Tougas, and Steve Ware. Smith gave words of welcome.

Secretary's Report

Autio presented the minutes of the February 13, 2003 Directors' Meeting. It was moved, seconded, and passed to accept the minutes as presented.

Treasurer's Report

The General Fund began the year with a balance of $73,816.82. Receipts to date totaled $42,042.02, and disbursements totaled $74,240.40. The balance on December 3, 2003 was $41,618.44. The Horticultural Research Fund began the year with a balance of $360,625.01. A total of $4,314.30 in receipts and $11,677.59 in expenses have occurred to date. The balance on December 3, 2003 was $430,927.32. So far in 2003, the Horticultural Research Fund has increased in value by 19.5%. The Treasurer's Report was moved, seconded and passed.

Committee Reports

Trustees of the Horticultural Research Fund, Annual Meeting Facilities, Program, Legislative, Cider, UMass Fruit Advisory, Harvest Labor, and Marketing committees reported. Much discussion ensued.

Motion: *MFGA will contribute $150 to support Ag. Day at the State House.* The motion was seconded and passed unanimously.

Old Business

Graham gave an update on the Crop Disaster Program.

New Business

Motion: *MFGA Annual Business Meeting will occur on December 17, 2003 at the New England Fruit Meetings in Manchester, NH.* The motion was seconded and passed unanimously.

With the meeting occurring in only two weeks, the Directors assumed the responsibilities of the Nominations Committee. The following nominations were moved, seconded, and passed unanimously: President–Nicewicz, 1st Vice President–Ware, 2nd Vice President–Kimball, 3rd Vice President–Fitzgerald, Secretary–Autio, Treasurer–Autio, Auditor–Davis, Board of

Directors–Bishop, Broderick, Clark, and Dowse.

Carlson updated the group on efforts to grow the endowments in support of the UMass Cold Spring Orchard Research & Education Center. Much discussion ensued, and it was decided to invite Doug Reid (Director of Development for the College of Natural Resources & the Environment) to the next Directors' Meeting.

Fisher updated the group on the Trade Assistance Program, suggesting that in the immediate future, it will not apply to New England apple growers.

Some discussion occurred regarding the location and time of the next (2004/05) New England Fruit Meetings. The decision was tabled until the Annual Business Meeting on December 17.

The meeting was adjourned at 4:10 PM.

Respectfully submitted by
Wesley R. Autio, *Secretary*

Minutes
Annual Business Meeting
Massachusetts Fruit Growers' Association, Inc.
Center of New Hampshire Holiday Inn, Manchester, NH
December 17, 2003

The Annual Business Meeting was called to order at 12:10 PM by President Timothy Smith. President Smith offered words of welcome to the membership. Twenty individuals were present.

Secretary's Report

The Annual Business Meeting was held on January 8, 2003, with 24 members present. Directors met on February 13 and December 3. Trustees of the MFGA Horticultural Research Fund met on March 19. The Annual Summer Meeting was on July 23 at Apex Orchards. Approximately 150 individuals attended the meeting.

One-hundred and ninety-five individuals were members of the Association in 2003, similar to 2002. Below are the membership figures for 1995-2003.

Category	1995	1996	1997	1998	1999	2000	2001	2002	2003
Active members	52	51	47	45	45	43	42	49	44
Associate members	58	73	62	59	56	60	65	73	78
Exhibitor members	67	72	69	56	62	57	60	59	50
Courtesy members	18	16	15	15	15	14	16	11	16
Life members	8	8	7	7	7	7	6	4	7
Total	203	220	200	182	185	181	189	196	195

It was moved, seconded, and passed to accept the Secretary's Report.

Treasurer's Report

The General Fund began the year with a balance of $73,816.82. Receipts totaled $42,575.13, and disbursements totaled $83,428.84. The balance on December 31, 2003 was $32,963.11. The Horticultural Research Fund began the year with a balance of $360,625.01. A total of $2,500.00 was moved into the Horticultural Research Fund from the General Fund, $1,725.00 were received as general donations, and $93.54 were received as interest. In total, $17,483.59 were expended on grants. The balance on December 31, 2003 was $438,664.18 (an overall increase of 21.6%). Please note that the data presented here are slightly modified from those presented at the meeting, reflecting the final activity and balances of 2003. Details follow.

GENERAL FUND

Balance -- Fleet Bank, 12/31/02			$73,816.82
Receipts			
	Active member dues -- 2003	$8,800.00	
	Associate member dues -- 2003	$1,950.00	
	Exhibitor member dues – 2003	$425.00	
	Exhibitor member dues – 2004	$0.00	
	Annual meeting – 2003	$9,099.00	
	Annual meeting registration fee -- 2003	$7,550.00	
	Annual meeting – Dec. 2003	$0.00	
	Summer meeting	$0.00	
	Subscriptions	$35.00	
	Cider	$650.00	
	Galaxy Fund interest	$280.91	
	Apple Market Report	$372.00	
	Horticultural Research Fund donations	$625.00	
	Travel	$258.22	
	Agro-Environmental Tech. Grant -- Schloemann	$1,190.00	
	Agro-Environmental Tech. Grant -- Clements	$5,850.00	
	Fruit Notes & Healthy Fruit	$4,030.00	
	UM Cold Spring Orchard R & E Center donations	$805.00	
	IPM donations	$655.00	$42,575.13
Disbursements			
	Administration	$2,087.45	
	Secretary/Treasurer salary	$2,600.00	
	Annual meeting – 2003	$23,353.49	
	Annual meeting – Dec. 2003	$211.00	
	Proceedings – 2001/2/3	$1,000.00	
	Cider	$650.00	
	Web page	$0.00	
	Summer meeting	$0.00	
	Affiliations	$1,015.00	
	US Apple Association	$8,204.00	
	New England Tree Fruit Growers Res. Com.	$0.00	
	Transfer to Horticultural Research Fund	$3,125.00	
	Specialty Crops Grant -- Clements	$23,412.81	
	Specialty Crops Grant -- Prokopy	$7,158.99	
	Agro-Environmental Tech. Grant -- Schloemann	$490.00	
	Agro-Environmental Tech. Grant -- Clements	$3,916.22	
	Travel	$258.22	
	Service charge	$18.66	
	Ag. Day at the Statehouse	$150.00	
	Apple Market Report	$288.00	
	Fruit Notes & Healthy Fruit	$4,030.00	
	Horticultural Research Center Donations	$805.00	
	IPM Donations	$655.00	$(83,428.84)
Balance -- Fleet Bank + Galaxy Fund, 12/31/03			$32,963.11

HORTICULTURAL RESEARCH FUND

Balance -- Fleet Bank, 12/31/02		$13,244.19
Receipts		
Sincuk Fund	$1,725.00	
From General Fund	$2,500.00	
From Merrill Lynch Investment Account	$10,000.00	
Interest	$93.54	$14,318.54
Disbursements		
Sincuk Fund	$8,704.15	
Weis Grant	$1,506.00	
Sign Grant	$696.00	
Irrigation Grant	$3,458.98	
Autio Grant	$1,006.00	
Clements Grant	$566.78	
Sincuk Grant	$810.30	
Leahy Grant	$735.38	$(17,483.59)
Balance -- Fleet Bank, 12/31/03		$10,079.14
Balance -- Merrill Lynch, 12/31/02		$347,380.82
Cash -- 12/31/03		$95,566.00
Transfer to Fleet Bank account	$10,000.00	
Investments (value as of 12/31/03)		
Altria Group	$10,884.00	
AMLI Residential Properties	$5,360.00	
Chesapeake Energy	$40,740.00	
Consolidated Edison	$21,505.00	
Exxon Mobil Corporation	$41,000.00	
General Electric	$30,980.00	
Puget Energy	$11,885.00	
Southern Company	$15,125.00	
Thornburg Mortgage	$27,200.00	
TXU Corporation	$11,860.00	
Franklin Universal Trust	$8,745.00	
Liberty All-Star Equity Fund	$59,002.02	
Liberty All-Star Growth Fund	$9,992.29	
Royce Value Trust	$33,144.93	
Zweig Fund	$5,595.80	$333,019.04
Balance -- Merrill Lynch, 12/31/03		$428,585.04
Total Balance -- Horticultural Research Fund/Reserve Fund		$438,664.18
Overall change in value in 2003		21.6%
Overall change not related to grant expenditures and deposits		22.5%
Approved expenditures for operation of the Horticultural Research Center		$23,777.28

It was moved, seconded, and passed to accept the Treasurer's Report. Davis, after auditing the 2003 data, reported that the Treasurer's Report was accurate as presented. It was moved, seconded, and passed to accept the Auditor's Report.

New England Fruit Meetings & Trade Show – 2004

Smiley presented the available options for meeting in New Hampshire in December, 2004.

Motion: *The New England Fruit Meetings & Trade Show will be held on December 15 and 16, 2004 at the Center of New Hampshire Holiday Inn in Manchester, NH. Two concurrent sessions will be presented during each of the two days, one featuring tree-fruit crops and the other featuring vegetable and small-fruit crops.*

The motion was seconded and passed unanimously.

Nominations Committee Reports

Smith presented a slate of candidates for officers and directors, including Ken Nicewicz for President, Steve, Ware, Gordon Kimball, and Bill Fitzgerald for Vice Presidents, Wes Autio for Secretary and Treasurer, Bob Davis for Auditor, and David Bishop, Bill Broderick, Tom Clark, and Alex Dowse for directors. No nominations were received from the floor, so it was moved, seconded, and passed to instruct the Secretary to cast a single ballot for the slate of candidates.

President Smith passed the gavel to Ken Nicewicz, the incoming president, and the meeting was adjourned at 12:40 PM.

Respectfully submitted,

Wesley R. Autio, *Secreatry/Treasurer*

Ground Floor Management and Rootstock Selection for Organic Apple Production

Roberto Zoppolo, Dario Stefanelli and Dr. Ron Perry
Department of Horticulture Michigan State University
East Lansing, MI

The production of organically grown products continues to gain favor and interest by consumers. Consumers see organic products as arising from an agricultural management system that enhances biodiversity, which appreciates the nature of biological cycles, and stresses the importance of soil biological activity. A research and outreach project to grow organic apples was initiated in spring 2000 at the Clarksville Horticulture Experiment Station, Clarksville, MI. This is a study which includes scientists from many disciplines and an advisory panel of organic growers. Part of the research in the plot being carried out by horticulturists is to study the interaction of ground floor management systems and rootstock performance. We are using a hypothesis that rootstocks with higher vigor might compensate for greater stress imposed by weed competition and other pest infestations. A second hypothesis establishes the fact that soil cover and weed management affects the timing of N availability and uptake in the system, and impact apple tree's growth under organic production practices.

We began this work by establishing some 468 trees of Pacific Gala on three rootstocks, M.9 NAKB 337, M.9 RN 29 and Supporter 4. Trees have been trained to a Vertical Axe, planted at variable spacing of 1.35 (NAKB 337), 1.65 (RN 29) and 1.95 (Spptr 4) X 4.5 m apart with drip irrigation. The orchard floor is being managed within the protocols of three systems; mulching, weed suppression flaming and the Swiss Sandwich system. The mulch treatment is comprised of alfalfa hay laid in a 1 meter wide strip on each side of the row. The flaming treatment consists of the use of a Propane burner: 4 torches of 220,000 BTU/h on a strip 1 meter wide when vegetation grows over 10 cm high. The Swiss Sandwich System was developed at the Research Station for Organic Production, FiBL in Frick, Switzerland. The center of the tree row (60 cm wide) allows the development of spontaneous vegetation with two side strips (60 cm wide) tilled at each side. A rotovator and spring tooth harrow has been used when weeds get around 10 cm in height.

Preliminary Results

This was our first cropping year for the planting with limited volume.

- Treatments affect nitrate-N content in soil (Mulch showed the highest values)
- Total N in leaf tissue is being affected by the treatments but is at adequate levels.
- Rootstock vigor differences appear as expected with Spptr 4>RN 29>NAKB 337.
- The Ground Floor treatment effect is not having a significant impact on tree branch growth, but does effect trunk vigor.
- The first harvest showed differences among treatments and rootstocks, with a significant interaction between both factors. (Flaming lowest and M9-NAKB 337 highest).
- The volunteer vegetation (species) is changing in the sandwich strip.

Remarks

Applicability of the flaming needs more engineering and evaluation of the effect of heat . Mulching requires less maintenance but has some draw backs: rodents, fire, nitrogen and weed establishment in the mulch. Secondly, mulching effectiveness is heavily affected by redressing to compensate for decomposition. The sandwich system is simple to manage and results are promising in Michigan. It appears at this time that an adjustment is needed related to area of soil inhabited by vegetation versus tilled area.

Acknowledgments

Support for this work has been sponsored by Instituto Nacional de Investigación Agropecuaria INIA – URUGUAY, Michigan Agricultural Experiment Station and the Clarksville Horticultural Experiment Station staff J. Skeltis, G. Byler, S. Byler, L. Erb, D. Nash, and A. Perry

Managing Insect Pests in New England Orchards

Yellow Mites, Green Pug Moth, and Rose Leafhopper

Heather Faubert, University of Rhode Island
120 Greenhouses, Kingston, RI 02881
(401) 874-2750 hhf@uri.edu

Yellow Spider Mites

I've noticed several orchards in Rhode Island with pest spider mites that look like two spotted spider mites, but don't have spots. These mites are in fact a different species: yellow spider mites, *Eotetranychus carpini borealis*. The reason you should care about which species of spider mite you have is that the timing of the life cycle is different for TSSM and yellow mites. Both mites overwinter as adult females, but TSSM overwinter in the ground cover and yellow mites probably overwinter right on apple trees. So where we don't usually see TSSM until well into the summer, we can find yellow mites on apple leaves in the end of April or early May. I've seen large populations of yellow mites in early June.

Yellow mites cause the same kind of damage as TSSM. Spider mites feed on plants by piercing the leaf tissue with their mouthparts and sucking out cell contents. Injured leaves have lower rates of photosynthesis, increased transpiration, and lower chlorophyll contents. The injury causes mottling of the leaves and if the damage is severe enough, the leaves turn brown. The mites usually feed on the underside of leaves, near the main leaf vein, so damage is usually first seen along the mid-vein.

Yellow mites are a pest in the Pacific Northwest. There the mites attack many tree fruits including apples, peaches, nectarines, and pears. In the Pacific Northwest, yellow mites also attack raspberries; TSSM and yellow mites are the two most important mite species that attack raspberries. Yellow mites were reported for the first time feeding on raspberry leaves in 1992 in Washington state. So in only a few years, yellow spider mites have become a common problem in the Northwest.

Yellow mites have been found on apples in Rhode Island, Connecticut, and southern Quebec. Other researchers in New England and New York have not reported finding yellow mites, but it seems likely that they either could be there, or could be there soon. I have not found them on raspberries in Rhode Island, but I have looked in only a couple of raspberry plantings.

Predator mites that typically feed on TSSM and European red mites also feed on yellow mites. Speaking of predator mites, don't confuse yellow mites with *Zetzellia mali*, the predator mite. *Zetzellia mali* nymphs are bright yellow and the adults are yellowy-orange. The pest yellow mites are very pale.

Yellow mites seem fairly easy to control with miticides. I've seen yellow mite populations controlled with Acramite or Apollo as well as with Vendex mixed Tactic. In the Pacific Northwest they recommend using Agri-Mek, Acramite, Pyramite, Apollo, Savey, Kelthane, or Vendex, against yellow mites or TSSM on tree fruit.

Green Pug Moth

You have probably heard of green pug moth before, but since it is still a relatively new pest I want to review it. Green pug moth*, Chloroclystis rectangulata,* is a small moth native to Europe and Asia. It was first detected in North America in Nova Scotia in 1970. Since then it has spread throughout New England, New York and New Jersey. It was found in Maine in the

early 1980's and spread to Connecticut by 1997. I found it in Rhode Island in 1998. It also occurs in the Pacific Northwest.

For a new pest, this isn't such a bad one. Even though the caterpillars feed directly on apple and pear buds and flowers, the feeding causes the flowers to abort rather than deform the fruit. The only economic damage that could be caused by green pug moth is if the insect is present in very high numbers and aborts too many flowers. I must admit that I've seen what I thought was a scary amount of damage during bloom, but it really didn't amount to too much loss in fruit set. Consider all the fruit you usually want to thin.

The green pug has one generation per year. The insect overwinters as eggs on the bark of twigs of apples and pears and at least 30 species of trees. The eggs hatch in April and the pale, green caterpillars feed upon buds, flowers, and developing leaves. The caterpillars bind flower parts or leaves together with silk to make a shelter. The caterpillars complete their growth by petal fall, at which time most large caterpillars have a burgundy stripe down their backs. The caterpillars grow up to 3/8-1/2 inch in length. Caterpillars pupate under loose bark of trees or in soil under trees. Two to three weeks later, small gray moths emerge and lay eggs for overwintering. The moths don't look very green and are not easily. I have seen green pug moths in only one orchard, though I've found larval damage in nearly every orchard I've scouted.

The caterpillars move in inchworm fashion and make small holes in developing flower clusters. During the pink bud stage, you may see small holes on petals and when you pull open the petals you find chewed up flower parts. A green pug moth caterpillar has eaten away at the anthers and pistol of the flower, sometimes completely hollowing out the flower. One caterpillar can damage several flowers. Often, when the culprit is actually found, it is inside the developing bud feeding on the anthers, well protected by the closed flower petals.

Nova Scotia fruit researchers recommend applying an organophosphate insecticide at tight cluster to early pink if you're finding six or more green pug moth larvae per 100 fruit clusters.

Leafhoppers

I think everyone knows that we deal with two species of leafhopper that look nearly identical, white apple leafhopper, *Typhlocyba pomaria*, and rose leafhopper, *Edwardsiana rosae*. It seems as though we always had white apple leafhoppers attacking apple trees, but then rose leafhopper started becoming a problem as well. In Rhode Island, it was 1992 when we decided something was different about the leafhoppers we were finding in orchards. I believe other New England states started noting a difference about the same year. It's difficult to say why rose leafhoppers started causing problems in orchards recently. Rose leafhoppers could have always been there, but in low numbers. It could be that there is more multiflora rose on more abandoned pastures now which has allowed more rose leafhoppers to develop. It doesn't appear to be a newly introduced species because rose leafhopper was found to be a pest of Northeast apple in the early 1900's.

I want to review these species because I think confusion still exists and it's important to understand the differences in the two species so that proper decisions can be made. Both species cause the same type of damage, stippling or chlorosis of leaves, and the spotting of fruit by the excrement of nymphs and adults. Nymphs feed more than adults and cause more damge. Another problem with leafhoppers, and perhaps the most significant, is that adult leafhoppers are a nuisance to apple pickers.

White apple leafhopper overwinters as eggs just beneath the bark on 1-5 year old wood. Hatching begins around late pink and is completed by petal fall. The pale, white nymphs feed on undersides of leaves and cause the typical stippling damage. The nymphs develop into adults by mid June and lay eggs for the second generation. The second generation eggs do not hatch until mid to late August; the nymphs develop into adults just in time for harvest and lay overwintering eggs.

Rose leafhopper overwinter as eggs on roses, primarily multiflora rose. Eggs hatch in early spring, nymphs develop into adults and then migrate to apples as well as other plants such as pear, peach, hawthorn, and raspberry. The migration takes place in early to mid June, so that the rose leafhoppers are arriving in orchards at about the same time as white apple leafhoppers are maturing into adults. Rose leafhoppers do not pause between generations as white apple leafhoppers do. The adults lay eggs that quickly hatch to start the next generation. There is a third generation that develops into adults just in time for harvest. These adults migrate back to roses to lay overwintering eggs.

You've probably heard that you can tell the difference between the two species when nymphs are mid to large size. The rose leafhopper nymphs have rows of small, dark spots on their backs. You need a hand lens to see the spots.

You might say 'so what, what does it matter which species I have?' I think it's helpful to know which species you have so you know what to expect in your orchard and make more informed decisions. If leafhoppers appear well controlled at petal fall, but then you find adults in June, does that mean rose leafhoppers have emigrated into your orchard or that you missed controlling the white apple leafhoppers?

In mid June if you find many leafhopper adults, these could be from either species, but you can't tell which one. At this time you should look at the foliage. If the adults you are finding are white apple leafhoppers there will be leafhopper stippling damage on the oldest foliage. The nymphs developed on the trees and the damage will be there for you to see. If mid June leafhopper adults are present and there isn't any foliar damage, the leafhopper is rose leafhopper which has recently emigrated to your trees. So if you decide the leafhoppers are rose leafhoppers and you don't treat them, you'll be plagued with leafhoppers all summer long. If you decide they are white apple leafhopper, once the adults die you won't find them again until August. Of course, there is always the possibility that you have both species.

Rose and white apple leafhoppers are resistant to organophosphate insecticides. Pesticides that do control leafhoppers include Sevin, Thiodan, and Provado. Agri-Mek used at first cover against leafminers will also control leafhoppers. Sevin used as a thinner will control white apple leafhoppers nymphs, provided it is used at the higher rate. I had always heard that sprays should be aimed at small leafhopper nymphs because they are easier to kill at this stage. They probably are easier to control at this stage, but the larger nymphs and adults are not difficult to control with the proper insecticide. Recently, researchers from New York have been recommending controlling the adults just before harvest. Since the damage by leafhoppers is primarily a nuisance to pickers, it may be better to wait until close to harvest and apply Sevin or a low rate of Provado. For a low rate, New York is recommending 1/2 ounce per 100 gallons. Also, it may be that attacking the adult stage of insects with insecticide, rather than the immature larval or nymphal stage, is a technique to reduce insects becoming resistant to insecticides. Perhaps knocking down the adults just before harvest is a good method to get rid of the nuisance of leafhoppers and also reduce the chance they'll develop resistance to the chemicals that do control them.

Mineral Nutrient Management for Organic Fruit Production

Dr. Jim Schupp, Department of Horticultural Sciences
Cornell's Hudson Valley Lab Highland, NY

Dr. Renae Moran, Highmoor Farm
University of Maine Monmouth, ME

Many apple growers are currently seeking to increase profitability through market diversification. One way that growers can distinguish their product to consumers is by describing and promoting the process by which it is produced (O'Rourke, 2002). Examples of "process-driven" market alternatives include Integrated Fruit Production, Integrated Pest Management, Sustainable, Organic, and Biodynamic. The largest and best established of these is organic production, a label that provides an alternative for affluent socially conscious consumers who prefer fewer chemicals in their food (Fresh Trends, 2002).

Although mineral nutrition is an important component of organic orchard management, there are other factors that are more critical to the success of an organic orchard. Factors which must be in place include good market demographics, grower commitment, and a workable pest management strategy. Demand for organic produce is higher in metropolitan areas, especially those with nearby college campuses, than in rural areas (Fresh Trends, 2002). While some consumers are willing to pay a modest premium for organic produce, the extreme complexity of apple pest management, with the limited organic management options and higher production costs requires great dedication on the part of the grower. Only growers who are committed to making the system work will remain organic in the long run.

Organic Regulations

Organic production has a regulatory component: typically third party certification that only approved practices and products were used in the production and handling of the crop. The USDA National Organic Program (NOP) established national standards for organic labeling in 2002, and these regulations are interpreted by accredited state or private certification agencies. The certification agency has the final word on whether the crop can be certified as organically produced, although the NOP should result in uniform, consistent standards. Certification agencies can vary considerably by fees, documentation required, and sometimes by the products that are restricted or the practices that are required. Make sure you have read and understood the rules for certification, and make sure your intended customer accepts the same practices and products as the certifying agency.

Farms with less than $5000 in annual sales of organic products can be exempt from certification, but still must abide by NOP standards. A person who knowingly sells or labels a product that fails to meet NOP standards as organic can face a civil penalty of up to $10,000.

The Organic Material Review Institute (OMRI) is an organization that evaluates proprietary products to see if they meet the standards for organic production under the NOP. OMRI lists brand name products, such as blended fertilizers with more than one ingredient. They also provide a "generic materials list" for single ingredient products such as ground limestone or peat moss, which can be used regardless of brand name, provided the product is pure. Not all manufacturers are willing to pay the fees to have their products listed by OMRI. It is possible that an unlisted product may be organically acceptable, however the grower must determine whether all the product's ingredients and its manufacturing process are organically acceptable.

Mineral Nutrition & Groundcover Management

Groundcover management and mineral nutrition are integrally linked. While it is beyond the scope of this paper to present an in-depth description of organic groundcover management, some inclusion is necessary to help the reader envision the type of groundcover system into which the mineral nutrient practices are being integrated.

Orchards are typically planted on slopes where erosion is a concern. A permanent fescue sod between the tree rows will prevent erosion and reduce soil compaction from the operation of farm equipment in the alleys. Hard or red fescues are slow growing, reducing the need for mowing, and are poor alternate hosts for apple pest organisms. Because fescues are slow to establish, it is best to apply the seed at the high end of the recommended seeding rate to establish a full ground cover as rapidly as possible and prevent weeds from becoming reestablished. A seeding mixture of annual rye and fescue is sometimes used to speed the rate of groundcover establishment.

Apple is a weak competitor for water and nutrients. A three- to four- foot-wide weed-free strip under the trees is maintained to lessen this competition. This is particularly important during the first several seasons of the orchard. Newly transplanted trees have impaired root systems and this further weakens the ability of the trees to compete with weeds. An effective weed management program fosters rapid early tree growth and early fruit production, resulting in a faster return on investment. Weed management is among the biggest challenges in organic apple production (Jim Bittner, Singer Farms, personal communication).

The primary weed control options for organic blocks are cultivation or mulches, and each option has pros and cons. Cultivation provides immediate and effective weed control, but must be reapplied several times each season, resulting in increased labor and fuel costs (Schupp and McCue, 1996). Long-term use of cultivation reduces soil organic matter. To minimize the negatives, cultivation should be limited to monthly applications in May, June and July, followed by a cover crop of canola or vetch in late August.

Mulches can provide adequate weed control if renewed every one or two years, but are expensive, and create a favorable habitat for voles. The decomposition of mulches contributes organic matter to the soil in the long term, but ties up mineral nutrients in the short term, especially N, the lack of which can be limiting to tree growth and

productivity. Coarse shredded bark or woodchip mulch will decompose more slowly than finer materials and is less favorable to voles (Merwin, 1995). Bark or woodchip mulch should be supplemented with hand or flame weeding when the trees are young.

Site Selection & Preparation

The primary component of organic mineral nutrient management is building and maintaining a soil that is biologically active and high in organic matter. Orchard sites are typically selected for climatic conditions, slope, elevation, location relative to other producers and markets, and of course, availability of the real estate. Soil characteristics of a prospective orchard site are often a secondary consideration. Selecting an orchard site with good soil properties is essential when planning an organic block.

Changing soil characteristics is a long-term process and correcting soil problems in an established orchard is difficult. Furthermore, there are few rapid rescue options available to the organic grower. Starting out with soil that has adequate depth, drainage, texture, water and nutrient holding capacity, pH and mineral nutrient content is always advisable, but with organic production, it is vital.

Once an appropriate site has been selected, pre-plant soil preparations to correct any deficiencies, and to increase organic matter and biodiversity of the soil begin. Ideally one should plan on spending two years on site improvement before planting the orchard.

Soil testing is used to establish the baseline values of soil acidity, organic matter content, nutrient holding capacity, and mineral nutrient content. Liming to increase soil pH and measures to increase organic matter and mineral nutrients are best addressed prior to planting. In this way lime and organic matter can be incorporated deeply into the soil with cultivation so that soil properties are optimized throughout the root zone. This is also the time to tile poorly drained parts of the site and eliminate existing weeds.

Lime should be added to raise the soil pH to 6.5. If the soil test indicates a need for magnesium (Mg), dolomitic, or “high mag” lime should be used. One or two annual applications of 20-25 tons per acre cow or chicken manure can also be beneficial for increasing organic matter and adding mineral nutrients to the soil. Horse manure should be avoided, as it is low in nutrient value relative to other animal manures. Furthermore, weed seeds often survive the inefficient digestion of a horse’s gut and can contribute to the introduction of new weed species.

Animal manure must not be stockpiled prior to use, as it can cause severe problems with neighboring residences due to both odor and flies. Manure should be tilled in promptly after spreading to incorporate it and prevent loss of N due to volatilization. Typically, seeding a green manure or cover crop such as buckwheat or Sudax follows manure applications. These crops are mowed down before going to seed and then tilled down. The manure application and cover crop are repeated, followed by seeding the permanent ground cover in late summer the season before planting.

Pre-plant Compost

Organic matter is often low in many existing orchard soils, and increasing it improves soil water and nutrient holding capacity. This enhances root regeneration and promotes overall tree vigor. Adding compost as a source of organic matter to planting holes has been demonstrated to have beneficial effects on young apple tree growth in experiments in Massachusetts and Maine (Autio, et al., 1991). The effects of planting hole treatments are most visible during the year of planting. As root growth extends beyond the volume of the planting hole, the effects of planting hole treatments diminish. If organic matter amendments were broadcast throughout the orchard soil, perhaps the beneficial growth response could be sustained for a longer period.

For pre-plant compost to be a feasible management practice, an economical, local source of compost must be available. University of Maine Cooperative Extension developed an apple pomace composting project in cooperation with Chick Orchards, Monmouth, Maine. Apple pomace from Chick's cider operation was mixed with leaf waste from the local waste transfer station, and chicken manure from a local egg farm at a 2:6:1 ratio by volume. Wood ash was used to adjust the pH to 5.8 prior to composting. Composting reduced the volume of apple pomace waste by 50%, and converted it into an organic soil amendment with highly desirable characteristics. A study was initiated in Maine in 1998 to determine if pre-plant incorporated apple compost or synthetic phosphate (P) fertilizer, either alone or in combination, would improve early apple tree growth and precocity.

The results of this study indicated that pre-plant compost incorporation was more effective than P fertilization for increasing tree growth during the establishment years (Schupp and Moran, 2002). Soil-incorporated compost resulted in increased tree growth and flowering into the third year after planting. Greater tree growth with compost was most likely due to improved N and K status of the trees, and through improved soil aeration and water holding capacity. Cumulative yield has been greater for trees grown in compost plots over the first six years of the study. These results show that trees planted in soil amended with apple pomace compost fill their space more quickly and are more productive than untreated trees in the first years of cropping.

Mineral Nutrient Maintenance

Harvesting an apple crop doesn't remove large amounts minerals from the soil, compared to many crops (Stiles and Reid, 1991). Apple trees are deciduous perennials with mechanisms for remobilizing essential minerals and storing these in the perennial organs prior to leaf abscission in the autumn. Potassium is the one mineral that is removed in significant amounts with the harvested crop. The result is a production system that requires relatively modest mineral nutrient inputs to maintain optimal production.

Selecting soils with good nutrient holding capacity, maintaining optimal soil pH, and maintaining high (3-4%) soil organic matter can lead to most of the orchard's nutritional

needs being met by natural cycling, provided weed control is adequate to prevent competition. Still, some supplementary fertilizer application is usually necessary to maintain optimal yield and fruit quality.

The primary method of providing both organic matter and mineral nutrients is the application of compost. The availability of mineral nutrients from compost is usually slower than from inorganic salts. For this reason, compost is often applied after harvest in autumn or at bud break in early spring. The compost application rate is often based upon the amount of available N relative to that required by the block. For example, if one were applying compost with 5 percent N to an orchard requiring 40 lb actual N per acre, the rate of compost would be 800 lb. By comparison the rate of compost with two percent N for the same block would be 2000 lb per acre.

Composts can vary greatly by ingredients, nutrient value and cost. Use care in selecting composts that originated from approvable ingredients and processes, that provide adequate amounts of the nutrients needed, and that provide good value relative to the cost. One way to reduce the both the purchase price and transportation cost of compost is to use farm waste to produce one's own. Apple pomace is one potential source of high carbon waste available to many apple growers, and can be combined with other ingredients to produce high quality compost, as previously described. See Edwards (1998) for detailed information on on-farm composting.

Under NOP regulations products, including fertilizers, are listed as "allowed" or "not allowed", "not prohibited" or "prohibited". Only those materials that are listed "allowed" and "not prohibited" may be used on organic crops. In some cases the origin of a substance affects its status. Gypsum from a mined source is non-synthetic and is not prohibited, while gypsum by-products, such as scrapped dry wall is synthetic and not allowed. Always check with the certifying agency to make sure that the products you intend to use comply with organic standards.

Adequate mineral nutrients must be available in order for the trees to assimilate large amounts of carbohydrates, partition those assimilates into fruits, and for those fruits to maintain premium eating quality until consumed. Organic nutrient sources are lower in nutrient concentration and generally more complex than non-organic salts. Organically derived nutrients may not be readily available until decomposition. This lower-slower process requires management with a long-term perspective.

Tracking the trends in mineral nutrient levels in annual leaf samples over several years is the single best way to monitor orchard fertilizer needs. The annual leaf sample should be supplemented with a soil sample every third year. Steps can then be taken to begin corrective measures when a macronutrient shows a trend toward becoming sub-optimal, rather than waiting for an actual shortage to develop. Conversely, foliar sprays of micronutrient fertilizers are permitted under NOP guidelines only when there is a documented shortage. In either case, leaf analysis is necessary to assess the situation.

The principal nutrient required to maintain adequate tree vigor and productivity is N. Organic N sources include manure, fish emulsion/meal, bone meal and blood meal.

Animal manures should be applied pre-bloom in most cases, as NOP regulations prohibit use of animal manures within 90 days of harvest to prevent possible E. coli contamination of the crop. Manures can provide higher concentrations of mineral nutrients, especially N, compared to compost, however much of the N value of manure can be lost to volatilization unless it is soil incorporated. For this reason, manures are better suited to groundcover management systems utilizing cultivation.

Matching nutrient needs with those provided by alternative sources allows the grower to provide the best fit of nutrient supplements. Manures provide multiple nutrients besides N. For example chicken manure is high in phosphorous.

Fertilizers containing soluble forms are more expensive, but are more quickly available, thus useful for correcting a deficiency. Sodium nitrate (Chilean nitrate) is listed as not prohibited as long as use is restricted to no more than 20% of the crop's total nitrogen requirement. Organic standards in the UK prohibit the use of blood and bone meals, so these N sources should not be used on fruit grown for export.

Harvest removes 60-100 lb per acre of potassium (K) annually, while most orchard soils in the northeastern U.S are naturally low in magnesium (Mg) (Stiles and Reid, 1991). Compost can provide meaningful amounts of these minerals (Schupp and Moran, 2002). In addition to organically derived sources, Sulpomag, a mined material, is frequently used as a source of both K and Mg. Magnesium sulfate (Epsom salts) is allowed as a soil amendment if there is a documented soil Mg deficiency.

Calcium (Ca) deficiency is often associated with low soil pH, thus lime is the primary material for maintaining soil Ca. Mined gypsum may be applied when it is desired to increase soil Ca without raising pH.

Bitter pit is an apple disorder associated with low fruit Ca (see the preceding article by Watkins, et al.). Nutritional imbalances such as excessive N, K, or Mg, and deficient B, as well as non-nutritional factors, such as variety, excessive fruit size/low crop load, or drought can contribute to low fruit Ca, even when soil Ca is adequate. In such instances, foliar sprays of calcium chloride ($CaCl_2$) are permitted to reduce the incidence of bitter pit. Under NOP regulations, the $CaCl_2$ used in organic orchards must be extracted from brine.

Deficiency of boron and other micronutrients may be corrected using synthetic foliar fertilizers, if a deficiency is documented by soil or leaf analysis. In general, micronutrient chelates and sulfates are allowed. Those made from nitrates or chlorides are not allowed.

Summary

Organic production requires a holistic approach to agricultural ecosystem management. Because of the perennial nature of apple orchards, this is not a great departure from conventional orchard management, except that corrective techniques are limited primarily to naturally derived materials. It is very challenging to produce apples organically, because of the need to maintain the planting over many years without rotation, the vast pest complex, and the exacting demand for high quality, unblemished fruit in the fresh apple market, where much of the growth potential for organic fruit lies.

Organic mineral nutrition management hinges on two principals: 1) practices that lead to the buildup and maintenance of soil that is biologically active and high in organic matter; and 2) supplementing the mineral nutrients provided by the soil with fertilizers from approved sources. Organic orchards should be sited on land with superior soils and pre-plant soil preparation to increase organic matter and correct any sub-optimal soil characteristics. Weed management is critical to reduce competition for nutrients and water.

Soil and leaf analysis provide the basis for correcting mineral nutrient deficiencies or imbalances, and with organic production, changes should be tracked over several years. It may be necessary to use a number of strategies to supply mineral nutrients over the life of the orchard. The slower, natural methods applied require a management approach that is simultaneously patient and dynamic. The organic approach may increase crop value, however as with most premium market niches, the value is balanced with higher production costs and more management inputs. Personal satisfaction has to be considered part of the reward in order to sustain the energy required to manage an organic orchard.

Literature Cited

Autio, W.R., D.W. Greene, D.R. Cooley and J.R. Schupp. 1991. Improving the growth of newly planted apple trees. HortScience 26: 840-843.

Edwards, Linda. 1998. Organic Tree Fruit Management. Certified Organic Associations of British Columbia, Keremeos, BC, Canada. pp. 198-201.

Fresh trends. 2003. Organically speaking. The Packer, Lenexa, KS. p. 5.

Merwin, I. 1995. IPM systems for orchard soils: Groundcover management vs. weed control. Proc. New Engl. Fruit Mtg. 101: 43-49.

O'Rourke, D. 2002. Major trends in U.S. and world apple markets. N.Y. Fruit Quarterly 10(4): 10-18.

Schupp, J.R. and J.J. McCue. 1996. Effect of five weed control methods on growth and fruiting of 'McIntosh'/M.7 apple trees. J. Tree Fruit Prod. 1(1): 1-14.

Schupp, J. R. and R. E. Moran. 2002. Testing pre-plant monoammonium phosphate and apple compost for improving the growth of newly planted apple trees. N. Y. Fruit Quarterly 10(1):5-7.

Stiles, W. C. and W. S. Reid. 1991. Orchard nutrition management. Cornell Coop. Ext. Bul. 219.

Acknowledgements

The author wishes to thank Mr. Brian Caldwell, Farm Education Coordinator for the Northeast Organic Farming Association of New York, and Dr. Ian Merwin, Associate Professor of Pomology, Department of Horticulture, Cornell University for their helpful suggestions in the preparation of this manuscript.

Information Resources for Organic Apple Production

Organic Certification

National Organic Program (NOP): http://www.ams.usda.gov/nop/

Organic Material Review Institute: http://www.omri.org/crops_generic.pdf

Organic Apple Production Manuals

Edwards, Linda. 1998. Organic Tree Fruit Management. Certified Organic Associations of British Columbia, Keremeos, BC, Canada. ISBN 0-7726-3615-X

Swezy, S.L., P. Vossen, J. Caprile, and W. Bentley. 2000. Organic Apple Production Manual. Univ. Calif. Agric. and Nat. Resources Publ. 3403. Univ. Calif. Agric. and Nat. Resources Commun. Serv., Oakland, CA. ISBN 1-879906-48-1

Organic Apple Web Sites

http://www.attra.org/attra-pub/apple.html

http://www.attra.org/attra-pub/fruitover.html

http://www.attra.org/attra-pub/ipm.html

http://www.caf.wvu.edu/kearneysville/organic-apple.html

http://www.canr.msu.edu/vanburen/appleweb.htm

http://www.canr.msu.edu/vanburen/organasp.htm

http://orchard.uvm.edu/uvmapple/pest/#Organic Pest Management

Orchard Soils and Their Influence on Apple Root Systems

Dr. Ron Perry
Chairperson and Professor
Department of Horticulture Mich. State University
East Lansing, MI

Apples have root systems that inhabit the soil profile with relative permanence. The fact that roots develop at the mercy of underground conditions means that soil characteristics have a major impact on development, survival and orchard performance. In the Great Lakes, soils are extremely variable due to the nature of how they were formed through glacial retreat. Soils in New England were formed as a result of Glacial action (Wisconsinan advance in all of NE) which deposited unsorted materials within and under glacial ice. The material ends up being a heterogeneous mixture of particle sizes from rocks to clay. Basal tills left by glacial retreat formed drumlins and moraines which characteristically have dense restrictive layers which inhibits water movement and root penetration. These hard pans can occur on a hill (drumlin or moraine) which perches water and floods root systems. Glacial outwash (melt water) left behind plains and deltas with stratified layers of sand and other materials. Following glacial retreat, Elolian sands were spread across the surface for some areas in New England (Northern Michigan also). Therefore, some sites have a surface layer of mineral sand in the top 1.5 – 3 feet. When it comes to orchard sites, those which possess elevation changes and slope are not only helpful in cold air drainage, they often can be beneficial to relieve soil drainage. The exception would be in drumlins and moraines where a hard pan perches water on slope.

What is a desirable orchard soil? Basically, historical research has indicated that in general, fruit tree root systems need about 3 feet or 1 meter of cultivatable well drained soil to support good consistent crops and be long-lived. Tree roots prefer loamy soils with good Cation Exchange Capacity to retain nutrients and good moisture holding capacity. Soils with coarse texture (sandy soils) may provide excellent internal drainage, but often are poor in water and nutrient holding capacities. We often see apples on dwarfing rootstocks which struggle in such soils and rarely fill their spacing in Michigan. The other extreme in soil conditions for apple root systems is where the soil has fine texture (heavy clay) which causes problems related to poor aeration and conditions that foster Phytophthora root rotting. Plant roots absorb oxygen and release carbon dioxide.

Most terrestrial plants can not transfer oxygen from the above ground to the below ground portions of the plant. Therefore, adequate root respiration requires the soil to be aerated. Gas composition in soil will be similar to air if well aerated. Respiration by plants and microbes can increase the amount of carbon dioxide by 10 to 100 times if aeration is poor. Under saturated conditions, oxygen content of soil can approach zero. Plant growth depends more upon the occurrence and duration of periods of oxygen deficiency than upon average conditions. Anaerobiosis (wet feet), caused by oxygen stress, occurs when the rate of supply is less than demand. The detrimental effects are lessened in winter, very early spring and late fall when trees are less active or have less

leaf area. Once a tree is actively growing during the season, it is very vulnerable to stresses caused by wet feet or drought.

Soils which are shallow, caused by a hard pan in the B horizon, can force roots to develop near the surface where soils dry readily during the summer. Many or most of the dwarfing rootstocks that have limited root systems such as M.9 to M.26, which do not handle soil stresses as well as more vigorous rootstocks. More vigorous stocks should be selected where soils are inherently more sandy or where soils are shallow.

Methods to Alleviate and Improve Soil Structure in Orchards

We prefer to select a good site which has a desirable orchard soil with adequate depth. If the soil is heavy or wet, then seek methods to alleviate problems. These include subsoiling and mixing, moldboard plowing (effective down to 1-1.5 ft deep). The objective is to provide good mixing of A and part of B horizon. The effects on rooting are long lasting. Deep plowing or mixing using slip plows is possible at a cost of $500 or more per acre. Installation of a tile drain system can provide relief for heavy wet soils, but only if designed correctly. Raised beds is another effective method, but requires much earth moving. This technique has a long history practiced by the Romans.
Our experience is fairly positive but we found that single row beds dry too fast and are less effective than wide beds. There are over 750,000 Acres citrus on beds in FL. We evaluated this technique for cherry, peach and apples from 1981-1990. Peach and Sour Cherry trees had improved productivity and survival after 10 yrs on medium size, wide bed (30 cm high, 2 m wide). Apples on MM 106, were not affected by bed treatments.

Soil Preparation and Management for Planting an Orchard

In preparation to establish a site the following spring, subsoil when dry, during the previous summer. If mechanical planters are used for apple, plant so that the union is set at a minimum of 4 - 6 inches above ground line. If holes are prepared using an auger, set the tree so that the union is at a minimum of 6-8 inches above ground line. Expect more settling following planting with augered holes. Do not fertilize until mid summer. Roots can and should be pruned back to fit a hole / furrow. Keep root systems moist and back fill with soil to remove air pockets. For apples on dwarfing clonal rootstocks, if you must error in depth, make it on the side of shallow planting and not deep plant. Scion rooting, common in apples (not in stone fruit), can mean disaster later, resulting in extreme vigor for the spacing. Use a 2”X4” (2-4 ft long) piece of wood to help as a reference. Place the 2X4 on its edge adjacent to the planted tree (perpendicular to the row) to check its depth. The union should clearly appear above the edge of the board indicating that it is at least 4” high. A 2X6” board may serve best for where the desired union height is for 6 “.
The same 2X4 or 6 can be used for union height reference for stone fruit if the board is placed on its flat side so that the union height appears 1-2 “ above ground level.

To suppress the impact and population of Dogwood Borers, we have been recommending to growers to form a berm of soil above the union during the first 2-3 growing seasons. Once burr knots, commonly formed on dwarfing rootstocks, have extended into the soil (berm), larval infestation is largely avoided.

Organic Apple Production from a Grower's Perspective

Brian Caldwell, Hemlock Grove Farm
180 Walding Lane West Danby, NY 14883

I have managed a small certified organic apple orchard since 1988. It is about an acre with about 140 trees, mostly Jonagold, Liberty, Golden Delicious, Idared, and Melrose on MM111 or MM106. Since 1997 West Haven Farm of Ithaca has also been a partner in this orchard. We market the apples at the Ithaca Farmers' Market and some small wholesale accounts. Our site at 1300 feet elevation has very good air drainage but marginal soils.

In the past few years there have been important developments in Northeast organic apple production methods that have reduced pest damage. The first major change was the introduction of Surround which has allowed us good plum curculio control. Because of that, we are also able to thin the trees on time and are starting to reduce a severe alternate bearing problem. The second was the introduction last year of an approved spinosad product, Entrust. This gave us excellent control of caterpillar pests.

In 2002, the National Organic Program came into full force. To us, this meant that requirements for the products we use became even stricter than before. For instance, I trialed compost tea against apple scab on a few trees. Since I had mistakenly used a non-approved compost product for the tea, those trees were decertified. Another problem we had was that we could not find an organically-approved lime sulfur product that was also registered in NYS.

The 2003 season was wet, and we had a scab control failure. We use sulfur sprays against scab, and control was good in the early season. However, a 2 inch rain on June 1 must have washed off the sulfur residues, and about 17 days later scab lesions were common on the susceptible trees. It is possible that spraying the sulfur and Surround together interferes with the sulfur's effectiveness. Things went downhill from there, as we had a very wet season. I think that a lime sulfur spray after the heavy rain would have improved the situation. Later I found that the lime sulfur product under the Miller label sold in NYS is the same as the approved product (repackaged by Ag Formulators, Inc.), but I didn't know that at the time.

Nonetheless, our Liberty, Melrose, Paulared, Redfree, and other scab-resistant or tolerant varieties graded out better than ever, with 75% or more going into our "select" grade.

Our spray program this year included sulfur sprays from first green to June 21. Surround was applied from pink through June 16. Three of those sprays, including the last two, included Dipel. This presumably gave us reasonable early season caterpillar control. Then we put up pheromone traps and monitored Codling Moth, Lesser Apple Worm, Oriental Fruit Moth, and Obliquebanded Leafroller. We sprayed Entrust on July 7 for the midseason flights, then Dipel on August 16, based on the trap results. Unlike the data from the Geneva Experiment Station last year, at our orchard three of the four pests

tracked close enough together that we felt we could catch most of them on these dates. We put the sprays on one week after the peak flights, trying to target peak egg-laying. OBLR numbers were low and didn't really factor in. There was greatly reduced lep damage at harvest compared to previous years.

We are still dealing with alternate bearing. The orchard yielded over 400 bu. in 2001, was down to around 100 last year, and will come in around 250-300 bu. this year. There are still a number of young replants, especially in an area of interstem trees that did not do well on our soil.

We have been able to get very good prices for our apples—$7.50 per half peck (about 5.5 lb) of "select" grade at the farmers' market. Our bushel wholesale price is $32-$40. Cider goes for $5.50 per gallon. There is no doubt in my mind that our apples are highly flavored compared to most—I think because of the lack of an herbicide strip.

Important frontiers for organic apple production include reliable, biologically-based scab control, thinning, and sooty blotch/flyspeck control. Of course, we always need to better understand orchard nutrition and ground cover management, as well as refine our overall pest management programs. I would also like to point out that other Northeast organic orchardists, including Biodynamic farmers, have been able to achieve better results than we have, so we are always learning from them.

Research on Plum Curculio & Apple Maggot: Latest Developments

Ronald J. Prokopy, Department of Entomology
University of Massachusetts, Fernald Hall, Amherst, MA 01003
(413) 545-1057 prokopy@ent.umass.edu

This presentation will cover findings from our experiments in commercial apple orchards in 2003 on use of odor-baited "trap trees" for monitoring plum curculios and use of odor-baited pesticide-treated spheres for directly controlling apple maggot flies.

Plum curculio (PC).

PC adults overwinter in border areas adjacent to orchards. They immigrate into orchards during April, May, and June. Over the past decade, we have developed and evaluated several kinds of odor-baited traps aimed at capturing immigrating PC adults and correlating rises and falls in adult captures with rises and falls in injury to fruit. None of the traps has proved useful for this purpose. Therefore, in 2003 we bypassed use of traps and instead decided to bait perimeter-row apple trees themselves with attractive odor. Such odor-baited "trap trees" could aggregate incoming PC adults and thereby aggregate injury to fruit. To assess the occurrence of fresh injury in an orchard as a trigger for insecticide application, a grower or consultant could restrict fruit sampling solely to trap trees, saving time and enhancing accuracy.

In 2003, we conducted trap tree experiments in more than 80 blocks of apple trees in Massachusetts, Vermont and New Hampshire. Trap trees were baited with our most powerful odor combination: the synthetic fruit volatile benzaldehyde (BEN) and the synthetic pheromone grandisoic acid (GA). We found the following:

GA released at 1mg per day plus BEN released at 40 mg per day performed as well as or better than trap trees baited with greater or lesser amounts of these attractants in combination. The distance over which a trap tree baited with such odor was effective in aggregating damage to fruit extended to at least 31-33 meters (maximum evaluated) along a perimeter row. Trap trees at corners of orchard blocks were as effective as perimeter-row trap trees midway between corner trees. Within the canopy of a trap tree, damage to fruit did not tend to be localized in the vicinity of the odor source but tended to be rather evenly distributed among various sectors of the canopy. Finally, among three candidate thresholds evaluated as a trigger for insecticide application, a threshold of 1 freshly-injured fruit proved better than thresholds of 2 or 4 freshly-injured fruit out of 50 fruit sampled on a trap tree in assuring that orchard-wide damage would remain below a pre-set economic injury level of 1%. Our findings lead us to suggest that after a whole-orchard application of insecticide to apple trees shortly after petal fall, subsequent applications of insecticide against PC can be confined to peripheral-row trees and be driven by a provisional threshold of 1 freshly injured fruit out of 50 fruit sampled on a perimeter-row trap tree baited with above odor.

Apple Maggot Flies (AMF)

AMF build into large numbers on abandoned apple trees outside of commercial orchards. They immigrate into orchards during July and August. Very few originate within commercial orchards.

AMF can be controlled very effectively using organophosphate insecticides, whose long-term future use under FQPA remains uncertain. For over a decade we have been evaluating an alternative that we have developed as a substitute for whole-orchard spraying of insecticide to control AMF. It involves placement of odor-baited red spheres on perimeter-row apple trees to intercept immigrating AMF before they lay eggs in apples. In 2003, we conducted 2 experiments in 18 commercial apple orchard blocks in Massachusetts aimed at improving the effectiveness and simplicity of using traps for AMF control.

In our first experiment, we surrounded 1-acre blocks of apple trees with sticky-coated red spheres baited with a 5-component blend of attractive odor. The spheres were placed different distances apart on perimeter-row apple trees. Distances between traps were pre-programmed to vary from 5 to 15 meters apart according to the architecture of the orchard. Orchard blocks having small trees (M.9 rootstock), well pruned trees, AMF-tolerant front-row cultivars (e.g., McIntosh) and open terrain or sprayed apple trees as bordering area received traps 15 m apart (equivalent to 55 traps per 10-acre block). Orchard blocks having large trees (e.g., M.7 rootstock), trees in need of pruning, AMF-susceptible front-row cultivars (e.g., Gala) and hedgerow or woods as bordering area received traps 5 m apart (equivalent to 160 traps per 10-acre block). Orchard blocks having intermediate characteristics received traps 10 m apart. Results showed that adjusting distance between traps according to orchard architecture gave excellent AMF control (equivalent to 3 organophosphate sprays) in 8 of the 12 experimental blocks. Control using traps was less effective in 4 of the blocks, all characterized by large trees and less than ideal pruning.

In our second experiment, we compared sticky (tangletrap) on the sphere surface as AMF killing agent with 2 kinds of plastic spheres that received pesticide as killing agent plus feeding stimulant to induce AMF to ingest pesticide. In each of 6 commercial orchards, we surrounded _-acre blocks of apple trees with above-type spheres. Results showed that plastic spheres capped with a 200-gram rodent-proof disc containing sugar (feeding stimulant), paraffin wax (to meter out the sugar) and Entrust (= Spinosad) as toxicant gave AMF control equal to that of plastic spheres coated with latex paint containing Provado (= Imidacloprid) as toxicant and capped by sugar-paraffin discs. Control by each type of sphere was equal to that provided by sticky spheres or 3 organophosphate sprays. AMF that alight on pesticide-treated spheres feed on the sugar that drips down from the sugar-paraffin disc atop the sphere and in so doing ingest pesticide.

Together, results from these 2 experiments suggest that effective AMF control can be obtained by placement of pesticide-treated odor-baited spheres on perimeter-row apple trees at distances prescribed by orchard architecture. Pesticide-treated spheres should be available for sale by a West Virginia company along with EPA-approved use for commercial orchards by the 2005 growing season.

Recent Developments in Apple Disease Control

David A. Rosenberger, Cornell University's Hudson Valley Lab,
P.O. Box 727, Highland, NY 12528
dar22@cornell.edu

In this presentation, I will review our current thinking in New York State concerning the best approaches for controlling the major diseases of apples. The material that I am presenting is derived from the work of many colleagues at Cornell and at other institutions, but I am especially indebted to Dr. Wolfram Koeller (Cornell-Geneva) and his students who have generated most of the available information on fungicide resistance to apple scab.

Apple Scab Fungicides: Don't Depend on Post-Infection Activity!

Resistance to SI fungicides (Rubigan, Nova, Procure) is now fairly common in apple scab populations in New York State. The fruit entomologists in NY completed a detailed study of pest damage on apple fruit from 15 orchards across the state in fall of 2002. Much to our surprise, four of those orchards had high incidences of fruit scab with 8% to 50% of fruit affected. Subsequent testing by Dr. Koeller showed that three of the four problem orchards had scab populations that were resistant to the SI fungicides. I have noted similar SI-related scab control failures in several other orchards in eastern NY during the past two years. In most cases, failures are occurring where growers have consistently used 3-5 applications of SI-fungicides per year for 10-12 years.

Now for the bad news: resistance to SI fungicides appears to be linked to loss of activity in several other fungicide classes. Dr. Koeller has found that when apple scab becomes resistant to SI fungicides, it also loses some sensitivity to the anilinopyrimidine and strobilurin fungicide groups. The anilinopyrimidines include Vangard and the not-yet-registered Scala. Sovran and Flint are strobilurin fungicides. In orchards with SI resistance, Sovran and Flint continue to work as protectants, but their post-infection activity is compromised. Resistance to the protectant activity of Sovran and Flint is likely to develop in the future as it already has in Europe, but resistance to the protectant activity of Sovran and Flint has not yet been detected in the U.S. Resistance to benzimidazole fungicides (Benlate, Topsin M) and to dodine (Cyprex, Syllit) has been widespread in NY orchards for many years. There are no new fungicides in university trials that can be used to replace the SIs. Thus, when an orchard develops SI-resistance, the grower will probably be left for the foreseeable future with only fungicides that have no post-infection activity.

Dodine resistance and SI resistance can lurk undetected in some orchards for many years. If dodine is used only at green-tip and/or half-inch green, loss of activity will not be noticed until a year in which that activity is really needed. In many years, there are no significant infections prior to tight cluster. Or the levels of inoculum in the orchard may be so low that no sprays are really needed prior to tight cluster (e.g., as predicted for orchards with a very low predicted ascospore dose or PAD). Similarly, the contact fungicides that are routinely tank mixed with the SI fungicides may mask the fact that the SI fungicides are no longer working until a really bad scab year over-whelms the low rate of the contact fungicide that is included in the combination.

How can growers know which products are still effective in specific orchards? The best solution would be to test scab samples from individual orchards to determine which fungicides are still working. However, no simple test is available. As a result, it is currently impossible to

tell whether or not dodine, the SI fungicides, or the strobilurin fungicides will provide post-infection activity in any given orchard.

Scab has never developed resistance to copper, captan, mancozeb, or metiram (Polyram). Therefore, these products remain effective in all orchards if applied as protectants. They will also arrest developing infections if applied within 12 hours from the start of a warm wetting period (>60 °F), within 18 hr at 53 °F., or within up to 40-48 hr from the start of infection periods with mean temperatures below 43 °F.

Current Recommendations for Controlling Apple Scab

1. Forget most of what you learned about scab control over the past 20 years and revert to conservative, protectant fungicide programs during the prebloom period. Even in orchards where SI-resistance seems unlikely, a conservative program is the best way to further delay resistance, thereby preserving the post-infection activity (read: emergency activity) that the SIs can provide. In orchards with resistance to dodine and the SI fungicides, just a little bit of prebloom scab can turn into a season-long management nightmare if the summer is cool and wet, so do everything possible to avoid further selection of isolates resistant to these fungicides.
2. Start protectant fungicide programs at green-tip unless a PAD assessment in the fall verifies that the start of the spray program can be delayed. The concept of delaying sprays in low-inoculum orchards was developed and tested using only protectant fungicides, so this program should still work in orchards with dodine and SI resistance. However, even when the PAD is low, the delayed spray program is riskier in orchards with dodine and SI resistance. Without an effective post-infection fungicide, the PAD/delayed spray system has no built-in redundancy to cover any errors in calculating PAD or to eliminate the occasional lesion that might arise as a result of inoculum blown in from external sources.
3. The protectant fungicide program should start with a copper spray at green-tip. Copper fungicides are just as effective as mancozeb for controlling scab. Copper applied at green-tip may help to suppress superficial cankers caused by *Botryosphaeria* species (black rot, white rot) that sometimes develop on trunks and scaffolds in older orchards that have been consistently sprayed with only mancozeb and SI fungicides during the scab season.
4. Protectant fungicides should be renewed at roughly 7-day intervals or just prior to predicted rains if intervals are greater than 7 days. Forget about the routine 10-12 day spray intervals that were promoted with SI fungicides.
5. In orchards containing large trees or high levels of carry-over inoculum, tank mixed combinations of mancozeb (3 lb/A of formulated product) plus captan have proven more effective than mancozeb applied alone. In this combination, captan can be used at the rate of 1.5 to 3 lb/A of Captan 50W, or an equivalent rate of a different captan formulation. Of course, captan cannot be included near oil sprays whether used alone or in combinations.
6. The anilinopyrimidine fungicides are not recommended for scab control. Vangard has rarely performed better than mancozeb used alone at 3 lb/A. Given our inability to predict where SI resistance may be lurking, and given the apparent linkage between SI resistance and resistance to the anilinopyrimidines, we see no reason to use this class of chemistry on apples.

Controlling Powdery Mildew

SI fungicides are less effective against apple powdery mildew today than when this chemistry was first introduced, but the SI fungicides are still provide good mildew control in most orchards when applied at appropriate rates and timings. Bayleton provided good control of

mildew at rates as low as 1.5 oz/A when it was first introduced many years ago, but today most growers need at least 3-4 oz/A to achieve the same levels of control. Nova applied at rates recommended for scab control still provides excellent mildew control in most orchards. Sovran and Flint are also effective mildewcides, especially if control programs are initiated at pink or bloom. Sovran and Flint are somewhat less effective if control programs are not initiated until petal fall.

The absolutely critical sprays for controlling powdery mildew are the petal fall and first cover sprays. In years when the prebloom and bloom periods are warm and humid (but without significant rainfall to wash away mildew spores), a pink or bloom spray may also be essential.

Never leave mildew-susceptible cultivars unprotected at petal fall. Applying the first mildewcide spray at first or second cover (or when extensive secondary infections are already evident) should be classified as "revenge spraying." Such delayed sprays seldom provide acceptable mildew control, but they do provide strong selection pressure for development of fungicide resistance within the large mildew population that is usually present within several weeks after petal fall.

Controlling Fire Blight

Anyone growing pears or blight-susceptible apple cultivars should be using either MaryBlyt or Cougar Blight to predict when fire blight blossom infections are likely to occur. These models are very helpful for proper timing of streptomycin sprays during bloom. Fire blight outbreaks in Quebec in 2002 and in New York's Champlain Valley in 2003 are reminders that fire blight can destroy orchards even in colder climates where this disease is occurs only sporadically.

Honeycrisp is very susceptible to fire blight. As with other blight susceptible cultivars, the greatest losses are likely to result from blossom blight control failures in orchards that are 3 to 6-years old. In such immature orchards, blight frequently spreads to the rootstock and kills entire trees. McIntosh growers who are switching to Honeycrisp should be aware that fire blight poses a much greater risk to Honeycrisp than it did to McIntosh. Thus, streptomycin sprays may be warranted for Honeycrisp in geographic regions where fire blight was never considered a serious threat in the past.

Controlling Flyspeck and Sooty Blotch

Ascospores of the flyspeck fungus are released during or soon after the petal fall stage on apples. However, this primary inoculum is probably more important in non-orchard hosts than in sprayed orchards where the apple scab fungicides prevent infection. The flyspeck fungus can grow on numerous wild hosts in woods and hedgerows. Primary infections on the non-orchard hosts produce conidia later during summer, and the conidia cause most of the infections on apple fruit.

Brown and Sutton, working in North Carolina, determined that after flyspeck spores land on apples, 270 hours of wetting are required before those infections become visible on the fruit surface. Observations of flyspeck development on unsprayed trees at the Hudson Valley lab suggest that most flyspeck infections on apple fruit are initiated only after at least 270 hr of accumulated wetting have occurred after petal fall. This corresponds with the time that would be required for primary infections on wild hosts to mature and begin releasing conidia. Flyspeck is more severe in wet years when conidia become available earlier in the season because wet years

allow more time for apples to become infected and also the potential for more secondary cycles to be completed.

More than four inches of rain was recorded for 1-2 September 2003 at the Hudson Valley Lab. Growers who opted not to re-apply a fungicide after that rain reported a flush of flyspeck symptoms appeared on fruit at the end of September. A total of 275 hr of wetting was recorded during September. This series of events provided indirect verification that 270 hr of wetting are required for symptom development of flyspeck: The rain on 1-2 September eliminated all fungicide residues and initiated infections. Flyspeck became evident in numerous orchards almost exactly after 270 additional hours of accumulated wetting. In most years, fungicide sprays are not necessary after mid-August. However, in 2003, a September spray was essential for preventing flyspeck in varieties harvested in October.

Topsin M, Sovran, and Flint are all very effective for controlling flyspeck. All three of these fungicides provide some post-infection activity and may control infections that have accumulated less than 100 of the 270 total hours of wetting required for symptom development.

The major limiting factor for controlling flyspeck during August is probably poor spray coverage. Getting complete spray coverage can be almost impossible in poorly pruned trees or where fruit are clustered. In orchards with dense canopies, summer pruning that reduces canopy density and hand thinning to break up fruit clusters may be essential for achieving flyspeck control in a wet year.

Controlling Summer Rots on Honeycrisp

Honeycrisp is more susceptible than most other cultivars to summer fruit rots caused by *Botryosphaeria obtusa* (black rot), *B. dothidea* (white rot), and *Colletotrichum* species (bitter rot). Bitter rot is primarily a problem in regions with hot humid weather during August, and such climates are less than ideal for producing Honeycrisp. However, black rot and white rot are likely to occur to some degree anywhere that Honeycrisp is grown. This cultivar tends to retain fruitlets that are killed by thinning sprays, and these small fruitlet mummies harbor the fungi that later produce spores to infect maturing fruit during August.

Topsin M, Sovran, and Flint are all effective for controlling black rot and white rot. A combination of Topsin M plus captan applied approximately 28 and 14 days before harvest may be needed to control fruit rot diseases on Honeycrisp, especially if the preharvest period is especially warm. Flint can be applied on a similar preharvest schedule, but Sovran has a 30-day preharvest interval and therefore is not useful for late summer sprays on Honeycrisp.

Development of Alternative Thinning Strategies

Jim Schupp
Dept. of Horticultural Science
Cornell's Hudson Valley Lab

The Most Important Single Spray?

- Crop load mgt. important for good:
  - fruit size
  - fruit quality
  - return bloom
- Concerns:
  - Consistency of response
  - Cost
  - Regulatory/ Market issues

New Thinners Needed

- New MOA, timings for use in multiple thinner programs.
- Carbaryl concerns:
  - Possible FQPA actions,
  - IFP restrictions on UK exports.
- Organically acceptable options.

Fish Oil + Lime Sulfur (FOLS)

- Liquid Lime Sulfur reduced fruit set when used as a pesticide in early era.
- Burns flowers / Reduced assimilation.
- Certain cultivars susceptible (Macs).
- Role of Fish Oil?
  - Surfactant/penetrant.
  - Also reduces assimilation.

Materials:

- FOLS
  - Crocker's Fish Oil (G.S. Long),
    - Dilute Rate: 2 gal. / 100.
  - Liquid lime sulfur (Miller Chemical),
    - Dilute Rate: 2.5 gal. / 100.
- NC 99 calcium/magnesium brine
  - G. S. Long Co., Yakima, WA,
    - Dilute Rate: 4 gal. / 100.
- Ammonium Thiosulfate (ATS) 1 gal/100.

Hudson Valley Study, 2000

- Mature Delicious / M. 7 trees.
- Transitional block.
- Applied air-blast @ 120 gal./ acre.
- Materials concentrated to dilute equiv.
- Timings: 80% bloom or
  20% + 80% bloom.
- Dates: 2 May, and 5 May, 2000.

Western N.Y. Study, 2000

- Mature McIntosh, Cortland and Delicious trees on seedling rootstock.
- Certified Organic block.
- Single application at 80-100% bloom.
- Applied air-blast, 100 gal / acre.
- Materials not concentrated.
- Date: May 8, 2000.

Delicious, Hudson Valley, 2000

Treatment	Set (%)	Yield / tree (kg)
Control	138 a	150 a
FOLS	67 bc	102 b
FOLS (2)	40 bc	121 ab
NC99	98 ab	125 ab
NC99 (2)	106 ab	141 ab

Delicious, Hudson Valley, 2000

Treatment	Wt. (g)	Dia. (in.)
Control	157 b	2.77 b
FOLS	200 a	3.02 a
FOLS (2)	180 ab	2.89 ab
NC99	185 a	2.94 a
NC99 (2)	183 a	2.94 a

Delicious, W. N.Y., 2000

Treatment	Set (%)	Size (g)	Yield (kg)
Control	42 a	168 b	65 a
FOLS	26 b	186 a	59 a
NC 99	21 b	170 ab	68 a
ATS	46 a	176 ab	66 a

2000 Summary

- Both NC 99 and FOLS show promise as blossom thinners for apple.
- Double applications were slightly better than a single spray at 80% bloom.
- No russetting in 2000.

Gala Set & Yield , 2001

Treatment	Fruit Set (%)	Yield/ tree (lb)
Control	79 a	111 a
NC 99 x 1	62 ab	109 a
NC 99 x 2	47 bc	75 ab
FOLS x 1	52 b	75 ab
FOLS x 2	57 ab	69 ab
FOLS PF + FG	25 c	47 b
Wilthin	76 a	101 a

Gala Fruit Size , 2001

Treatment	Fruit dia. (in)	Fruit wt. (g)
Control	2.4 b	116 b
NC 99 x 1	2.5 b	126 b
NC 99 x 2	2.8 a	150 a
FOLS x 1	2.5 b	124 b
FOLS x 2	2.8 a	151 a
FOLS PF + FC	2.8 a	167 a
Wilthin	2.4 b	117 b

Gala Phytotoxicity, 2001

Treatment	Leaf Burn	Russet
Control	0 d	1 b
NC 99 x 1	2 b	1 b
NC 99 x 2	3 a	1 b
FOLS x 1	1 c	1 b
FOLS x 2	3 a	2 a
FOLS PF + FC	1 c	1 b
Wilthin	0 d	1 b

Post-bloom FOLS Timing,2002

- 12-year-old Empire and McIntosh/M.26 trees.
- RCBD with 4 reps in Empire and 5 reps in McIntosh.
- Tank mixed and applied with a high pressure hand gun sprayer.

Treatments

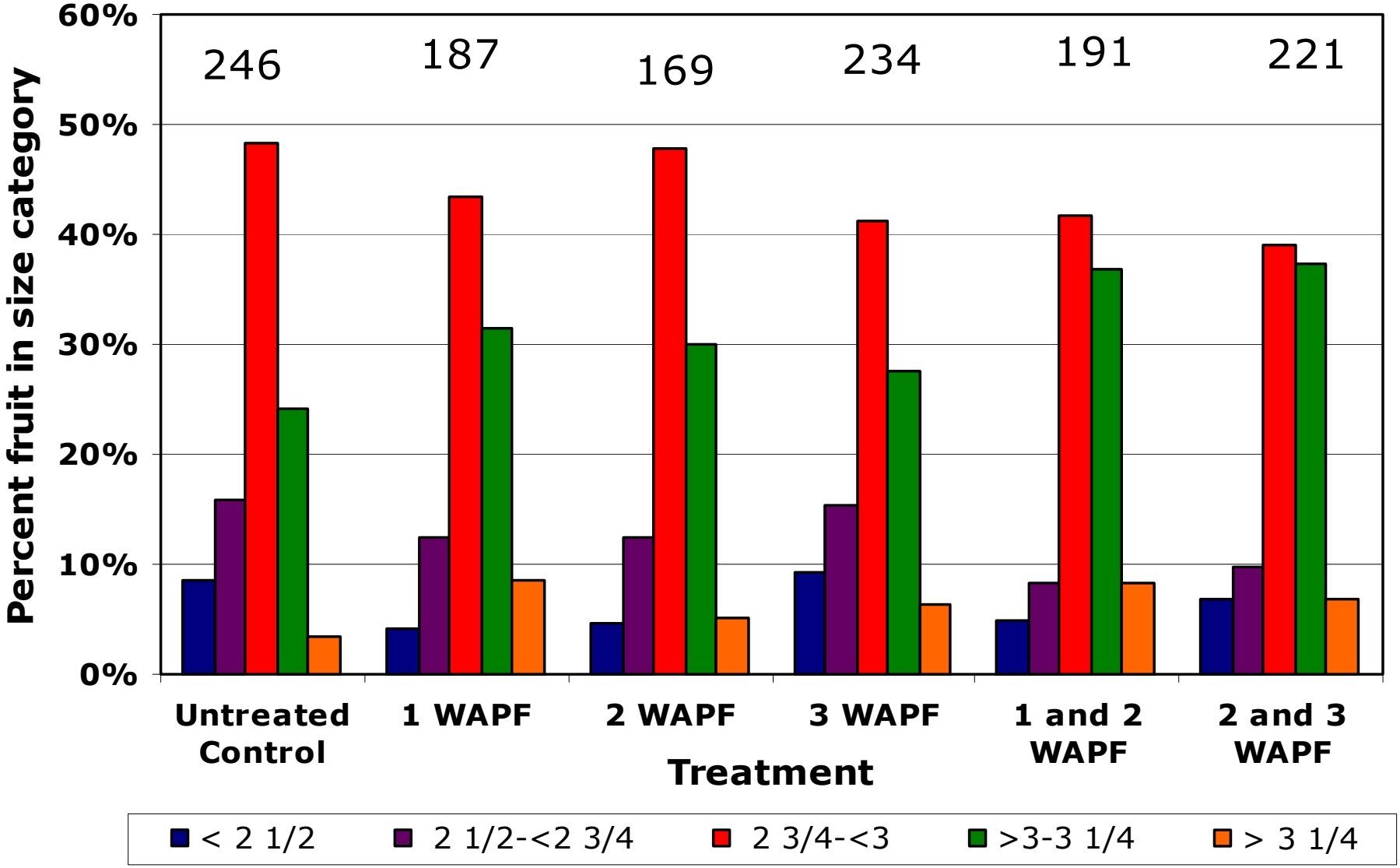
- Control
- 1 week after petal fall (WAPF)
- 2 WAPF
- 3 WAPF
- 1 and 2 WAPF
- 2 and 3 WAPF

Sprays were applied on May 6, 16, and 22.

FOLS Timing: McIntosh, 2002

Treatment	Set (%)	Fruit wt (g)	3 in. & up (%)
Control	120 a	164	27
5 DAPF	89 b	180	40
15 DAPF	74 bc	173	35
21 DAPF	83 bc	172	34
5 + 15	69 bc	180	45
15 + 21	55 c	181	44

McIntosh Fruit Size Distribution



Fruit Russet

Treatment	Fruit Russet (1-5 scale) Empire	McIntosh
Control	1.3 c	1.9 b
1 WAPF	2.2 a	2.2 ab
2 WAPF	1.4 bc	2.3 a
3 WAPF	1.4 c	2.2 ab
1 and 2 WAPF	1.9 ab	2.4 a
2 and 3 WAPF	1.5 bc	2.3 a

No differences in L:D ratio or seed number

Return Bloom 2003

Treatment	Blossoms/LCSA	
	Empire	McIntosh
Untreated control	10.9	8.4
1 WAPF	16.9	8.5
2 WAPF	10.8	6.9
3 WAPF	15.0	8.0
1 + 2 WAPF	10.7	9.2
2 + 3 WAPF	16.6	7.9

McIntosh Summary

- FOLS reduced fruit set in all treatments.
- Double applications and early thinning of FOLS resulted in the largest fruit.
- FOLS slightly increased fruit russet.

Post Bloom Timing Conclusions

- Post-bloom FOLS applications were effective, especially on McIntosh.
- Later timing more effective, but may not result in larger fruit.
- Growers will have to accept noticeable amounts of leaf burn.
- More studies are needed before FOLS is recommended.

Liberty Thinning, 2002

Treatment	Rate	Dates applied
Control	--	--
FOLS	2% + 2.5 %	22, 28 May
Kerry seaweed extract	22 fl. oz./ 100	16, 22, 28 May & 2 June
6BA (Valent)	150 ppm	16, 22 May

Liberty Thinning, Fruit Size, 2002

Treatment	Juice	Bags	120 ct	100 ct	80 ct
Control	28 a	34 a	35 c	3 c	0.4 b
FOLS	5 b	16 b	61 a	17 b	0.6 b
Kerry	32 a	39 a	25 d	3 c	0.3 b
6BA	6 b	12 b	47 b	31 a	4 a

FOLS Negatives

- Smelly, corrosive, hard to wash off.
- Limited availability of FO.
- Potentially phytotoxic.
- Not Cheap: $US 45-$90 / Acre.
- Not fully researched.

LS Concentration & LS:FO Ratio

Lime Sulfur (%)	Fish Oil (%)
0.0	0
1.5	0
2.5	0
0.0	1
0.0	2
1.5	1
1.5	2
2.5	1
2.5	2

LS Concentration & LS:FO Ratio

Treatment	Crop Load	Fruit wt.	Leaf burn
Control	9.4 ab	98 b	0.2 c
LS 1.5	9.8 ab	122 a	0.7 b
LS 2.5	10.1 a	109 ab	0.4 bc
FO 1.0	8.3 abc	113 ab	0.7 b
FO 2.0	6.1 cd	126 a	0.4 bc
1.5: 1.0	6.4 cd	128 a	0.6 bc
1.5 : 2.0	7.6 bc	113 ab	0.5 bc
2.5 : 1.0	6.5 cd	118 ab	0.8 b
2.5 : 2.0	8.1 abc	114 ab	0.4 bc
NC99 4%	5.4 d	130 a	2.4 a

FOLS Summary

- Effective, consistent thinner.
- Broad application window.
  - Effective blossom thinner,
  - Excellent post-bloom activity.
- FOLS shows promise as a replacement for carbaryl & as an organic thinner.
- More research underway.

FOLS Research Needs

- Alternatives to Crocker's fish oil.
- Effect of timing on efficacy and on fruit size.
- Effect of spray volume and concentration on efficacy, $/acre, and crop safety.
- Confirm MOA.
- Pest Mgt. implications need study (scab, beneficials).

Co-investigators & Cooperators

- Heidi Noordijk, Grad. Research Assoc.
- Dr. Terence Robinson, Hort. Sci. Geneva
- Dr. Lailiang Cheng, Hort. Ithaca
- Dr. Jim McFerson, WTFRC
- Steve Clarke, Prospect Hill Orch., Milton, NY
- Jim Bittner, Singer Farm, Appleton, NY