



Vermont Apple Newsletter

*M. Elena Garcia, Lorraine Berkett, Terry Bradshaw, and Marlys Eddy
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Horticultural News

M. Elena Garcia, Tree Fruit Specialist

Selecting Rootstocks to Maximize Productivity and minimize Winter Damage.

Rootstock selection is one decision that affects the productivity and profitability for the entire life of an orchard. Adaptability of rootstocks to a region's climatic conditions greatly influences the rootstock performance and can dramatically affect not only the productivity of the rootstock, but also its survival. Growers choose rootstocks to influence tree size, precocity, productivity, fruit quality, pest resistance, and tolerance to abiotic factors such as water and temperature stress.

Vermont apple growers have continually identified cultivar and rootstock evaluation as priority research areas. To respond to their research needs the Apple Team has been involved in national cultivar (NE-183) and rootstock (NC-140) evaluation trials since 1992. One of the objectives of the current NC-140 project is to evaluate the field performance of pome- and stone-fruit rootstocks in various environments and under different management systems.

At the February meeting of the VTFGA, I presented preliminary results of the 1999 planting of the NC-140 apple rootstock evaluation project as summarized by W. Autio (UMass). Wes has analyzed the data from 1999 through 2003 from all the states participating in this project. We will continue to collect data until 2007 when a final analysis and report will be done. Several of you asked me to publish these results in this newsletter. Below is the information I presented on the performance of various rootstocks at different locations.

Background

1999 VT NC-140 Regional Rootstock Planting:

- Location: Horticulture Research Center (HRC) in S. Burlington.
- Planted: 1999
- Scion: McIntosh
- Rootstocks: Nine semi-dwarf and ten dwarf of the M. CG, and Supporter Series
- Data collected:: a) Bloom: the number of flower clusters per tree. b) Root suckers: the number removed and counted, c) Yield and fruit number: number and weight of all fruit per tree at harvest, d) tree size: trunk circumference 25 cm above the graft union

Results from all combined sites for the dwarf rootstock category:

- M.9 NAKBT337 had the lowest survival rate (67%).
- CG. 4013 had the highest cumulative yield (123.5 lb). G. 16N, G.16T Supporter 1, 2, & 3, M.26 EMLA, and M.9 NAKBT337 had the lowest cumulative yield ranging from 86 lb for G.16N and Supporter 3 to 62 lb for M.9 NAKBT337.
- M.26EMLA had the largest fruit weight (0.4 lb).

Results from selected states for the dwarf rootstock category:

Table 1 summarizes the cumulative yield of the dwarf rootstocks at locations that I think have similar climatic conditions to Vermont. Yield efficiency is a measurement that integrates crop density and fruit weight using the complete tree as a unit.

Table 1. Cumulative (200-03) yield efficiency (kg/cm² TCA) of McIntosh apple trees on various dwarf rootstocks and various locations (NC-140; W. Autio)

Rootstock	MA	NY-W	VT
CG.3041	2.14 a ^z	2.30 a	2.65 a
CG.4013	2.10 a	1.21 cd	1.87 abc
CG.5179	2.25 a	1.79 abcd	2.05 abc
CG.5202	2.01 ab	1.00 d	1.35 bc
CG.5935	.	2.05 abc	2.46 ab
G.16N	1.82 ab	2.39a	1.98 abc
G.16T	1.95 ab	1.99 abc	1.76 abc
M.26 EMLA	1.19 b	1.41 bcd	1.38 bc
M.9 NAKBT337	1.89 ab	1.91 abcd	2.35 ab
SUPPORTER 1	2.42 a	1.86 abcd	2.09 abc
SUPPORTER 2	2.50 a	2.19 ab	1.27 c
SUPPORTER 3	2.53 a	1.88 abcd	2.23 abc

^zMean separation within column and cultivar by Tukey's HSD (P = 0.05)

Results from all combined sites for the semidwarf rootstock category:

- CG.7707 had the lowest survival rate (73%).
- G. 30 had the highest cumulative yield per tree (84 lb).
- M.7EMLA had the highest cumulative number of root suckers per tree (8.0), but not significantly different from CG.4814 (5.4).
- The largest fruit was from CG.7707 (0.4 lb)

Results from selected states for the semidwarf rootstock category :

Table 2 summarizes the cumulative yield of the semidwarf rootstocks at locations that I think have similar climatic conditions to Vermont. Yield efficiency is a measurement that integrates crop density and fruit weight using the complete tree as a unit.

Table 2. Cumulative (2001-03) yield efficiency (kg/cm² TCA) of McIntosh apple trees on various semidwarf rootstocks and various locations (NC-140; W. Autio)

Rootstock	MA	NY-W	VT
CG.4814	2.82 a	1.42 a	2.03 a
CG.6210	.	0.94 ab	1.63 a
CG.7707	1.73 b	0.97 ab	1.53 a
G.30N	1.71b	1.33 ab	1.72 a
G.30T	.	1.04 ab	1.70 a
M.7 EMLA	0.96 b	0.87 ab	0.91 a
M.26 EMLA	1.23 b	1.06 ab	.
Supporter 4	1.12 b	0.63 b	1.31 a

²Mean separation within column and cultivar by Tukey's HSD (P = 0.05)

Winter Damage (2003-2004 winter season)

Bitter cold temperatures set in for December 2003 through February 2004, with a maximum low temperature of -20°F on January 15. The area experienced over 20 days with tempera-

tures reaching below 0°F. To compound the problem of cold temperature, there was little to no snow cover in the early winter season.

When bloom time came, severe winter damage to blossoms in two and three year old wood for all rootstocks was apparent. To determine the amount of damage to blossoms and yield of two and three year old wood, we counted the number of viable flower clusters, fruitlet number after June drop, and yield at harvest.

Results

- There were no viable flowers in two year old wood of dwarf and semidwarf rootstocks.
- No significant differences in three year old wood for parameters measured in the semidwarf rootstocks although
 - M.7 EMLA had the lowest fruit number (185).
 - CG.8, G.30N and G.30T had the highest fruit number (~265).
 - There were significant differences for three year old wood in the dwarf category. Results are given in Table 3.

Across the Lake in Chazy, NY, T. Robinson (Cornell University) has a planting of rootstocks with Honeycrisp and McIntosh as scions. The soil in the area has more clay

Table 3. Winter damage to three year old McIntosh wood in the VT-NC-140 dwarf rootstock evaluation trial

Rootstock	Number of viable flower clusters in 3 year-old wood	Number of fruits in 3 year-old wood	Total number of fruit per tree
CG.3041	2.7 d ^z	1.2 b	140.0a
CG.4013	4.9 cd	3.8 ab	259.3a
CG.5179	6.1 c	2.1 b	222.3a
CG.5202	10.0 ab	3.3 ab	188.8a
CG.5935	4.9 c d	2.7 b	207.6a
G.16N	4.8 cd	1.5 b	190.6a
G.16T	4.7 cd	1.7 b	177.2a
M.26 EMLA	10.5 a	5.9 a	228.5a
M.9 NAKBT337	5.9 c	3.5 ab	170.8a
SUPPORTER 1	7.2 bc	3.7 ab	165.0a
SUPPORTER 2	6.6 c	2.2 b	135.4a
SUPPORTER 3	5.5 cd	3.2 b	164.3a

^zMean separation within columns for each rootstock by LSD at alpha = 0.05 (n =6)

than we have at the HRC. There was severe damage manifesting itself in tree death in this rootstock trial.

Tables 4 and 5 are the data that T. Robinson shared with me to share with you.

Table 4. Survival of Honeycrisp apple trees planted in 2001 on various rootstocks (Chazy Orchard, NY; T. Robinson)				
Rootstock	% Alive		Rootstock	% Alive
O.3	100 a		B.9	66 bcde
V.3	98 ab		M.9Nic29	55 cdef
V.1	98 ab		Sup.4	54 cde
G.16	92 ab		M.26	39 ef
G.30	92 ab		M.9/M.111	36 ef
Mark	92 ab		MM.111	32 fg
B.118	88 abc		M.7	24 fg
M.9T337	86 abcd		MM.106	0 g

Table 4. Survival of McIntosh apple trees planted in 2001 on various rootstocks (Chazy Orchard, NY; T. Robinson)				
Rootstock	% Alive		Rootstock	% Alive
O.3	.		B.9	37 cd
V.3	.		M.9Nic29	58 bc
V.1	.		Sup.4	.
G.16	92 a		M.26	26 cd
G.30	100 a		M.9/M.111	34 cd
Mark	96 a		MM.111	38 cd
B.118	88 ab		M.7	31 cd
M.9T337	36 cd		MM.106	17 d

Conclusions:

Bad News:

- M.26 (dwarf category)
 - One of the lowest yield efficient in MA, NY, and VT
 - High mortality rate in NY after severe winter:
 - 61% mortality for Honeycrisp and 74% mortality for McIntosh
- M.7 (semidwarf category)
 - One of the lowest yield in MA, NY, and VT
 - High mortality rate in NY after severe winter: 76% for Honeycrisp and 69% for McIntosh

Good News:

- Rootstocks in the CG series such as CG.3041 and G.30 have high yield efficiencies.
- G.30 showed high survival rate in NY after severe winter: 92% survival for Honeycrisp and 100% survival for McIntosh

Remember that the performance of a rootstock depends on many variables such as cultural practices, soil types and pH, scion, and climatic conditions in the area. Although the NC-140 has a standard protocol that all the scientist in this project must follow that minimizes variability in the performance of the rootstocks, there are some variables that are beyond our control. So, please use caution when interpreting the results given here.

Pre-bloom Fertilizer Application

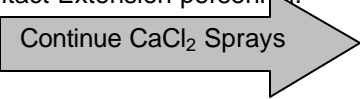
Before too long, it will be time to begin your pre-bloom foliar fertilizer application. Your rates should be based on foliar and soil analysis results, and personal observations. Included in this mailing is a generic chart to guide you in your decision on how much fertilizer to add to your trees.

Farewell

I will like to thank for having given me the opportunity to work with you while I was at UVM. I have accepted a position as Extension Fruit Specialist at the University of Arkansas in Fayetteville. It will be a very challenging position since I will be giving advise and answering questions on all fruits and nuts grown in the state. I just hope that the Arkansas growers are as patient and understating as you were when I first came to Vermont and my practical knowledge in growing apples was very limited.

Once again, thanks for making my experience of Vermont a very positive one. I wish you the best in your life and your orchard.

Table 1. Generic Recommendations for Foliar Nutrient Applications for a Bearing Orchard by Phenological Stage.** To be used only when leaf and soil analyses have not been done. These recommendations cannot account for individual orchard situations and following these guidelines may result in deficiencies and/or toxicities. **Orchard specific** recommendations can be found on leaf and soil analysis reports.

Dormant→Silver Tip	Green Tip→ ½ inch Green	Pink	Bloom	Petal Fall	7-10 Days after Petal Fall (1 st Cover)	Growing Season (2 nd →Final Cover)
<p>Zinc¹: Zinc Sulfate (36% Zn): 10-14 pounds/100 gallon dilute equivalent. (3.5 to 5 lb actual Zn)</p> <p>Manganese¹: Manganese Sulfate (24% Mn): 2-4 pounds/100 gallon dilute equivalent) (1/2 to 1 lb actual Mg)</p> <p>Copper²: Copper Sulfate (22% Cu): 4 pounds/100 gallon dilute equivalent OR Bordeaux Mixtures (follow label rate)</p> <p>Potassium: <i>No foliar application.</i> Potassium may be added via ground application during fall or early spring as muriate of potash (0-0-60): 150-200 pounds/acre/season can be applied. Sul-Po-Mag (2 pounds/tree) should be applied pre-bloom if Mg addition is also desired.</p>		<p>Nitrogen³: Urea (45% N): 3 pounds/100 gallon dilute equivalent (1 of 2 applications)</p>		<p>Nitrogen³: Urea (45% N): 5 pounds/100 gallon dilute equivalent (2 of 2 applications)</p> <p>Boron⁴: Solubor (20.5% B): ½-1 pounds/100 gallon dilute equivalent (1 of 2 applications)</p> <p>*DO NOT MIX SOLUBOR with Calcium Nitrate</p> <p>Magnesium⁵: Either Magnesium Sulfate (11% Mg) OR Epsom Salts (10% Mg): 15 pounds/100 gallons dilute equivalent</p>	<p>Boron⁴: Solubor (20.5% B): ½-1 pounds/100 gallon dilute equivalent (2 of 2 applications)</p>	<p>Calcium⁶: Calcium Chloride (77-80% CaCl₂): 1-4 pounds/100 gallon dilute equivalent /spray. Calcium chloride sprays should continue every 10-14 days over the course of the growing season for a maximum of 8 sprays. For different calcium formulations, contact Extension personnel.</p> <div style="text-align: right;">  </div>

¹Zinc and Manganese can also be found in some fungicides-check pesticide label

² Copper can also be added via Cu-based fungicides-check pesticide label. CAUTION! These copper treatments may burn leaves and cause fruit russetting.

³ Alternatively, Nitrogen can be applied in a split **ground** application of either Calcium Nitrate (15.5%N; 2-4 pounds/tree/appl) or Ammonium Nitrate (33.5%N; 1-2 pounds/tree/appl). One application pre-bloom, the other six weeks after bloom.

⁴ Alternatively, this split application can be replaced by a single **ground** application of granular Boron during the "Dormant-Silver Tip" period. In this case, the recommended application is 2-3 pounds of granular boron/ young trees and 7-8 pounds of granular boron/older trees.

⁵ This application of Mg can be reapplied at 10-14 day intervals after the PF application, if desired. Maximum of three Mg sprays per season.

⁶ Additionally, Magnesium and/ or Calcium can be added via ground applications of lime or dolomitic lime. This should not be done without a soil test.

****It is NOT recommended that foliar nutrients be applied with horticultural oils.**

Further information: [Orchard Nutrition Management](#). Warren C. Stiles and W. Shaw Reid. Cornell Cooperative Extension Bulletin #219. Prepared by Linda Boccuzzo and Terry Bradshaw



Vermont Apple IPM News

Lorraine P. Berkett, IPM Specialist
April 2005

A Season of Change ...

As you know, we will not have the horticultural expertise and insights that Dr. Elena Garcia has provided for the last 7 growing seasons. It will truly be missed. How will your horticultural questions be answered? The UVM Apple Team will do its best at helping you make effective links with appropriate horticultural resources in the region since we will not have the expertise here at UVM.

What else will we be able to provide? We will continue the **IPM News** section of the Newsletter. As in the past, we will also send out **IPM Alerts**. However, because of the additional cost of photocopying and mailing, both the **IPM News** and the **IPM Alerts** will be sent out primarily via email. They are also more timely by email and can reach you 1-3 days quicker than by mail. The publications will only be mailed to those growers who are not hooked up to the internet.

Please send your email address if you have not done so already to:

lorraine.berkett@uvm.edu

In terms of apple research/demonstration orchards at the UVM Horticultural Research Center, we have received support from **Associate Dean Mike Vayda** and from the **Vermont Tree Fruit Growers Association** to continue the Apple Rootstock Evaluation Trials on which Elena had reported at the VTFGA Annual Meeting in February and to continue maintaining the Apple Cultivar Evaluation Orchard for this year.

Also, I do plan on making as many orchard visits as I can this growing season to see how things are going in orchards around the state.

As always, if you have a pest management question or a problem, please do not hesitate to contact me at: 802/656-0972 or lorraine.berkett@uvm.edu

2005 Reports of Apple Bud Stage (McIntosh) for Selected Sites				
Date	South Burlington Elev. 71 M	Shoreham Elev. 107 M	South Hero Elev. 54M	Dummerston Elev. 171 M
4/04	Dormant	Dormant	Dormant	Dormant
4/10	Dormant, slight swelling	Dormant	Dormant	Silver Tip

IPM Tool — Tracking Degree Days

As in previous years, we are tracking degree day accumulation at locations in the state using *Skybit E-Weather Service*. Charts for ascospore maturity (starting at Green Tip) and degree day accumulation for arthropod activity will be updated weekly (usually on Monday and Thursday) and posted on: <http://orchard.uvm.edu/uvmapple/pest/index.html>

2005 <u>Estimated</u> Degree-Day Accumulation (Base 50F, from Jan. 1) for Selected Vermont Sites ¹				
Date	So.Burlington	Shoreham	South Hero	Dummerston
04/09	13	20	12	26

¹Degree Days received from Skybit E-Weather Service: <http://www.skybit.com/>

Arthropod 'Events' Based on Degree-Day Accumulation ¹	
Pest/Phenology Event	Estimated DD Base 50 F for Event (from Jan 1)
Spotted Tentiform Leafminer (STLM) - 1st adult catch	39-114
Tarnished Plant Bug (TPB) - 1st observed	43-167
Rosy Apple Aphid	56-116
STLM - 1st egg observed	58-130
European Red Mite (ERM) - egg hatch observed	100-168

¹ Source of Estimated DD (Base 50F) for arthropod pest events: Pest Management Guidelines for Commercial Tree-Fruit Production 2005. A Cornell Cooperative Extension Publication, Table 14: "Degree-day accumulations (from January 1) corresponding to selected fruit phenology and arthropod pest events."

Trap Captures at the UVM HRC

White sticky traps for the **Tarnished Plant Bug (TPB)** were placed in the orchard on April 6th and first checked on April 11th. A total of 4 TPB were captured in a total of 15 traps. Not much activity to date.

Twenty red sticky traps were placed on tree trunks for **Leafminer (LM)** adults on April 6th and checked on April 11th. No adults were observed.

The following table is from the **IPM 'Quick' Summary for Monitoring Apple Arthropod Pests** that was distributed last year in the *Vermont Apple IPM News* and which is on the web at:

<http://orchard.uvm.edu/uvmapple/pest/2004IPMQuickSummaryForMonitoring.PDF>

Pest	Phenology			
	Silver Tip	Tight Cluster	Early Pink	Late Pink
TPB	Place White Sticky Traps in Orchard	Threshold		
		Wholesale: 3/trap		5/trap
		Retail: 5/trap		8/trap
ABLM	Place red visual traps on south side of tree trunks. Minimum of 4 traps per 8-acre block	McIntosh: 4/trap	Non-McIntosh: 8/trap	9/trap
				21/trap

2005 Update to the 2003-2004 New England Apple Pest Management Guide (NEAPMG)

Enclosed is the **2005 Update** to the New England Apple Pest Management Guide (NEAPMG). It is also posted on the web at:

<http://orchard.uvm.edu/uvmapple/pest/2005NEAPMGUpdateRevised.PDF>

A Limited Number of Hard Copies of NEAPMG still available

If you need a printed version of the 2003-2004 New England Apple Pest Management Guide it can be purchased for \$15.00 using the **Order Form** in this mailing.

It is also available on the web at: <http://www.umass.edu/fruitadvisor/NEAPMG/index.htm>

Thank you and Best Wishes to a Wonderful Colleague... Elena Garcia.

For over 7 years we have had the pleasure of working with Elena Garcia. She is a wonderful, caring person ... she has been so generous in sharing her knowledge and expertise and has been totally committed to helping the apple industry in Vermont prosper. She also has been a good friend. Wishing you the very best as you embark on a new phase of your career...

Lorraine, Terry and Marlys



Elena receiving a gift of appreciation at the 2005 VTFGA Annual Meeting

Contact Information

A Commitment to Excellence and Service:

If you have any questions or want to arrange for an orchard visit regarding your concerns, please call or write.

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The Vermont Agricultural Experiment Station, University of Vermont Extension, and U.S. Department of Agriculture, cooperating, offer education and employment to everyone without regard to race, color, national origin, sex, religion, age, disability, political beliefs, and marital or familial status.