

## Apple Rootstocks for Michigan



R. Perry & D. Stefanelli  
Department of Hort.  
Michigan State Univ.

### Nature of the trials

- Trials are **long term** (8-10 years) before assessments are determined to be valid.
- Multiple trials are desirable over years to evaluate and confirm findings from independent trials.
- Multiple sites are best to assess performance under differing pressures; **across many soil and climate stresses**.
- Set up in experimental designs to facilitate evaluation, use minimum land space & without influence of soil type and management practices.
- Cooperative projects with NC-140 regional project (<http://www.nc140.org/>) and with breeders (ex. Dr. Fazio, NYAES/USDA; <http://www.nysaes.cornell.edu/hort/breeders/appleroots/appleroostocks.html>).
- Assessment accomplished fairly and under management styles and practices that yield the least amount of bias.

R. Perry, MSU, Hort



Size 1	Size 3	Size 5	Size 7	Size 9
M.27	M.9	G.30	MM.106	P.18
P.22	P.2	G.935	CG.7707	
G.65	G.41	CG.5087		
	G.16	CG.5179		
		CG.5757		
Size 2	Size 4	Size 6	Size 8	Size 10
B.9	M.26	M.7	MM.111	Sdng
Mark	G.11	CG.6210	CG.8534	
P.16	G.202			
	CG.4013			
	CG.4213			

R. Perry, MSU, Hort

### Rootstocks Under Trial in Michigan: Clarksville / Belding\*

Gala (131) 1998*	Gala (132) 1999 (Guards)	Gala (136) 2002*	G. Golden (138) 2003*	HoneyCrisp (139) 2003	McIntosh (132) 1997	HoneyCrisp (140)* 2004
G 16	B.9	Bermer 756	B.9	CG 3041	CG 3041	CG 4002
M 9 Emla	G.16	Bud.9	B-62-396	CG 4002	CG 4013	CG 4003
M 9 Wal	CG. 5206	Bud.9 Europe	CG.3041	CG 4003	CG 5179	CG 4011
	CG. 5202	M.26 EMLA	CG.4210	CG 4210	CG 5202	CG 4013
<b>Jonagold</b>	CG. 4247	M.26 NAKB	CG.5935	CG 4213	CG 5935	CG 4202
	CG. 5701	M.9 NAKB 337	G.16	CG 4814	G.16 N	CG 4210
G 16	CG. 5087	M.9 RN 29	JM.1	CG 5012	G.16 T	CG 4213
G 41	CG. 5757	P.14	JM.2	CG 5087	M.26 Emla	CG 4214
M 9 Emla	G. 16	PIAU 51-11	JM.7	CG 5257	M.9 NAKB 337	CG 4814
	G. 30	PIAU 51-4	JM.8	CG 5463	Supporter 1	CG 5912
	P. 14	Supporter 4	J-TE-G	CG 5757	Supporter 2	CG 5946
	M.7		J-TE-H	CG 5890	Supporter 3	CG 5087
			M.26 EMLA	B9		CG 5179
			M.9 Pajam 2	G11		M.9
			M.9T337	M.9 Pajam 1		CG 3041*
			PIAU 51-11	M9 EMLA		* Non HC scion
			PIAU 51-4			
			PIAU 56-83			** Coop trial at Wittenbach's, Belding

\*\* All are managed with support and trickle irrigation

R. Perry, MSU, Hort

## Rootstocks Under Trial in Michigan: Traverse City\*

Gala (223)	Golden (225)	McIntosh (223)	McIntosh (224)	Honey Crsp (226)	Honey Crsp (227)
1999 (Guards)	2002	1999*	2000	2003	CG Series 2004
Bud 9	CG 5087	CG 4814	CG 5046	CG 5012	5046
CG 5202	CG 5890	CG 6210	CG 5757	CG 5087	5087
CG 4247	CG 6006	CG 7707	G.30	CG 5257	5179
CG 5701	CG 6143	G.30 N	M.26	CG 5463	5257
CG 5087	CG 6210	G.30 T	M.7 EMLA	CG 5757	5463
G. 16	CG 6874	M.26 Emla	MM.106	CG 5890	5757
G. 30	CG 6879	M.7 Emla		CG 6006	5890
P. 14	CG 6969	Supporter 1		CG 6210	5935
	CG 8534	Supporter 2		CG 6589	6001
	G.16	Supporter 3		CG 6874	6006
	M.26	Supporter 4		CG 7480	6143
	M.7			CG 8534	6210
	M9			G11	6253
	MM.111			M.9 Pajam 1	6589
	Cameo/M.26			M9 EMLA	6874
					6879
					6969
					M.26
					M.7

All, except 1999 Guards, are managed **without** support in Central Leader system  
R. Perry, MSU, Hort

**Cornell / Geneva Apple Rootstock Trial**  
Honeycrisp / 14 stocks @ Wittenbach Orchards, Belding, MI  
Planted in 2004, Vert Axe system

CG 4002	CG 4013	CG 4213	CG 5012	CG 5179
CG 4003	CG 4202	CG 4214	CG 5946	M.9
CG 4011	CG 4210	CG 4814	CG 5087	CG 3041*

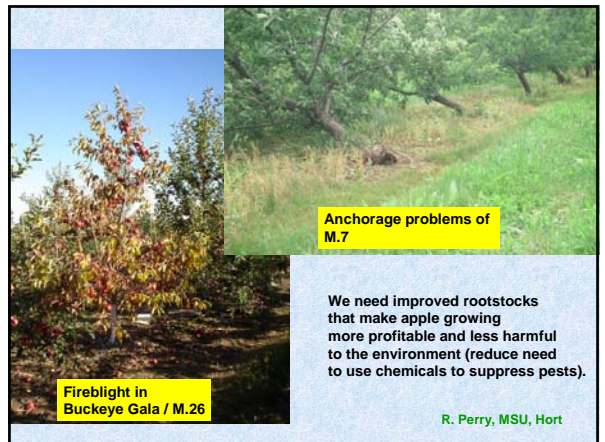
\* Non HC scion



## Apple Rootstock Improvement:

- Efforts to develop improved apple rootstocks have led to rootstock breeding programs in:
  - the United States (CG, MAC, OAR, Arkansas and Minnesota series)
  - Canada (KSC, Ottawa, Vineland series)
  - the United Kingdom (M, MI, MM, and AR series),
  - Germany (J9 and Pillnitzer-Supporter series),
  - Sweden (Alnarp, BM series and Bemali),
  - Russia (Budagovskij series),
  - Poland (P series),
  - the Czech Republic (JT-E series),
  - Israel (MH series),
  - Romania (Voinessti series)
  - Japan (JM series).

R. Perry, MSU, Hort



Anchorage problems of M.7

Fireblight in Buckeye Gala / M.26

We need improved rootstocks that make apple growing more profitable and less harmful to the environment (reduce need to use chemicals to suppress pests).

R. Perry, MSU, Hort

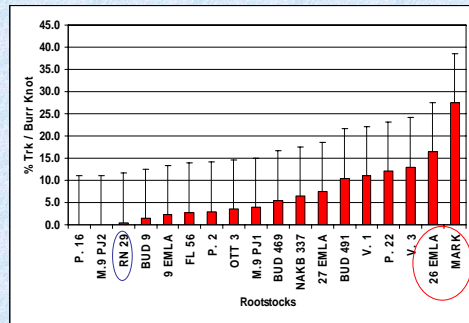
## Challenges with Current Apple Rootstocks:

- Over the last 60 years as growers worldwide have used the EM, M and MM series of rootstocks from England their limitations have become apparent. These have included:
  - lack of winter hardiness,
  - lack of resistance to *Phytophthora* root rot,
  - susceptibility to Fire blight
  - burrknots,**
  - poor anchorage,
  - root suckers,
  - sensitivity to apple replant disease,
  - brittle graft unions.
  - lack of precocity.



R. Perry, MSU, Hort

## % Trunk Area (RS shank) covered by Burrknots



R. Perry, MSU, Hort

## Soil berm (mound) on new apple planting



Now a common recommendation based on research, applied to Organic or conventional growers

Gut, McGhee, Perry, 2005 Soil Mounding as a Control for Dogwood Borer in Apple. HortScience 40(7): 2066-2077.

R. Perry, MSU, Hort

## Geneva™ Rootstocks

Rootstock Released	Tree Size	Year
Geneva™ 65 (G.65)	M.27 size	1991
Geneva™ 30 (G.30)	M.26-M.7 size	1994
Geneva™ 11 (G.11)	M.26 size	1997
Geneva™ 16 (G.16)	M.9 size	1998
Geneva™ 202 (G.202) (NZ)	M.26 size	2002
Geneva™ 41 (G.41) (CG 3041)	M.9 size	2004
Geneva™ 935 (G.935) (CG 5935)	M.26 size	2004
CG.4210 (NZ)	M.9	2006

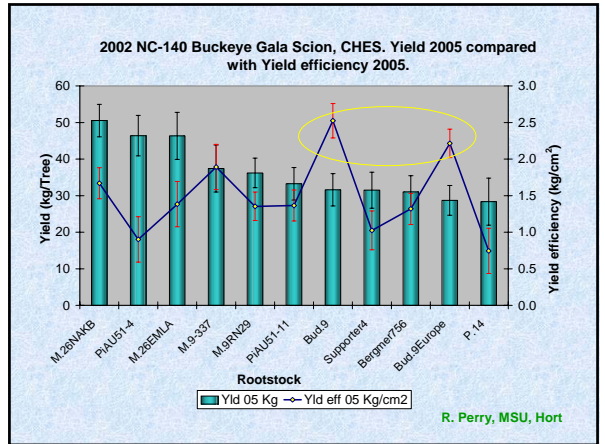
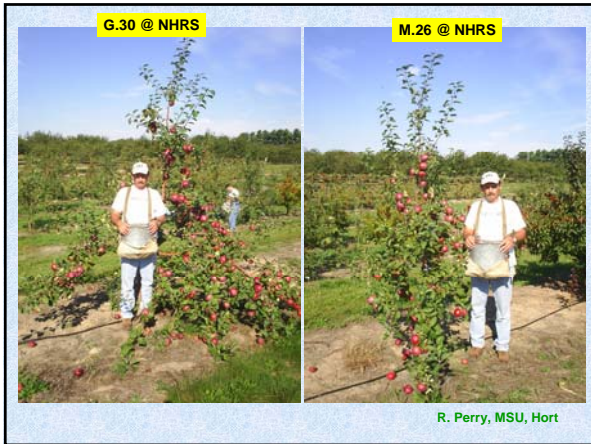
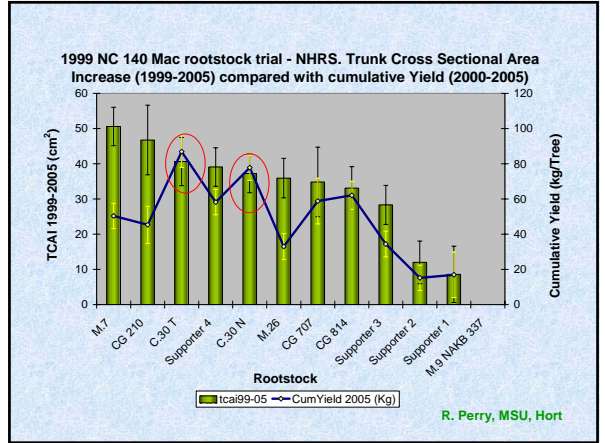
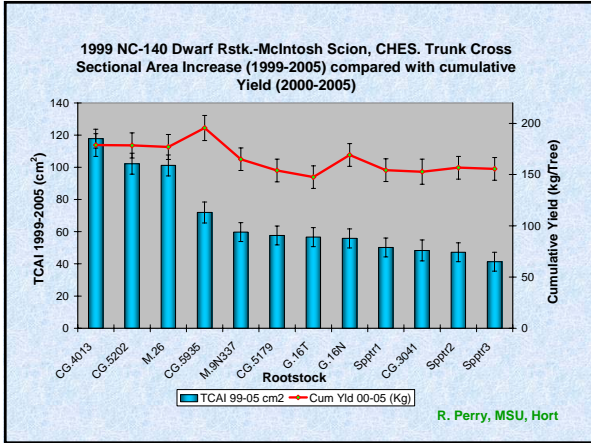
**G.16 Tol of Phytoph, FB (R), no burrknots, sensitive to latent viruses. Strong M.9 (EMLA)**

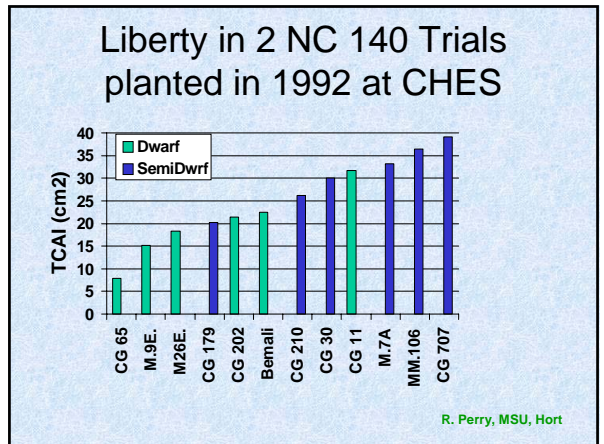
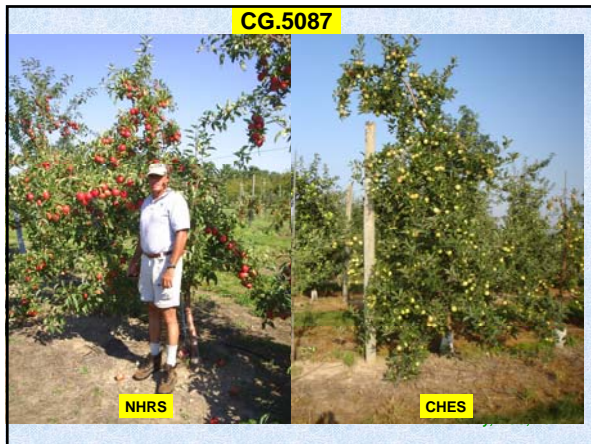
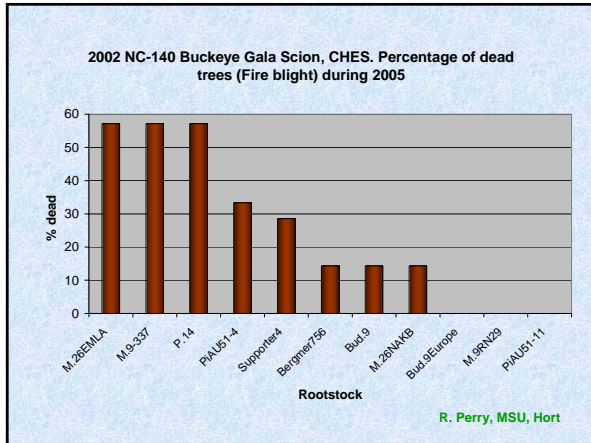
**G.30 Weak graft union, spprt needed, res. to replnt dis.(Merwin, 2000) Tolerant of Phytophthora, Resistant to FB, no burrknots**

**G.11 Mod.resistant to Phytophthora & FB, very few burrknots.**

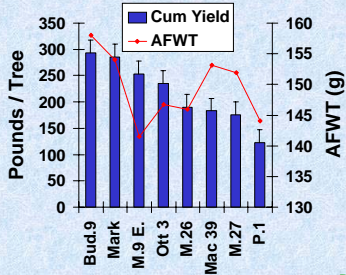
**G.41 Resistant to Phytophthora & FB., weak M.9**

R. Perry, MSU, Hort



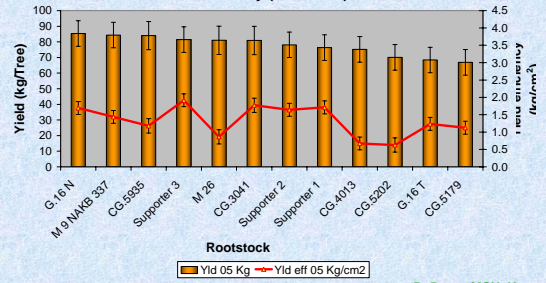


Cumulative Yield (90-96) & Avg. Frt Wht (93-95) of Gala After 7 Years at CHES on 8 Rootstocks



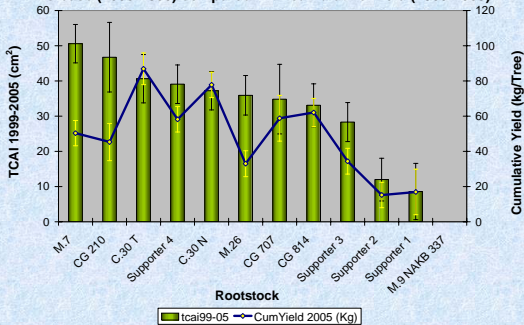
R. Perry, MSU, Hort

1999 NC-140 Dwarf Rstck.-McIntosh Scion, CHES. Yield (2005) compared with Yield Efficiency (2005) and Cumulative Yield Efficiency (2000-2005)



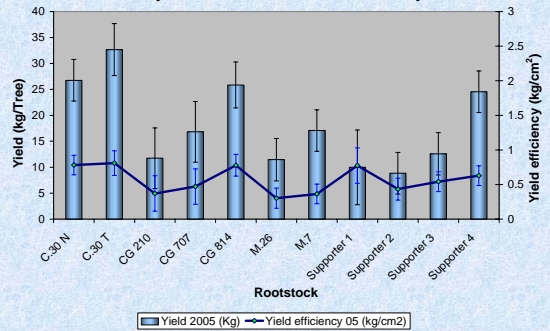
R. Perry, MSU, Hort

1999 NC 140 Mac rootstock trial - NHRS. Trunk Cross Sectional Area Increase (1999-2005) compared with cumulative Yield (2000-2005)

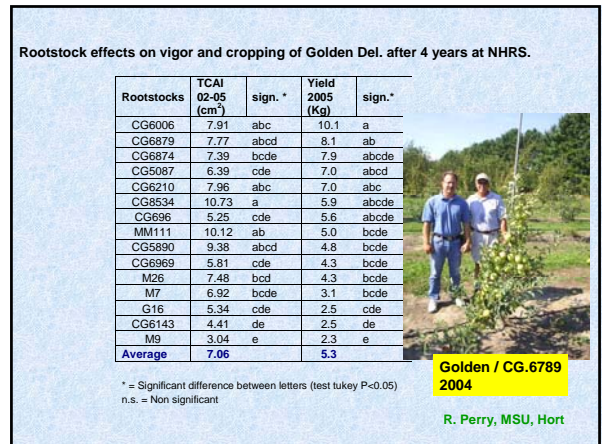
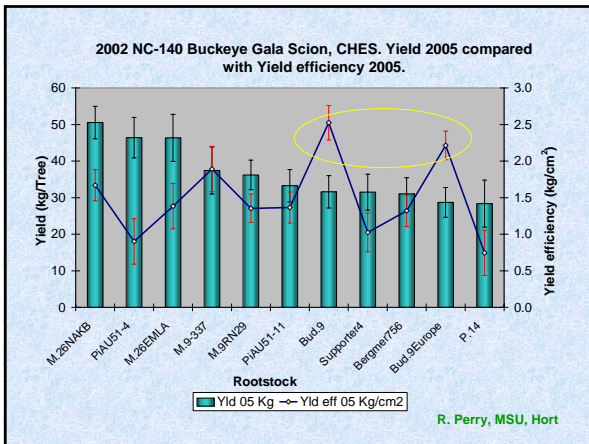
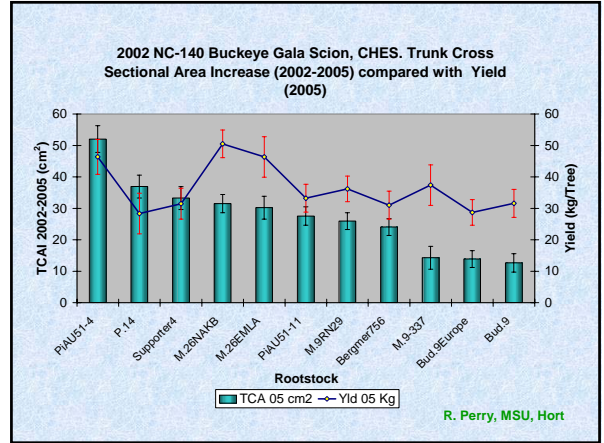
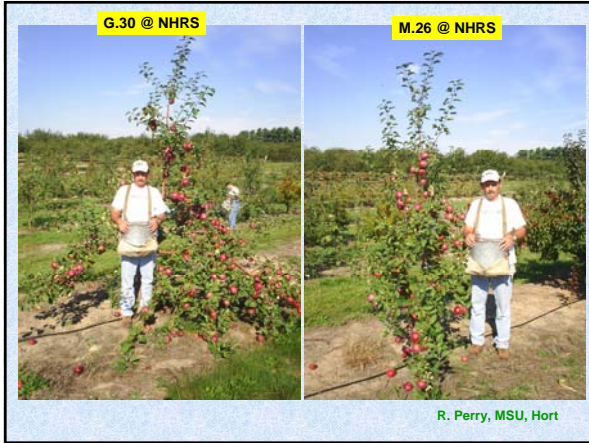


R. Perry, MSU, Hort

1999 NC 140 Mac rootstock trial - NHRS. Yield 2005 compared with Yield efficiency 2005 and cumulative Yield efficiency 2000-2005



R. Perry, MSU, Hort



### **Rootstocks which have the greatest commercial potential for Michigan**

- Bud. 9 continues to perform well for high density systems. Maybe a little weak for N. Michigan, unless Super Slender Spindle.
- Northern Michigan sites will require vigor of M.26 – M.7.
- CG rootstocks have the greatest potential to address our challenges regarding Fireblight, Phytophthora, cold injury, yield and fruit quality.
- Many CG stocks in the M.9-M.26-M.7 vigor range which adapt best for our central leader and Vertical Axe training systems.