

Rootstocks for 'Honeycrisp™'

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Dept of Horticulture

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Rapids, MI

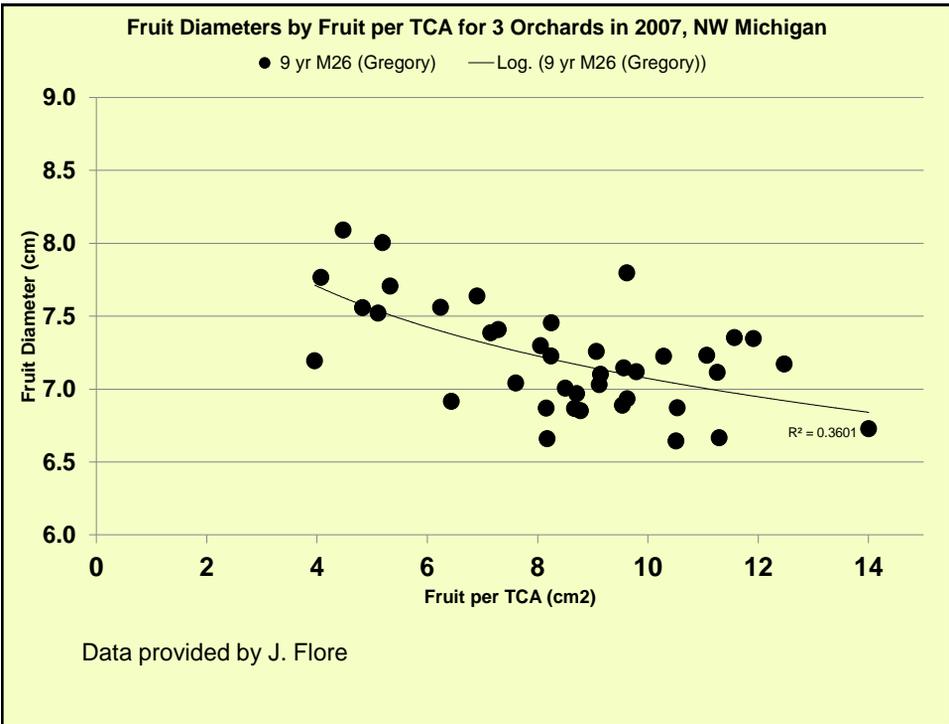
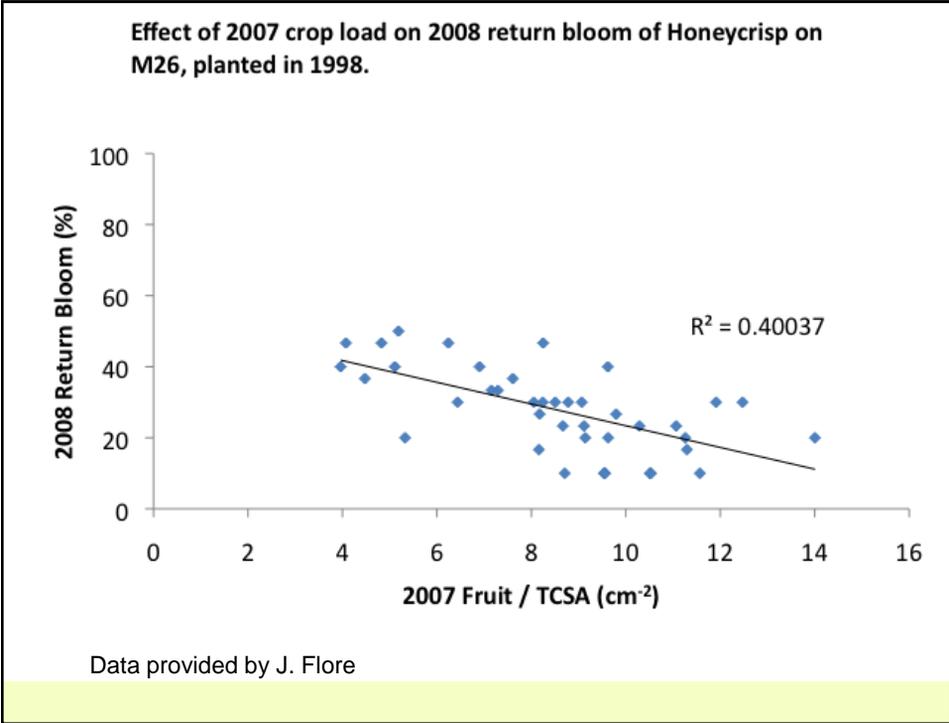


Variety Characteristics



- **Weak Growth**
- **Crop Load Must Be Managed**
 - Can alternate bear
 - Problems with Return Bloom if over-cropped
 - Bitter Bit when under-cropped
 - Tree vigor suffers when over-cropped in developing years
 - Research at Geneva, NY suggests (Robinson, et. al. 2009*)
 - Years 1-4 max. 4 fruits / cm² trunk cross sectional area
 - Years 5+ max 6 fruits / cm² trunk cross sectional area

*Robinson, T., S. Lopez, K. Iungerman and G. Reginato. 2009. Crop load management for consistent production of Honeycrisp apples. NY Fruit Quarterly 17(1): 24-28.



Honeycrisp rootstock trial on Cornell-Geneva elite rootstock clones est. **2004**; NHRS, TC



HC / CG 5757 in foreground
Before

HC / CG 5757 in foreground
After

Some trees had to be tied up to vertical support in 2006 if leaning beyond 15 degrees

Performance of Honeycrisp on Rootstocks - NY



- In a trial established at NYAES, Geneva, 64 rootstocks were tested over 5 years with Honeycrisp, Gala and Golden Delicious.
- The 3 varieties produced the most crop on 'CG.6210' followed by 'G.935', 'G.41', and 'G.11'.
- Cropping on 'G.16', 'P.22' and 'M.27' was lowest
- All remaining rootstocks intermediate.
- The rootstocks with the **highest yield efficiency** were 'G.65', 'G.11', 'B.9'-OR, 'G.935', 'G.41', 'B.9'-NE, 'P.22', and 'CG.6210'.
- Yield efficiency was **lowest** on 'Supporter 4', 'M.9', and 'M.9NAKBT337'.

Russo, et.aAl., 2007. Field Evaluation of 64 Apple Rootstocks for Orchard Performance and Fire Blight Resistance. HORTSCIENCE 42(7):1517–1525. 2007.

Field Evaluation of 64 Apple Rootstocks for Orchard Performance and **Fire Blight Resistance**. HORTSCIENCE 42(7):1517–1525. 2007.

Probability of Developing Rootstock Fireblight - Honeycrisp and Gala scions.

Great	Low	Resistant (> 10%)
M.9 Burg756	PIAu 56-83	PIAu 51-4
M.9 EMLA	G.935	G.16
M.9 NAKBT337	G.11	
M.9 Nic29	G.65	
M.26 NAKB	G.41	
M.26 EMLA	P.14	
M.26	B.9 NE	
Ottawa 3'	B.9 OR	
'P.22'		
'JM.2'		
'Supporter 4'		
'M.27'		

In 2005 a duplicate plot was inoculated with fireblight at 60% bloom using a back pack sprayer to determine rootstock influence on fireblight sensitivity.

From: Russo, N.L., et., al., 2007. HORTSCIENCE 42(7):1517–1525. 2007.

Fireblight Infection in 2004



Gala / B.9 OR

FB Spread Suppressed



Gala / B.9 OR

Gala / M.9 NAKB 337



Gala / M.26

Variety Characteristics

- M.26 enhances susceptibility of vulnerable varieties to Fireblight
- Brittle Wood / Union
- Requires Support

Champlain Valley Trials, NY

- “Honeycrisp suffered from biennial bearing and had less than a full crop.”
- “B.9 rootstock was the most productive rootstock with Honeycrisp in 2006 but M.9 and G.16 were the most productive with McIntosh. In 2007 and 2008 there was a large crop with both varieties.”
- “With Honeycrisp, B.9 had the greatest yield followed by M.9, G.16, G.30, M.26 and MM.111.”
- Robinson, T. and K. Lungerman, Improved Apple Orchard Management Systems and Rootstocks for NNY, Northeast NY Fruit Program. Northern NY Agricultural Development Program, 2007-2008 Project Report.

Performance of Honeycrisp on Rootstocks - Michigan

- Collaboration with NYAES / USDA Apple Rootstock Breeding program.
 - Established trials in
 - 2003 non randomized/limited reps.
 - 2004 randomized /replicated.
1. Clarksville Hort. Exper. Station
 2. Wittenbach Orchard, Belding (2004 only)
 3. Northwest Hort Research Station

Dr. Jim Cummins, NYAES, Geneva, NY



Breeding and Developing New Apple Rootstocks by Dr. Jim Cummins
Established in 1968, Geneva, NY (NYAES)

Goals; Develop new rootstocks resistant to Fireblight, Phytophthora and Woolly Apple Aphids and still be as productive and precocious as Malling stocks



Work continued
By Dr. Gennaro Fazio
USDA Res Scientist



Testing and Trial of Cornell-Geneva Series Rootstocks in Michigan

- MSU began evaluating clonal rootstocks in 1945 (H.B. Tukey and R.F. Carlson).
- Carlson organizes Dwarf Fruit Tree Association; 1957
- NC-140 Regional Rootstock project established in 1976 along with new trials.
- Initiated the evaluation of elite candidates from the CG program in 1982
- Incorporated CG clones into NC-140 testing program with the first trials in 1992.



Trialing of rootstocks for Honeycrisp

- Honeycrisp trials oldest established in 2003 in Northern and Mid Michigan
- Trials in N. Michigan at NHRS on sandy soil, M.26 – MM.106 vigor rootstock clones.
 - Established without support in CL system
 - Some require support; VA sys.
- Trials in Mid Michigan at CHES and Wittenbach's on M.9 – M.7 vigor rootstock clones
 - Established with support in VA sys.

Honeycrisp rootstock trial on Cornell-Geneva
elite rootstock clones est. 2003; CHES
2003 NC 140 CG/Honeycrisp trial - CHES- 2006

Rootstock	Yield 06 (kg/Tree)	sign. **	AFW (g)	sign. **
B.9	11.4	cd	120.9	cd
CG3041	7.7	de	189.9	b
CG4002	3.7	e	165.7	bc
CG4003	11.5	bcd	68.4	d
CG4210	9.1	de	141.6	bcd
CG4213	16.9	abc	210.7	b
CG4814	16.9	abc	130.6	bcd
CG5012	12.0	bcd	180.2	bc
CG5087	3.7	e	145.4	bcd
			136.6	bcd
CG5463	10.3	cde	180.7	bc
CG5757	8.1	de	156.1	bc
			178.4	bc
G.11	3.9	e	201.3	b
M.9EMLA	7.0	de	149.9	bcd
M.9PJ1	6.0	de	294.4	a
Average	10.66		165.67	

** = Highly significant (Pr>F0.01)

* = Significant (Pr>F 0.05)

n.s. = Non significant

2004 NC 140 CG/Honeycrisp trial - NHRS- 2006

Rootstocks	TCA 06 (cm ²)	sign. **	Yield 06 (kg/Tree)	sign. **	% of MM.106 #	sign. **
CG5046	6.98	fgh	0.95	a	80	fgh
CG5087	8.67	bcde	0.00	b	100	bcde
CG5179	6.73	gh	0.07	b	77	gh
CG5257	10.04	b	0.88	a	115	b
CG5463	12.84	a	0.02	b	148	a
CG5757	6.96	fgh	0.28	b	80	fgh
CG5890	9.38	bcd	0.32	b	108	bcd
CG5935	7.99	defg	0.12	b	92	defg
CG6001	9.65	bc	0.13	b	111	bc
CG6006	7.84	efg	0.07	b	90	efg
CG6143	5.96	h	0.16	b	69	h
CG6210	8.64	bcde	0.16	b	99	bcde
CG6253	8.43	cdef	0.30	b	97	cdef
CG6589	12.73	a	0.19	b	146	a
CG6874	7.88	defg	0.12	b	91	defg
CG6879	9.39	bcd	0.14	b	108	bcd
CG6969	5.89	h	0.09	b	68	h
M.7	6.97	fgh	0.03	b	80	fgh
MM.106	8.70	bcde	0.04	b	100	bcde
Average	8.51		0.21		97.81	

** = Highly significant (Pr>F0.01)

* = Significant (Pr>F 0.05)

n.s. = Non significant

Different letters means statistical significance obtained with LSMEANS pdiff (P<0.0

= Based on TCA 2006

Honeycrisp rootstock trial on Cornell-Geneva elite rootstock clones est. **2004**; NHRS



MM 106

Harvest 2006

CG 5257

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 5046	M.9
CG 4011	CG 4210	CG 4814	CG 5087	CG 3041*

* Non HC scion



Ed W.

Dr. Fazio

Mike W.

Wittenbach's Orchard Rootstock Trial



Student independent study project effects of rootstocks on HC foliar yellowing, etc
J. King, A. Dietrich, Dr. E. Hanson, Dr. J Flore, Dr. Paolo Sabbatini

Wittenbach Rootstock Trial



Harvest 2006

Cornell – Geneva Elite Clone Rootstock Trial with
HC scion; Est 2004 @ Wittenbach Orchard,
Belding



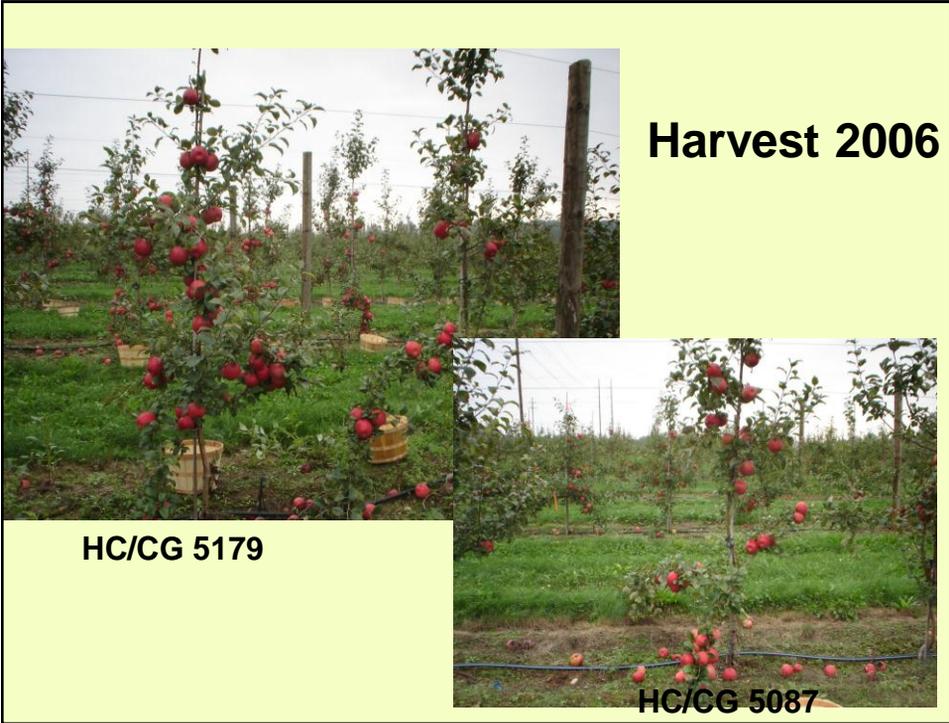
P. Schwallier &
D. Ruersma help
Collect data.



Wittenbach's
HC/RN 29

CG Elites at Wittenbach's

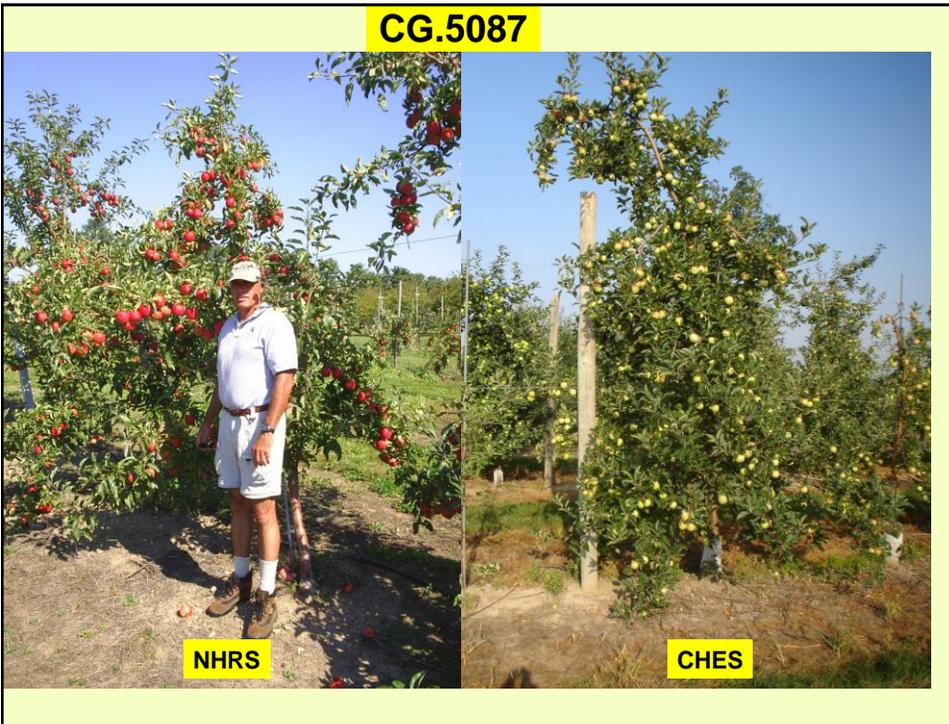
Harvest 2006



HC/CG 5179

HC/CG 5087

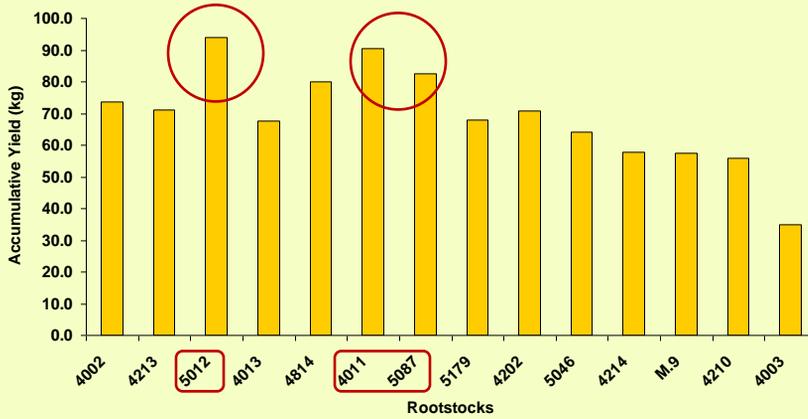
CG.5087



NHRS

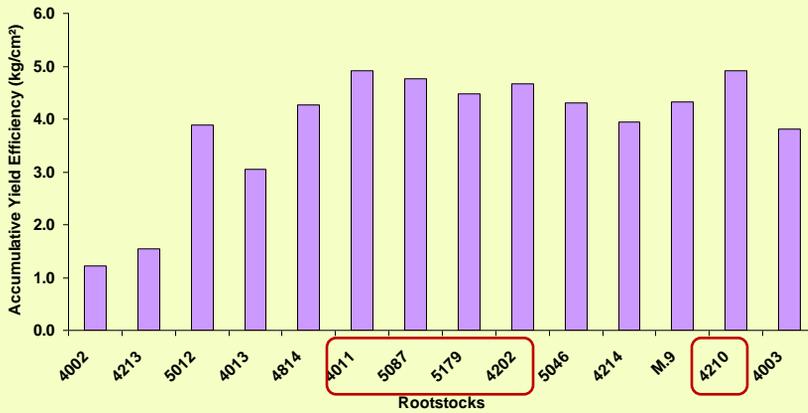
CHES

Accumulative yield (kg) from 2006-2009, for the CG Elite Honeycrisp rootstock trial planted 2004 at Wittenbach Orchards, Belding Michigan.



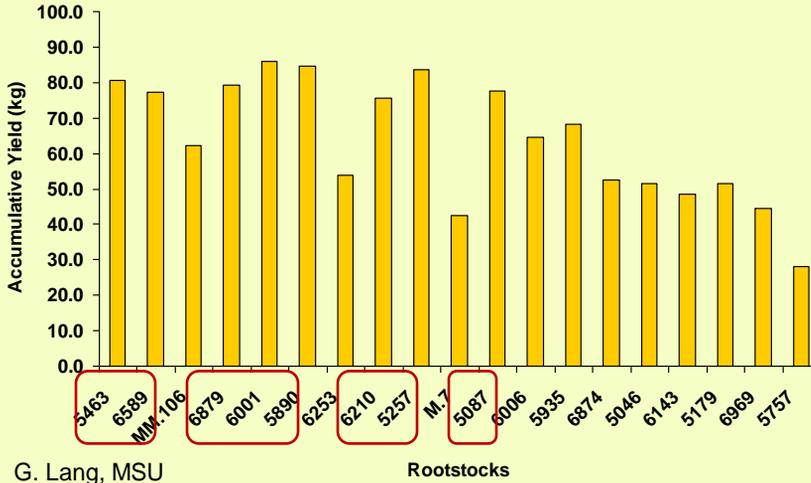
G. Lang, MSU

Accumulative yield efficiency (kg/cm²) from 2006-2009, for the CG Elite Honeycrisp rootstock trial planted 2004 at Wittenbach Orchards, Belding Michigan.

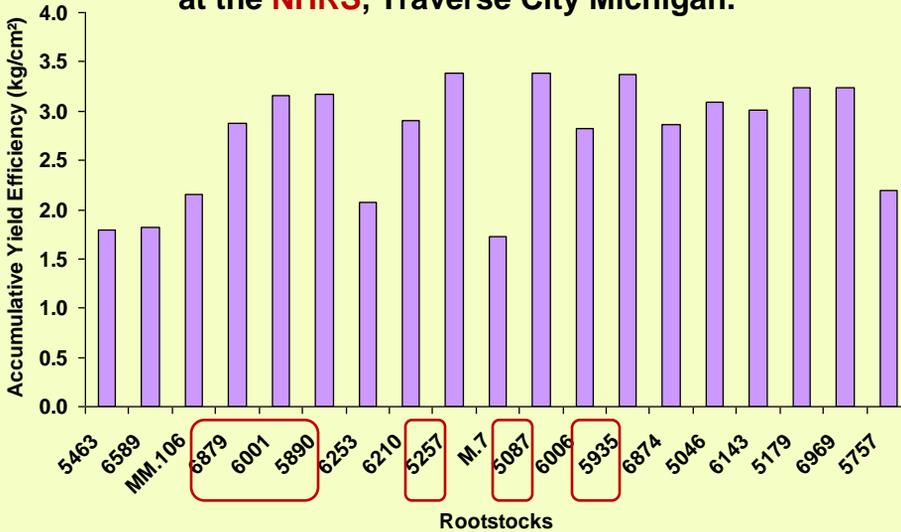


G. Lang, MSU

Accumulative yield (kg) from 2006-2009, for the CG Elite Honeycrisp rootstock trial planted 2004 at the Northwest Michigan Horticulture Research Station, Traverse City Michigan.



Accumulative yield efficiency (kg/cm²) from 2006-2009, for the CG Elite Honeycrisp rootstock trial planted 2004 at the NHRS, Traverse City Michigan.



Star Performers after 4 years

Wittenbach Plot	NHRS	
* Yield	* Yield	* Yield Effic
5012	5087	5087
4011	5257	5257
5087	6210	
	6879	6879
* Yield Efficiency	6001	6001
5087	5890	5890
4011	5463	5935 (G.935)
5179	5890	
4202		
4210		

If the Future is to rely on more mechanization... the rootstock is the tool to help us get there!

