

ANNUAL REPORT TO NC-140

2014 'Honeycrisp' Rootstock Trials – Report for 2017 data

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2017 was the fourth year of the 2014 NC-140 Apple Rootstock Trials. Rootstocks included in this experiment are listed below. All data presented in this report were collected in 2017 and analyzed by the data coordinator. All cooperators submitted data except two sites (ON-Ridgetown, Michigan).

An Excel data template worksheet was provided to all cooperators to submit data. This generally worked well, however there were some data issues at some sites. Please use the Excel data template when submitting data -- a new worksheet template will be provided each year. Participants are encouraged to review their data and make sure that all measurements are in the units requested. Include only those data requested in the protocol – which is provided in addition to the data template.

Summary of Data Submission

1. Review the data protocol located on the NC-140 website
2. Be sure to correct any errors in the data structure (treatments, reps) communicated by the data coordinator to you in 2018.
3. Submit only the data requested using the Excel data template worksheet, which can be found on the NC-140 website
4. Submit **only** data collected in **2018** (not prior years) and use the correct units using the data template provided for 2018 (see website).

Rootstocks, cultivars and locations involved in the 2014 NC-140 Apple Rootstock Trial. Honeycrisp plantings are spaced 4'x12' (1.22m x 3.66m). All trees are trained to the tall spindle orchard system.

Rootstocks	Honeycrisp sites
B.10	ID
G.11	IN*
G.202	MA
G.214	ME
G.30	MEX
G.41	MI****
G.5890	MN
G.935	NJ***
G.969	NY
M.26 EMLA	ON (Simcoe)
M.7	ON (Ridgetown)**
M.9 T337	PA
MM.106	VA
V.1	WA
V.5	WI
V.6	
V.7	

* No data were submitted for 2014, 2015, and 2016.

** No data were submitted for 2014-2017.

*** No data were submitted for 2016.

**** No data were submitted for 2017.

NC 140 Accomplishments Report Statement

2014 NC-140 Apple Rootstock Planting

The 2014 Apple rootstock planting was established in 15 locations in the United States (AL, ID, IN, MA, ME, MI, MN, GA, NJ, NY, PA, SC, UT, VA, WA, WI), two in Canada, and one in Mexico (<http://bit.ly/1zv3wCc>). The trial consists of the following rootstocks: B.10, G.11, G.202, G.214, G.30, G.41, G.5890, G.935, G.969, M.26 EMLA, M.9 T337, V.1, V.5, V.6, and V.7. Trial coordination and data analyse are being coordinated by John Cline. Trees were planted to a 'tall spindle' systems at a 4 x 12 ft spacing. Trees are planted in a randomized block design with single trees serving as experimental units. There are 10 replicates of each treatment. Each site selected their own pollinizer varieties. The trees were propagated by Willow Drive Nursery, WA and planted in the spring of 2014.

Data protocols have been established and made available to study participants each year the data that has been collected is summarized below.

Key findings:

Measurement	2014	2015	2016	2017	2018
1) initial trunk diameter measured at planting 30cm above graft union	X				
2) number of side branches >10 cm at planting	X				
3) trunk circumference in the fall	X	X	X	X	X
4) height of the graft union above soil;	X				
5) tree status at the end of the growing season	X	X	X	X	X
6) date of full bloom		X	X	X	X
7) date of harvest		X	X	X	X
8) total yield per tree		X	X	X	X
9) flower clusters per tree	X				
10) total number of fruit per tree		X	X	X	X
11) total number of rootstock suckers per tree		X	X	X	X
12) tree height in the fall					X
13) tree spread in the fall (in-row and perpendicular to the row)					X

Figure 1. Location of participants of the 2014 NC-140 Apple rootstock planting evaluation of 'Aztec Fuji' (red) and 'Honeycrisp' (teal) in Canada, the United States, and Mexico. Map updated as of Nov 10, 2014 (not all participants provided gps coordinates). For an updated interactive map visit <http://bit.ly/1zv3wCc>



Important points to discuss at the 2018 NC-140 annual meeting

- Protocol and data to collect in 2019
- Sites not submitting data
- Concerns raised by study participants
- When to terminate the experiment
- 5-year manuscript (2014-2018 data)

Summary of results

General comments

- Response variables were greatly affected by both rootstock and location
- Rootstock by location interactions were highly significant
- There were few statistically significant differences between M.9 T337 and M.26 EMLA making it difficult to separate rootstocks into different vigor categories
- Based on TCA, rootstocks were broadly classified into 3 vigor categories: those similar to M.9 T337, those similar to M.26 EMLA and those more vigorous than M.26 EMLA

Rootstocks in the M.9 T337 size class

- M.7, G.11, G.41 were generally similar in vigor to M.9 T337 (Table 1)
- G.202 similar in vigor to M.9 T337 except at NY, VA and WA (Table 1)
- Tree survival was excellent for these rootstocks at most locations except for M.9 T337 at WA (80%), G.11 at VA and WA (90%), G.202 at MN, NY, VA and WA (90%). G.41 had the lowest mean survival of all rootstocks and was less than 100% at MA, NY, VA and WI (90%), ON-S (80%), WA (70%) and IN (36%). (Table 2)
- All rootstocks in this size category produced few suckers. (Table 3)
- No statistically significant differences in cumulative yield compared to M.9 T337, however yield of G.202 was less than 50% of M.9 T337 at MA, MEX, MI, and NJ. (Table 4)
- Cumulative yield efficiency for these rootstocks was similar to M.9 T337 except for G.11 at NJ which was significantly higher and M.7 at ON-S which was significantly lower. (Table 5)
- Fruit weight was similar to M.9 T337 at all sites

Rootstocks in the M.26 EMLA size class

- MM.106, G.935, B.10, G.214, G.969 were generally similar in vigor to M.26 EMLA (Table 1)
- V.1 was similar in vigor to M.26 EMLA except at ME, MN, NJ, PA and VA where it was significantly larger than M.26 EMLA.
- Tree survival was 100% for most of these rootstocks, except for B.10 at VA (90%), G.214 at IN and ME (90%), G.935 at ME, ON-A and VA (90%), MM.106 at ON-S (90%), V.1 at NY (90%). Tree survival was especially low for G.935 at IN (70%) and G.969 at ME (70%) and WA (44%). (Table 2)
- In general, these rootstocks produced few suckers except for G.214 at MA. Averaged across sites, G.214 produced the highest number of suckers in this class of rootstock (Table 3)
- Cumulative yield (CY) was generally similar to M.26 EMLA but was significantly higher than M.26 EMLA for: G.969 at MA, ME, PA, WI; V.1 at PA and WI; G. 214 at ME; G.935 at WI. Although not statistically significant, CY of G.969 at VA and V.1 at ME was double M.26 EMLA and CY of V.1 at IN was less than half of M.26 EMLA. (Table 4)

- Cumulative yield efficiency (CYE) of these rootstocks was generally similar to M.26 EMLA, but was significantly higher than M.26 EMLA for: G.969 at ME, NY, ON-S, PA and WI; G.935 at ME, ON-S and WI; G.214 at ME. Although not statistically significant, CYE of G.969 at IN and B.10 at VA was double M.26 EMLA and CYE of G.969 at NJ was less than half of M.26 EMLA. (Table 5)
- Fruit weight was similar to M.26 EMLA at all sites. (Table 6)

Rootstocks more vigorous than M.26 EMLA

- G.30, G.5890, V.7, V.6, V.5 were generally more vigorous than M.26 EMLA (Table 1)
- At the IN site, the TCA of G.30, G.5890 and V.7 was not statistically different than M.26 EMLA (Table 1)
- Tree survival was 100% for G.30, G.5890, and V.5 except for: G.30 at IN (90%), ME (90%), WA (82%); G.5890 at MN (89%); and V.5 at VA (90%). Survival of V.6 and V.7 were generally lower than the other rootstocks in this class and was less than 100% for: V.6 at IN (89%), MEX (86%), MN (67%), NJ (78%); V.7 at ME (88%), MN (78%), NJ (88%), ON-S (88%), VA (89%) and WI (88%). (Table 2)
- In general, these rootstocks produced few suckers except for G.30 at ID and MA and G.5890 at MA and PA. Averaged across sites, G.5890 produced the highest number of suckers of this class of rootstock. (Table 3)
- Cumulative yield (CY) was significantly higher than M.26 EMLA for: G.5890 at all sites; G.30 at MA, ME, MI, MN, NY and WI; V.7 at ME, ON-S, PA, WA and WI; V.5 at ME, MI, MN, ON-S, WA, WI; V.6 at MN, ON-S, PA and WI. CY of the other vigorous rootstocks/site combinations were similar to M.26 EMLA. (Table 4)
- Cumulative yield efficiency of these vigorous rootstocks was generally similar to M.26 EMLA, but was significantly higher for G.5890 at IN and PA and G.30 at MA and ME. (Table 5)
- Fruit weight was similar to M.26 EMLA except for G.5890 at WA which was significantly higher. (Table 6)

2017 'HONEYCRISP' DATA

Table 1. Growth of 'Honeycrisp' trees, as indicated by trunk cross-sectional area (cm²), as of 2017 from the NC-140 apple rootstock trial planted in 2014 at 14 locations.

Rootstock ^y	ID	IN	MA	ME	MEX	MI	MN	NJ	NY	ON-S	PA	VA	WA	WI	Mean
V.6		20.4 ab	16.1 ab		11.6 ab		15.5 ab	49.7 a	13.7 bc	12.0 ab	23.1 a	17.7 a	17.4 a-d	22.5 ab	20.0
V.5		20.9 a	14.1 bc	11.7 ab			18.1 a	40.6 ab	16.3 ab	12.6 a	19.4 ab	16.3 a	23.2 a	24.3 a	19.8
V.7		17.9 abc	13.9 bc	9.5 bc			13.9 bc	43.0 ab	14.8 ab	12.4 a	17.8 b	16.5 a	20.9 ab	19.2 bc	18.2
G.5890		17.8 abc	17.2 a				15.8 ab		17.6 a		19.6 ab		17.8 abc	21.1 ab	18.1
G.30	27.8 a ^z	15.0 cd	12.6 cd	12.4 a	12.4 a		11.7 cd	25.4 cd	14.3 bc	11.6 ab		15.9 ab	17.1 a-e	19.3 bc	16.3
V.1	19.3 ab	16.0 bcd	10.4 de	9.1 bc			13.7 bc	33.5 bc	11.1 cd		17.8 b	15.5 ab	15.3 b-f	15.2 cd	16.1
G.969	14.6 bc	13.7 cdef	10.0 de	7.5 cd	9.0 bc		10.9 cde	25.6 cd	9.1 def	7.4 cde	13.2 c	12.8 bc	9.7 c-g	12.7 de	12.0
G.214		15.1 cd	9.2 e	6.3 de			8.5 def	12.8 e	10.1 de	9.0 c		12.1 cd	10.6 efg	13.7 de	10.7
B.10		14.8 cde						10.1 e	8.7 def	9.6 bc		9.1 de		10.8 efg	10.5
M.26 EMLA	11.5 bc	15.3 cd	8.1 ef	6.2 de	7.2 cd		9.1 def	15.8 de	8.7 def	8.1 cd	12.6 c	10.1 cde	9.4 fg	11.3 def	10.3
G.935		11.4 def	8.2 ef	6.0 de			7.8 ef	15.0 de	6.8 f	5.4 ef		8.7 e	10.8 d-g	11.7 def	9.2
MM.106										9.0 c					9.0
G.41		10.4 def	7.8 efg		8.5 cd		8.5 def	8.5 e	7.8 ef	6.0 def		8.3 e	7.5 g	10.7 efg	8.4
M.9 T337		10.3 f	5.9 fg		7.5 cd		8.1 ef	10.8 e	6.2 f	6.1 def	10.0 c	9.3 de	7.8 g	8.1 fg	8.2
M.7										7.8 cde					7.8
G.11		10.5 ef	5.8 fg	5.0 e	8.1 cd		7.6 ef	5.6 e	6.8 f	5.6 ef		8.2 e	7.8 g	9.8 efg	7.3
G.202	9.0 c	9.9 f	5.2 g	4.5 e	5.6 d		6.6 f	7.2 e	8.0 def	4.3 f		10.0 cde	9.9 fg	6.9 g	7.3
Mean	16.5	14.6	10.3	7.8	8.7	ND	11.1	21.7	10.7	8.5	16.7	12.2	13.2	14.5	12.3
P-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	

^y Rootstocks ranked by decreasing mean trunk cross-sectional area.

^z Mean values with the same letter within a given column are not significantly different according to the Tukey-Kramer test at P=0.05.

Table 2. Percent survival of 'Honeycrisp' trees as of 2017 from the NC-140 apple rootstock trial planted in 2014 at 14 locations.

Rootstock ^y	ID	IN	MA	ME	MEX	MI	MN	NJ	NY	ON-S	PA	VA	WA	WI	Mean
B.10		100						100	100	100		90		100	98
G.11		100	100	100	100		100	100	100	100		90	90	100	98
G.202	100	100	100	100	100		90	100	90	100		90	90	100	97
G.214		90	100	90			100	100	100	100		100	100	100	98
G.30	100	90	100	90	100		100	100	100	100		90	82	100	96
G.41		36	90		100		100	100	90	80		90	70	90	85
G.5890		100	100				89		100		100		100	100	98
G.935		70	100	90			100	100	100	90		90	100	100	94
G.969	100	100	100	70	100		100	100	100	100	100	100	44	100	93
M.26 EMLA	88	100	100	100	100		100	100	100	100	100	80	100	100	98
M.7										100					100
M.9 T337		100	100		100		100	100	100	100	100	100	80	100	98
MM.106										90					90
V.1	100	100	100	100			100	100	90		100	100	100	100	99
V.5		100	100	100			100	100	100	100	100	90	100	100	99
V.6		89	100		86		67	78	100	100	100	100	100	100	93
V.7		100	100	88			78	88	100	88	100	89	100	88	92
Mean	98	92	99	93	98	ND	95	98	98	97	100	93	90	99	96
P-value ^z	-	-	-	-	-		-	-	-	-	-	-	-	-	-

^y Rootstocks ranked in alphabetical order.

^z Data did not correspond to the assumptions of the ANOVA. Data is not normally distributed.

Table 3. Cumulative number of rootstock suckers (2015-2017) from 'Honeycrisp' trees from the NC-140 apple rootstock trial planted at 14 locations.

Rootstock ^y	ID	IN	MA	ME	MEX	MI	MN	NJ	NY	ON-S	PA	VA	WA	WI	Mean
B.10		0.0				0.0		0.0	0.0	0.0		0.6		0.2	0.1
G.11		0.0	0.6	0.0	0.0	0.0	0.5	0.1	0.0	0.0		0.1	0.1	1.1	0.2
G.202	0.1	0.1	0.8	0.0	0.0	0.0	0.1	0.2	0.0	0.0		2.0	0.1	1.8	0.4
G.214		0.2	12.4	0.0		0.0	0.5	2.5	0.1	0.6		4.7	1.8	3.1	2.4
G.30	9.3	0.4	17.3	0.1	0.8	0.0	0.4	3.8	0.2	0.1		3.2	2.0	0.7	2.9
G.41		0.0	1.2		0.0	0.0	0.0	0.5	0.0	0.0		1.1	1.4	0.2	0.4
G.5890		0.7	7.1				0.3		0.6		10.2		3.5	0.7	3.3
G.935		0.1	4.6	0.0		0.6	0.0	3.6	0.2	0.0		5.0	3.9	2.8	1.9
G.969	1.9	0.3	2.0	0.3	2.2	0.1	0.0	2.4	0.1	0.1	2.2	1.7	0.8	0.1	1.0
M.26 EMLA	0.1	0.3	2.6	0.2	0.3	0.0	0.2	2.9	0.0	0.0	0.5	0.3	0.0	1.1	0.6
M.7										2.0					2.0
M.9 T337		0.2	5.2		0.6	0.0	1.1	2.2	0.0	0.0	3.0	4.2	1.1	0.6	1.5
MM.106										0.0					0.0
V.1	0.4	0.3	2.0	0.0		0.1	0.0	1.9	0.1		3.4	0.2	1.0	1.0	0.9
V.5		0.4	2.4	0.0		0.0	0.1	1.2	0.1	0.0	4.8	0.7	1.0	0.1	0.9
V.6		0.1	2.8		1.7	0.0	0.0	1.7	0.1	0.0	3.0	0.4	1.7	0.2	1.0
V.7		0.5	4.7	0.1		0.0	0.1	1.0	0.6	0.1	5.8	0.5	0.4	0.1	1.2
Mean	2.4	0.2	4.7	0.1	0.7	0.1	0.2	1.7	0.1	0.2	4.1	1.8	1.3	0.9	1.2
P-value ^z	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

^y Rootstocks ranked in alphabetical order.

^z Data did not correspond to the assumptions of the ANOVA. Data is not normally distributed.

Table 4. Cumulative yield (2015-2017; kg/tree) of 'Honeycrisp' trees from the NC-140 apple rootstock trial planted in 2014 at 14 locations.

Rootstock ^y	ID	IN	MA	ME	MEX	MI	MN	NJ	NY	ON-S	PA	VA	WA	WI	Mean
G.5890		15.0 a	14.8 bc				22.8 ab		34.4 a		46.9 a		19.7 ab	49.5 a	29.0
G.30	32.7 a ^z	7.5 bc	22.2 a	29.7 a	5.4 a	9.7 ab	19.9 abc	11.7 a	30.1 ab	7.0 c-f		2.9	17.8 abc	47.9 a	18.8
G.969	22.0 bc	8.1 b	16.2 ab	16.8 b	4.3 ab	7.2 bcd	14.3 cde	5.6 ab	25.0 abc	8.6 a-e	33.9 b	7.0	10.5 abc	35.9 bc	15.4
V.7		3.8 bc	6.5 de	14.0 b		7.4 bcd	19.2 a-d	8.0 ab	23.4 bcd	10.2 abc	28.2 bc	3.5	20.5 a	39.0 ab	15.3
V.5		2.9 bc	5.8 de	14.9 b		11.5 a	24.4 a	8.7 ab	22.5 bcd	11.7 a	22.6 cd	3.7	19.9 ab	32.8 bcd	15.1
V.1	22.7 b	1.5 c	11.0 bcd	12.9 bc		7.4 bcd	17.1 bcd	8.9 ab	15.5 c-f		28.4 bc	2.8	14.3 abc	32.4 bcd	14.6
V.6		3.7 bc	8.1 cde		2.4 abc	8.8 abc	20.8 abc	7.1 ab	22.0 b-e	9.7 a-d	34.5 b	3.1	14.4 abc	33.7 bcd	14.0
G.214		6.3 bc	11.3 bcd	15.1 b		7.1 bcd	14.3 cde	6.8 ab	16.8 c-f	8.3 a-f		5.1	13.7 abc	19.7 ef	11.3
G.935		3.6 bc	7.7 de	12.1 bc		5.8 cde	14.0 cde	10.1 ab	8.8 f	7.7 b-f		3.1	16.2 abc	34.9 bc	11.3
B.10		7.3 bc				6.2 bcd		6.9 ab	17.6 c-f	10.6 ab		4.8		23.3 def	11.0
M.26 EMLA	17.2 bc	5.0 bc	7.3 de	6.2 cd	2.5 abc	4.9 cde	12.2 de	10.0 ab	15.5 c-f	5.8 ef	17.7 d	3.1	10.4 c	20.0 ef	9.8
M.9 T337		3.8 bc	6.4 de		3.2 abc	5.2 cde	9.7 e	9.3 ab	12.3 ef	8.0 b-f	21.5 cd	4.6	10.3 c	22.9 def	9.8
G.11		4.9 bc	6.6 de	9.6 bcd	2.2 bc	4.7 de	13.8 cde	9.4 ab	14.0 def	5.8 ef		2.8	11.2 abc	25.8 c-f	9.2
G.41		3.8 bc	6.7 de		1.6 c	4.0 de	13.4 cde	4.9 ab	16.2 c-f	7.3 b-f		2.6	8.3 c	29.0 b-e	8.9
MM.106										6.5 c-f					6.5
G.202	14.0 c	2.1 bc	2.7 e	4.3 d	0.9 c	1.9 e	7.4 e	4.1 b	10.7 f	5.2 f		3.4	11.1 bc	15.7 f	6.4
M.7										6.4 def					6.4
Mean	21.7	5.3	9.5	13.6	2.8	6.5	15.9	8.0	19.0	7.9	29.2	3.7	14.2	30.8	12.5
P-value	<0.0001	<0.0001	<0.0001	<0.0001	0.0003	<0.0001	<0.0001	0.0080	<0.0001	<0.0001	<0.0001	0.0591	<0.0001	<0.0001	

^y Rootstocks ranked by decreasing mean cumulative yield.

^z Mean values with the same letter within a given column are not significantly different according to the Tukey-Kramer test at P=0.05.

Table 5. Cumulative yield efficiency (2015-2017; kg/tree/cm² TCSA^x 2017) of 'Honeycrisp' trees from the NC-140 apple rootstock trial planted in 2014 at 14 locations.

Rootstock ^y	ID	IN	MA	ME	MEX	MI	MN	NJ	NY	ON-S	PA	VA	WA	WI	Mean
G.5890		0.8 a ^z	0.9 bcd				1.5 ab		2.0 ab		2.5 a		1.1 bcd	2.4 abc	1.6
G.969	1.6	0.6 ab	1.7 ab	2.3 a	0.5 a		1.4 ab	0.2 c	2.8 a	1.2 a-d	2.6 a	0.5	1.4 a-d	2.9 a	1.5
G.11		0.5 abc	1.1 a-d	1.9 ab	0.3 ab		1.9 a	1.7 a	2.1 ab	1.1 a-f		0.3	1.4 abc	2.7 ab	1.4
G.935		0.3 bc	1.0 bcd	2.0 ab			1.8 ab	0.7 bc	1.4 b	1.4 a		0.3	1.6 a	3.1 a	1.4
M.9 T337		0.4 abc	1.1 a-d		0.4 ab		1.2 ab	1.0 b	2.1 ab	1.3 ab	2.1 ab	0.5	1.5 ab	2.8 a	1.3
G.30	1.3	0.5 abc	1.8 a	2.4 a	0.5 ab		1.7 ab	0.5 bc	2.1 ab	0.6 f		0.2	1.1 a-d	2.5 ab	1.3
G.214		0.5 abc	1.3 abc	2.4 a			1.7 ab	0.5 bc	1.7 b	0.9 b-f		0.4	1.3 a-d	1.5 cd	1.2
B.10		0.5 abc						0.7 bc	2.1 ab	1.1 a-e		0.6		2.2 a-d	1.2
G.41		0.4 abc	0.9 bcd		0.2 ab		1.6 ab	0.7 bc	2.1 ab	1.2 a-d		0.3	1.1 a-d	3.1 a	1.2
V.1	1.3	0.1 c	1.1 a-d	1.4 bc			1.3 ab	0.3 c	1.4 b		1.7 bc	0.2	0.9 d	2.2 a-d	1.1
M.26 EMLA	1.5	0.3 bc	0.9 bcd	1.0 c	0.4 ab		1.4 ab	0.7 bc	1.7 b	0.7 ef	1.4 bc	0.3	1.1 a-d	1.9 bcd	1.0
V.7		0.2 bc	0.5 cd	1.3 bc			1.4 ab	0.2 c	1.6 b	0.8 b-f	1.6 bc	0.2	1.0 cd	2.2 a-d	1.0
G.202	1.6	0.2 bc	0.6 cd	0.9 c	0.2 b		1.1 b	0.7 bc	1.4 b	1.3 abc		0.3	1.1 bcd	2.2 a-d	1.0
V.5		0.1 bc	0.4 d	1.3 bc			1.3 ab	0.2 c	1.4 b	1.0 a-f	1.2 c	0.2	0.9 d	1.4 d	0.9
M.7										0.8 c-f					0.8
V.6		0.2 bc	0.5 cd		0.2 ab		1.3 ab	0.2 c	1.7 b	0.8 def	1.5 bc	0.2	0.9 d	1.5 cd	0.8
MM.106										0.8 def					0.8
Mean	1.4	0.4	1.0	1.7	0.3	ND	1.5	0.6	1.8	1.0	1.8	0.3	1.2	2.3	1.1
P-value	0.4379	<0.0001	<0.0001	<0.0001	0.0068		0.0050	<0.0001	0.0002	<0.0001	<0.0001	0.0018	<0.0001	<0.0001	

^x Trunk cross-sectional area.

^y Rootstocks ranked by decreasing mean cumulative yield efficiency.

^z Mean values with the same letter within a given column are not significantly different according to the Tukey-Kramer test at P=0.05. There were no significant differences for VA according to the Tukey-Kramer test.

Table 6. Fruit weight (g), averaged over all cropping years (2015-2017) for 'Honeycrisp' trees from the NC-140 apple rootstock trial planted in 2014 at 14 locations.

Rootstock ^y	ID	IN	MA	ME	MEX	MI	MN	NJ	NY	ON-S	PA	VA	WA	WI	Mean										
B.10		323	ab			230	a-d	317	283	207	abc	224		274	abc	266									
G.5890		300	ab	263	a			153	ab	290		269	281	a	282	abc	263								
G.41		288	ab	275	a	223	ab	289	a	154	ab	311	301	210	abc	216	232	ab	288	ab	254				
G.30	286	a ^z	293	ab	266	a	238	a	214	ab	247	a-d	162	a	281	287	240	a	198	269	ab	281	abc	251	
V.6		255	ab	266	a			227	ab	271	ab	171	a	318	294	217	abc	263	181	243	ab	295	a	250	
V.5		258	ab	255	ab	244	a			268	abc	149	ab	289	293	214	abc	260	210	245	ab	288	abc	248	
M.26 EMLA	271	a	327	a	263	a	208	ab	215	ab	218	bcd	138	ab	298	302	209	abc	262	239	224	b	280	abc	247
G.11		255	ab	260	a	243	a	236	ab	247	a-d	178	a	306	280	211	abc		212	257	ab	262	abc	246	
V.1	253	ab	283	ab	256	ab	215	a		205	bcd	149	ab	305	255			242	222	270	ab	255	abc	242	
V.7		261	ab	229	ab	213	ab			258	a-d	161	ab	267	274	216	abc	255	214	249	ab	277	abc	240	
M.9 T337		245	b	260	a			215	ab	202	cd	171	a	314	279	206	abc	248	234	233	ab	266	abc	239	
G.214		259	ab	260	a	225	a			248	a-d	102	b	273	267	232	ab		215	233	b	286	abc	237	
G.969	254	ab	261	ab	255	ab	216	a	201	b	202	d	176	a	297	264	198	abc	250	236	241	ab	250	abc	236
G.935		278	ab	235	ab	216	a			243	a-d	137	ab	301	268	187	c		227	253	ab	242	c	235	
G.202	218	b	270	ab	196	b	168	b	258	a	193	d	147	ab	247	272	175	c		204	236	ab	243	bc	217
M.7																	196	bc						196	
MM.106																	187	c						187	
Mean	256	277	253	219	224	237	154	295	281	207	256	217	247	271	238										
P-value	0.0012	0.0131	0.0054	<0.0001	0.0223	<0.0001	0.0019	0.0265	0.1086	<0.0001	0.0523	0.1396	0.0019	0.0001											

^y Rootstocks ranked by decreasing mean fruit weight.

^z Mean values with the same letter within a given column are not significantly different according to the Tukey-Kramer test at P=0.05. There were no significant differences for NJ according to the Tukey-Kramer test.