Eighth Year Performance of Honeycrisp Grafted on Dwarfing Rootstocks of the NC-140 Regional Apple Rootstock Trial

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Introduction

Dwarfing rootstocks have the potential to increase profitability for tree-fruit growers by controlling tree size to allow more trees/acre. Although the initial installation cost can be 10 to 30 times greater than lower-density plantings, the long-range returns can far exceed the traditional plantings. However, to be viable as a commercial rootstock, dwarfing rootstocks must be adapted to a range of agro-climatic conditions, moderately disease resistant, high yielding, and produce quality fruit. To evaluate the adaptability and performance of new and promising apple rootstocks, an NC-140 regional rootstock trial was established in 2010 at 11 sites in the United States (CO, IA, IL, MA, MI, MN, NJ, NY, OH, UT, WI), two sites in Canada (BC, NS), and one site in Mexico (CH) with Honeycrisp apples serving as the test cultivar. Iowa has been evaluating 31 dwarfing rootstocks since 2010 at the ISU Horticulture Research Station, Ames, Iowa. The new selections are from the Cornell-Geneva breeding program (G., CG.), Russia (B.), and Germany (PiAu, Supp.), with M.26 EMLA, M.9 Pajam2, and M.9 T337 serving as industry standards. Tissue cultured propagated (TC) rootstocks of G.41, G.202, and G.935 were included for comparison with normal (N) stool bed propagated rootstocks. This report summarizes the results for the 2017 growing season.

Materials and Methods

The trees were planted in a 4 ft x 14 ft spacing with 1 to 3 trees/plot in a randomized block design replicated four times. Gala/B. 9 trees were planted between each block and at the ends of the rows as pollinators, and Auvil Early Fuji/Bud 9 trees were inserted as replacements for trees broken off by wind in 2010. Trees were trained to the tall spindle system using a 3/4-in. metal conduit for support. Supplemental water was provided through trickle irrigation.

Results and Discussion

Yields varied widely in both average number of fruits/tree (1.5-116.5) and lb of fruit harvested (0.54-33.4) (Table 1). However, three rootstocks stood out: G.11, CG.3001, and M.26EMLA. Trees grafted onto G.11 produced the greatest number of fruit and was the highest yielding in terms of fruit weight. Honeycrisp grafted onto CG.3001 had high yields but above average suckering (13.5 suckers/tree). M.26EMLA was above average in both yield categories and produced two suckers/tree on average. Lowest yielding (numbers and weight) rootstocks were CG.4814, PiAU9-90, and Supp.3, with the latter two with zero harvested fruit.

Zonal leaf chlorosis continues to be a problem in Honeycrisp trees. In 2017, zonal chlorosis varied widely throughout the trial with a range of 4.4-53.3 percent. PiAu9-90 exhibited the most zonal chlorosis. However, ratings were similar to all other rootstocks with the exception of B.7-3-150 and B.64-194, which had the lowest ratings.

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Table 1. Characteristics of Honeycrisp apple trees in the Iowa planting of the NC-140 rootstock trial.

	2016		2017					
Rootstock	**Trunk CSA (in.^{2})^z**	**Yield efficiency (lb/in.^{2})^y**	**Yield (no.)**	**Yield (lb)**	**Suckers (no.)**	**Zonal leaf chlorosis (%)**	**Average fruit weight (lb)**	**Trunk CSA (in.^{2})**
B.09	1.0	6.2	32.5	10.5	1	12.1	0.32	1.2
B.10	1.7	6.6	26.4	8.1	0	25	0.27	2.1
B.64-194	5.1	9.9	3.1	0.9	2.1	6.4	0.1	5.9
B.67-5-32	5.5	8	3.5	1.4	0.1	7.5	0.15	5.9
B.70-6-8	5.5	3.9	33.7	11.4	0.4	8.8	0.32	7.5
B.70-20-20	6.9	6.5	2	0.9	8.3	7.9	0.18	8.9
B.71-7-22	0.6	5.4	12.3	3.7	1.5	35	0.32	0.6
B.70-20-21	4.6	4.8	23.8	8.5	0.3	10	0.28	6
B.7-3-150	6.1	5.8	14.8	6.5	0.3	4.4	0.39	7.1
CG.2034	1.5	4.6	40.4	12.7	3.2	30	0.27	1.7
CG.3001	2.8	6.3	65	25.5	13.5	15	0.39	4.2
CG.4003	1.4	4.8	25	7.5	3.3	8.3	0.27	1.7
CG.4004	2.8	9.9	29.3	11	2	15	0.31	3.4
CG.4013	4.2	7	29	10.4	11.7	20	0.12	6.1
CG.4214	2.4	8.4	1.6	0.5	5.5	17.5	0.12	2.6
CG.4814	3.9	11.4	1.5	0.6	2.8	18.8	0.18	4.7
CG.5087	2.5	7.9	6	1.7	1.7	31.7	0.2	2.7
G.11	2	5.7	116.5	33.4	1.3	21	0.29	2.2
G.202 N	3.2	8.5	16	6	1.5	10	0.19	4.4
G.202 TC	2.7	9.3	7.8	3.5	2.3	13.8	0.24	3.1
G.41 N	2	8	33.8	10.7	0	37.5	0.2	2.3
G.41 TC	2.4	11.3	19.3	7.8	1.7	16.7	0.2	2.8
G.935 N	2.3	10.1	3.9	1.4	13.5	24	0.14	2.9
G.935 TC	1.7	7.7	31.7	10.9	12	21.7	0.24	2
M.26 EMLA	2.6	7.1	75	25.4	2	20	0.23	3.2
M.9 Pajam2	2.2	8.5	10.9	3.6	10.5	12.7	0.2	2.7
M.9-T337	2	8.4	23.6	8.4	1.7	30.8	0.3	2
PiAu 51-11	4.3	3.5	39.3	12.7	2	22.7	0.28	5.5
PiAu 9-90	2.5	7.3	.	.	0.8	53.3	0	2.7
Supp.3	2.4	7.0	.	.	0	10	0	2.4
^{w}HSD	2.0	4.4	71.8	24.0	11.1	46.4	0.44	3.5

^{z}Trunk CSA: Trunk cross-sectional area = (trunk diameter/2)^2 × π.

^{w}HSD: Tukey's Honestly Significant Difference quantile value.