Seventh 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 of tree-fruit growers by providing smaller trees suitable for high density plantings. 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 in the dwarfing size-control category, 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's project is located at the ISU Horticulture Research Station, Ames, Iowa, where 30 dwarfing rootstocks are currently being evaluated: new selections 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 2016 growing season.

Materials and Methods

The trees were planted at a 4 × 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. 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 per tree (130-129.1) and pounds of fruit harvested (6.2-51.2). B64-194 had the highest yield in both respects. Mean yields for the plot were 61.1 fruits and 22.2 lb harvested. Only two rootstocks produced no suckers, but the median for the plot was 1.65, suggesting overall low sucker production. Zonal leaf chlorosis varied widely throughout the trial with a range of 11.4-70.0 percent. The median (40.65) was very close to the mean (40.76), suggesting a fairly even distribution.

Average fruit weight ranged between 0.24 lb and 0.44 lb, with an outlier of 0.84 lb on B.71-7-22. Mean for this characteristic was 0.37 lb. Disregarding the outlier, high yield efficiency was seen in CG.4814 (11.4 lb/in^2), G.41 TC (11.3 lb/in^2), and G.935 N (10.1 lb/in^2).

Four trees stood out this year (B.64-194, B.67-5-35, B.70-20-20, and CG.4814). B.64-194 yielded the highest in both fruit number and average weight per tree. B.70-20-20 and CG.5087 both had high yields, but above-average suckering from the rootstock. B.67-5-35 was well above average in both yield categories and produced zero suckers. CG.481 was above average in yield number (119.3) and pounds (42.7), moderate fruit weight (0.36 lb), and nearly the highest yield efficiency (11.4). However, it does have a tendency to produce suckering from the roots.

It should be noted that overall yields were lower in 2016. A brief hail storm moved through the plot in June causing widespread damage to the entire apple plot.

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

	2015		2016						
Rootstock	2015 Trunk CSA ($in.^2$)^z	2015 Yield efficiency ($lb/in.^2$)^y	Yield (no.)	Yield (lb)	Suckers (no.)	Zonal leaf chlorosis (%)	Trunk CSA ($in.^2$)	Yield efficiency ($lb/in.^2$)	Cum. yield efficiency ($lb/in.^2$)^x
B.10	1.0	26.1	31.2	11.0	0.2	47.8	1.7	6.6	36.5
B.64-194	2.7	5.2	129.1	51.2	1.7	11.4	5.1	9.9	24.0
B.67-5-32	2.9	2.7	104.2	43.9	0.0	21.0	5.5	8.0	17.9
B.7-20-21	2.5	13.2	52.8	21.4	0.2	20.0	4.6	4.8	21.6
B.7-3-150	3.1	8.1	81.0	35.1	0.0	16.0	6.1	5.8	19.2
B.70-20-20	3.8	1.1	110.3	43.6	11.7	15.8	6.9	6.5	12.5
B.70-6-8	2.9	7.9	57.2	21.8	0.1	21.7	5.5	3.9	15.4
B.71-7-22	0.3	28.9	13.0	9.7	0.8	47.5	0.6	5.4	58.3
B.9	0.7	32.0	18.5	6.2	1.6	69.1	1.0	6.2	41.2
CG.2034	0.9	25.0	20.4	7.4	3.0	70.0	1.5	4.6	33.2
CG.3001	2.2	25.4	43.7	17.9	0.7	53.3	2.8	6.3	33.7
CG.4003	0.9	26.4	24.7	6.4	3.0	53.3	1.4	4.8	33.3
CG.4004	1.7	23.6	79.0	27.6	1.5	35.0	2.8	9.9	39.7
CG.4013	2.7	8.5	76.3	31.6	31.3	20.0	4.2	7.0	20.3
CG.4214	1.4	15.1	64.8	20.2	9.6	41.3	2.4	8.4	29.1
CG.4814	2.3	14.2	119.3	42.7	5.3	40.0	3.9	11.4	32.9
CG.5087	1.5	28.0	68.0	18.9	0.7	56.7	2.5	7.9	40.6
G.11	1.2	35.2	30.0	11.5	0.2	61.0	2.0	5.7	44.7
G.202 N	1.9	12.8	78.0	28.0	1.5	30.0	3.2	8.5	27.5
G.202 TC	1.4	23.9	69.3	25.3	5.7	20.0	2.7	9.3	41.6
G.41 N	1.2	26.6	47.3	15.9	0.4	36.3	2.0	8.0	40.1
G.41 TC	1.4	17.9	70.0	27.0	1.7	30.0	2.4	11.3	37.6
G.935 N	1.4	20.9	69.3	22.9	19.1	45.0	2.3	10.1	37.0
G.935 TC	1.0	34.1	37.7	13.2	11.7	63.3	1.7	7.7	47.4
M.26 EMLA	1.6	21.9	47.3	18.4	1.0	60.0	2.6	7.1	33.6
M.9 Pajam2	1.3	14.5	57.5	19.2	12.8	39.1	2.2	8.5	29.5
M.9-T337	1.3	25.6	50.8	16.7	3.3	50.0	2.0	8.4	38.5
PiAu 51-11	2.4	13.7	41.5	15.8	2.9	38.2	4.3	3.5	20.3
PiAu 9-90	1.5	5.8	77.2	19.0	1.0	60.0	2.5	7.3	18.4
Supp.3	1.4	3.9	65.0	16.1	4.0	50.0	2.4	7.0	15.6
HSD^w			66.1	24.5	14.3	53.2	2.0	4.4	14.8

^{z}Trunk CSA: Trunk cross-sectional area = (trunk diameter/2)^2 x π.
^{y}Yield efficiency: (yield/trunk CSA).
^{x}Cumulative efficiency: [2015 yield (lb) + 2016 yield (lb)]/2015 Trunk CSA (in^2).
^{w}HSD: Tukey's honestly significant difference quantile value.