

2013

# Performance of Gibson Golden Delicious on Dwarfing Rootstocks

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## Recommended Citation

Domoto, Paul A. and Schroeder, Lynn R., "Performance of Gibson Golden Delicious on Dwarfing Rootstocks" (2013). *Iowa State Research Farm Progress Reports*. 1905.  
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## **Abstract**

To evaluate the adaptability and performance of new and promising apple rootstocks in the dwarfing size-control category, a NC-140 regional rootstock trial was established in 2003 at 14 total sites in the United States (AR, CA, IA, GA, KY, ME, MI, NY, OH, PA, UT, WI), Canada (BC), and Mexico. The Iowa planting, located at the ISU Horticulture Research Station, includes 23 rootstocks with new selections from the Cornell-Geneva breeding program (G., CG.), Russia (B.), Czech Republic (J-TE), Japan (JM.), and Germany (PiAu) with M.26, M.9 Pajam 2 and M.9 T337 serving as industry standards. These rootstocks are being evaluated with Gibson Golden Delicious serving as the test cultivar. This report summarizes the tree-growth and production characteristics through the 2012 growing season.

## **Keywords**

RFR A1216, Horticulture

## **Disciplines**

Agricultural Science | Agriculture | Fruit Science | Horticulture

# Performance of Gibson Golden Delicious on Dwarfing Rootstocks

## RFR-A1216

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### Introduction

To evaluate the adaptability and performance of new and promising apple rootstocks in the dwarfing size-control category, a NC-140 regional rootstock trial was established in 2003 at 14 total sites in the United States (AR, CA, IA, GA, KY, ME, MI, NY, OH, PA, UT, WI), Canada (BC), and Mexico. The Iowa planting, located at the ISU Horticulture Research Station, includes 23 rootstocks with new selections from the Cornell-Geneva breeding program (G., CG.), Russia (B.), Czech Republic (J-TE), Japan (JM.), and Germany (PiAu) with M.26, M.9 Pajam 2 and M.9 T337 serving as industry standards. These rootstocks are being evaluated with Gibson Golden Delicious serving as the test cultivar. This report summarizes the tree-growth and production characteristics through the 2012 growing season.

### Materials and Methods

The trees were planted at a 8.2 × 16 ft spacing as two-tree plots in a randomized block design replicated four times (8 trees/rootstock with PiAu 36-2, JM.10, JM.5, and JM.8 tested with less than a full complement of trees). Pacific Gala/B.9 trees were planted between each block and at the ends of the rows as pollinators. Trees were trained to a vertical axis using a 3/4-in. metal conduit for support.

### Results and Discussion

Although the 2011-12 winter was considered mild, freezing events were recorded in the

field on January 21(-8°F) and March 5 (6°F). An unusual warm spell occurred in mid-March when recorded high temperatures ranged from 77 to 84°F. Golden Delicious king blossoms were open by April 2 and full bloom occurred on April 7, about three weeks ahead of normal. During the period from April 10-12, a severe freeze occurred with a low temperature of 21°F recorded on April 11.

The bloom density was rated prior to the April freeze. Even though fruit yields were low in 2011, trees on JM.5, PiAu 36-2, and PiAu 56-83 had below normal blossom densities, while heavy crop loads on J-TE-G and B.9 in 2011 did not affect the return bloom (Table 1).

Following bloom, some trees exhibited symptoms of decline that were most evident on B.9, JM.1, and J-TE-G rootstocks when rated on April 24 (Table 1). Previous studies have shown that B.9 is sensitive to late winter freezes, and suggests that the injury probably occurred on March 5 when it dropped to 6°F.

The only fruit to survive the April freeze were produced from lateral buds on shoots. The fruit were counted but not harvested and a fruiting density was calculated based on the trunk cross-sectional area (Table 1).

Based on trunk cross-sectional area, trees continue to be separated into four size groupings: PiAu 51-4, PiAu 56-83, JM.5, PiAu 36-2, and JM.2 in the largest; JM.4, JM.10, CG.6210, JM.8, M.26, PiAu 51-11, CG.5935, J-TE-H, and B.62-396 in the M.26-size range; CG.5179, M.9 Pajam2, M.9 T337, JM.7, CG.3041, G.16, and JM.1, in the M.9-size range; and J-TE-G and B.9 in the smallest size range (Table 1). Based on the cumulative yield efficiency, none of the rootstocks in the

largest size range are suitable for high density training systems. For the other size ranges the most promising rootstocks include: CG.5935 and CG.6210 in the M.26-size range; CG.3041 followed by JM.7 and G.16 in the M.9-size range; and J-TE-G and B.9 in the smallest size range were similar.

### Acknowledgements

Thanks to the Iowa Department of Agriculture and Land Stewardship and Iowa Fruit and Vegetable Growers Association for providing funds to purchase the trees as part of a specialty crops grant. Thanks to the ISU Horticulture Station staff for their assistance in maintaining the planting.

**Table 1. Bloom, growth, and fruit yield characteristics of Gibson Golden Delicious apple trees on 23 rootstocks in the Iowa planting of the 2003 NC-140 dwarf apple rootstock trial for 2012.**

Rootstock	2011	2012	Tree vigor rating <sup>x</sup>	Trunk dia. (in.)	Tree height (ft)	Tree spread (ft)	No. of suckers /tree	No. of fruit /tree	Fruit density <sup>w</sup>	Cumulative	
	Yield Eff. <sup>z</sup>	Bloom rating <sup>y</sup>								Yield <sup>v</sup> (lb/tree)	Yield Eff. <sup>z</sup>
PiAu 51-4	.07	3.0	1.0	6.39	18.7	12.3	9.4	8	.04	209.6	.46
PiAu 56-83	.05	2.4	1.0	6.35	19.4	12.7	1.5	5	.04	135.7	.34
JM.5	.05	2.0	1.0	6.12	18.6	11.3	.0	1	.01	117.5	.28
PiAu 36-2	.11	2.3	1.0	6.01	18.3	12.2	.3	1	.01	229.9	.57
JM.2	.12	3.6	1.0	5.76	17.6	11.2	2.6	11	.07	286.3	.78
JM.4	.17	3.1	1.0	5.15	17.4	10.6	.0	6	.04	118.2	.40
JM.10	.20	3.5	1.3	4.72	15.9	9.6	.0	8	.07	162.5	.66
CG.6210	.34	4.7	1.3	4.63	15.2	10.4	6.0	21	.19	368.5	1.55
JM.8	.23	4.8	1.0	4.54	15.2	10.3	2.4	23	.22	314.9	1.37
M.26	.30	4.1	1.6	4.41	15.4	10.2	.3	21	.20	261.9	1.27
PiAu 51-11	.29	4.3	1.7	4.32	12.9	9.2	9.4	29	.31	232.0	1.15
CG.5935	.30	4.3	1.1	4.29	14.5	10.3	1.6	42	.44	331.9	1.64
J-TE-H	.35	4.3	1.0	4.24	14.6	10.4	1.4	19	.20	275.7	1.41
B.62-396	.23	4.3	1.1	4.28	15.0	9.9	.1	20	.21	238.9	1.17
CG.5179	.36	3.5	1.5	4.05	14.8	10.0	2.0	37	.39	255.6	1.47
M.9 Pajam2	.36	4.3	1.3	4.05	13.9	10.0	3.1	21	.24	258.4	1.43
M.9 T337	.37	4.1	1.4	4.03	13.8	10.3	4.9	27	.32	257.8	1.43
JM.7	.45	3.7	1.3	4.02	14.4	10.1	.0	13	.15	339.4	1.91
CG.3041	.61	4.9	1.6	3.59	12.9	9.2	.0	23	.35	293.9	2.06
G.16	.54	4.3	1.8	3.52	12.1	8.8	.8	14	.21	264.2	1.93
JM.1	.47	4.8	2.4	3.43	10.4	8.7	.0	10	.19	199.4	1.63
J-TE-G	1.00	4.8	2.3	2.59	9.9	8.5	.0	14	.39	195.9	2.68
B.9	.77	4.8	3.1	2.47	10.2	7.5	7.6	7	.19	169.9	2.50
LSD (P < .05)	.19	.7	.8	.56	1.7	1.1	4.2	16	.19	38.9	.35

<sup>z</sup>Yield efficiency is reported in kilograms of fruit per cm<sup>2</sup> of the trunk cross-sectional area. Higher values indicate more productive trees.

<sup>y</sup>Bloom rating: 0 = failed to bloom, 1 = very light, 2 = light, 3 = normal, 4 = heavy, 5 = very heavy.

<sup>x</sup>Tree vigor rating: 1 = healthy; 2 = leaves slightly off-color; 3 = leaves off-color, some growth suppression; 4 = leaves off-color and small, grow weak; 5 = leaves off-color, small and sparse, growth very weak; 6 = dead.

<sup>w</sup>Fruit density reported as the number of fruit per cm<sup>2</sup> of the trunk cross-sectional area. A value of 6 would indicate a near optimal crop load.

<sup>v</sup>Cumulative yield up through the 2011 growing season.