# Second Year Performance of Honeycrisp on 31 Dwarfing Rootstocks in the Iowa Planting of the NC-140 2010 Regional Apple Rootstock Trial

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Paul Domoto, professor
Department of Horticulture
Lynn Schroeder, field lab tech
ISU Horticulture Station

## 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 2010 at 12 sites in the United States (CO, IA, IL, IN, MA, MI, MN, NJ, NY, OH, UT, WI), two sites in Canada (BC, NS), and one site in Mexico (CHIH) with Honeycrisp serving as the test cultivar. The Iowa planting, located at the ISU Horticulture Research Station, includes 31 rootstocks with new selections from the Cornell-Geneva breeding program (G, CG.), Russia (Bud), Germany (PiAu), and Japan (Supp), with M.26, M.9 Pajam 2, 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 tree-growth characteristics of the Iowa planting during the 2011 growing season.

## Materials and Methods

The trees were planted at a 4 × 14 ft spacing with 1 to 3 trees per plot in a randomized block design replicated four times. Gala/Bud 9 trees were planted between each block and at the ends of the rows as pollinators. Trees broken off by high winds in 2010 were replaced with Auvil Early Fuji/Bud 9. Trees are being trained to a tall spindle using a 3/4-in. metal conduit for support. Supplemental water is being provided though trickle irrigation.

## Results and Discussion

Trees continue to reflect the poor growth characteristics observed in 2010. Tree mortality has been confined to wind breakage in 2010 (Table 1). Few trees bloomed in 2011 with trees on Bud 71-7-22 producing the most blossoms. Suckering has not yet been a problem. Leaf zonal chlorosis is a physiological disorder that occurs on Honeycrisp apple trees (Figures 1 and 2). It is caused by an inability to transport carbohydrates out of the leaves and is associated with a corresponding reduction in photosynthesis. By mid-season, leaf zonal chlorosis became evident and was visually rated on three occasions (Table 1). The severity of the symptoms generally progress during the season. Trees on PiAu 9-90, G.935N, G.935TC, Supp ,3 and Bud 71-7-22 exhibited the severest symptoms while trees on M.26 EMLA and G.202N were least affected. Growth of the central leader shoot was generally poor, but there were exceptions within rootstocks as reflected by the range in shoot length.

## Acknowledgements

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**Table 1. Growth characteristics of Honeycrisp apple trees on 31 dwarfing rootstocks in the Iowa planting of the NC-140 2010 regional apple rootstock trial for 2011.**

| | 2010 | | | | 2011 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Trunk | Blossom | Suckers | Leaf Zonal | | | Trunk | CL shoot length | |
| | Tree | dia. | clusters | per | Chlorosis rating [z] | | | dia. | Avg. | Range |
| Rootstock | mortality | (in.) | / tree | tree | Aug 1 | Sep 6 | Oct 4 | (in.) | (in.) | (in.) |
| Bud 70-20-20 | 0/12 | .79 | .0 | .1 | 1.7 | 2.2 | 2.3 | 1.27 | 12.0 | 5.1–29.9 |
| Bud 64-194 | 0/7 | .73 | 1.1 | .0 | 1.3 | 1.9 | 1.9 | 1.11 | 9.8 | 8.2–12.2 |
| CG.3001 | 0/2 | .76 | .0 | .0 | 1.5 | 2.5 | 3.0 | 1.10 | 7.1 | 7.1 |
| Bud 70-20-21 | 2/12 | .71 | .8 | .0 | 1.6 | 2.3 | 2.7 | 1.08 | 8.6 | 5.1–21.3 |
| G.202 N | 3/6 | .77 | .0 | .0 | 1.0 | 1.3 | 1.3 | 1.08 | 8.5 | 7.1–9.4 |
| Bud 7-3-150 | 0/10 | .65 | .7 | .0 | 2.2 | 2.4 | 2.6 | 1.05 | 12.4 | 5.9–31.8 |
| PiAu 9-90 | 0/6 | .79 | .0 | .2 | 7.3 | 8.5 | 9.0 | 1.02 | 7.2 | 3.9–9.8 |
| Bud 67-5-32 | 0/10 | .66 | .1 | .0 | 1.5 | 2.1 | 2.4 | 1.01 | 13.6 | 6.3–25.1 |
| Bud 70-6-8 | 0/12 | .64 | .8 | .0 | 1.9 | 2.4 | 2.8 | 1.01 | 12.7 | 5.1–34.6 |
| PiAu 51-11 | 0/11 | .68 | .0 | .1 | 1.5 | 2.9 | 3.4 | 1.00 | 10.5 | 5.5–26.4 |
| CG.4814 | 4/8 | .62 | .0 | .1 | 2.0 | 5.0 | 5.5 | .99 | 6.9 | 4.39.4 |
| CG.4004 | 0/4 | .66 | 2.0 | .0 | 3.0 | 4.3 | 4.8 | .98 | 13.2 | 6.2–20.5 |
| M.26 EMLA | 4/8 | .64 | .0 | .0 | 1.0 | 1.0 | 1.0 | .96 | 6.3 | 3.9–7.1 |
| G.202 TC | 1/5 | .67 | .0 | .0 | 1.8 | 2.8 | 3.3 | .96 | 5.8 | 3.9–7.9 |
| CG.4013 | 1/4 | .62 | .0 | .0 | 2.3 | 4.7 | 6.0 | .93 | 5.5 | 3.9–7.5 |
| G.935 N | 0/10 | .63 | .0 | .1 | 5.0 | 7.8 | 8.1 | .91 | 8.5 | 7.1–9.4 |
| CG.5087 | 0/3 | .55 | .0 | .0 | 2.3 | 5.3 | 5.7 | .90 | 13.0 | 6.3–22.8 |
| G.11 | 0/10 | .62 | .5 | .0 | 1.7 | 3.4 | 4.0 | .89 | 8.5 | 7.5–9.8 |
| M.9 Pajam2 | 0/12 | .64 | .1 | .0 | 1.8 | 3.1 | 3.6 | .88 | 9.2 | 5.5–31.5 |
| CG.4214 | 0/8 | .59 | .3 | .0 | 1.6 | 3.3 | 4.1 | .87 | 5.7 | 4.3–7.5 |
| G.41 TC | 1/4 | .55 | .0 | .0 | 1.3 | 1.7 | 2.0 | .84 | 6.3 | 4.7–9.1 |
| Bud 10 (62-396) | 0/9 | .57 | .1 | .0 | 2.0 | 2.1 | 2.1 | .83 | 8.7 | 4.7–15.7 |
| M.9 T337 | 0/12 | .58 | .4 | .2 | 1.8 | 2.5 | 2.6 | .83 | 8.4 | 3.1–26.0 |
| G.41 N | 3/11 | .57 | .0 | .0 | 1.5 | 2.5 | 2.6 | .82 | 10.2 | 6.3–21.7 |
| CG.4003 | 1/4 | .51 | .0 | .0 | 2.0 | 2.0 | 2.3 | .80 | 9.4 | 7.8–11.0 |
| G.935 TC | 0/3 | .59 | .0 | .0 | 5.3 | 7.7 | 7.8 | .80 | 6.3 | 5.5–7.5 |
| Supp 3 | 0/6 | .53 | .5 | .0 | 4.7 | 6.0 | 7.3 | .78 | 8.9 | 6.3–15.0 |
| CG.2034 | 0/5 | .52 | .0 | .0 | 2.6 | 5.2 | 6.4 | .75 | 6.1 | 4.7–8.7 |
| Bud 9 | 0/12 | .52 | .8 | .0 | 2.3 | 3.0 | 3.2 | .70 | 6.2 | 1.2–9.1 |
| Bud 71-7-22 | 2/6 | .40 | 5.0 | .0 | 3.5 | 5.3 | 7.0 | .51 | 6.8 | 5.9–7.9 |
| CG.5222 | 7/7 | . | . | . | . | . | . | . | . | . |
| *LSD .05* | | *.07* | *1.7* | *ns* | *1.7* | *2.0* | *2.1* | *.11* | *ns* | |

[z]Leaf zonal chlorosis rating: 0 = 0 to 9%; 1 = 10 to 19%; 2 = 20 to 29%; 3 = 30 to 39%; 4 = 40 to 49%; 5 = 50 to 59%; 6 = 60 to 69%; 7 = 70 to 79%; 8 = 80 to 89%; 9 = 90 to 99% of the leaves exhibiting symptoms.

**Figure 1. Mid-season symptoms of leaf zonal chlorosis on Honeycrisp apple leaves.**

**Figure 2. Late-season, very severe symptoms of leaf zonal chlorosis on Honeycrisp apple leaves.**