A Comparison of Six Strains of M.9 Over 10 Years

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Serious interest in the use of clonal, dwarfing rootstocks for apples developed in the United States only in the latter half of the 1900's. The use of dwarf apple trees, however, dates back more than 2,000 years, and the identification of potentially useful material for rootstocks likely began about 500 years ago. Up through the 1800's, these rootstocks were categorized as either Doucin (semidwarf) or Paradise (full dwarf). The variety of clones within these two categories and the misidentification of clones led the researchers at the East Malling Research Station in Kent, England to collect, name, and properly describe 24 different apple rootstocks. They were given the names East Malling I through East Malling XXIV. One of these rootstocks, EM.IX (later changed to M.9) was originally found in France in 1879. It originated as a chance seedling and was given the name Jaune de Metz. Subsequently, it became known as the fully dwarf rootstock of choice, and now is the most widely planted apple rootstock in the world.

All living organisms are subject to occasional mutation in their genetic code. Apples are no exception. Obvious examples of random mutations (or sports) are seen in some varieties more than others. Delicious, Gala, and Jonagold, for example, are prone to obvious skin-color mutations. Marshall McIntosh is a random mutation of Rogers Red McIntosh found at Marshall Farms in Fitchburg, MA. Rootstocks also express mutations from time to time. Since much of the plant is below ground, however, most mutations are not obvious, and even ones that may be beneficial are lost. Even so, several genetically different strains of M.9 have been characterized over the years. Until relatively recently, U.S. growers have had access only to M.9 and M.9 EMLA. In the last 10 or more years, other strains have entered the U.S. market, most notably M.9 NAKBT337. These strains offer some variation in the grafted tree. Likely, the most obvious difference is in the degree of dwarfing, but other characteristics may change with mutations. It is important for nurseries and growers to understand strain differences, so that the best possible rootstocks and management systems are used.

In 1994, the NC-140 Multistate Research

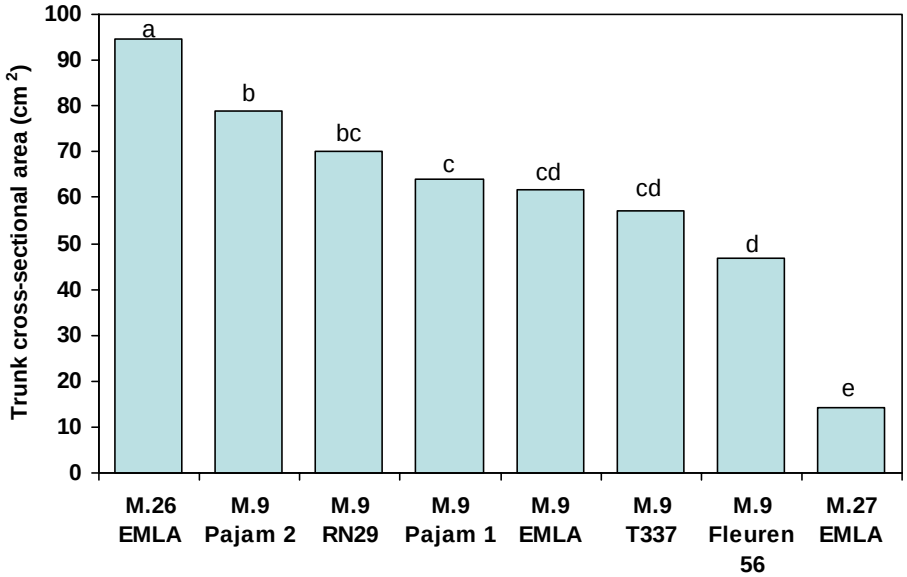

Figure 1. Trunk cross-sectional area of Gala apple trees on various strains of M.9 and on M.26 EMLA and M.27 EMLA, after 10 growing seasons. Bars topped by different letters are signficantly different at odds of 19:1.

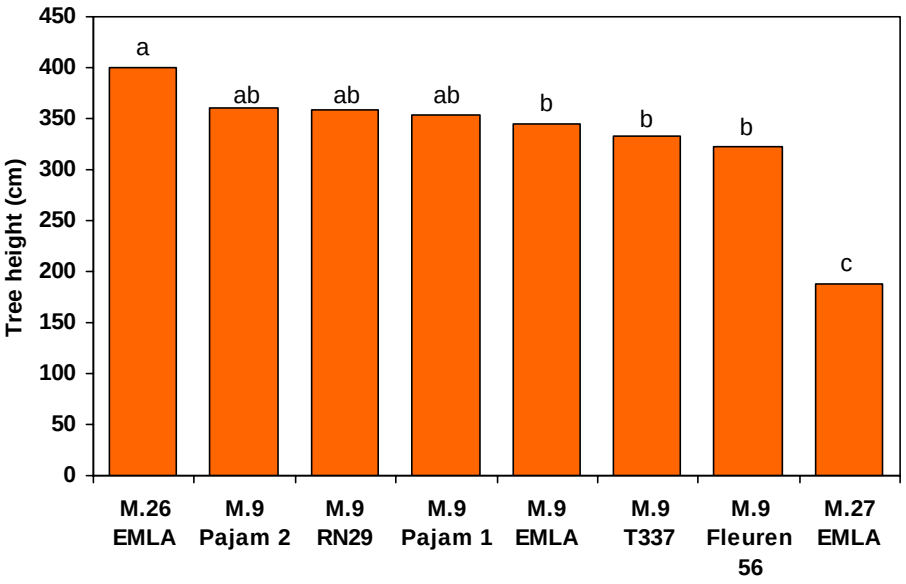

Figure 2. Height of Gala apple trees on various strains of M.9 and on M.26 EMLA and M.27 EMLA, after 10 growing seasons. Bars topped by different letters are signficantly different at odds of 19:1.

Committee established a trial including 17 rootstocks with Gala as the scion cultivar at 25 locations. Six of the rootstocks were different strains of M.9. In this article, we report the results gathered from one location after 10 years of trial, concentrating on the M.9 strains.

Materials & Methods

Gala trees were budded on various rootstocks during 1992 growing season and grown in the nursery through the 1993 season. Trees were dug in the fall, stored, and shipped to cooperators in the Spring of 1994. The rootstocks of interest in this article are M.9 EMLA, M.9 Fleuren 56, M.9 Pajam 1, M.9 Pajam 2, M.9 RN29, and M.9 NAKBT337. Data for M.26 EMLA and M.27 EMLA are included in this article for comparison (they also were part of this trial). Trees were planted in April of 1994 at the University of Massachusetts Cold Spring Orchard Research & Education Center in Belchertown, MA in a randomized-complete-block design with 10 replications. All trees were staked and maintained roughly as vertical axes. Pest and fertility management was per local recommendations. Root suckers were counted and cut annually. Yield per tree and fruit size were assessed each year from 1996 to 2003. Trunk cross-sectional area (20" above the graft union), canopy spread, and tree height were measured at the end of the 2003 growing season.

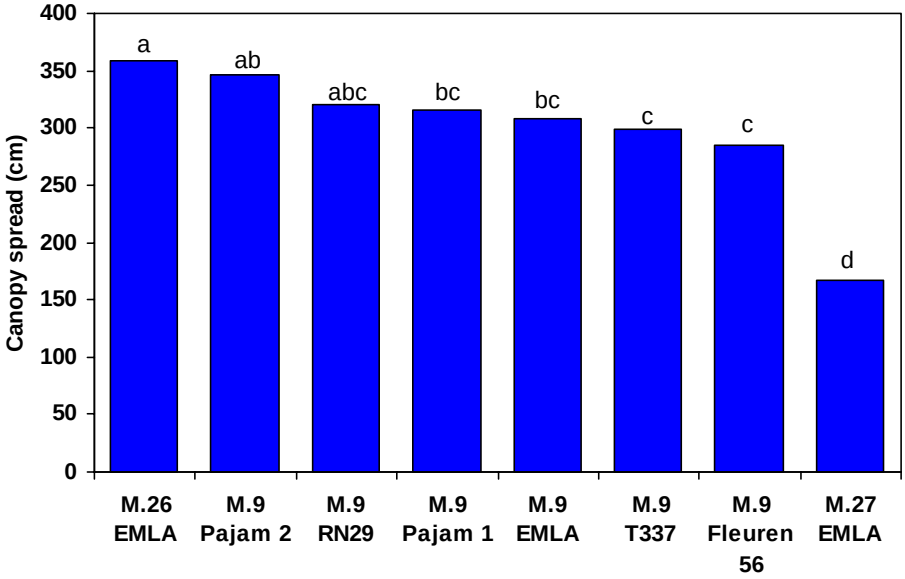

Figure 3. Canopy spread of Gala apple trees on various strains of M.9 and on M.26 EMLA and M.27 EMLA, after 10 growing seasons. Bars topped by different letters are signficantly different at odds of 19:1.

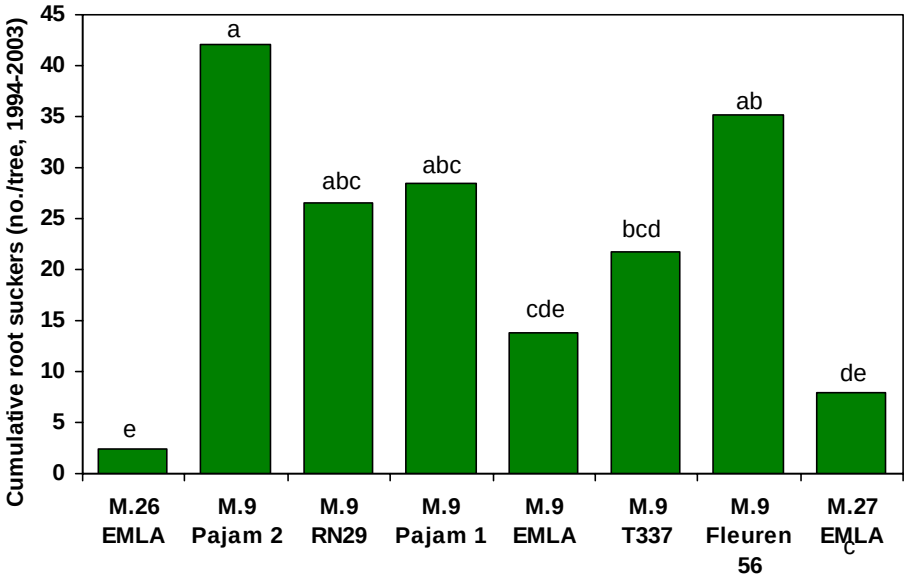

Figure 4. Cumulative root suckering of Gala apple trees on various strains of M.9 and on M.26 EMLA and M.27 EMLA, over 10 growing seasons. Bars topped by different letters are signficantly different at odds of 19:1.

Results

After 10 growing seasons, differences among the six M.9 strains were striking, particularly related to tree size. Of the six, the largest trees were on Pajam 2, and the smallest were on Fleuren 56 (Figures 1, 2, and 3). Trees on Pajam 2 were nearly 70% larger than those on Flueren 56. The order of tree size from largest to smallest was Pajam 2, RN29, Pajam 1, EMLA, NAKBT337, and Fleuren 56. Trees on Pajam 2 were somewhat smaller than those on M.26 EMLA, and trees on Fleuren 56 were substantially larger than those on M.27 EMLA.

Root suckering varied greatly over the 10 years of the trial (Figure 4). Cumulatively, trees on Pajam 2 produced 42 suckers on average; whereas, those on EMLA produced only 14. The differences in suckering were not strictly related to tree vigor, since trees on Fleuren 56 were the least vigorous but produced the second most root suckers. As a comparison, trees on M.26 EMLA produced only two suckers on average in the 10 years of this trial.

Cumulative yield per tree (Figure 5) was closely related to tree size. The more vigorous the M.9 strain, the greater the yield. When the yield was adjusted for tree size, that is was assessed as yield efficiency, the strains of M.9 were similar (Figure 6). It is interesting to note that trees on all strains of M.9 were significantly more

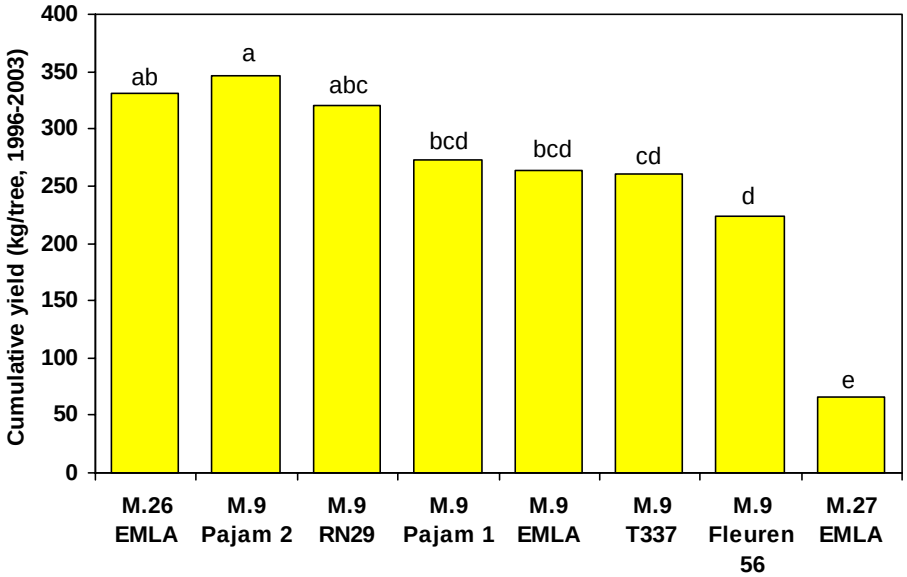

Figure 5. Cumulative yield of Gala apple trees on various strains of M.9 and on M.26 EMLA and M.27 EMLA, over eight fruiting seasons. Bars topped by different letters are signficantly different at odds of 19:1.

yield efficient than trees on M.26 EMLA.

Fruit size averaged over the fruiting life of the trial, like yield efficiency, was not affected by M.9 strain (Figure 7). Interestingly, fruit from trees on M.26 EMLA were larger than those from trees on three of the M.9 strains, and fruit from trees on M.27 EMLA were significantly smaller than those from trees on any of the M.9 strains.

Conclusions

Dramatic differences in tree size and relatively similar differences in per-tree yield resulted from the six different M.9 strains. Differences in yield efficiency and fruit size did not result from the different strains. So, the important M.9 qualities of high yield and large fruit did not vary among the strains evaluated here. The degree of dwarfing, however, did vary. Growers must therefore be careful not so much in the choice of M.9 strain but in the planting system and tree spacings utilized with the particular M.9 strain.

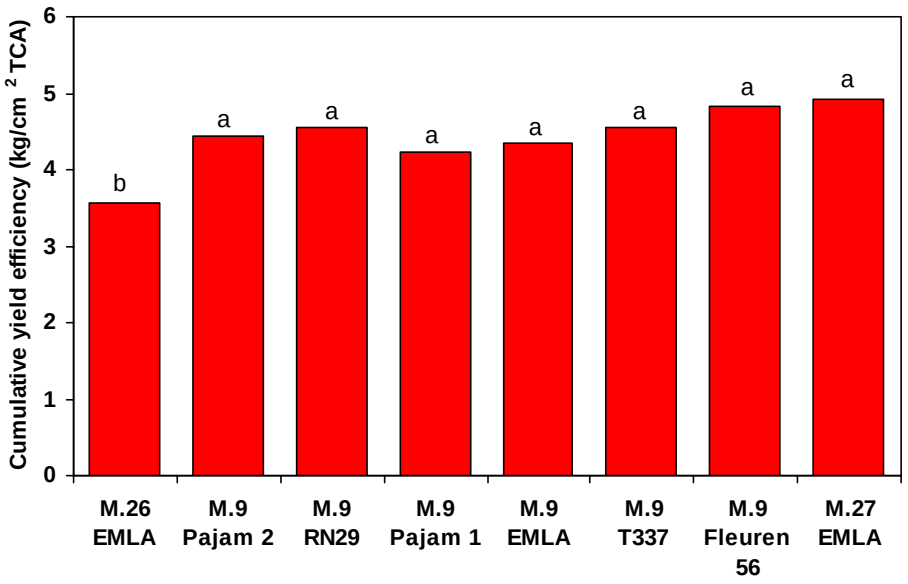

Figure 6. Cumulative yield efficiency of Gala apple trees on various strains of M.9 and on M.26 EMLA and M.27 EMLA, over eight fruiting seasons. Bars topped by different letters are signficantly different at odds of 19:1.

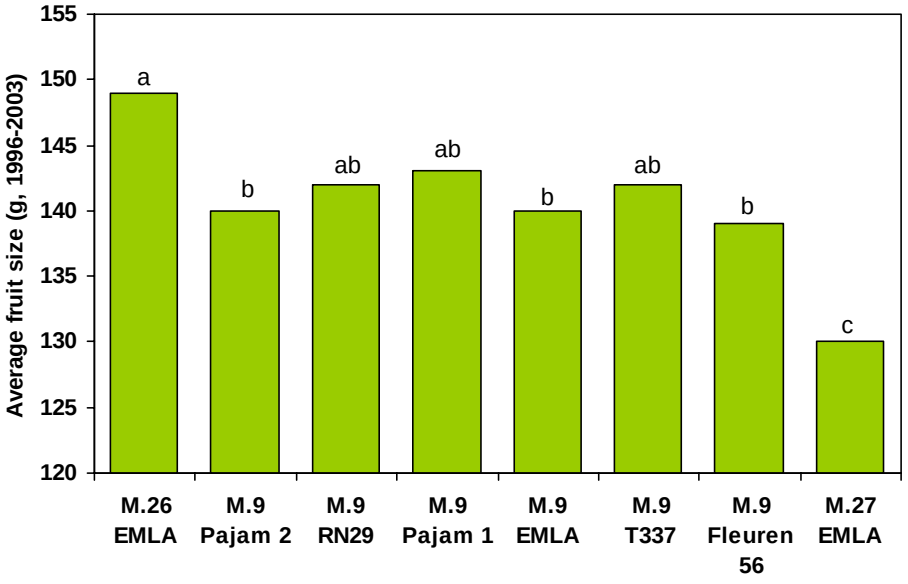

Figure 7. Average size of fruit harvested from Gala apple trees on various strains of M.9 and on M.26 EMLA and M.27 EMLA, over eight fruiting seasons. Bars topped by different letters are signficantly different at odds of 19:1.

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