

# Growth and Compatibility Characteristics of Crabapple/Rootstock Combinations<sup>1</sup>

HENRY A. ROBITAILLE<sup>2</sup> AND ROBERT F. CARLSON<sup>3</sup>

**Abstract.** Successful graft combinations between four crabapple species (*Malus sargentii*, *M. floribunda*, *M. P. Lemoinei* and *M. baccata*) and six rootstocks ('M.9', 'M.26', 'M.7', 'MM 104', 'MM 106' and 'MM 111') ranged between 0-90% and averaged 33% as compared to 90-100% with an average of 92% for 'Golden Delicious'; incompatibility differences were apparently due to latent viruses in the scion cultivars. The crabapple 'scions' did not produce as much terminal growth and were smaller than 'Golden Delicious' on these rootstocks.

Controlled size and improved uniformity in mass plantings would increase the value of ornamental crabapples. In this study several crabapple/rootstock combinations were examined for compatibility and vigor.

Ten trees of each combination shown in Table 1 were grafted in March 1966, stored in peat moss at 2°C until May, and subsequently planted in the nursery and provided with mulch and irrigation. At the end of Sept. 1966, two trees from each combination were sacrificed for microscopic examination of the graft union (7). In Nov. 1970, the average shoot growth of each scion/rootstock combination was used as an indication of tree vigor.

The rootstocks in these studies were virus indexed for chlorotic leaf spot and stem pitting, but the crabapple scions source were not indexed. In different virus studies it has been shown that *M. floribunda*, and *M. sar-*

*gentii* can be carrying chlorotic leaf spot virus (2, 3) and that *M. purpurea* 'Lemoinei' is very sensitive to apple mosaic, rubbery wood and stem pitting viruses (9). The same workers (9) reported *M. floribunda* tolerant of chlorotic leaf spot virus, and sensitive to stem pitting. Since virus indexed crabapple cultivars were not readily available when these studies were initiated, latent viruses, no doubt, influenced graft take and to some extent, growth of these scion/rootstock combinations.

After the first growing seasons, all trees of some crabapple/rootstock combinations were dead and after 4 years, more trees succumbed (Table 1). The trees that made poor growth the first year did not survive. The fact that many trees died, indicates that latent viruses such as stem pitting and chlorotic leaf spot were present in these combinations. Similar results of bud failure of crabapples on Malling rootstocks, especially on 'M.9', have been reported (8).

Anatomical examination of these graft unions gave only a limited indication of incompatibility (7). Other workers have also been unable to correlate anatomical characteristics with incompatibility (4, 5). The success of 'Golden Delicious' on the same rootstocks suggested that the crabapple scions were responsible for the incompatibility. The trees which lived through the first season made strong, healthy trees 4 years later. However, anatomical studies did suggest that the margin of allowable technical er-

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<sup>2</sup>Present Address: Department of Horticulture, Purdue University, Lafayette, Indiana.

<sup>3</sup>Professor of Horticulture, Michigan State University, East Lansing, Michigan.

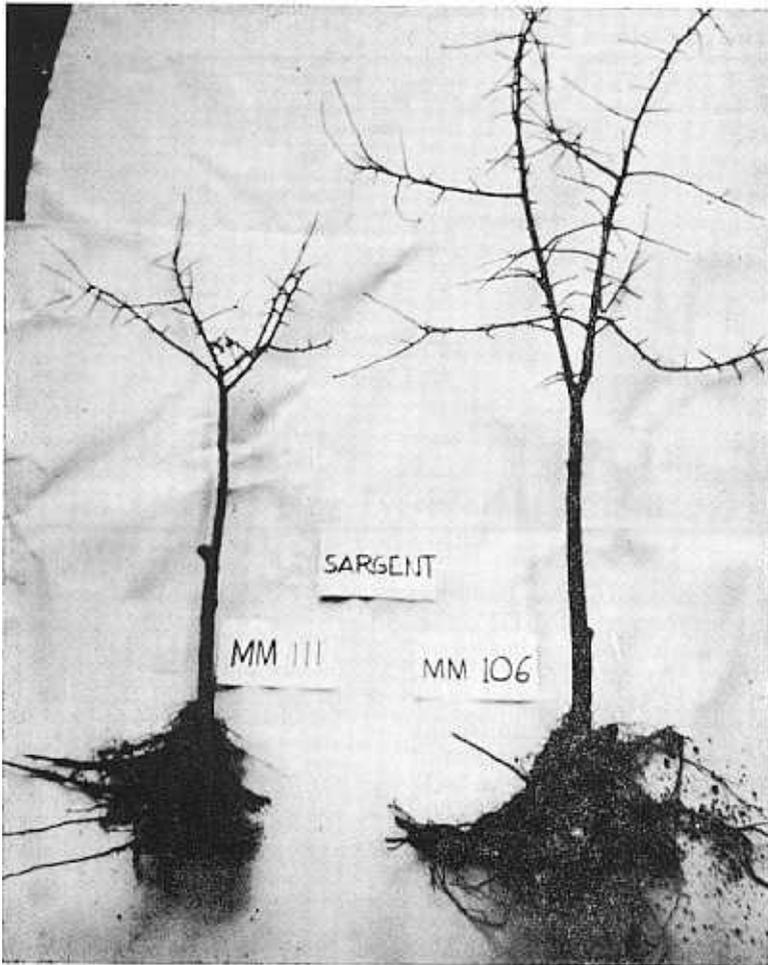


Figure 1. Four-year old trees of *M. sargentii* on 'MM 111' and on 'MM 106' showing differences in tree vigor.

ror in grafting was much greater for 'Golden Delicious' than for the crabapples. Scions often made up to 6 inches of growth before succumbing late in the season, also suggesting that more than poor grafting technique was involved. Other trees showed a more immediate reaction and succumbed before growth occurred, suggesting incompatibilities due to viruses.

Taking into account all cultivars tested, 'MM 111' was most compatible with the rootstocks tested, producing

60% survival after 4 growing seasons. *M. purpurea* 'Lemoinei' on 'MM 106' demonstrated a strong graft union and only 10% tree loss (Table 1). For flower and fruit production, "MM 111" proved to be an excellent, semi-vigorous, well-anchored rootstock for most of the crabapple species tested. 'MM 111' rootstock in previous studies has shown drought tolerance (1, 6).

Although unequal replications, due to incompatibility, made statistical analysis impossible, rootstock induced variations in species vigor were ap-

**Table 1. Graft take and growth response of 'Golden Delicious' and 4 crabapple varieties on 6 clonal rootstocks.**

Scion	M.9	M.26	Rootstock			
			M.7	MM 104	MM 106	MM 111
			<b>Successful Grafts (%)</b>			
'Golden Delicious'	90	90	90	90	100	100
<i>M. sargentii</i>	10	40	—	10	40	20
<i>M. floribunda</i>	10	—	50	40	30	70
<i>M. P. 'Lemoinei'</i>	40	—	20	30	90	60
<i>M. baccata</i>	—	40	50	—	60	90
			<b>Shoot Growth (in.) 1970</b>			
'Golden Delicious'	58	62	66	92	90	94
<i>M. sargentii</i>	—	42	—	—	70	—
<i>M. floribunda</i>	—	—	40	44	48	38
<i>M. P. 'Lemoinei'</i>	23	—	38	62	84	68
<i>M. baccata</i>	—	42	48	—	46	52

parent. *M. sargentii*/'MM 106' was more vigorous than on 'MM 111' (Fig. 1). 'M.7' made intermediate-sized trees with *M. baccata* and *M. floribunda*. Trees of *M. sargentii* on 'MM 111' and 'MM 106' were comparable in root growth, but the latter was most vigorous. The trees that grew on 'M.9' and 'M.26' were the most dwarfing and these trees were smaller than 'Golden Delicious' trees on the same rootstocks.

These data indicate that certain clonal rootstocks, commonly used for commercial apple cultivars, can be used to obtain dwarfing advantages in ornamental crabapple plantings. Size controlling rootstocks will give the landscape architect more latitude in the choice of plant material. Additional advantages may include disease resistance and drought tolerance in cultivars and rootstocks. Since only a few out of many crabapple cultivars were included in these experiments, further testing and evaluation of more cultivars and rootstocks is essential before large scale commercial use can be recommended. Before such tests or plantings are initiated, the virus status of both the cultivar and the rootstock should be known.

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