20 Years Watching Rootstock

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Many things in gardening and the nursery industry are done by tradition, but several of these practices are also based on availability of raw materials or local conditions. The available choice and use of rootstocks for magnolia grafting is no different. In this article, I plan to discuss the extensive observations of grafting I have done here in New Zealand since 1987. The results, of course, are based on our conditions, but I will be interested in any feedback that comes from international readers.

Refining the Rootstock Choice

In 1987, I joined the New Developments Department at Duncan and Davies Nursery. Magnolias were undergoing a resurgence in popularity due to the importation of new cultivars, as well as the newly introduced New Zealand-produced hybrids. Many of these hybrids have a degree of *Magnolia campbellii* parentage, which results in a tendency to outgrow the stem diameter of their rootstocks. By observing these different rates of caliper growth, based on parentage, of a wide range of hybrids, I performed a series of trials to see if it was possible to develop rootstocks which would match the various caliper growth rates of these hybrids. At the time, Duncan and Davies was producing a wide range of magnolia cultivars from cuttings, and this meant there was an opportunity to trial several of these for rootstocks. The export market was a significant part of the overall production, so the preference that some customers have for the use of *Magnolia kobus* as a rootstock had to be considered. We were able to trial *Magnolia ×loebnerii* hybrids as a substitute, which worked well because most of the hardy hybrids had a similar caliper growth rate. An added advantage of using *M. ×loebnerii* 'Merrill' was that it did not suffer from root disease as much as *M. kobus* seedlings in our soils. The heavy wooded hybrids like *M.* 'Mark Jury' and *M.* 'Caerhays Belle' were trialed on *M.* 'San Jose', which has many features that suggest it is a *M. ×veitchii* type hybrid. When grafted with *M. ×veitchii,* the union was seamless, and as a stock for *M. doltsopa* 'Silver Cloud', it proved ideal.

Being conscious of the variation in caliper led to the accidental discovery of a wildcard clone in *M.* 'Iolanthe'. When *M.* 'Iolanthe' was budded on *M. ×soulangeana* rootstocks or *M.* 'Rustica Rubra', some scions overgrew, and some did not. Close inspection revealed that there were two clones being grown as *M.* 'Iolanthe'. The original stock plant, which had developed a strong secondary stem was, in fact, rootstock. Cutting collectors doing trials on *M.* 'Iolanthe', unaware of the problem, multiplied the numbers. However, the positive side of this situation meant we had a

heavy-calipered clonal rootstock that was easy to produce. The clones that were incorrectly sold as *M.* 'Iolanthe', we concluded, were really *M.* 'Eleanor May'. The flowers and foliage habit of 'Eleanor May' suggest the parentage *M.* 'Rustica Rubra' × *M.* 'Lanarth'. From this point on I designated these 'Eleanor May' rootstocks as Rootstock A.

For one reason or another Rootstock A eventually became the default rootstock for anything and everything. Although *M. stellata* types are usually cutting grown, we found Rootstock A had a strong dwarfing effect on *M. stellata* 'Waterlily'. Using Rootstock A as a rootstock for the likes of *M.* 'Early Rose' and *M.* 'Caerhays Belle' resulted in overall larger plants and delayed onset of flowering, while those grafted onto *M.* ×*soulangeana* seedlings produced smaller plants over the same time frame.

To propagate *M.* ×*weiseneri* and *M. obovata* (due to seed unavailability), a cutting-grown clone of *M. sieboldii* was used as a rootstock, since seedlings tend to be prone to soil diseases in a similar way to *M. kobus*.

While it was a relatively quick process to address the caliper variation, only time could reveal the other traits that would be modified or moderated by the use of clonal rootstocks.

Final recommendations made for clonal rootstocks were:

- *M.* ×*loebnerii* 'Merrill' for *M.* ×*brooklynensis* and *M. acuminata* hybrids destined for cold climates
- *M.* ×*soulangeana* 'Etienne Soulange-Bodin' for middle range hybrids
- *M.* 'San Jose' for lighter caliper *M. campbellii* hybrids such *M.* 'Charles Raffill' or *M.* 'Kew's Surprise'
- Rootstock A. for the heavier caliper hybrids such as *M.* 'Mark Jury' and *M. doltsopa* 'Silver Cloud'

Combinations Successful and Otherwise

In the 20-odd years I have been handling grafted *magnolias*, I have only seen maybe six or eight cases of outright physical incompatibility where the graft union failed. This incidence rate (maybe 1 in 5000) is so minor that graft incompatibility in magnolias is effectively non-existent. In any case, these have all been in the first year of growth in the nursery. For this to happen in garden trees would be extremely rare.

Often the difference in caliper between rootstock is viewed as incompatibility, but these trees will often grow for many years and flourish with no problem. Felix Jury proved that when he originally planted his garden in the 1950s and 1960s. Felix often grafted an insurance tree as soon as he could to avoid the disappointment of losing a treasured variety

such as *Magnolia campbellii* 'Lanarth', which he successfully introduced to New Zealand after several attempts. He often used *M. kobus* when it was available, but sometimes he had to use *M.* ×*soulangeana,* which has tended to produce more rootstock suckers than *M. kobus*. The accompanying photographs show some of these trees and the variable rootstock/scion growth rates. In the case of *M. sargentiana* var. *robusta,* the crown growth in these trees was as healthy as trees of a similar stature observed growing on their own roots in Cornish gardens.

Successful, but uneven calipered, grafts of *M. 'Lanarth'* on *M. kobus*, *M. 'Lanarth'* on *M.* ×*soulangeana*, *M. sargentiana* var. *robusta* on *M. kobus* (left to right, respectively)

One of the fastest caliper-growing scions we graft regularly is *M. doltsopa* 'Silver Cloud'; years ago I grafted it onto a *M. kobus* to see what would happen. After three years the stem of the scion cultivar was twice the diameter of that of the rootstock, so I drilled a wire directly through the stem and attached it to a post for support. Unfortunately, I moved and was unable to follow the progress. *M.* 'Silver Cloud' is often budded onto *M.* ×*soulangeana* seedlings and cultivars, but without such a marked difference of the scion/rootstock calipers. This has been done for at least 20 years with no record of problems. I have been able to keep track of one of the original plants of *M.* 'Silver Cloud' budded onto *M.* ×*soulangeana* and recently was granted permission to dig around the tree to prove that the scion had rooted down above the graft union, which they had. I have not seen magnolias root above the graft very often.

Another one of the heaviest-caliper scion cultivars is *M. campbellii* ssp. *mollicomata* 'Bernie Hollard'. When budded onto *M.* ×*soulangeana* seedlings it often appears to be twice as thick as the rootstock. *M. c.* ssp. *mollicomata* has been recorded as difficult in warm climates, and as being heat sensitive. This tendency was observed with *M. c* ssp. *mollicomata*. 'Bernie Hollard' plants on their own roots grown in the old Duncan and Davies layering beds. The symptoms were a gradual

'Bernie Hollard' on Rootstock A after one year

reduction in vigor and leaf size followed by dieback, and a periodic revival of the plant from watershoots at the base. Similar symptoms can be observed on plants grafted onto *M.* ×*soulangeana* seedlings. With this in mind, I specifically budded several plants of *M. c.* ssp. *mollicomata* 'Bernie Hollard' onto the Rootstock A clonal rootstock to get a reliable plant for the New Zealand-raised magnolia collection we are establishing. One of these was planted out last year and made the best growth I have observed on budded plants of *M. c.* ssp. *mollicomata* 'Bernie Hollard'.


"Cook Block" selection

Since Rootstock A was selected as a stock for heavier wooded *M. campbellii* types, I grafted two seedling selections of *M. campbellii* in 1999. The first flowered in 2007 at eight years from grafting and the second flowered for the first time in 2009 at ten years from grafting. As illustrated on the "Cook Block" selection, the union is seamless. Upon checking the history of these plants the timeframes to flowering mirrored the first flowering sequence of the original seedlings. This suggests that the using Rootstock A is nearly the same as having the clone on its own roots.

Grafting Evergreen Magnolias

With the wide range of rootstock experiments I have done over the years, one of the most fascinating and practical combinations is the ability to put evergreen species on deciduous rootstocks. Again, much of the practical experimentation has been done with *M. doltsopa*. When *M. doltsopa* was used as a rootstock, the resulting plants were much more difficult to handle when lifting field-grown plants into containers to sell. The nature of the deciduous seedling making a more fibrous root system than a michelia seedling (which is also prone to root rot in our soils when root pruned) meant the plants were easier to pot up for sale. The root system of deciduous magnolias also encourages a more complete dormancy. The major lesson from these experiments was that the evergreen/deciduous combination really only works well when grafting evergreen scions onto deciduous rootstock. There have been reports from Australia where *M. doltsopa* was used as a rootstock for *M.* 'Vulcan', with very unsatisfactory results. In my experience, deciduous scions on evergreen rootstocks appeared to deteriorate over a couple of years, presumably because there was no foliage to "feed" the roots in winter.

I have also found that *Magnolia maudiae* is performing well on *M.* 'Rustica Rubra' seedlings and the plants are setting flowers well in the first year from budding. These rootstocks also respond well, forming a fibrous root ball when root-pruned for lifting and containerizing for sale.

Other Tests and Results Comparing *M. kobus* and *M. ×soulangeana* Rootstock

Up to this point a range of scion/rootstock combinations have been discussed, but these observations have been based on limited numbers of each combination. With the release in New Zealand of large numbers of *Magnolia* 'Genie' has come the opportunity to observe significant numbers of the same combinations. For the first two years *M.* 'Genie' was budded onto *M. kobus* and *M. ×soulangeana* seedlings. The results must be averaged to allow for seedling variation in the rootstocks, but overall there are definite trends in each species used as seedling rootstock crops. The plants budded on *M. kobus* grew stronger than those on *M. ×soulangeana* and appeared to have an increased degree of juvenility. They began to set summer flowers about a month later, which allowed them to grow taller by an average of 30 cm (12 in.). The lateral branch also set fewer axillary flower buds, making the bud wood from the plants budded on *M. kobus* more desirable for harvesting as scion wood to use for further grafting. To look at the overall growth performance, the plants budded on *M. kobus* appeared to be intermediate between *M.* 'Genie' on their own roots, and *M.* 'Genie' on *M. ×soulangeana*. This equates to Maurice Foster's findings in his article in *Magnolia* (Issue 69).

So why bother to graft *M.* 'Genie' on *M. kobus* if it performs better on its own roots? It is because *M.* 'Genie' is not easy to root, thus grafting is more reliable and results in far better production rates. (In our long growing season, cuttings don't usually reach a desirable ripeness early enough. In addition, some cultivars are more difficult to root.)

With the results from work with *M.* 'Genie' in mind, our experience with *M.* 'Butterflies' on *M. ×soulangeana* seedling rootstock with a good flower set at three years from budding is understandable. A white-flowered clone of *M. campbellii* called 'Mt Pirongia' also illustrates the influence of *M. ×soulangeana* rootstock compared to *M. kobus*. Most significantly, the original plant on *M. kobus* shows no sign of flowering at four or five years whereas a two-year-old budded on *M. ×soulangeana* has set four flower buds the year after being shifted.

Conclusions

It is not often that you have the chance to follow a project through for 20-odd years. I have been able to keep track of trees planted in my previous gardens by keeping some trees in the collection by moving them around the country with me. Others I have regrafted in my current nursery so I can build on earlier experiences.

Although watching these rootstocks over this time has not been a truly scientific trial, time and again, with individual trees and crops of several thousand trees, I have observed the same or similar growth trends. From the results of my own grafting, I have been able to see the trends described by Maurice Foster and compare his observations based on using *M.* ×*soulangeana* seedling rootstocks, which tend to produce a more dwarfing influence than does *M. kobus*. Our main production in the nursery uses *M.* 'Rustica Rubra' seedlings as rootstock since this is a fairly stable strain and *M.* 'Rustica Rubra' tends to produce selfed seed crops readily. I have used *M.* ×*soulangeana* 'Lennei Alba' seedlings, but this strain tends have a shorter growing season and the seedlings are slower to develop. Once grafted, however, the scions tend toward their own normal growing habits, but in a more compact plant compared with *M.* 'Rustica Rubra' rootstocks.

The *M.* 'Rustica Rubra' seedlings also show an ability to grow from hardwood cuttings set in the field. Rooting hardwood cuttings in the field has variable results, so the actual method involving timing and conditions needs refinement.

The tendency for *M.* 'Rustica Rubra' seedlings to be somewhat chlorotic in spring does not appear to come through in the scion varieties. The dwarfing effect from *M.* ×*soulangeana* rootstock that encourages more flowering is useful for smaller-sized modern gardens. Another observation is that free-flowering seedling strains can tend to encourage scion varieties to flower sooner.

Magnolia 'Eleanor May', or Rootstock A, has proven itself as a useful option as a rootstock for the large species like *M. campbellii* and similar forms, as well as *M. doltsopa*.

The importance of soil fertility and adequate direct sunlight must not be overlooked, either. I am sure there is much more to learn about how soil fertility can affect and enhance these combinations. In the meantime, it is interesting to build on the trends observed and enjoy the heavier flowering displayed by grafted magnolias.

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