The Future of Grafting©

Marc Légaré
Quebec Institute for the Development of Ornamental Horticulture, 1120 Boul. de la Rive-Sud local 77, Lévis (Québec) G6V 4Z2, Canada
Email: mlegare@iqdho.com

Grafting propagation is a fascinating thing for many peoples. Grafting techniques have existed since 17th century. Propagators grafted plants because it is (or it was) the best method to propagate some plants with a high success rate. Most nurseries grafting techniques include: T-budding, chip budding, whip and tongue graft, and side veneer graft.

I really think that whatever you decide to use, your goal is to propagate plants with the best return on investment. You also have to propagate plants which will live for a long time.

I have my idea about the future of grafting but I wanted to get viewpoints from propagators in the industry about this topic. I contacted many nursery people around the world to determine what they are thinking about the future of grafting. The answers I got were from small and large businesses located in Canada, U.S.A., France, and Belgium. I asked questions about:

- Grafting machines and their use.
- Number of cuttings/hour/person, budding/hour/person, and grafts/hour/person done in the nurseries.
- Difficulty to find good workers to do grafting.
- Growing grafted plants or growing plants on their own roots.
- Short- and long-term incompatibility problems with grafts.
- Loss of knowledge due to retired workers.
- New developments about grafting in your nurseries.

GRAFTING MACHINES AND THEIR USE

There are many grafting tools made in Australia, U.K., and Asia. New tools coming from U.S.A. will be here soon because new copyrights were lately received. All the peoples who answered my questions agreed that they tried them but don't use them. The contacted toolmakers seemed to target fruit nurseries more than ornamental nurseries. Their advertisements are showing mostly grapevine grafting. Why don't ornamental nursery growers use them? After many emails, I never had an answer from the tool manufacturers. Here are the answers I got from nursery people:

- Rootstock and scion must have the same diameter to get a high rate of success.
- With the tool use, the blades become worn and the cuts become less sharp. The graft success decreases with this situation.
- Chips are too small for my taste when done with the grafting tool.
- A good grafter is as fast as or faster than these machines.

Grafting mechanization in ornamental nurseries seems not easy to do with the tools we can presently find on the market.

Information about units done per hour by grafters or tools from many nurseries for different propagation methods are shown in Table 1.

Table 1. Grafting rates.

Country	Propagation type	Units per hour per worker	Remarks
Canada	T budding	100	Trees in the field
Canada	Top grafting	60	Trees in the field
U.S.A.	Top grafting	75–100	Container plants
U.S.A.	Chip budding	120–150	Container plants
U.S.A.	Whip and tongue	100–120	Dormant container plants.
U.S.A.	Whip and tongue	120–150	Dormant bare-root seedlings
U.S.A.	Side grafting	100–120	*Acer palmatum* in pots during summer
Europe	Rose T budding	125	People paid by hourly rate
Europe	Rose T budding	375	Specialized team peoples paid by contract and by percent of success
Europe	Bench grafting	63	Fruit trees and ornamental trees
Raggett top grafter	V graft	< 125	Grapevine grafts
Raggett Pneumatic Graftech	V graft	175–375	ultra fast worker Grapevine grafts
Canada	Softwood cutting	150	

DIFFICULTY FINDING GOOD WORKERS TO DO GRAFTING

Finding people to work in this industry is becoming a nightmare for many nurseries. Small and large nurseries both have these problems. Grafting operations need workers with knowledge, dexterity, and experience. Constant renewal of workers is a mayor problem for grafting operations. In Canada and in the U.S.A. many Mexican and other Spanish speaking people are doing the grafting. Special grafting teams are hired on a temporary basis by many nurseries to do this task. In Europe, workers are coming from U.K., Poland, and New Zealand. Many nurseries are calling back retired people to supervise grafting operations. All around the world, local workers are not interested in working in the nurseries.

There's a consensus that worker turnover results in higher production costs. Training new workers cost a lot of money.

KNOWLEDGE LOSS BECAUSE OLDER WORKERS ARE RETIRED

Small nurseries don't consider this factor to be a problem. Normally, they are younger enterprises and they have less history than larger nurseries. For these small nurseries, the boss is often doing the grafting. For larger established nurseries, they were often relating problems of knowledge loss. Here are the comments I obtained from small and large nurseries:

- Previous higher success rate in some species.

- Percent of grafting success is good one year and bad another year. We don't know why?

For many nurserymen, keeping the grafting tips and knowledge tips in computers will help to teach this information to new workers. Special grafting teams who are working by contract in many nurseries often keep their grafting tips to protect their work year after year.

PLANT PRODUCTION ON THEIR OWN ROOTS INSTEAD OF GRAFTING

Rose production is often mentioned. In Europe, rose production on their own roots is favoured because rose rootstocks are not suckering when the rose bushes are planted in gardens. A Belgian nurseryman said that grafted roses are somewhat taller and more vigorous than roses grown on their own roots. In North America, roses on their own roots are supposed to be hardier than grafted rose bushes.

For many nurserymen, in vitro-propagated plants seem to take the place of traditionally grafted plants.

GRAFTING INCOMPATIBILITY PROBLEMS DURING PLANT LIFE

Many incompatibility problems are well known by the propagators. Long-term incompatibility problems are not necessarily well known by the nurserymen when the trees are planted in cities or parks. *Acer* (especially *A. rubrum* species), *Crataegus*, *Pyrus, Syringa, Quercus, Pseudotsuga,* and *Ulmus* species (Figs. 1, 2, and 3) are often mentioned as having graft incompatibility problems if we don't use the right rootstock but with the correct rootstock success can be achieved.

Again, for many nurserymen, in vitro- (Figs. 4 and 5) and cutting-propagated plants will be the solution for some plants to get rid of these problems because they are on their own roots.

PROPAGATING METHODS USED FOR A NUMBER OF PLANTS

Table 2 presents examples of propagation methods employed with selected plants.

Table 2. Examples of propagation methods used for selected plants.

Plant	Propagation methods			
Acer rubrum cultivars	Layering	T or chip budding	*Softwood cutting**	*In vitro*
Ulmus 'Morton' Accolade™ elm (Figs. 4 and 5)	T budding	*Softwood cutting*	*In vitro*	
Pinus cultivars	Grafting	Micro-grafting		
Betula cultivars	Grafting	Chip budding	*In vitro*	
Syringa vulgaris cultivars	Grafting	Softwood cutting	*In vitro*	
Amelanchier cultivars	Layering	T or chip budding	*Softwood cutting*	*In vitro*
Rosa	Division Layering	T or chip budding	*Softwood cuttings*	*In vitro*
Malus	Layering	Softwood and hardwood cuttings	*T or chip budding, grafting*	*In vitro*

*Methods marked in italics look to be used more in the future.

NEW GRAFTING DEVELOPMENT

- All people questioned agreed that there will not be spectacular developments in grafting. People want to find ways to do this task faster and finding ways to produce plants in shorter time.
- In Europe, with T and chip budding, they try to lower the production time by 1 year by doing sequential budding as soon as there are mature scion buds. Rootstocks are trimmed back only by half to keep sap suckers which will help the scion development right away after budding. This method is presently used in areas which have mild climate during winter.
- To lower plant production time, greenhouses are used more for grafting trees and whip production.
- In U.S.A., callusing pipe was traditionally used with grafting. Some nurseries are trying this method with T or chip budding with species which are known to be hard to graft.
- Micrografting is done in Australia with conifers.
- Many nurseries are trying to reorganize their work to lower the production costs. Grafting operations can be fast but you have to take 1 year to produce a rootstock and another year to do the graft. Cutting or in vitro are faster propagating methods and you don't have to give the post-grafting care required to your plants.

CONCLUSION

Grafting will always be used for plants which are difficult to root. Top work grafting is also a unique propagating method to create certain small trees. As we can see, grafting seems to loose its place for other methods. The reasons related are:

- Difficulty finding workers to do this task.
- Trained people quit their job as they become older.
- Grafting mechanization seems difficult to implement in the nurseries.
- There's new cutting methods which now gives good results with plants normally hard to root.
- Tissue culture plant propagation is coming on stronger.
- It is sometimes difficult to get rootstocks from other countries because virus and diseases make propagation still risky using them.

Grafting will be used to propagate plants as long as there will be no other existing methods to root plants easily. Mechanization and tips to lower grafting costs are now challenges for the nursery people.

Figure 1. *Ulmus glabra* 'Camperdownii' grafted on *Ulmus pumila* as often seen today. Normally, their life is relatively short.

Figure 2. *Ulmus glabra* 'Camperdownii' grafted on *Ulmus* sp. (unknown) 125 years ago. They had a good rootstock at that time.

Figure 3. *Ulmus glabra* 'Camperdownii' 125 years old. They can live a long time with the right rootstock.

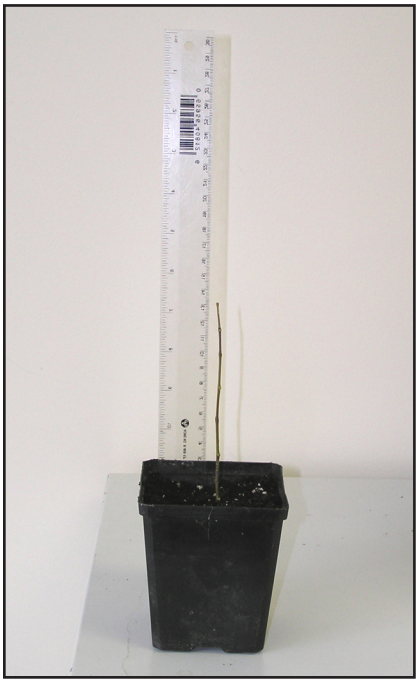

Figure 4. Tissue culture *Ulmus* 'Morton' as it was in March 2007.

Figure 5. Same plants as seen on Figure 4 but in August 2007. They were grown in a greenhouse. Some trees reached 10 ft. In the past they were traditionally budded.