

Improved Grafting Techniques for Nursery Stock

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INTRODUCTION

Grafting has with increasing labor costs become an expensive way of propagating plants. An important factor for the bottom line in this process is a high percentage of successful grafts. In a number of genera, e.g., *Malus*, *Pyrus*, *Sorbus*, *Salix*, and *Tilia*, this is easy to obtain. In other genera, however, a low percentage of “takes” can make grafting an unreasonably expensive method of propagation. In particular species of *Juglans*, *Quercus*, *Corylus*, and partly *Acer* can be tricky in that respect. Therefore, there are good reasons to optimize every step in the grafting process in order to ensure high grafting success especially for the more difficult-to-propagate species. The methods presented below by the author are meant as a source of inspiration for other propagators.

GRAFTING PLANE

The grafting plane was first seen in Australia where it is used for grafting of the macadamia nut tree with its very hard wood. It is a small woodworking plane equipped with a disposable heavy duty razor blade (Fig. 1). The advantage of using this tool is that the cut surfaces under correct use are perfectly plane so that even the slightest callus growth can ensure cambial contact that is a prerequisite for a good result. Another advantage is that it is possible to fit rootstocks and scions with very hard wood which are up to a couple of cm in diameter.

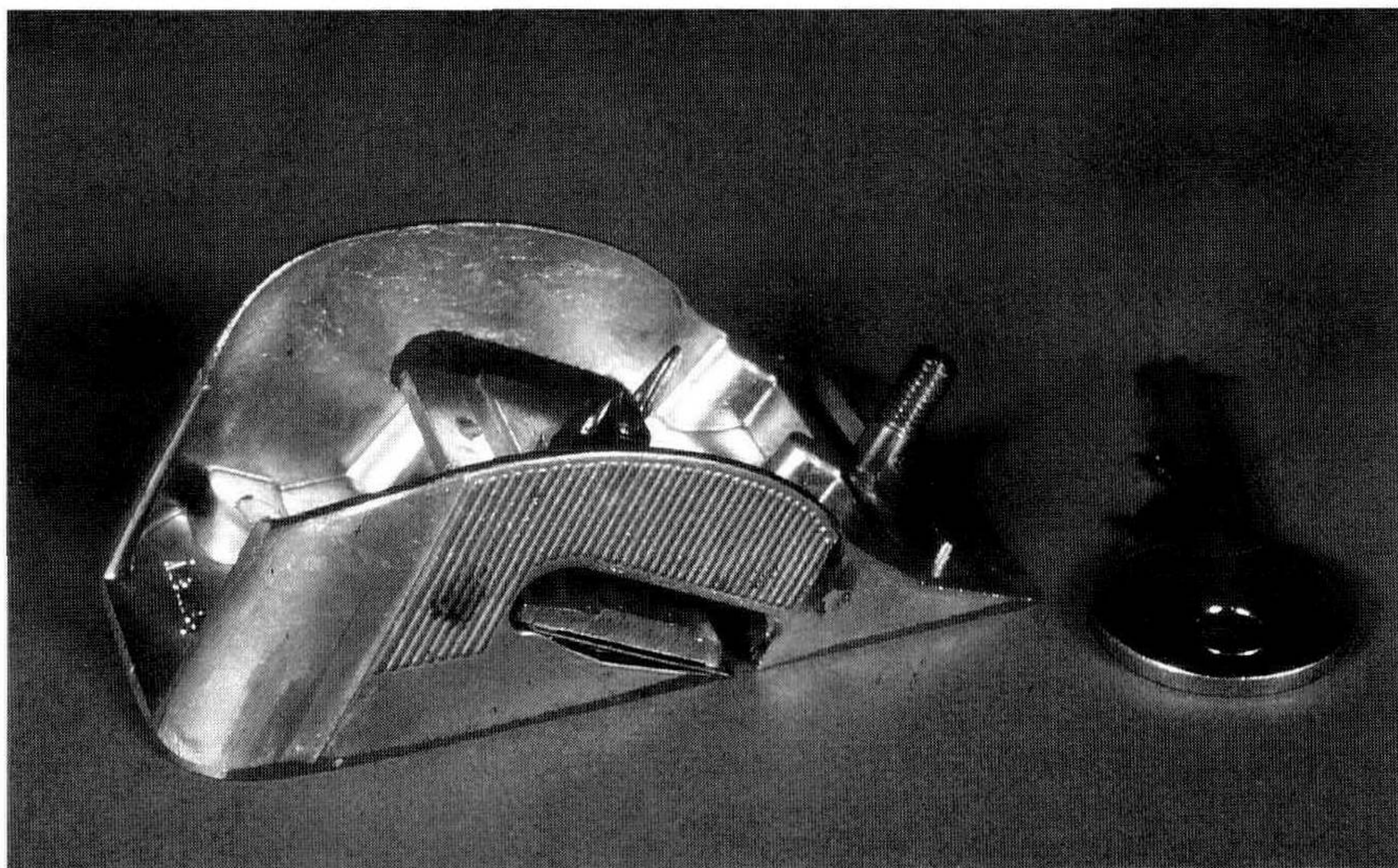


Figure 1. The grafting plane is a small woodworking plane equipped with a disposable heavy duty razor blade. It allows for accurate fitting of scions with thick and hard wood.

HOT CALLUSING

Certain species require high temperatures before the callus formation starts. In particular hazelnuts and walnuts are known for this (Sitton, 1931). When grafting these genera the traditional way it is often found that the scion bursts in spring and dies a couple of weeks later due to lack of cambium contact. At Oregon State University (Corvallis, Oregon, U.S.A.) the hot-callusing technique was developed in the 1970s. The idea is to give heat to the graft union while keeping the root and top quiescent (Lagerstedt, 1981). In practice this is done by placing the graft union over a thermostatically controlled hot water pipe and keeping the union insulated from the winter cold with a suitable material. In this way a union is formed while keeping the root and top quiescent and there are no problems with bud burst prior to the formation of a proper union.

PARAFILM

Parafilm is a transparent wax film which for a long time has been used in laboratories for sealing of glass and other items, but recently a grafting film of the same material has become available. The film is prepared for cutting into suitable lengths. Parafilm can be stretched 6 to 8 times its own length and then becomes self adhesive; combining the need for tying and sealing. It is, however, still necessary to seal the cut top of the scion which can also be done with a small piece of Parafilm. See Beineke (1978) for a presentation of the product.

SUMMER GRAFTING

Species that are difficult to graft by conventional winter grafting can sometimes be grafted successfully during the growth period. The scions are either cold-stored wood from last year, which is the easiest material to work with, or alternatively shoots from present years growth can be used. The latter is called green grafting. As the evaporation during the growth season is larger than in the wintertime it is necessary to protect the union with a polythene bag, which should be white in order to avoid excessive solar heating. When the scions start to grow the outer corners of the bag are cut in order to harden the shoots. After another week the entire bag is removed. It is important that this happens before the first leaves are fully unfolded as they otherwise will be burned by the sun. The method has been successfully used for the grafting of *Juglans* and *Quercus* species. If the grafting is done on potted rootstocks in a greenhouse the callus formation is very fast and can sometimes be seen after 4 to 6 days.

SEED GRAFTING

Seed grafting, also called nurse-seed grafting, is a grafting method in which extra small scions are inserted on the sprouts from germinating seeds (Jaynes, 1965). This way the grafting process has some in vitro resemblance as everything is very tiny and all the cuts are done with a razor blade. The advantage of this method is that the time for cultivation of the rootstock is shortened and sometimes it is possible to produce a grafted tree in the same time as just the production time of the rootstock for normal grafting. Naturally the method is only applicable for species with large seeds and seed sprouts, e.g., *Aesculus* which is ideal to start with. Other genera that have been propagated using this method includes: *Quercus*, *Juglans*, *Corylus*, *Castanea*, and *Ginkgo*. In China the method has been used on a semicommercial

scale for the propagation of walnut trees (Li and Tang, 1990). The small scions were obtained by stimulating the scion trees to form numerous side shoots using defoliation and hormone treatments. In other places the method is used to some extent by hobbyists and it does not seem to have relevance in Danish nurseries where none of the species are of economic significance in grafting.

CHIP BUDDING

Several decades back British trials showed us that chip budding when used correctly is superior to T-budding. Chip-budded trees have a higher growth rate and more laterals than T-budded trees (Howard, 1977). The reason for this is faster cambial contact during the healing process. For various reasons, however, the method has never become standard in Denmark where T-budding continues to be most widely used. My own experience is that difficult-to-bud species should be budded early in the season where the formation of callus is fastest. Trees budded later than 1 Aug. have a tendency to lose the chip over winter. This does not apply for the easy-to-bud genera mentioned above, where even chip budding in the beginning of September can yield satisfactory results.

CONCLUSION

Grafting is an ancient propagation method which is thought to have originated in China more than 3000 years ago. It is significant in the evolution of the different grafting techniques that the most progress has occurred as a result of individual experimentation and testing of new methods. Comparatively little genuine research has been conducted in the area. As several of the problems in grafting still remain to be solved it is hoped that the creativeness and the experiments will continue in the future.

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