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Grafting on Roots

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INTRODUCTION

Root pieces have a number of advantages over regular understocks. They are among others things, readily available when harvesting nursery stock, can be dug from original plants, are compatible with plants from which they originate, and prevent abnormal growth habits that can occur with seedlings. The disadvantage is, root pieces that can be used as root cuttings will generally produce shoots if used, but are the only choice for grafting of taxa that can not be produced any other way.

Root pieces are harvested when plants have ripened sufficiently so that they could be dug bare-root. After harvesting, roots should be packed in moisture-retentive material and stored at 0C. They could be cut into pieces at this time to facilitate accurate counts. At no time should roots be permitted to dry.

Size of root pieces optimally should be from 6 to 15 mm thick, their length can be between 10 and 20 cm depending on the pot size if they need to be potted. Branched roots are best. Roots that need added temperature to heal are potted and placed into a grafting case 3 to 4 weeks before grafting is to commence—temperature should be 18 to 20C. This procedure promotes heavy rooting. Roots that do not need heat are taken directly from cold storage and grafted and waxed. Grafting for either method is by a side graft. Scions should be from one to five buds in length depending on the particular plant. Rubber grafting strips are used to tie the grafts. If heat is required the grafts are placed back into the grafting case with the unions covered by a moisture-retentive material. The case can stay closed until callusing commences—usually between 4 to 6 weeks. Top growth will also have started by this time and the plants need to be hardened gradually with the temperature not exceeding 20C. After the plants have fully hardened, the grafting strips are removed and the grafts are planted into larger pots or grown on in open ground. It is important that the root part of the graft is covered when planting.

OBSERVATIONS AND TRIALS

Observations and trials, that I have made with plants grafted on roots.

***Aralia elata* 'Variegata'**. This plant is a bud sport and in my experience it can not be rooted. Graft this cultivar on *A. elata* roots in winter, pot, and keep at 20C. In addition it is possible to wax the grafts and keep cool until field planting. There is less suckering if grafts are planted deep and in a heavy soil. A patch bud should be used.

***Corylus avellana* 'Contorta'**. This cultivar can be grafted in winter on *C. colurna* to prevent suckering, potted, and kept at 20C or wax after grafting, coldstored, and planted out in spring. The scion should contain two to three buds.

***Malus* species and Cultivars.** While *Malus* can be produced by cuttings and tissue culture the majority of plants are still produced by budding or grafting on seedling rootstock. This practice while economical for the producer does not provide the consumer with the best product. Such grafted plants will generally sucker from the understock usually because the plant grafted is less vigorous. If grafting is practiced on own roots a considerable amount of aftercare is avoided. Root grafts with *Malus* can either be given a warm period during callus development, or waxed and then cold store.

***Paeonia suffruticosa*.** Cultivars are grafted in August as soon as buds are fully developed. Use one bud scions with the leaf removed except for a short piece of the petiole and graft on *P. lactiflora* cultivar roots. Heel the grafts into a sand and perlite medium in a closed case—the buds should be covered, and the temperature maintained between 20 and 24C. After healing, cold store until spring and pot or plant out. Using peat as covering material will cause rotting of the scion bark.

Grafting Oaks. A side graft with well-ripened scions of three to five buds is made and then potted and placed into a grafting case. Oaks heal well with temperatures of 20 to 24C. As soon as the grafts are healed they should be hardened off. The emerging leaves are very sensitive to moisture and care should be taken to prevent rotting. After the grafts are well healed, they can be repotted or planted out after danger of frost is over.

- **White Oak Group.** *Quercus robur*, *Q. alba*, and *Q. macrocarpa* seem to be quite compatible within the species and even on *Q. robur*. *Quercus robur* f. *fastigiata* does not always show the characteristics of the original plant. Instead of the normal tight columnar growth a more open wavy growth is exhibited when grafted on some seedlings of *Q. robur*. By using roots from the typical grafted form I believe that this growth deformity can be avoided.
- **Red Oak Group.** Since my trials only involved roots from either the original tree or plants that were successfully grafted, I had no problems with graft take. However, there is a problem with graft incompatibility when grafting on seedlings.

Santamour (1992) in one of his papers to this society states that there are three lignin-enzyme groups that are only compatible with each other. Unless the understock and scion are of the same group, failure of the graft will eventually occur.

I believe that by using the original tree root or roots from a successful graft this problem can be avoided and no typing of plants needs to be carried out.

With *Q. rubra*, while there are few if any growth variations propagated, there is considerable interest in the forestry industry to produce superior seed trees. Root grafting works well with this species.

Quercus palustris has a number of growth habit variations and some have been patented, but they have not been listed for sale for a while. I wrote to Bill Flemer at Princeton Nurseries on this subject and he replied that they used to bud the *Q. palustris* cultivars 'Sovereign' from Cole's Nurseries and 'Crownright' a selection of their own. Good stands were obtained when budding in August. Later 15% of 'Sovereign' and 10% of 'Crownright' showed incompatibility with overgrowth on the graft union.

A new cultivar 'Green Pillar' has so far not shown incompatibility problems. My trials with 'Sovereign' using roots from a successful grafted plant worked well when grafted onto each other.

CONCLUSION

I hope that this paper gives you a practical approach, grafting on roots, for the propagation of some difficult-to-propagate plants.

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