

## Winter Bench Grafting of Walnut Varieties

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Walnut (*Juglans regia*) is regarded as difficult to propagate, needing more heat for callus formation and healing than easier species. In Hungary it cannot be propagated by chip- or T-budding, or by outdoor whip or cleft grafting in the spring. This paper describes trials using bench grafting. One- and two-year old seedlings of *J. regia* were used as rootstocks. They were lifted in late autumn and cold stored until grafting time. Scions of the local clones 'Alsoszentivani 117', 'Milotai 10', and 'Tiszacsecsi 83' were collected before grafting and were cut to one-bud sections. Whip grafts were made by hand in February and March 1994. The grafts were forced for 2 to 3 weeks, until an unbroken ring of callus was formed at the point of graft union then moved to cold storage and planted into the open ground at the end of April. Success rate was 70.5% for 'Alsoszentivani 117' and 91.5 % of the trees of this clone were in size category 1.5 m+.

### INTRODUCTION

Walnut (*Juglans regia* L.) is one of the difficult-to-propagate plants. In the Hungarian climate it cannot be propagated by such common methods as chip- or T-budding in summer, or outdoor whip or cleft grafting in the spring. It needs extra heat for callus formation and healing. The high level of phenolic compounds in the tissue may also prevent healing of graft or bud unions in some periods (Karadeniz et al., 1995).

In Hungary, the propagation of selected walnut cultivars was started in the 1950s. Porpaczky enhanced the method of greenhouse grafting which was originally developed by German nurserymen. He grafted potted seedlings in early spring after the plants had started into leaf. The grafted plants were kept at 26 to 30C and at high humidity and were transplanted to the open ground in May.

In the 1960s and 1970s, Szentivanyi adapted the method of patch budding, using a bud with a 1 cm × 2 cm bark piece budded onto the rootstock (Szentivanyi, 1974). Optimum time for patch budding is end of July to early August. This method remained the principal method of walnut propagation for some time but since cold and rainy weather after budding reduce the success rate (the rate varies between 10% and 70%, depending on the year) few nurseries use the method today.

An alternative is by woody ring graft in May. A dormant bud with a ring of bark is removed from the lower part of a leafing shoot. The bark of the rootstock is removed and the scion bud with the bark ring is pulled on until it fits tight. It gives good results for small quantities but is fairly slow to do. Green grafts in any season and stage of woodiness give poor results.

To find a more effective method we tried winter bench grafting which was developed by Duhan (1958, 1960) in Austria and Curkan (1975) in Moldavia. We adapted and somewhat modified their method and we have been using it for years.

## MATERIAL AND METHODS

One- and two-year-old seedlings of *J. regia* were used as rootstocks. Optimum diameter is 12 to 22 mm. They were lifted in late autumn and cold stored until grafting time. The tap root was cut to 20 cm, the side roots to 2 cm. Scionwood, collected from a stock plantation, was cut into one-bud sections. Scions were the main Hungarian clones, 'Alsoszentivani 117', 'Milotai 10', and 'Tiszacsecsi 83'.

Whip grafts were made by hand in February and March 1994. The tip of the scion was dipped into wax and the cut part of the roots into 1 : 10 v/v mixture of the fungicide Kaptan and talc. Completed grafts were put into wooden boxes and covered completely by damp sawdust. No tying was applied. The boxes were moved to a forcing room with 26 to 28C temperature and 80% to 90% humidity. The grafts were kept there until an unbroken ring of callus was formed at the point of graft union. After callusing, grafts were moved to cold storage and stored at 1 to 3C. Altogether 9821 grafts were made—1592 to 4237 pieces of each cultivar.

Grafts were planted to the open ground at the end of April. Spacing was 1.5 m × 0.3 m. Before transplanting, etiolated rootstock sprouts were removed. Only grafts with strong callus formation were planted out. Grafts were completely molded up with earth to protect them against drying out and late frosts. Weed control, spraying, elimination of rootstock sprouts, and irrigation were done as necessary. In the second year bamboo stakes were needed to prevent wind damage.

Trees were graded to less than 1 m, 1.0 to 1.5 m, and 1.5 m+ size categories. Trees under 1 m were considered unmarketable. The data were collected in the commercial nursery of the Fruit Research Institute in Erd, Central Hungary, and this technology has been applied for 8 years.

## RESULTS AND DISCUSSION

During callusing, the newly formed callus appeared after 7 to 10 days. After 3 weeks a complete ring was formed at the graft union. An even 26 to 28C is important for callus formation—lower or higher temperatures inhibit healing. Plants grew 0.2 to 0.6 m in the first year and reached 0.8 to 2.2 m tall in the second year.

**Table 1.** Results of winter bench grafting of three walnut cultivars.

Scion cultivar	Success rate (%)	Percentage of trees in size category	
		100-150 cm	150 cm+
Alsoszentivani 117	70.5	8.5	91.5
Milotai 10	59.9	34.2	65.8
Tiszacsecsi 83	65.8	26.4	73.6
Average	65.4	21.0	79.0

Table 1 shows the results of propagation season 1994/95. The success rate is derived from the number of trees larger than 1 m compared to the number of grafts made. These data are similar to the previous years' results and confirm our earlier

experience that 'Alsoszentivani 117' is the most, and 'Milotai 10' the least, vigorous clone both in the nursery and orchard.

All the trees make a fibrous root system as they were transplanted once. The grafts can alternatively be planted into 10- or 12-litre containers when, with good care, they reach the same size as in the open ground. Black walnut (*J. nigra*) can be used as an alternative rootstock, but the success rate is about 20% lower than when *J. regia* is used.

Other hardwood species such as *Aesculus*, *Carpinus*, *Castanea*, *Corylus*, *Fagus*, *Quercus*, etc. can also be grafted by winter bench grafting and callusing. *Castanea* and *Corylus* seem to have less demand for heat for good callus formation.

## LITERATURE

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