

## METHODS USED IN CUTTING PROPAGATION OF FOREST TREES IN FINLAND

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SELOSTE:

SUOMEN METSÄPUIDEN PISTOKASLISÄYSMENETELMISTÄ

Cutting propagation of forest trees has recently been done in Finland mainly by the Foundation for Forest Tree Breeding. The aim has been to develop methods which could be used in forest nurseries for large scale production of rooted cuttings. Methods are being developed for tree species which seem to offer possibilities for economically profitable vegetative propagation. Unlike willows and poplars, the most important Finnish tree species unfortunately cannot be rooted in the open nursery without special equipment, but even they have been propagated from cuttings in a small scale.

The most important object in Finland has been Norway spruce (*Picea abies*), the propagation of which has aroused interest

in many other countries, too. A relatively reliable method has been developed for it. The applicability of this method is already experimented in practical nursery scale. Also the propagation methods developed for broadleaved trees can be easily applied in practical scale as soon as there is material for which the vegetative propagation is reasonable. At present rooted cuttings of broadleaved species are produced only in small amounts for the clonal tests of forest tree breeding.

The amounts of cuttings which were attempted to root in a greenhouse under mist irrigation during the year 1977 and the success of rooting is presented by tree species in the following:

Tree species	Attempte to root	Succesfully rooted	Transplanted
Norway spruce .....	150 000	132 000	(88 %)
Larches .....	20 000	16 400	(82 %)
Lodgepole pine .....	4 400	4 000	(89 %)
Birches .....	6 700	6 200	(92 %)
Alders .....	8 300	7 700	(92 %)
Hybrid aspen .....	5 600	4 900	(88 %)

## EQUIPMENT USED IN CUTTING PROPAGATION

The formation of roots is an important phase in cutting propagation, in which precise regulation of growing conditions is needed, especially in the case of the tree species dealt in this connection. Special rooting houses have been constructed for this purpose. They are common plastic greenhouses which are used in seedling production and which are available in different sizes. The houses have ventilation on the roof top, mist irrigation equipment and separate heating systems for the air and the ground. All these are under an automatic control system constructed in Finland. The regulation of illumination has not been necessary. The rooting media is placed either on the ground or on tables with a height of 80 cm.

Plastic greenhouses are useful also in the

raising of mother plants for the production of branches to be cut and in the raising of rooted cuttings after transplanting. For these purposes quite ordinary nursery greenhouses are used. Their use is justified and profitable at least for the production of twigs to be rooted, because twigs produced in greenhouses form roots essentially better than branches of plants grown outdoors.

When rooted cuttings are transplanted in the open nursery, the same equipment is used for the raising of them which is used for the raising of seedlings. Anyhow, special attention should be paid on the efficiency and homogeneity of irrigation immediately after the transplanting.

The methods used for different tree species at present are described in the following.

## CUTTING PROPAGATION OF NORWAY SPRUCE

The twigs to be rooted are collected during autumn or winter and stored at temperature of  $-2^{\circ}$ ... $5^{\circ}$  C. The success and rapidity of rooting has been improved and the clonal amounts of cuttings had been increased by growing the mother plants in a greenhouse. Moreover, the collection of twigs indoors is much easier than in the open, often in bad weather conditions.

Before sticking into the rooting medium the twigs are cut into a length of 7–8 cm. Gravel with a grain size of 4–10 mm is used as the rooting medium. The gravel bed is about 10 cm thick. Spruce takes roots well also on other media, for instance on mineral wool or sphagnum moss. At the rooting phase the density of cuttings is 500–900 twigs/m<sup>2</sup>. The rooting is started in the beginning of March. The temperature of the rooting medium is attempted to be kept in  $20^{\circ}$  C and the temperature of the air  $5^{\circ}$  C lower. The relative air humidity is kept between 90 and 100 %. Slight and brief changes in air temperature and

humidity are not dangerous. Strong and healthy spruce twigs can be rooted without any bottom heating or even without any heating in the mist-irrigated greenhouse. In the case the root formation does not start before the end of April and it takes a longer time than in heated conditions, where roots start to appear in 3 weeks.

Rooted cuttings can be transplanted already in the spring during May–June into nursery beds or pots (eg. Enso-plastic containers). The other possibility is to raise the cuttings on the rooting medium until the autumn. In the case the cuttings must be fertilized continuously, because the gravel does not keep the nutrients in itself. Irrigation can be diminished when the cuttings have rooted. Rooted cuttings can be transplanted in the open nursery onto beds or containers in the late summer since the beginning of August.

Transplanted spruce cuttings grow into a plantable size (height at least 20 cm) in one season in the greenhouse or in two seasons in the open nursery.

## LOGEPOLE PINE

The branches are collected in the winter and stored in a frozen state. Sticking into rooting medium should happen at the same time as with spruce. A mixture of gravel and moss (1:3) in peat pots (Fp-620) or pure gravel as a 10 cm thick layer are used as the rooting media. Hormones IAA and IEK (0.05 % in talc) have been used

to promote rooting with nearly similar results. The conditions in the mist-greenhouse are kept similar as with spruce. The rooting takes about 2 months. Thereafter the cuttings are transplanted in a greenhouse, where they reach the planting size in the course of the following year.

## LARCH

Slightly lignified summer shoots are used as cutting material. Best success is obtained when twigs are taken from richly fertilized mother trees and the rooting is started in the beginning of July. A mixture of gravel and moss in peat pots is used as rooting medium. Hormones IAA and IEK (0.05 % in talc) promote rooting. Similar rooting conditions are maintained in the

greenhouse as in the case of spruce. Rooted cuttings are transplanted with their peat pots either in the open or in the greenhouse immediately in the autumn, or they may be stored outdoors and transplanted in the following spring. After the transplanting the cutting plants need to be grown for one season in order to attain a plantable size.

## BROADLEAVED TREES

Birches (*Betula verrucosa* and *B. pubescens*), alders (*Alnus incana*, *A. glutinosa* and *A. incana x glutinosa*) and hybrid aspen (*Populus tremula x tremuloides*) can be rooted from summer shoots. Mother plants are raised in plastic greenhouses under intensive management. Aspen forms roots best if the twigs are taken from root sprouts, which can be produced by cutting the mother plant into a short stump before the beginning of growing season. The new shoots to be used as cuttings should be forced to develop as early as possible in order to get enough time for the plants to grow after rooting and transplanting. This is most reliably achieved by growing the mother plants in containers and transferring them indoors into warm conditions in the beginning of March.

The twigs with a thickness of 3–7 mm

are cut into 5–10 cm long pieces so that one leaf and 1–2 buds is left on each of them. Such cuttings are very susceptible to drying, so that sufficient moisture is maintained at all stages of their treatment. A mixture of gravel moss in peat pots is used as the rooting medium. IBA is used as the hormone promoting root formation. The roots appear into the cuttings in 15–20 days. Thereafter the cuttings with their peat pots are transplanted into greenhouses. If it is possible to transplant the cuttings in June, in the greenhouse they reach the planting size (60–100 cm) already during the same summer. If transplanting is delayed until late summer, plantable size is not attained until the following summer. In such cases the overwintering of cuttings becomes threatened and the percentage of plantable cuttings certainly is lowered.

## SELOSTE:

### SUOMEN METSÄPUIDEN PISTOKASLISÄYSMENETELMISTÄ

Metsänjalostussäätiössä on kehitelty metsäpuiden pistokastaimien kasvatuserämenetelmiä. Pääpaino on ollut kuusen menetelmissä, mutta myös haapa, koivu, kontorta, lehtikuusi ja leppä on saatu juurtumaan hyvin. Muovihuoneiden käyttö emotaimien kasvatukseen on parantanut onnistumista ratkaisevasti. Juurruttamiseen käytetään huoneita, joissa on automaattinen ilmankostustus ja tuuletus, sekä erillinen lämmitys ilmalle ja alustalle.

Kuusen oksat juurrutetaan sorassa aikaisin keväällä ja koulitaan heti juurtumisen jälkeen paakkualustoihin. Istutuskelpoisia paakkutaimia saadaan 2 vuodessa käyttämällä muovihuonekasvatusta. Juurtuneet oksat on mahdollista koulia avomaalle loppukesästä tai pistämistä seuraavana

keväänä. Tällä menettelyllä kasvatusaika on vuotta pitempi. Kontortan pistokastaimia tehdään samalla tavalla, mutta juurtumista edistetään hormonikäsittelyllä.

Lehtipuiden lisäykseen käytetään kesäoksia, jotka pyritään saamaan pistämiskuntoon mahdollisimman aikaisin keväällä taimien jatkokasvatuksen varmistamiseksi. Juurrutuslupa on soran ja sammalen seos. Hormoneja käytetään. Juurtuneet pistokkaat koulitaan muovihuoneisiin, joissa ne kasvavat istutuskokoon saman kesän aikana.

Lehtikuusi juurrutetaan kesäoksista soran ja sammalen seoksessa hormoneja käyttäen. Taimet saadaan istutuskokoon yhdessä kasvukaudessa koulinnan jälkeen.