



Research Information Note 200

Issued by the Forestry Commission Research Division

VEGETATIVE PROPAGATION OF ASPEN, by M.K. Hollingsworth and W.L. Mason

Abstract

Aspen (*Populus tremula* L.) is a natural component of British woodland and is in increasing demand for conservation and amenity planting. However, plants from native aspen sources are difficult to obtain from nurseries because of the lack of viable seed. Cuttings can be used as an alternative means of producing planting stock. Roots are dug up from mother trees in the forest and placed in a polyhouse to produce suckers. These suckers are excised and rooted under intermittent mist to produce one-year-old planting stock. Although there is considerable clonal variation, rooting percentages are generally high and growth after planting has been good.

Introduction

1. Aspen (*Populus tremula* L.) in Britain occurs on a range of sites. It is commonest in the north and west and more scattered further south (Jobling, 1990). The status of aspen as a native tree and the fact that it is a diminishing species are good reasons for efforts to be made to regenerate it. It is also valuable for wildlife conservation. It supports a large and diverse population of insect species, approximately 140 nationwide, of which in the order to 60 are known to be associated with aspen in Scotland (R. Soutar, Nature Conservancy Council, Edinburgh, personal communication). Because aspen is palatable to red and roe deer it is one of the few broadleaved species listed for planting in clearings for browse by deer (Prior, 1983). Aspen is one of the species recommended for use as part of the Native Pinewoods scheme. It could also form part of the broadleaves planted in other schemes if stocks were more readily available.
2. Unfortunately, the species produces little viable seed in Britain. As a result, most aspen grown in British nurseries are derived from imported seed lots. Regeneration in existing woodlands can take place only from root suckers. Digging up rooted suckers and planting them on a new site is laborious and gives limited multiplication. This Note describes techniques that can be used by nurseries to bulk-up aspen from cuttings from native origins to provide a regular source of supply for conservation plantings. These techniques are broadly based upon those reported by Schier (1978, 1980) and Zufa (1971) for *Populus tremuloides* (Michx.).

Root collection

3. Mother trees are best identified in early autumn before leaf fall. In the absence of tested clonal stock it is desirable to obtain material from local mother trees (clones) of acceptable form and vigour, preferably utilising a mixture of clones. Roots can be collected from these trees in February and March. Location of roots is often indicated by the presence of suckers, but if these are absent then the roots can be found by digging at the base of the stem. These lateral roots are traced and sections with diameters of 1-3 cm are removed. Care must be taken to avoid skinning roots when digging them up. Roots smaller or larger than the stated diameter range tend to produce much fewer adventitious shoots. Convenient lengths of root can either be wrapped in moist hessian or put in polythene bags immediately after collection for transport to the nursery.

Root preparation

4. It is important to wash the roots in order to remove soil and to expose the bark so that any damage can be seen. Areas exhibiting bark stripping, cankers or decay should be removed at this time. Using a sharp knife or secateurs the roots are cut into pieces, the length of which is determined by the size of tray to be used during shoot production. We have found convenient lengths to be either 15 cm or 30 cm when using a tray with internal dimensions of 35 cm x 55 cm x 6 cm. The root segments are treated with a fungicide, e.g. by total immersion in a 0.1% aqueous solution of thiophanate-methyl for 15 minutes.

Sucker production

5. The prepared root segments are laid horizontally in trays on a substrate of sphagnum moss peat:perlite 1:1 by volume and covered to a depth of 2 to 4 times the diameter of the roots. The trays should have good basal drainage. No fertiliser is required. Insertion should take place from early March within a polytunnel or greenhouse where daily temperatures of between 15°C and 25°C can be maintained and nightly temperature not allowed to fall below 10°C. The substrate must be kept moist to avoid the roots drying out. Light watering is necessary although this can be reduced to a minimum by covering the trays in black/white polythene. If the white side is kept uppermost this helps to avoid the substrate overheating in sunny conditions.
6. Sucker emergence starts about 3 weeks after insertion. Both speed of emergence and in particular the number of shoots produced, are very clone dependent. In trials the number of shoots per metre of root varied with clone from nil to 35 with 50% averaging 20 or more (Table 1). Production declines rapidly after 10 weeks and harvesting beyond this period is generally not worthwhile.

Table 1. Variation in shoot production and rooting percentage for a range of aspen clones

Clonal identity number	Location of mother tree	Average number of shoots per metre of root	Rooting percentage
ASP C00014	Drummond Hill	19	75
ASP C00024	Rannoch	28	85
ASP C00030	Tummel	10	95
ASP C00004	Crianlarich	5	67
ASP C00005	Crianlarich	35	73
ASP C00006	Crianlarich	14	89
ASP C00007	Crianlarich	21	95
ASP C00008	Crianlarich	Nil	Nil
ASP C00015	Glenhurich	14	93
ASP C00016	Glenhurich	13	100
ASP C00017	Kintyre	28	18
ASP C00018	Kintyre	8	70
ASP C00019	Loch Awe	12	80
ASP C00020	Loch Awe	2	33
ASP C00025	Rhu	24	58
ASP C00026	Rhu	24	31

(See Samuel and Mason, 1988 for details of nomenclature.)

7. Shoots are harvested when 4 to 10 cm in length and are severed at or just below compost level with a scalpel or very sharp knife; more shoots will emerge from this cut stump as long as it has not been taken right back to the root.

Propagation

8. The normal propagation facility is a polyhouse equipped with mist irrigation and ventilation. If these facilities are not available then a sealed polythene enclosure to maintain humid conditions could be tried as a possible alternative.
9. Shoots are collected in polythene bags and inserted as soon as possible into trays containing an unfertilised mixture of vermiculite:perlite 1:1 by volume to a depth of 1 to 3 cm depending on size of material.
10. Callus formation and subsequent rooting is rapid; rooting can take place as quickly as 7 days but generally takes 2 to 3 weeks. As with sucker production there are large clonal differences, both in time taken to root and rooting percentage (Table 1). Root extension is rapid, therefore the cuttings require to be potted-up as soon as possible. We have found peat:vermiculite 3:1 and peat:bark 1:1 by volume to be suitable potting substrates. Additional basal fertilisers have followed standard prescriptions, e.g. Ficote 70 NPK 16:10:10 incorporated at 1.5 kg per m³, with magnesium limestone at 2.4 kg per m³, ground limestone at 1.2 kg per m³, and fritted trace elements at 0.25 kg per m³. Plants should be transferred to outside growing conditions within a week of potting-up but kept under a shade net until acclimatised. In trials, cuttings potted-on into 2 litre polyliners have attained heights of up to 1 m in the year of propagation. Cuttings can therefore be produced as one-year-old plantable stock.

11. An alternative method to potting-up the cuttings is to insert directly into containers and root as normal under mist. A suitable container size would be around 100-200 cc. Sphagnum moss peat:pine bark:perlite 2:2:1 by volume has proved to be a suitable substrate. Such a rapid rooting species requires nutrition early therefore, the incorporation of a basal fertiliser, e.g. Osmocote Mini-prill NPK 18:3:10 at 1.5 kg per m³ would be advantageous. Weaning should be completed as soon as rooting allows as extended exposure to misting conditions increases the degree of leaf necrosis. It may be necessary to top-dress to attain a particular height requirement, in which case a high N fertiliser could be applied once or twice weekly at around 250 ppm N.

Stock plants

12. Once the initial batch of one-year-old cuttings has been produced, some of these can be used as stock plants for future supplies of either root or shoot cuttings. Any clones showing poor levels of shoot production or rooting ability can be weeded out at this time. The rooted cuttings are planted in the open nursery and grown on as stock plants for at least one year in order to develop a vigorous root system. Annual applications of a general fertiliser are required to maintain soil fertility. If shoot production is required these trees are cut back almost to ground level in late February/early March the following year. Adventitious shoots emerge from the cut stump and these can be harvested as cuttings from late April onwards. All subsequent treatments follow the propagation methods as outlined earlier. Preliminary indications are that rooting success with cuttings from stock plants is similar to that of roots dug up in the forest.

Forest performance

13. Although the data are limited, growth after planting in the forest has been favourable. For example, 25 one-year-old cuttings of clone 1 (ex Tummel) produced in 1988 were planted on a surface water gley in Lothian and Tweed Forest District in spring 1989. Mean height at planting was 40 cm. At the end of the 1990 growing season survival was 100 per cent and the plants had a mean height of 131 cm without the aid of treeshelters.

Costs

14. We have no details of the costs of producing aspen by cuttings, but indications from Sweden are that such plants might cost 4-6 times more than standard conifer stock of seedling origin.

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Issued by:
Technical Publications Officer
Forest Research Station
Alice Holt Lodge
Wrecclesham
Nr Farnham
Surrey GU10 4LH

April 1991

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ISSN 0267 2375

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