

## Storage and Production of Selected Conifers from Hardwood Cuttings

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Many propagators have collected, stored, and rooted *Thuja*, *Taxus*, and *Juniperus* from hardwood cuttings without supplement bottom heat (Bailey, 1967; MacKay, 1962; Wells, 1967). Briefly, cuttings are taken in the fall or winter (Carville, 1979; Rigby, 1981), sealed in polyethylene bags, and stored at 28 to 32F for up to 4 months. They are then removed and stuck in outdoor beds without supplemental heat.

### COLLECTION AND STORAGE OF CUTTINGS

The initial collection of cuttings is conveniently done after two or three frosts (Cross, 1971; Holmes, 1967; Schultz, 1983), but in practice it is best to wait until January or February (Regan and Robesting, 1988). Cuttings can even be taken as late as March provided they have not broken bud and cool weather prevails. It is not entirely necessary for conifer cuttings to be exposed to hard frosts (Shugart, 1989). Experience has shown that if a period of cold night temperatures between 35 and 40 precedes the taking of cuttings by 5 to 10 days, the cold requirement can be met. Extended storage of cuttings between 28 and 32F also will probably supply the necessary cold conditions to allow for satisfactory rooting and subsequent bud break (Miller, 1982; Rigby, 1981).

The techniques outlined here apply to most *Thuja* species, *J. virginiana* such as 'Hetzii Glauca', and cultivars of *T. × media*, such as 'Densiformis' or 'Wardii'. In the case of *Thuja* and *Juniperus* wood is selected so that at least ½ in. of the basal end is from 2-yr or older wood. Newly hardened previous-season's growth is normally avoided. The reason for selecting 2-yr wood is the presence of preformed root initials, which can often give rise to adequate rooting without extensive efforts. *Taxus* cuttings do not share this attribute, but in general the thicker the cutting the more likely the stored food reserves are to be adequate for rooting.

Cuttings are collected from field-grown plants, cut to 6 to 8 in., and placed loosely in polyethylene bags, as outlined by Behrens (1984). Once the bags are full, they are sealed and placed in cold storage (Bailey, 1967; Cross, 1971; Rigby, 1981) and held between 28 and 32F. No supplemental water is added to the sealed bags in order to avoid the possibility of botrytis or other types of mold formation (Behrens, 1984; Cross, 1971). Cuttings remain in the bags from January to April (Thomsen, 1978; Wells, 1967). Miller's work (Miller, 1982) with Fraser fir showed that chilling requirements for rooting could be met in 6 to 10 weeks under these conditions.

### STICKING CUTTINGS

The stored cuttings are removed from the cooler and allowed to warm to room temperature. It is not good to begin work immediately handling cold cuttings. Once the cuttings have warmed and become flexible, they are trimmed lightly, wounded 1/2 in. on two sides, and treated with rooting chemicals. Wounding accelerates cell division that leads to rooting and also increases the surface area

for the adsorption of the root-inducing chemical. Studebaker (Studebaker et al., 1988) indicated that wounding definitely contributes to the rooting of *taxus*. Once properly prepared the cuttings are stuck directly into pots.

The pots are filled with a 1 sand : 1 peat (v/v) mixture or in some cases such as *Taxus baccata* 9 sand : 1 peat (v/v). It is always advisable to have at least 10% peat in a rooting medium but it is also prudent not to exceed 50% as too much moisture will interfere with the rooting process. Most conifers will root best when the soil is kept towards the dry side (Carville, 1979; Regan, 1988). Conifer cuttings rooted in pure sand usually have large brittle roots that break easily when transplanted. In a peat and sand mix a much finer and more branched root system develops.

### CULTURAL CONDITIONS

Full trays of cuttings are placed out of doors (Studebaker et al., 1988; Wells, 1967) directly upon gravel beds or on pallets, which ensures constant drainage. The cuttings are normally exposed to the full sun and watered for 10 to 15 min daily. The water is set to come on during the warmest part of the day. No water should remain on the foliage during the night as this could give rise to disease problems.

Cuttings are left in this environment till they are rooted. In the Philadelphia area this is usually mid-June to July. The warmer the weather, the faster the rooting. Previous work has shown that a cold medium that warms up gradually benefits the rooting process (Davis, 1988; Thomsen, 1988). It is not unusual for the cuttings to break dormancy and put on some growth during the rooting period or before they start to root. This does not seem to interfere with the rooting nor does it appear to harm the cuttings even though they may yellow and look chlorotic. Once the cuttings are rooted, they can be fertilized lightly with 75 to 100 ppm N from a balanced fertilizer. The intent is to reestablish the nutritional balance of the cuttings, not to give rise to large amounts of new growth. The cuttings will root enough by August to plant out or pot.

### SUMMARY OF TECHNIQUE

- Cuttings are taken from January to March, preferably after a period of cold.
- Cuttings are collect from field-grown plants and placed in polyethylene bags.
- Cuttings are removed and processed around mid-April. They are trimmed, wounded, treated with hormone, and stuck.
- Cuttings are direct stuck in containers in peat/sand.
- Trays of cuttings are placed on pallets or gravel to provide adequate drainage. They are watered twice daily, 10 to 15 min each time.
- Cuttings are fully rooted by mid-June to July.

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