

Plant Propagation Laboratory Introduction and Exercise

Module 3

Propagation of Woody Plants

A. Types of Woody Stem Cuttings

Many woody plants can be propagated by hardwood, semi-hardwood or softwood stem cuttings. Some plants can be propagated by more than one type of cutting and others by only one type (often only with proper timing, use of root-promoting compounds, and very precise environmental conditions during rooting). Some plants may be impossible to propagate by stem cuttings.

1. Hardwood cuttings

A hardwood cutting is one which is taken from a completely mature stem (wood is firm). The plant is generally fully dormant with no obvious sign of active growth (usually in late fall, winter, or early spring). Hardwood cuttings are most often used in propagation of deciduous woody species although some broad-leaved evergreens can be propagated by hardwood cuttings.

a. Deciduous hardwood cuttings

Hardwood cuttings of deciduous species are considered the least expensive and easiest method of vegetative propagation since little to no special equipment is necessary to prepare them. Hardwood cuttings are easily stored or shipped with minimal preparation to prevent desiccation. Hardwood cuttings vary in length from 4 to 30 inches and at least two nodes are included with the basal cut usually just below a node. In some instances basal wounding may be beneficial in inducing rooting.

b. Narrow-leaved evergreen hardwood cuttings

Narrow-leaved evergreen hardwood cuttings are best taken between late fall and late winter. These cuttings are more perishable than deciduous hardwood cuttings and will desiccate quickly if not handled properly. There is considerable variability among genera in regard to the ease of rooting with this type of cutting. Results may be improved by selecting a particular type of wood to use in making the cutting. Cuttings are usually 4 to 8 inches in length but some propagators will use cuttings that are 2 to 4 inches in length. Mature terminal shoots of the previous season's growth are usually used and the leaves are removed from the portion of the cutting stuck in the rooting substrate. In some instances basal wounding may be beneficial in inducing rooting.

c. Specialized hardwood stem cuttings

In addition to classifying hardwood stem cuttings on the basis of the type of plant from which they are collected we also classify stem cuttings based on the age of the wood. Cuttings may contain tissues that represent wood from more than one growing season.

Plant Propagation Laboratory Introduction and Exercise

Module 3

1. Heal cutting

A heal cutting will include a small piece of stem with the older wood (previous seasons growth) intact.

2. Mallet cutting

A mallet cutting will contain a short section of stem of the older wood. You can think of this as a node of mature wood (previous seasons growth) with a branch of current seasons growth intact.

3. Straight cutting

A straight cutting does not include older wood and is the type of hardwood cutting that is most commonly used.

2. Semi-hardwood cuttings

Semi-hardwood cuttings are generally made from woody, broad-leaved evergreen species. These cuttings are usually prepared from partially-matured wood of current season's growth a short while after a flush of growth. Thus, the timing of this type of cutting ranges from summer into fall, depending on the species and climatic conditions. These cuttings may range in length from 3 to 6 inches and the leaves are removed from the lower portions that will be inserted into the propagation substrate. These cuttings are more perishable than hardwood cuttings and will desiccate quickly if not handled properly. Species with large leaves may require a trimming of the leaves to reduce the large leaf surface, which reduces transpirational water loss and allows for closer spacing of cuttings.

3. Softwood (greenwood) cuttings

Softwood (greenwood) cuttings are prepared from the soft, succulent, new growth of woody plants before it begins to harden. This type of growth is normally found in the spring, but material of this nature is also available from plants that grow throughout the warm season or have late flushes of growth for various reasons. Softwood cuttings of some species root easier and quicker than other cutting types, but require more attention and equipment because the leaves are left intact. The best cutting material has some degree of flexibility, but is mature enough to break when bent sharply. Weak, thin, interior shoots and vigorous, abnormally thick or heavy shoots should be avoided. These cuttings are generally 3 to 5 inches in length and consist of at least two nodes. Lower leaves are removed and large leaves may be trimmed. All flowers or buds should be removed and in some cases the terminals should be removed to reduce the potential for desiccation since these young expanding tissues have little or no cuticle formation to reduce water loss through processes of evapotranspiration.

Plant Propagation Laboratory Introduction and Exercise

Module 3

B. Wounding

Basal wounding is beneficial in rooting cuttings of many species, especially cuttings with older wood at the base. This response is related to several physiological and mechanical factors.

1. Physiological factors

Physiological factors include changes such as a natural accumulation of auxins, ethylene and carbohydrates in the wounded area that will stimulate cell division resulting in the formation of callus and root primordia along the margins of the wound.

2. Mechanical factors

Mechanical factors include an increase in the surface area through which water or auxins may be absorbed and a mechanical separation of the layer of sclerenchyma tissues (fiber cells) present in some species, which acts as a physical barrier through which developing root primordia cannot penetrate.

3. Light wounding

Light wounds can be produced in cuttings of narrow-leaved evergreens species in the process of *stripping* off the lower side branches of the cuttings. Light wounding is also achieved by making a vertical cut down the side of a cutting on the basal end approximately 1 to 2 inches in length. This cut would penetrate through the bark and into the wood.

4. Heavy wounding

Heavy wounds can be produced in cuttings by removing a small strip of bark on two sides of a cutting on the basal end approximately 1 to 2 inches in length. This cut would penetrate through the bark and into the wood. Heavy wounding can also be achieved by splitting the basal end approximately 1 to 2 inches in length. This cut would penetrate the bark and wood.

C. Sample Laboratory Experiments

The following laboratory experiments will introduce you to the general procedures of propagating various woody plants from stem cuttings. The plant species you will be working with exhibit varying rooting capacity.

Plant Propagation Laboratory Introduction and Exercise

Module 3

Effects of Wounding With and Without Subsequent Auxin Treatment on the Rooting of Woody Stem Cuttings.

Prepare 24 uniform cuttings of one cultivar or species. Divide them into groups of 6 cuttings each. Make the cuttings of comparable length and stem diameter if possible. One group of 6 should be labeled "nontreated" and should be placed in the propagating bench following preparation. Designate the second group of 6 as "IBA-treated". Quickly dip the basal 3/4" of each cutting into a 5000 ppm IBA solution and then place them in the rooting bed. Label the third group "wounded" and administer a light or heavy wound to the bottom 1 to 1/2" of the cuttings on two sides of the stem before placing them in the rooting bed. The last group should be labeled "wounded + IBA" and should be wounded as above and given a quick IBA dip before being placed in the rooting bed. All cuttings will be evaluated after several weeks and the number of cuttings rooted, number of roots per cutting, and mean root length recorded.

Effect of cutting type on the rooting of narrow-leaved evergreen cuttings.

You will need to prepare a total of 18 cuttings representing 3 types of cuttings. The cuttings should represent the 3 types of hardwood cuttings described previously. Make the cuttings of comparable length if possible. One group of 6 should be labeled "Straight" and should be taken from shoot tips, the second group of 6 should be labeled as "Heel" and prepare them with a small portion of older wood intact, and label the third group "Mallet" prepare them with a portion of the node (older wood) intact. All cuttings should be given a 10 second IBA dip before being placed in the rooting bed. All cuttings will be evaluated after several weeks and the number of cuttings rooted, number of roots per cutting, and mean root length recorded.

For each experiment, calculate the percentage of rooted cuttings, mean root number and mean root length within each treatment. Also calculate a root index (root length X root number) to estimate the total root length per cutting. Discuss the differences in rooting among the various treatments within each experiment.