Propagation of Woody Ornamentals by Cuttings

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Cuttings are probably the most important method for starting new plants. A cutting is any detached plant part which, under favorable conditions for regeneration, will produce a new plant identical to the parent plant.

Several types of cuttings can be made and are classified as follows: Stem cuttings (softwood, semi-hardwood, and hardwood); leaf-bud cuttings; and root cuttings.

Many plants can be propagated with good results by several cutting types. The type selected depends upon the propagator's circumstances, the time of year, and the plant to be propagated.

STEM CUTTINGS

Stem cuttings are the most important type. They are classified into several groups according to maturity or age of wood. To propagate by stem cuttings, segments of shoots containing buds are taken and used to produce new and independent plants.

Softwood Cuttings

Softwood stem cuttings are taken from woody plants when growth is still relatively soft and succulent before tissues have matured and lignified, or become woody, usually 3 to 4 weeks after a new flush of growth. Many ornamental plants can be started by softwood cuttings. Among them are crape myrtle, magnolia, pyracantha, oleander, azalea, jasmine and boxwood.

Softwood cuttings usually root easier and faster than other types of stem cuttings, taking 5 to 8 weeks. An important factor in making this type cuttings is obtaining wood of the proper age. Extremely fast growing, soft and tender shoots are not desirable, because they often will deteriorate before rooting. On the other hand, old woody stems are very slow to root. The best cutting material is flexible, but mature enough to break when bent sharply. The snap or turgidity test is a quick way to determine if the material possesses proper maturity for successful rooting. Bend the stem between thumb and forefinger; if it snaps, tissues are in prime condition for rooting. However, the break must be clean, and not merely a bending of the stem.
Semi-Hardwood Cuttings

A semi-hardwood cutting differs from a softwood cutting only in maturity of the wood. This type cutting generally is collected from deciduous plants later in the growing season when the lower portion of the cutting has become lignified or partially matured. Semi-hardwood cuttings of evergreen species generally are taken from new shoots 6 to 9 weeks after a flush of growth when the wood is partially matured. This can be any time from mid-spring months to the end of the growing season, which may be mid-fall in Florida. Many ornamental plants, such as camellia, pittosporum, some hollies and junipers are commonly propagated by this type of cutting.

Hardwood Cuttings

Narrow-Leaved Evergreens. Not all narrow-leaved evergreens root at the same rate, nor do all propagate readily from cuttings. In general, a low-growing *Juniperus* species roots easily, while upright junipers are more difficult to root. Narrow-leaved evergreen cuttings can be taken successfully throughout much of the year but are best taken between late summer and late winter.

Mature terminal shoots of the current season's growth are usually used. Easier rooting has also been associated with cuttings taken from the lower halves of mature plants. In some instances, such as with *Juniperus chinensis pfitzeriana* older and heavier wood can also be used, resulting in a larger plant when it is rooted.

Deciduous. Deciduous hardwood cuttings are taken in the dormant season when tissues are fully matured or lignified through their entire length and when leaves have dropped. Common ornamental shrubs in Florida started by hardwood cuttings are wisteria, spirea, caliandra, crape myrtle and multiflora rose. In Florida these cuttings can be planted in the propagating medium immediately after harvesting. They should be planted upright with the top 2 to 3 buds above the medium. Cuttings of some plants can be taken during the dormant period and stored at 5° C or 40° F until spring.

LEAF-BUD CUTTINGS

The leaf-bud cutting method of propagation is particularly valuable when source material is scarce, because it produces at least twice as many new plants from the same amount of stock material as can be started by stem cuttings. Actually, each node can be used as a cutting. This cutting, which should be taken in the spring from shoots that are partially matured, consists of a leaf blade plus a short piece of the stem (1 to 11/2 inches) with the attached axillary bud. Cut the stem section about 1/2 to 1 inch above and below the point of leaf attachment. Place the bud in the rooting medium vertically and lightly cover (1/4 inch) so that only the leaf blade can be seen. This method of propagation has been successful with certain varieties of azaleas, bougainvilleas, camellias, crotons and hibiscus.

ROOT CUTTINGS

Root cuttings are not often used as an important method of propagation in Florida, but there are many plants which could be propagated by this method such as plumbago, bayberry, wisteria, some rose species, oak-leaf hydrangea, clerodendrum and yucca. Best results from root cuttings are likely if cuttings are taken in late winter or early spring from 2 to 3 year old stock plants. The period in the spring when plants are actively growing should be avoided.

The procedure for propagation by root cuttings is simple: Cut roots into short lengths 2 to 6 inches long, lay horizontally in the rooting medium and cover with 1/2 inch of medium. They may also be placed upright with the end of the root closest to the stem at the top. Roots 1/4 to 1/2 inches in diameter give the best cuttings.

Root cuttings can be treated similarly to deciduous hardwood cuttings. Cuttings can be taken in fall and stored at 5° C until spring or they can be planted immediately.

STOCK PLANTS

Other than exceptions mentioned for narrow-leaved evergreens, cuttings taken from outside branches of relatively young plants root more readily than those taken from older plants of the same...
species. Cuttings should be taken from healthy, vigorous, stock plants growing in ample light or full sunlight, depending upon the species. The wood selected should not be from extremely rank growth with abnormally long internodes or from small, weak growing interior branches. Cuttings taken from stock plants growing under good management conditions are capable of more rapid root production than cuttings from poorly-maintained stock plants. Heading or cutting back the main shoots will usually force out numerous lateral branches from which cuttings can be made.

**TAKING STEM CUTTINGS**

After the wood has been selected, section the shoot into cuttings of desirable length. Cuttings can be divided into two types: terminal or tip cuttings and subterminal or basal cuttings (Fig. 1). Tip cuttings will generally root faster and produce more uniform root systems due to age of material. Tip cuttings are made by taking the terminal 5 to 6 inches of the shoot with three or more nodes. The cut should be made just below a node.

Basal cuttings are made by taking 4 to 6 inch sections of the stem below the terminal portion. Some nurserymen prefer to use smaller cuttings only 3 to 4 inches in length and have obtained satisfactory rooting responses. This may be necessary when cutting material is limited, but is not the recommended practice for most plants because the reduced leaf area could reduce rooting rate and percentage.

To encourage branching some growers also remove the tip (the top 1 inch) of terminal cuttings. This again is a specialized practice rather than a rule.

**Treatment of Leaves on Cuttings**

Leaves are usually stripped from the lower third of the cutting before sticking it into the rooting medium 1 to 1 1/2 inches, or about one-third the total length of the cuttings (Fig. 2). Depth of sticking cuttings is important but often overlooked by propagators. Because root initiation and growth require adequate oxygen, cuttings must be inserted into the medium at the proper depth.

Some nurserymen reduce leaf size on cuttings to reduce water loss. However, retention of maximum leaf area will produce a stronger root system in a shorter period. If the upper leaves are extremely large—as on southern magnolia, some crotons and hibiscus—they can be reduced in size by about one-third to allow closer spacing in the propagating bed or they can be bunched and secured in an upright position. This practice also allows better mist coverage, more light and may reduce diseases. As a general rule, however, maximum leaf area should still be retained.

All flower buds should be removed because they can hinder rooting of many species.

Rapid handling of cuttings after removal from the stock plants is important. Cuttings should be taken in the early morning when stems are turgid and kept in clean, moist conditions and out of the sun at all times until stuck. Cuttings should be as uniform as possible so that all material will be equally exposed in the propagating container. Soaking of cuttings in water to keep them fresh is undesirable.

**Hardwood Procedures Differ**

Procedures for taking hardwood cuttings (deciduous species) differs from those for other types of stem cuttings. These cuttings can vary in length...
from 4 to 20 inches with at least two nodes included in the cutting. The basal cut is usually just below a node and the top cut 1/2 to 1 inch above a node. The diameter of cuttings may range from 1/4 to 1 inch depending upon the species. Where it is difficult to distinguish between the top and base of the cuttings, it is advisable to make all basal cuts at a 45° angle and the top cuts at right angles.

Three types of hardwood cuttings (deciduous and evergreen) can be prepared—the "mallet," the "heel" and the "simple or straight" cutting.

The mallet cutting, used occasionally for propagating some junipers, contains a 1/2 to 1-inch section of 2-year wood.

The heel cutting, used with arborvitae, is made by stripping laterals from a main stem, each cutting containing a small piece of 2-year wood. It is difficult to find enough wood to make mallet and heel cuttings on a commercial scale.

The straight or simple cut consisting of the current season's wood is the only one of commercial importance.

There are several methods commonly used for handling hardwood cuttings before planting. In Florida, cuttings taken in the dormant season should be bundled and stored during the callusing period in boxes of moist sand or peat moss in either an unheated building or out-of-doors. After cuttings have callused and dormancy is satisfied, they may be potted. As previously mentioned these cuttings can also be planted in the propagating medium immediately after harvesting.

**WOUNDING**

Cuttings of juniper, arborvitae, maple, magnolia, some holly species and cuttings from older wood are reported to be helped by basal wounding. There are several ways to make wounds on cuttings. Cuttings of junipers, for example, may be wounded simply by stripping off the lower side branches. Or a vertical cut with the tip of a sharp knife down the basal side of each cutting for about an inch will produce a wound. The cut should not be too deep, but the cambium should be exposed. After wounding treatment of cuttings with a root-promoting compound may facilitate rooting.

Wounding may produce varying results, depending upon the propagator. While some growers find it beneficial others do not.

**HORMONES**

The purpose of treating cuttings with "hormones" is to increase the rooting percentage of cuttings, to hasten root initiation, to increase the number of roots per cutting and to increase uniformity of roots produced.

Results from the use of rooting hormones are variable, and the range between promoting and inhibiting effects are narrow. Improved results can be expected for many species of evergreens, if the cuttings are taken at the right time of year and the proper hormonal material and concentration used. However, experiences with deciduous hardwood cuttings have shown that in most cases responses to growth-regulator treatments are less than with softwood cuttings. Commercial growers should test hormones and determine the best method for their operation to make certain that the material is beneficial.

**Reliable Root-Promoting Chemicals**

The most reliable root-promoting chemicals are indolebutyric acid (IBA), indoleacetic acid (IAA) and naphthaleneacetic acid (NAA). IBA is probably the most widely used commercially, because it is nontoxic over a wide range of plants and is effective in promoting rooting of a large number of plant species.

These chemicals are available in commercial preparations dispersed in a powder or talc into which the basal end of the cutting is dipped before inserting into the rooting medium. Difficult-to-root species should be treated with the more concentrated preparations, whereas easier-to-root species should be treated immediately after they are taken from the stock plant, fresh cuts should be made before dipping into the powder.
Several cuttings may be dipped in the powder at once rather than doing each cutting individually. And if there is little or no moisture at the base of the cuttings, they may be pressed against a damp sponge before being dipped into the powder so the powder will adhere. Cuttings may be tapped lightly after dipping to obtain uniform spread on all the cuttings.

Remove a small portion sufficient for treating cuttings rather than dipping cuttings into the entire stock of powder. Do not return unused powder into stock material as it can lead to early deterioration of the stock supply.

**Methods for Applying Chemicals**

A satisfactory method is to spread a thin film of powder on a piece of paper or aluminum foil, dip a handful of cuttings in the powder and rotate until the bases of the cuttings are evenly covered. Insert cuttings into the medium immediately after treatment. A thick knife may be used to make a trench in the rooting medium before the cuttings are inserted to avoid brushing off the powder during insertion.

The dilute solution soaking method of applying hormones can be used satisfactorily, although it is more difficult and time consuming for commercial growers. With this method the basal inch of cuttings is soaked in a dilute solution of material for about 24 hours before being inserted into the rooting medium.

Concentrations used vary from about 20 ppm for easily-rooted species to about 200 ppm for the more difficult species. To prepare a 100 ppm solution of IBA, dissolve a level 1/4 teaspoon of the chemical in 1/4 cup of alcohol (ethyl or isopropyl) and stir thoroughly in a gallon of water. NAA dissolves best in a few drops of ammonia which is then mixed in water.

The concentrated dip method is preferred by most propagators because it is faster and usually gives more uniform results. A concentrated solution of the chemical in alcohol is prepared (500 to 10,000 ppm) and basal ends of cuttings are dipped for about 5 seconds and inserted into the rooting medium. To prepare an approximate 4,000 ppm solution of IBA dissolve a level 1/4 teaspoon of the pure material in 3 1/3 ounces of 10 percent alcohol.

Regardless of the method of hormone treatment used, fresh preparations are advisable. It should be remembered that treatment with hormones is not a substitute for good propagation procedures and will not ensure rooting if other factors are limiting.

**ENVIRONMENTAL CONDITIONS**

Even if cuttings are taken properly, they will not root if environmental conditions are not correct. The environmental conditions necessary for successful rooting of cuttings are: proper air temperature (65° -75° F or 18° -24° C), a humid atmosphere, ample light, and a moist but well-drained and well-aerated medium.

Light intensity cannot be controlled as easily as other factors. However, when plants are rooted under intermittent mist systems, full sunlight is best for most species. Light is necessary for production of foods and naturally occurring hormones in the cutting and higher light intensity means more foods to stimulate root development and initiation.

Shading is usually necessary to provide the proper temperature. A shading material which reduces natural sunlight by 30 percent is most often used. This still permits a high light intensity during rooting.

Bottom heat is rarely used in Florida, but should be used more. The ideal temperature for the rooting medium is 27° to 33° C or 80° to 90° F and is not usually obtained from normal air temperatures.

Maintenance of a high humidity for cuttings during propagation is most easily obtained by using mist propagation.

The major purposes of the rooting medium are to hold the cuttings erect and to provide adequate oxygen and moisture. High water-holding capacity, good drainage and good aeration must be provided by the medium that is selected. Volume of the medium should be fairly constant whether wet or dry. Usually one material will not provide all of these properties, so a mixture is required. Whatever the mixture selected, it should be sterile.
A mixture of organic and inorganic materials such as peat and perlite or peat and builder's sand 1:1 by volume is an excellent mixture. It is used by many commercial nurseries in Florida for rooting a wide range of woody ornamentals. Both media are relatively stable, easy to handle and provide moisture, drainage and aeration necessary for rooting. Both media also produce cuttings with a fibrous root system.

Although coarse sand and perlite have sometimes been used alone for rooting some plants, rooting responses have been extremely variable. Neither of these is as desirable alone as in combination with peat moss.