

PROPAGATING HERBACEOUS PERENNIALS: IS IT REALLY THAT MYSTERIOUS?

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Introduction

The use of herbaceous perennials continues to be one of the fastest growing segments of ornamental horticulture, but much mystery still surrounds their propagation and culture. Although the basic principles of propagating herbaceous perennials are similar to woody plants, many of the specific practices have been proprietary; that is, the methods have resided in the experience of a few master propagators whose information has been passed from one generation to the next. In addition, since many perennial nurseries have several thousand taxa, it is understandable that the exact propagation methods for many taxa may not be well known. However, with more perennials being grown, there is less mystery surrounding the propagation of these popular garden plants and the information is generally more available.

Herbaceous perennials grown above ground during the growing season, but with the onset of short days and freezing weather the tops die, and the plant retreats to an underground storage organ. These storage organs assume many sizes, shapes, and names. They may be fibrous rooted structures, bulbs, tuberous roots, tubers, rhizomes, stolons, crowns, or pips, and function as reservoirs of growth regulators, water, and nutrients that propel the plants into growth the following season. These storage units can be lifted, stored, shipped, and can serve as the basic propagating units.

My objective is to discuss some of the principles and practices of propagating herbaceous perennials, concentrating on root cuttings and division. Only one important genus is propagated by grafting; seed and shoot tip propagation will be lightly covered, and tissue culture propagation has been, and will be, adequately covered by other speakers.

SEED: The majority -- perhaps more than 50% -- of all herbaceous perennials are propagated by seed. Seed propagation has both advantages and disadvantages. The seed is a relatively inexpensive propagation unit, easily stored, and is well adapted to the automation provided by seeding machines. For this reason propagating perennials is becoming increasingly popular for bedding plant growers. Since herbaceous perennial seeds generally do not have as long or as deep of dormancy as do woody seeds; stratification times are usually shorter. However, seeds of some perennials tend to be shorter lived than their woody counterparts, and the biggest problem facing perennials propagators is the industry-wide problem of locating high quality, true-to-name seed.

Seed propagation has several disadvantages. Seed propagated plants may have many different phenotypes. For

instance, *Heuchera micrantha* 'Palace Purple' is prized for its rich, bronze foliage. It is easily propagated by seed and does not require stratification. Even though it has a cultivar name that implies uniformity, green or off-color variants are regularly produced and must be rouged out. If this is not done rigorously, many off types enter the market. For the most desirable plants though, selections should be made of the best types and they should be asexually propagated. In contrast, *Campanula carpatica* 'White Clips' is also propagated by seed, but the populations are very uniform, so there is no practical reason to propagate it asexually.

Some perennial seed, especially those in the pea family like *Baptisia australis*, have hard-coated seeds that, when dry, do not allow water to easily enter through the seed coat to begin initiating the germination process. *Baptisia* seed germinates easily if it is sown when the seed is fully ripe, but before it is allowed to dry out. If the seed dries out, seed coats must be broken down in a process called scarification. This is accomplished by either rubbing the seed lightly between two layers of sandpaper or by immersing the seed for 15 minutes in concentrated sulfuric acid. Usually no further treatment, such as stratification is necessary.

The perennial industry has experienced rapid growth in the last few years, resulting in customers who no longer want common seed-propagated plants like Shasta daisy, but are looking for named cultivars. The result is that, while seed propagation will always be important, greater emphasis will be placed on asexual methods to propagate the new cultivars.

SHOOT TIP CUTTINGS: Many popular genera of perennials like *Artemisia*, *Dianthus*, *Coreopsis*, *Lavendula*, and *Delphinium* can be propagated by shoot tip cuttings. The principles and methods are similar to those for woody plants. One significant difference from woody cuttings is that little or no rooting hormone is necessary. If it is used, it is usually the equivalent of Hormodine #1 (1000 ppm IBA). Another difference is that perennial cuttings, since they are soft, non-woody tissue, are more susceptible to rotting in the propagation bench. This is easily overcome either by reducing the misting frequency, or by covering the plants with row cover material. This cover is a thin, white, light-weight fabric. It is routinely used by European growers who prefer covering freshly-stuck herbaceous cuttings with this fabric to placing them in a mist bed.

Cuttings of herbaceous perennials are of two types. The most common is the tip cutting which is taken at the tip of elongated growth as is done with a woody shrub. *Aster*, *Chrysanthemum* (*Dendranthemum*) and *Tricyrtis* can be propagated by this type of cutting. In contrast, the growth habit of other plants like *Armeria*, *Geranium* and *Achillea* do not provide an elongated, well-defined cutting. Here the

cutting must be taken early in the growth cycle when the shoot is short, often with several attached roots. This type of cutting, sometimes referred to as a "rooted cutting," often requires minimal misting and establishes quickly.

The second type of herbaceous perennial cuttings is represented by easy-to-root plants like *Physostegia*, *Chelone*, *Monarda*, and many mints which can be rooted by leaf-node cuttings. The entire stem can be sectioned into individual nodes, each with one or two leaves. Although smaller than shoot tip cuttings, their increased numbers represent a way of inexpensively and rapidly increasing plant populations.

ROOT CUTTINGS: Root cuttings are a very useful method of asexual propagation, particularly for plants that do not produce many seeds, and have growth habits that produce relatively few divisions or cuttings. Many plants in the Borage family like *Pulmonaria*, *Brunnera*, *Anchusa*, and *Mertensia* have these characteristics and are routinely propagated by root cuttings. This method can be efficient, too. By using a combination of root cuttings and division, I have propagated nearly 100 salable-sized *Pulmonaria* 'E.B. Anderson' plants from three root pieces that were approximately 10 inches long. Imagine what a root-bound, two-gallon *Pulmonaria* would yield! Root cuttings are usually thought to be only for plants with thick roots like *Acanthus mollis*, but thin-rooted perennials like *Phlox paniculata*, summer phlox, willingly form shoots on root cuttings also.

Cuttings are usually gathered while the plants are dormant from November to February. There are exceptions. *Papaver orientale*, the oriental poppy, goes dormant in August, so cuttings can be taken anytime thereafter. *Anemone sylvestris* forms shoots on roots still attached to the plant, so they can be excised anytime after late September and transplanted. Cuttings can be gathered from plants that are grown in the field, but are most easily gathered from container-grown stock plants. Container-grown plants have the advantage of being readily available, and no roots are lost to digging. Further, the upper or crown part of the plant usually can be further divided or replanted.

To prepare root cuttings, the roots are shaken free of medium and washed, if necessary. Remove the roots from the stock plant with a knife or clippers, being careful to keep the roots oriented in the same direction. Next, the roots are sectioned into about 1" pieces. Many books suggest making an angle cut on one to denote the proximal (nearest the soil line) or distal (end farthest from the soil line) end, but some nurserymen do not follow this procedure, rather they lay all the roots out in the same direction and section them in bundles. The bundles are packed into holding flats in the same proximal position and await insertion into the propagating medium, usually in the upright position.

Cuttings can be propagated in two distinctly different ways. The easiest method is to bundle them into groups of about 15 sections and place them in an upright position in 72-cell

pack flats. The flats are then placed in a high humidity chamber in a shaded portion of a 60°F greenhouse where they can be observed for rooting. As each cutting or group of cuttings develop shoots and begin to root, they are removed and transplanted. In the second method, the cuttings are packed in rows into a 3 to 4" deep flat. The flat is placed on the bench at a 45 degree angle, and alternate layers of cuttings and medium are placed each on top of the other until the flat is filled. Flats filled in this manner can hold 300 to 400 cuttings, depending on the root diameter.

While the polarity of a shoot cutting is very important, it is less so with root cuttings. Even though fastest shooting and rooting is obtained if cuttings are oriented in the upright, proximal (with the end that was closest to the soil like position, cuttings placed in a horizontal position appear to root equally well, but require more space.

Not all plants can be propagated by root cuttings, nor is it desirable to propagate some plants by this method. For instance, variegated plants like *Brunnera macrophylla* 'Hadspen Cream' or 'Alba' can only be propagated by division. When propagated by root cuttings, plants with green leaves result. This is because the origin of the shoot within the root tissue is different from the tissue that resulted in the variegation.

DIVISION: Division is one of the simplest and easiest methods of propagate perennials like *Astilbe*, *Hosta*, *Hemerocallis*, *Iris*, and *Paeonia*. With this method, the storage organ is divided into sections, usually, but not

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always, while the plants are dormant. Late spring, just before bud break, seems to be the best time for most, although *Iris* and *Hemerocallis* are best propagated during August, and *Paeonia* during September. Division seems to be well adapted to plants that have a growth habit with multiple buds or eyes produced on the storage organ.

ASTILBE BY DIVISION: The only *Astilbe* that, when propagated by seed, yields reasonably homozygous populations is *A. chinensis* 'Pumilia'. Otherwise, propagating astilbe from seed is not recommended. Some tissue culture laboratories have recently begun selling astilbe from shoot tip cultures. While this is reasonably safe for cultivars with pink and white flowers, it is not recommended for those with red flowers because of their propensity to sport naturally. Finally, all astilbe have a crown type growth habit where the shoots are compressed into buds or eyes, so no shoots are available for tip cuttings. Thus, for the majority of astilbe cultivars, division remains the most reliable method to perpetuate cultivars.

Astilbes can be propagated at almost anytime during the growing season. However, the best time is in early spring, before buds break and shoot growth begins. The second best time, and a time that many nurserymen prefer because it established a plant that can then be sold the following year, is in August.

Astilbe is especially well adapted to container culture, so container-grown plants serve as the stock plants. Best results can be obtained if the stock plants are not more than one year old. The crowns on larger and older plants are too woody, contain few eyes (buds), and are generally more

difficult to separate. Larger and more vigorous growing crowns of the *Astilbe x arendsii* and *Astilbe japonica* types are best divided with a knife. *Astilbe simplicifolia* types tend to have more numerous, but smaller buds, and can often be separated by pulling them apart by hand.

Replanting the eye at the correct depth is critical to the success of astilbe propagation. The eyes should be planted at or just below soil (medium) level. With most cultivars planting a single eye in the spring should yield a salable sized plant with as many as 10 eyes by the end of the growing season. A vigorous three-eye division is considered to be a standard sized division ready to be transplanted into a one-gallon container.

PEONY BY DIVISION: *Paeonia lactiflora*, the herbaceous peony, like *Astilbe*, is propagated by division. However, there are several major differences. First, even though many peonies are sold in containers through garden centers, it is not a container crop. It is best adapted to field culture and requires two years in the field to establish a vigorous plant that can be further divided. Second, peonies can be divided only in the late summer and early fall. It is at this time of the year when, with the onset of short days, buds are formed on the top of the tuberous root.

To divide peonies, the plants are dug from the field and the root system is shaken from soil. Then, using a stout-handled knife or a pair of shears, the root system is divided so that each division contains three or more eyes. Some divisions will contain more than three eyes, but there will not be a sufficiently large sized tuberous root to support it. There must be as much root as possible, although roots that are excessively long are trimmed back so that the division can be either planted to the garden or placed into a container. Replanting is especially critical to peonies. Too many woody-plant nurserymen or garden center operators that buy peonies try to stuff a vigorous division in a small container. Choose a large enough container so that the buds will be about 1" below the surface of the medium AFTER it is watered in.

GRAFTING THE TREE PEONY: *Paeonia suffruticosa*, even though it is normally sold by herbaceous perennial nurseries, is technically a subshrub. Today, it is probably the only herbaceous perennial that is grafted. Most grafts are produced in Japan and shipped to the U.S. as newly callused units. There are only a few nurseries in the U.S. that are presently practicing the art of grafting to asexually reproduced this outstanding perennial. Why are tree peonies grafted? Mostly because the tree peony does not root readily and does not come true from seed.

Paeonia suffruticosa has small fibrous roots, so it is grafted on the large tuberous roots of the herbaceous peony, *Paeonia lactiflora*. The long and uniformly cylindrical roots of the Klehm Estate peonies are considered the best choice. Also, the Estate Peonies do not form adventitious buds the way other selections do.

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Grafting tree peonies is done in August or September. Scions are selected from new growth after the terminal bud has formed. The earliest maturing *P. suffruticosa* hybrids are grafted first. Single *P. suffruticosa* buds are selected, and the leaves snipped off. Then, using a single-edged razor blade or retractable knife, a wedge-shaped cut is made in the top end of the *P. lactiflora* root, and a similar-shaped cut on base end of scion. Clean cuts are important. Grafts are then wrapped so the stock and scion are held closely together without danger of desiccation or disease entry. Parafilm, a thin, flexible material used in laboratories to seal petri dishes, works very well.

The grafts are placed in moist peat moss in plastic bags and held at about 70°F to hasten the union. They can then be planted in the field. This can be done in late fall in areas where the soil does not freeze too deeply, or held until the following spring in northern climates. Plant with the union well below soil level so that the scion will be encouraged to initiate roots. After 2-3 years in the field, the plant is lifted and the *P. lactiflora* rootstock is removed. If not removed, it enlarges and may lift the entire plant out of the soil. Uncut *P. lactiflora* root systems the size of footballs have been observed. One wonders what happens to the fresh grafts that are sold through garden centers to the public in the spring, poorly established and probably with no chance that the *P. lactiflora* root system will ever be removed.

In summary, propagating herbaceous perennials is, in many respects, easier than for woody plants. However,

knowledge of timing, treatment, and method is still critical. The major difference between woody and herbaceous perennial propagation is that the average perennial nursery grows many more taxa than its woody counterpart, thus knowledge of plants and their requirements assumes greater importance.

Reprinted from Proceedings 1992 Perennial Plant Symposium.

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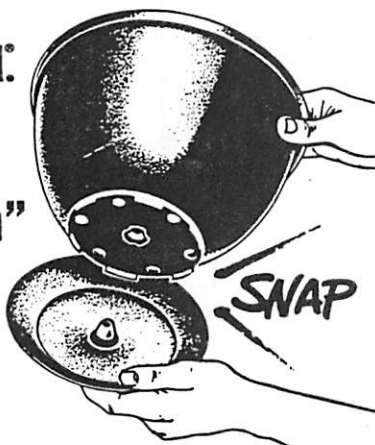
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PROPAGATION METHODS FOR COMMON HERBACEOUS PERENNIALS

Name	Seed	Stem cuttings	Root cuttings	Division	Shoot tip culture
<i>Acanthus</i> spp.	x		x	x	
<i>Achillea</i> spp. (Yarrow)		x		x	
<i>Aconitum</i> spp. (Monkshood)	x			x	
<i>Aegopodium podagraria</i> (Goutweed)			x	x	
<i>Ajuga</i> spp. (Bugleweed)		x		x	
<i>Althaea rosea</i> (Hollyhock)	x				
<i>Anemone x hybrida</i> (Japanese Anemone)	x		x	x	
<i>Anthemis tinctoria</i> (Golden Marguerite)	x	x		x	
<i>Aquilegia</i> spp. (Columine)	x				
<i>Arabis</i> spp. (Rock-Cress)	x	x	x		
<i>Armeria</i> spp. (Sea Pink)	x	x		x	
<i>Artemisia</i> spp. (Artemisia)		x		x	
<i>Asarum europaeum</i> (Ginger)	x			x	
<i>Asclepias tuberosa</i> (Butterfly Weed)	x		x		
<i>Asperula odorata</i> (Woodruff)		x		x	
<i>Aster</i> spp. (Hardy Aster)	x			x	x
<i>Astilbe</i> spp. (False Spirea)	x			x	x
<i>Aubreita deltoidea</i> (Rock-cress)	x				
<i>Aurinia</i> spp. (Alyssum)	x	x			
<i>Baptisia australis</i>	x		x		
<i>Bellis perennis</i> (English Daisy)	x				
<i>Bergenia cordifolia</i> (Bergenia)					
<i>Brunnera macrophylla</i> (Siberian Bugloss)	x	x	x		
<i>Campanula carpatia</i> (Carpathian Harebell)	x	x			
<i>Campanula medium</i> (Canterbury Bells)	x				
<i>Catanache caerulea</i> (Cupid's Dart)	x			x	
<i>Centaurea</i> spp. (Cornflower)	x			x	
<i>Cerastium tomentosum</i> (Snow-in-Summer)	x	x		x	
<i>Ceratostigma plumbaginoides</i> (Plumbago)		x		x	
<i>Cheiranthus</i> spp. (Wallflower)	x				
<i>Chrysanthemum x morifolium</i> (Garden Chrysanthemum)				x	
<i>Chrysanthemum x superbum</i> (Shasta Daisy)	x			x	x
<i>Chrysanthemum coccineum</i> (Painted Daisy)	x	x			x
<i>Convallaria majalis</i> (Lily-of-the-Valley)				x	
<i>Coreopsis</i> spp. (Coreopsis)	x	x		x	
<i>Delphinium</i> spp. (Larkspur)	x	x		x	
<i>Dianthus barbatus</i> (Sweet William)	x				
<i>Dicentra</i> spp. (Bleeding Heart)	x	x	x	x	
<i>Dictamnus albus</i> (Gas Plant)	x	x			
<i>Digitalis purpurea</i> (Foxglove)	x				

Name	Seed	Stem cuttings	Root cuttings	Division	Shoot up culture
<i>Dodecatheon</i> spp. (Shooting Star)	x			x	
<i>Doronicum</i> spp. (Doronicum)	x			x	
<i>Echinacea purpurea</i> (Purple Coneflower)	x			x	
<i>Echinops exaltatus</i> (Globe-thistle)	x		x	x	
<i>Echinops ritro</i> (Small Globe-thistle)	x		x	x	
<i>Erigeron</i> spp. (Fleabane)	x	x		x	
<i>Eryngium</i> spp. (Sea Holly)	x		x		
<i>Euphorbia</i> spp. (Spurge)	x	x			
<i>Filipendula</i> spp. (Filipendula)	x		x	x	
<i>Gaillardia x grandiflora</i> (Blanket Flower)	x		x		
<i>Gentiana</i> spp. (Gentian)	x				
<i>Geranium</i> spp. (Crane's Bill)	x	x	x	x	
<i>Geum</i> spp. (Geum)	x			x	
<i>Gypsophila</i> spp. (Baby's Breath)	x	x	x		x
<i>Helenium</i> spp. (Helen's Flower)				x	
<i>Helianthemum</i> spp. (Sun Rose)		x			
<i>Heliopsis</i> spp. (Heliopsis)			x	x	
<i>Helleborus</i> spp. (Hellebore)	x			x	x
<i>Hemerocallis</i> (Daylily)	x			x	x
<i>Heuchera</i> spp. (Coralbells)	x	x		x	x
<i>Hibiscus moscheutos</i> (Hardy Hibiscus)	x			x	
<i>Hosta</i> spp. (Plantain-Lily)	x			x	x
<i>Iberis</i> spp. (Candytuft)	x	x			
<i>Kniphofia uvaria</i> (Red-Hot-Poker)	x			x	
<i>Lamium maculatum</i> (Dead Nettle)		x		x	
<i>Lavandula angustifolia</i> (Lavender)	x	x		x	
<i>Liatris</i> spp. (Blazing Star)	x			x	
<i>Limonium</i> spp. (Hardy Statice)	x		x		
<i>Linum perenne</i> (Flax)	x	x			
<i>Lobelia</i> spp. (Cardinal Flower)	x			x	
<i>Lunaria annua</i> (Moneyplant)	x				
<i>Lupinus</i> spp. (Lupine)	x	x			
<i>Lychnis</i> spp. (Maltese Cross)	x			x	
<i>Lysimachia clethroides</i> (Goose Loosestrife)	x	x			
<i>Lythrum salicaria</i> (Purple Loosestrife)		x			x
<i>Matricaria</i> spp. (Feverfew)	x	x		x	
<i>Mentha</i> spp. (Mint)		x		x	
<i>Mertensia virginica</i> (Bluebells)	x		x	x	
<i>Monarda didyma</i> (Beebalm)	x	x		x	
<i>Myosotis</i> spp. (Forget-me-not)		x		x	
<i>Nepeta cataria</i> (Catmint)		x		x	
<i>Nepeta x fassenii</i> (Catnip)		x			

Name	Seed	Stem cuttings	Root cuttings	Division	Shoot tip culture
<i>Oenothera</i> spp. (Evening Primrose)	x				
<i>Pachysandra terminalis</i> (Pachysandra)		x			
<i>Paeonia lactiflora</i> (Herbaceous Peony)			x	x	
<i>Papaver orientale</i> (Oriental Poppy)	x		x	x	
<i>Penstemon</i> spp. (Beardstongue)	x	x		x	
<i>Phlox paniculata</i> (Summer Place)		x	x	x	
<i>Phlox subulata</i> (Creeping Phlox)		x		x	x
<i>Physostegia virginiana</i> (False Dragonhead)	x	x		x	
<i>Platycodon grandiflorum</i> (Balloon Flower)	x	x			
<i>Polemonium caeruleum</i> (Jacob's Ladder)	x			x	
<i>Polygonum cuspidatum</i> (Mexican Bamboo)			x		
<i>Potentilla</i> spp. (Cinquefoil)	x			x	
<i>Pulmonaria</i> spp. (Lungwort)	x		x	x	x
<i>Pulsatilla vulgaris</i> (Windflower)	x		x	x	
<i>Rudbeckia</i> spp. (Coneflower)	x		x	x	
<i>Salvia</i> spp. (Sage)	x			x	
<i>Santolina</i> spp. (Santolina)		x			
<i>Saponaria ocymoides</i> (Soapwort)	x	x	x	x	
<i>Saxifraga</i> spp. (Saxifrage)				x	
<i>Scabiosa caucasica</i> (Pincushion Flower)x	x	x		x	
<i>Sedum</i> spp. (Stonecrop)	x	x		x	
<i>Sempervivum</i> spp. (Hens and Chicks)				x	
<i>Solidago</i> spp. (Goldenrod)		x			
<i>Stachys lanata</i> (Lamb's Ear)				x	
<i>Stokesia laevis</i> (Stokes Aster)	x		x	x	
<i>Teucrium chamaedrys</i> (Germander)		x		x	
<i>Thalictrum aquilegifolium</i> (Meadowrue)	x	x		x	
<i>Thymus</i> spp. (thyme)		x		x	
<i>Tradescantia x andersoniana</i> (Spiderwort)				x	
<i>Trollius</i> spp. (Globe Flower)	x		x		
<i>Verbascum</i> spp. (Mullein)	x		x		
<i>Veronica</i> spp. (Speedwell)	x	x		x	
<i>Viola</i> spp. (Violet)	x			x	
<i>Walsteinia ternata</i> (Barren Strawberry)		x		x	
<i>Yucca filamentosa</i> (Spanish Bayonet)	x		x	x	



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