

**Hort 201**  
**Plant Propagation**  
**Lab 5: Propagation of Herbaceous Perennials**

**Key words and terms from CD:**

Acclimatization, adventitious roots, adventitious shoot formation, adventitious shoots, automated seeders, bottom heat, crown, division, dormancy, germination imbibition, plug production, radicle, rhizome, root cuttings, scarification, seeds, seeders, stolon, stratification, transplanting.

**Objectives:**

1. To learn how to prepare and handle root cuttings and to observe how roots and shoots are initiated from them.
2. To learn how to propagate perennial plants from stolon cuttings and divisions.

**Introduction:**

Perennial plants are those plants that live for three or more years. In contrast, an annual lives for only one season, while a biennial grows for one season, blooms the second season and then dies. Perennials can be either woody or herbaceous, though most often the term refers to herbaceous species that produce decorative flowers or foliage. Chrysanthemums, hostas, hollyhocks, bleeding hearts, coral bells, jack-in-the-pulpit, shasta daisies, culinary sage, ornamental grasses, ferns and tropical foliage plants are all examples of “perennials”. Unlike annuals, which usually flower all summer, perennials flower only at a specific time of year. For example, chrysanthemums flower in the fall, coral bells and jack-in-the-pulpit in the spring, usually for a period of 3 to 8 weeks. Perennials are finding increasing popularity in home gardens and landscaping because they provide a continually changing pattern in the landscape rather than the static uniform color and form that annuals produce. Nurseries are stocking many different types of perennials and there are numerous mail-order nurseries that sell everything from the most common perennials to rare native plants.

There are many ways to propagate perennials. As a propagator you must choose the method that is the best use of your resources, gives the best chance for success in the time allowed and meets your goals in terms of quality and diversity of plants.

**Sexual propagation of Herbaceous Perennials:**

Propagation from seeds

Many perennials are propagated by seed, especially by home gardeners or specialty nurseries. The seeds are planted to an appropriate depth in sterile, well-drained media and then kept moist until germination occurs. Seedlings are then ‘picked out’ and transplanted into larger containers to allow for growth to mature size.

## **Asexual propagation of Herbaceous Perennials:**

### Stem Cuttings

In this method the actively growing but non-flowering stem is removed. The lower stem is treated with a low concentration of auxin to stimulate root formation and the cutting is placed in rooting media. The cutting is then kept in a moist environment (mist house, pot sealed in a plastic bag) to reduce transpiration rate. Once the roots are formed, the plant is gradually moved to a drier environment until it is robust enough to sell or plant in a garden. **Tip cuttings** are a variation of stem cuttings that utilize new season's growth, making a cutting from a meristem (shoot tip). The lower leaves are removed; the base is treated with auxin and planted.

### Divisions

In this method, the plant is dug up and physically divided into several clumps, each of which has both roots and stems (or at least a dormant leaf bud). This method differs from stem cuttings because each division already has preformed roots and leaf buds while stem cuttings must regenerate roots. Each division will form new a new plant. Hostas, daylilies, peonies and irises are frequently propagated in this way. This works well with many perennials. In fact, some perennials, such as chrysanthemums, need to be divided every year or two to maintain health, vigor and attractiveness of the plant.

### Stolon cuttings

Some perennials produce special vegetative reproductive structures. Runners and stolons are specialized stems from the mother plant that extend out horizontally along or under the soil surface. Whenever a node of the runner or stolon come in contact with soil, the node will root and produce a new shoot as well. The rooted node can be separated from the mother plant to create a new plant. Stolons can also be cut into sections containing a node and propagated by techniques similar to root cuttings. Placed in the proper environment, the stolon sections will form adventitious roots and give rise to a new plant from the latent bud.

### Root cuttings

In this method, roots of perennial plants are harvested and placed in an environment where new shoots will form (note difference between stem cuttings and divisions and this method – here new stems must be regenerated). The root cuttings may be placed horizontally and covered with soil or they may be inserted vertically in the potting medium. **Polarity is important** - the proximal end (nearest to the root-shoot junction) must always be up. Use a straight cut at the proximal end and a slant cut at the distal end. Since the section of cut root must provide all the energy to create a new stem (no leaves are present for photosynthesis), the root cuttings must be made when the plant has stored most of its energy in its root system – that is, when the plant is dormant. It is also necessary to take the correct size of root. Both the diameter of the root and its length are important to insure that there are enough stored carbohydrates to support the growth of new stems. New roots will form from the root cutting itself or from the base of the new stem.

Root cuttings are best established in winter or early spring, before plants begin growth. Cuttings of at least two inches in length should be taken from pencil-sized diameter roots or larger of appropriate perennial species and placed in moist media.

## Common propagation methods for various herbaceous perennials

### Root cuttings

*Dicentra spectabilis* – bleeding heart  
*Papaver oriental* – Oriental poppy  
*Phlox paniculata* – garden phlox  
*Anemone*-Windflower  
*Brunnera* – Siberian bugloss  
*Bergenia* - heartleaf saxifrage  
*Cimicifuga* - bugbane  
*Dictamnus* – gas plant  
*Echinacea* - cone flower  
*Echinops* – globe thistle  
*Epimedium* – barrenwort  
*Gallardia* – blanket flower  
*Ligularia* – Loostrife  
*Salvia* – Sage

### Stem Cuttings

*Heuchera* – Coral bells (stem and/or stem-leaf)  
*Achillea* – yarrow  
*Dianthus* – pinks  
*Dicentra spectabilis* – bleeding heart  
*Asters* – hardy asters  
*Arabis* – rockcress  
*Iberis* – candy tuft  
*Veronica* – speedwell  
*Penstemon* – beard tongue  
*Phlox paniculata* – garden phlox (tip cutting)  
*Perivostkia atriplicifolia* - Russian sage (tip cutting)  
*Chrysanthemum* - mums

## Procedure for Today's Lab:

### Part A: Root Cuttings

Plant roots generally take two forms:

1. Fleshy roots as in
  - a.) *Dicentra spectabilis* (bleeding heart),
  - b.) *Ligularia dentata* ‘Desdemona’ (sencio, golden groundsel)
2. Fine roots as in
  - a.) *Papaver orientale* ‘Brilliant’ (Oriental poppy)

The form of the root suggests how cuttings should be planted. Fleshy roots are usually placed vertically in the media while fine roots are placed horizontally on the media. Because root cuttings lack buds, it can be difficult to determine their correct orientation once they're detached from the mother plant. For this reason, make the proximal cut (end closest to the root-shoot junction) at 90° and the distal (basal) cut at 45°. Today we will be using two different root forms for cuttings as well as different growth states. *Dicentra* and *Ligularia* cuttings will be from dormant, bareroot plants while *Papaver* cuttings will be made from actively growing plants. Over the next few weeks, we will observe new growth from the root cuttings.

### *Dicentra spectabilis* and *Ligularia dentata* ‘Desdemona’ – dormant bare-root

1. Cut large fleshy roots into 2-3 inch sections using proximal and distal cuts.
2. Insert 4 cuttings of each species vertically into a pot with the proximal ends up. Bury each root so the proximal tip is ½ -1 inch below the surface.
3. In a second pot, insert 4 cuttings with distal end up. Bury each root so the tip is ½ to 1 inch below the surface.
4. Place your pots on the growing bench in greenhouse zone 21.

***Papaver orientale* ‘Brilliant’ (Oriental poppy) – actively growing**

1. Smaller diameter roots should be cut in 2 inch lengths and placed horizontally in a 601 market pack. Cut roots into 2” lengths, making enough cuttings to fill the market pack.
2. Lay the cuttings in the market pack provided and cover them with a layer of media ½ inch deep.
3. Place your market packs on the growing bench in greenhouse zone 21.

**Part B: Stem Tip Cuttings:**

***Mentha spicata* (spearmint)**

1. Tip cuttings should be made from an active growing point.
2. Make 6 cuttings about 2-3 inches long and remove any foliage in the bottom 1”.
3. Treat the base of the cutting with Rhizopon AA #1 and plant your cuttings into a 601 market pack. These cuttings will be placed in Zone 16.

**Part C: Stolon cuttings:**

***Mentha spicata* (spearmint)**

1. Cut 4 stolons into 2-3 inch sections making sure to include a node and latent bud in each section.
2. Place the cuttings of each species horizontally in the 601 market pack provided. Make sure the cuttings are covered by a ½ inch layer of media. The place your market pack in Zone 21.

**Part D: Divisions**

***Heuchera sanguinea* ‘Ruby Bells’ (Coral Bells); *Achillea millefolium* ‘Apple Blossom’ (yarrow)**

1. Obtain a clump of *Heuchera* and *Achillea*. Notice that the nursery has already trimmed back foliage before shipping bare-root. Divide the clump into 2-3 divisions based on the size of your clump. Be sure to keep enough of the crown and roots in each division to ensure adequate growth.
2. Take your divisions and pots to the potting room and pot up using the soil provided on the potting bench reserved for HORT 201. Make sure that your crowns are right at the surface of the media.
2. Take your pots to zone 21 and water in your divisions (wet the media thoroughly). Add more soil (provided in Zone 21) around your divisions if needed to ensure only the top of the crown is just visible.

## **Part E: Collecting data from previous labs**

- 1. Deciduous Hardwood Cuttings** – score your deciduous hardwood cuttings you placed in Zone 16 and the cooler as instructed in the handout for Lab #2
- 2. Rescore seed germination** of seeds planted in the Cone-tainers from Lab #1. The data sheets you turned in earlier will be available for you to update with the new data.

## **Results – Lab #5**

Record your observations and results of experiments.

### **Part A: Root Cuttings:**

*Dicentra spectabilis* - number of root cuttings which produced shoots

Proximal end up –

Distal end up -

*Ligularia dentata* ‘Desdemona’ - number of root cuttings which produced shoots

Proximal end up –

Distal end up -

You potted up these root cuttings proximal end up and distal end up. Which way resulted in larger plants?

*Papaver orientale* ‘Brilliant’ (Oriental poppy) – actively growing fine roots

Number of root cuttings that produced shoots -

Observations

### **Part B: Stem Tip Cuttings:**

*Mentha spicata* (spearmint) – number of stem tip cuttings which rooted

Observations

**Part C: Stolon cuttings:**

*Mentha spicata* (spearmint) – number of stolon cuttings which produce shoots

Observations

Which propagation method worked best for mint? Which method was easiest? Which method would you recommend to a commercial propagator and why?

**Part E: Divisions:**

*Heuchera sanguinea* ‘Ruby Bells’ (Coral Bells);

Number of division planted?      Number of divisions producing new shoots?

*Achillea millefolium* ‘Apple Blossom’ (yarrow)

Number of division planted?      Number of divisions producing new shoots?