Plant Propagation

Courtney Keck
Horticulture Extension Educator
Canadian County OSU Extension
What is Plant Propagation?

- Plant propagation is the multiplication of plants by both sexual and asexual means. Totipotency
- It’s been around since the dawn of civilization.
- Observed nature to develop propagation methods in cultivation.

(Turn to handout)
What is Plant Propagation?

- Plant propagation is an art and a science.
- Requires knowledge, skill, and practice.
- Knowing plant families is useful in propagation.
Propagation Considerations

- Sanitation in all work areas
- Proper environment, including:
  - Temperature
  - Light
  - Water
  - Media
  - Oxygen
Sanitation

- Three areas of introduction of pathogens and pests
  - Propagation facilities
  - Propagation media
  - Plant material

- Wash equipment with a Clorox solution (1:9)

- Used sterilized media

- Take cuttings from top of plants

- Keep “clean” stock plant & purchase “clean” seeds
Media

- **Sand**
  - Heaviest of medias
  - Contain no minerals
  - Needs to be fumigated or steam-pasteurized

- **Peat/Sphagnum Moss**
  - Light weight
  - High moisture-holding capacity
  - High acidity (3.2-4.5)
  - Peat moss is the most widely used organic ingredient, however sphagnum is the most desirable but limited by expense
  - Peat moss should be pasteurized, sphagnum moss is relatively pathogen free
- Vermiculite
  - Mineral that expands when heated
  - Very light weight
  - Absorbs large quantities of water
  - Can hold nutrients
  - Use only horticulture grade

- Perlite
  - Light weight
  - Holds 3-4 times its weight in water
  - Can not hold nutrients
  - Increases aeration
  - Often used with peat as a rooting medium
Propagation by Seeds

- Be aware of pregermination requirements such as scarification and stratification.
- Be aware of viability.
- Provide proper environment for germination.
- Provide proper environment after germination for seedling growth.
Scarification

“Any process of breaking, scratching, or altering the seed coat through chemical or thermal methods to make it permeable to water and gases is known as scarification.”
Stratification

“In the wild, seed dormancy is usually overcome by the seed spending time in the ground through a winter period and having its hard seed coat softened up by frost and weathering action. By doing so the seed is undergoing a natural form of "stratification" or pretreatment. This cold moist period triggers the seed's embryo, its growth and subsequent expansion to eventually break through the softened seed coat in its search for sun and nutrients.”
Scarification, Stratification, and Soaking

http://www.youtube.com/watch?v=Dl9taMu-VG4
Seed Planting

- Optimum temperatures for germination of most ornamental plant seeds are 75° to 80°F.
- The germination medium must hold adequate water yet drain freely.
- The medium should be sterile to prevent disease. Damping-off, a common disease of seedlings, is caused primarily by the fungi *Pythium* and *Rhizoctonia*. 
Seed Planting Depth

- Seed should not be planted deeper than 1 to 2 times their diameter.
- Small seeds should be scattered over the germination medium surface or planted thickly in rows.
- Medium-sized seeds sown on the surface should be covered with a thin layer of shredded sphagnum or peat moss.
- Larger seeds should be planted at a depth less than their diameter since a 2- to 3-inch planting depth is maximum for any species.
- Coconut palm and cycad seeds are exceptions, and should be planted just under or level with the medium surface.
Seed Establishment

- Seedlings planted close together soon become crowded, resulting in slow growth and weak, spindly stems.
Propagation by Cuttings

- Cuttings have no root system for moisture uptake.
- Goal: reduce transpiration while maintaining photosynthesis.

How?

- Mist systems (HLA-6708)
- Humidity tents
Propagation by Cuttings

Consider:
- Source of cuttings
- Plant species (difficult to root?)
- Use of rooting hormones
Hormones - Auxin

- Important hormone that induces adventitious roots on cuttings
- Synthetic – IAA, IBA, NAA
- Most cuttings 1000-3000 ppm
- #1, #2, #3 = 1000ppm, 2000ppm, 3000ppm

- Most widely used is 2, 4-D – yes, that’s the herbicide
Hormones - Cytokinin

- Involved in cell division
- High auxin/cytokinin ratio favors rooting
- High cytokinin/auxin ratio favors shoot formation
- High levels of both favor callus development

- Most widely used cytokinins are benzylaminopurine & kinetin
Cytokinins & Leaf Cuttings

Begonias

Leaf Cutting

Shoot

Bud
Cytokinins & Leaf Cuttings (con.)

High Conc

7 days

14 days
Other hormones

- **Gibberellins** – germination and dormancy of seeds
- **Ethylene** – induce initiation of adventitious roots, stimulate germination in some seeds, and overcome dormancy
- **Abciscic Acid** – germination and dormancy of seeds
Propagation by Cuttings

- Hardwood
- Semi hardwood
- Softwood
- Herbaceous
Hardwood

- “the wood of any of numerous broad-leaved dicotyledonous trees, such as oak, beech, ash, etc., as distinguished from the wood of a conifer”
- “Hardwood refers to new branch growth that has matured over the life of a growing season.”
**Semi-hardwood**

“Wood is referred to as **semi-hardwood** when it is not soft and new, but is not yet mature enough to be hard. The term semi-hardwood refers to branches in tree growth that are beginning to mature.”
Softwood

“Softwood is wood from gymnosperm trees such as conifers. Evergreen trees are often called softwoods with the notable exceptions being bald cypress and the larches.”
Herbaceous

“Herbaceous plants are plants with non-woody stems. Their above-ground growth usually dies back in winter in the temperate zone, even in cases where the plants in question are perennials.”
Propagation by Cuttings

- Types of herbaceous cuttings
  - Leaf
  - Leaf-bud
  - Cane
  - Stem
  - Root
Leaf Cutting

- Part-leaf and Whole leaf
Leaf-bud Cutting

“Single-eye or leaf bud cuttings are used to propagate plants with large leaves or those that require lots of growing points to create a full appearance.”
Cane Cutting

“The stem, or cane, is cut into segments and placed into rooting mix. New shoots emerge from the buds that are on the cane; roots grow from the portion of the cane in the rooting mix. The initial absence of leaves reduces water loss.”
Stem Cutting

“Probably the most common method of propagating plants in the home is by stem cuttings. Pruning an old plant to acquire cuttings helps recondition the plant and causes new branches to form. Each cutting should be one to three inches long and have two or three leaves attached. Cut 1/4 inch below the node and pull off the leaf at the node. Insert the cutting in the media so this node is covered with soil.”
Root Cuttings

“The best time to take root cuttings is when the plants are dormant which is usually between November and February. At this time, there is a large amount of stored energy in the roots, and there is less stress on the parent plant because they are not actively growing and in as much need of their root system.”
“The most obvious way to prevent wilting is to simply stick the cuttings in a vase and allow them to root in standing water. This actually works for a few plants such as pothos, coleus and even African violet leaves, but the roots formed in this low oxygen environment don't function very well when finally transplanted to soil. Oftentimes a new root system will have to form when the water-rooted cuttings are transplanted to soil, so rooting in soil is much preferred to rooting in water.”
Tissue Culture

- Seed and seedling culture
  - Orchids
- Embryo culture
- Organ culture
  - Micropropagation
Micropropagation is a kind of tissue culture that’s meant to rapidly reproduce clones of plants. Faster than other methods of propagation.

It’s difficult, unless you’re a professional.

Apical buds preferred

Diff types of media used

Calluses & roots from auxins & cytokinins. Ratio sensitive.
Propagation by Division

- Divide plants by cutting or separating roots or crowns
Method of propagation used on plants with multiple stems coming from the ground.
Resources

* [http://baygardens.tripod.com/division.html](http://baygardens.tripod.com/division.html)
Propagation by Specialized Structures

- Bulbs
- Corms
- Rhizomes
- Tubers
- Tuberous roots
Bulbs

Planting Depth Guide
Spring Flowering Bulbs

- Tritellia
- Sparaxis
- Crocus
- Freesia
- Ranunculi
- Anemone
- Ixia
- Muscari
- Small Alliums
- Dutch Iris
- Ornithogalum
- Nerine
- Belladonna
- Tulips
- Jonquils
- Snowflakes
- Snowdrops
- Daffodils

Ground Level
- 5cm
- 10cm
- 15cm
Corms
Rhizomes
Tubers

- Flat underground stem that stores food and energy for the plant.
Tuberous Roots

- Swollen root that stores nutrients for the plant
TYPES OF CUTTINGS

LEAF CUTTINGS - must form both adventitious shoots and roots (except leaf bud).

- leaf bud
- leaf petiole
- leaf blade
- leaf section

STEM CUTTINGS - must form adventitious roots

- hardwood
- semi-hardwood
- soft or greenwood
- herbaceous
- cane (leafless stem)
- rhizome (underground stem)

ROOT CUTTINGS - must form adventitious shoots

- root section
- tuberous root
Propagation by Layering

Layering is the process of forming roots on a daughter plant while it is still attached to the parent.
Propagation by Layering

In greenhouse crop production, layering is sometimes used to propagate *Ficus* and other species.
Air Layering

http://www.youtube.com/watch?v=Uwq5CrMjDcw
http://www.youtube.com/watch?v=UzxY34MRhg8
Ground Layering

http://www.youtube.com/watch?v=ZzJjGXgw7kI
Propagation by Layering

- Other layering techniques are used outdoors.
Trench Layering
Serpentine Layering
Propagation by Grafting or Budding

Propagation by grafting or budding is the process of placing a shoot system of one cultivar or species on the root system of another.
Propagation by Grafting or Budding

Terminology
- Scion – the shoot system of the grafted plant.
- Stock – the root system of the grafted plant.
Propagation by Grafting or Budding

- The difference between grafting and budding is...
Propagating by Grafting or Budding

- In grafting, the scion contains more than one bud.

- In budding, the scion consists of a single bud.
Chip Budding -
http://www.youtube.com/watch?v=T48uGvO5Er0

T-Budding -
http://www.youtube.com/watch?v=xNP9OIgwwTo&list=TL1jJrPv7wfY
Grafting Tomato Plants

http://www.youtube.com/watch?v=tHnOYcl6B44
Propagation by Grafting or Budding

- Grafting can be used to get unusual forms.
References