Bedford Extension Master Gardeners

Navigation Bar

Plant Propagation

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This module was developed by Jim Revell, Extension Master Gardener

Welcome to ‘Plant Propagation’

- In this module you will learn the most common types of plant propagation and how to respond to homeowner questions about plant propagation.
- Read Chapter 8, in your Master Gardener Handbook before viewing these slides
- Browse the Suggested Readings at the end of these slides. They contain online sources that will be helpful for your learning
- The Test Your Knowledge section is for fun and review
- When you are ready, take the quiz, you can print out a copy by clicking on “Printable Copy of Quiz” on the first slide to get a copy to work on

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What I Will Learn in This Module (Objectives)

- Definition of propagation, asexual propagation, and sexual propagation: give the advantages of each
- Basic guidelines for starting plants from seed
- How to handle transplants, including hardening-off
- How to propagate from stem cuttings
- **Be Familiar With:**
- Propagation from cuttings (other than stems), layering, division, budding, and grafting
- Times of year to propagate various classifications of plants (i.e. houseplants, spring-flowering shrubs, needled evergreens, etc.)
- Seed scarification and stratification

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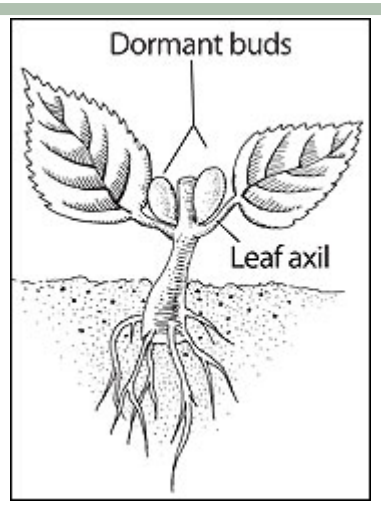
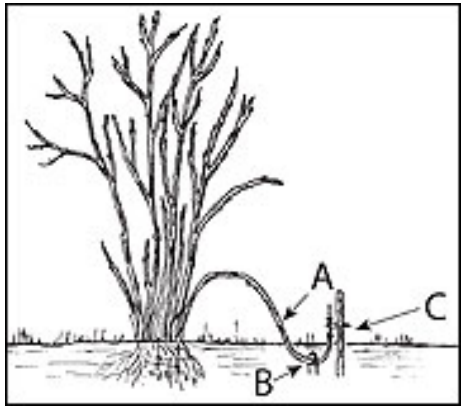
What I Will Do in the Lab

- Apply non-biased research based knowledge in a variety of propagation techniques (i.e. seeds, cuttings, layering, division)

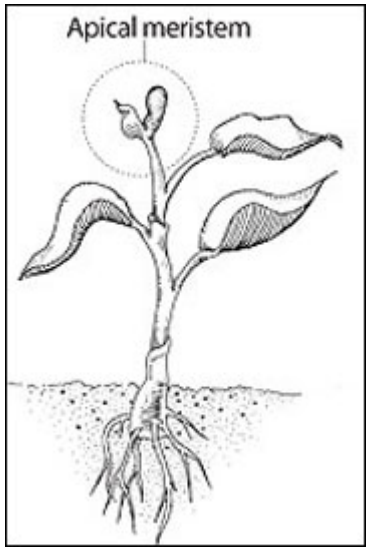
- Use appropriate terminology in describing propagation (i.e. stratification, scarification, hardening off, sexual and asexual propagation)



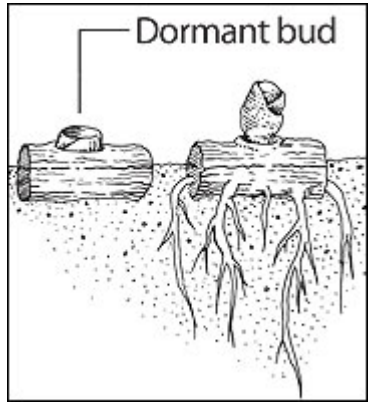
Leaf & bud cutting



Layering

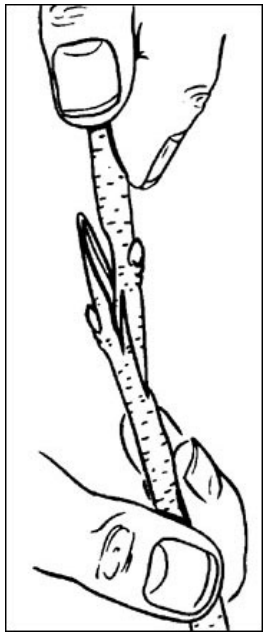


Stem tip cutting



Propagation

[Plant Propagation.](#)Photos credit



Grafting

Multiplication of Plants

To preserve the genotype "Internally coded [DNA], inheritable information"

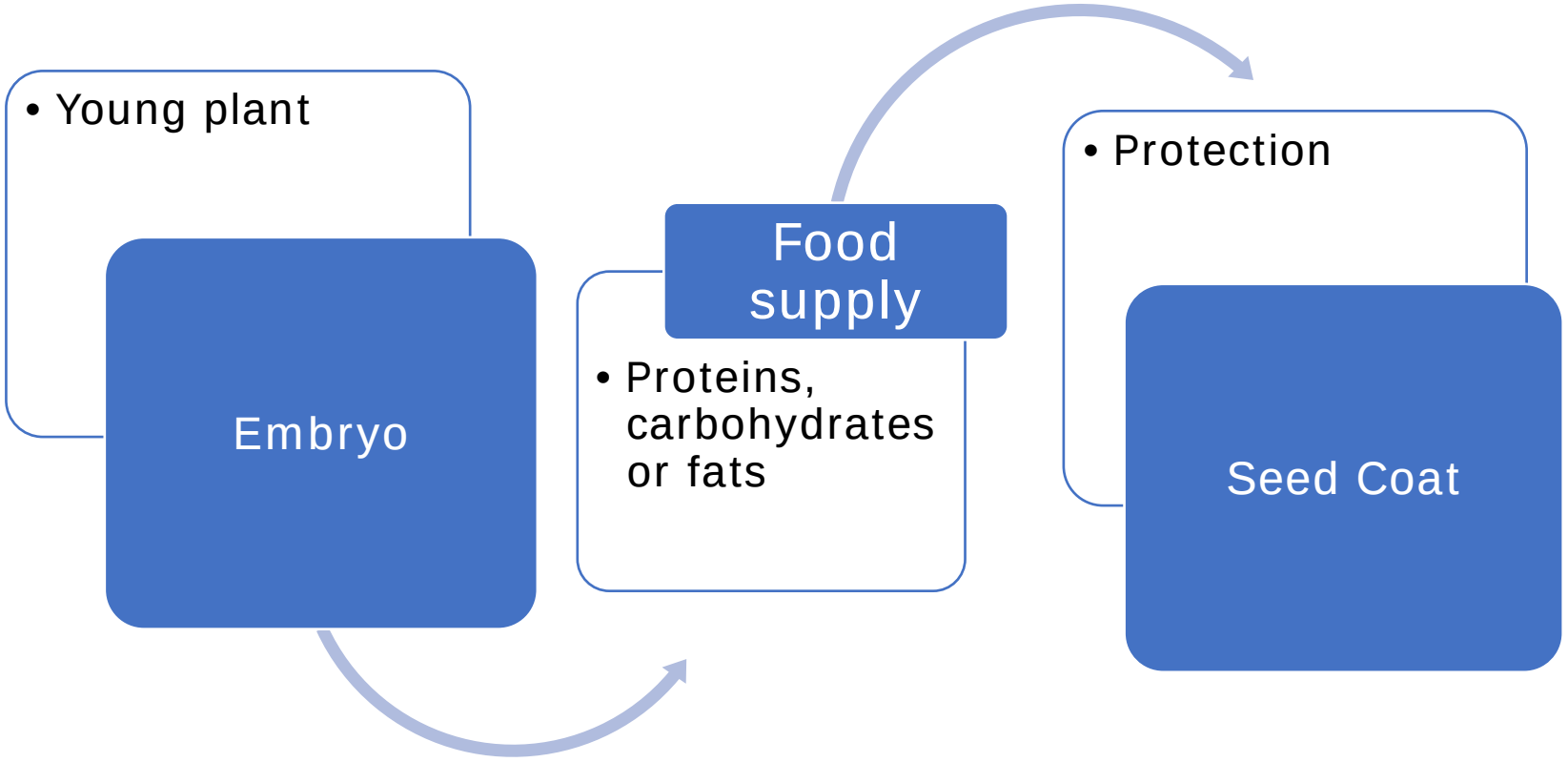
Sexual (seed)

- A cross between two parent plants or male and female gametes on same plant, resulting in seedlings with similar or varied genotypes

Asexual (vegetative) or

- Cloning (genetically uniform); regenerating a new plant from the parent by a vegetative means

Sexual means of propagation (seeds)



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Types of Seeds

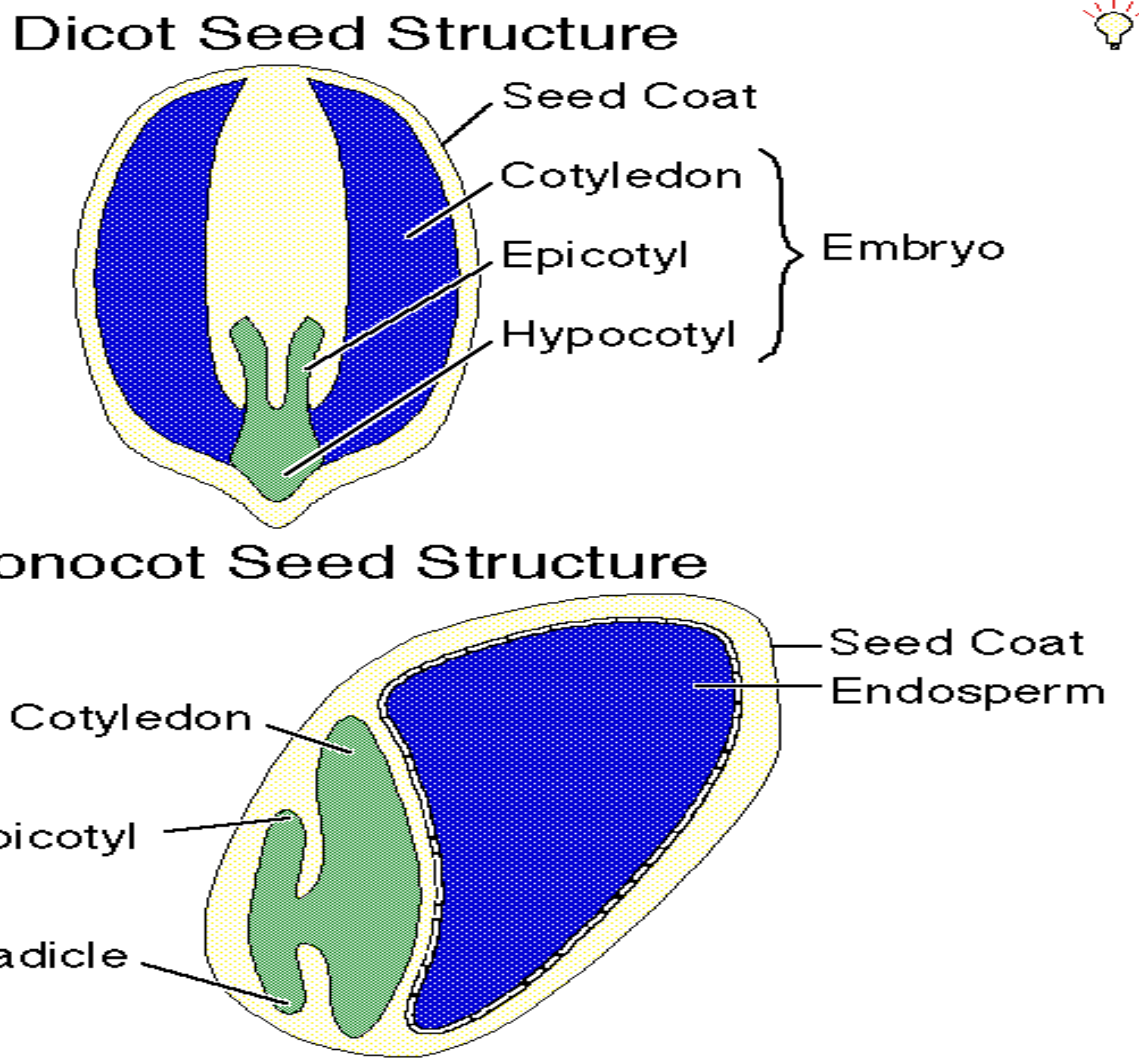

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Photo credit

Propagation by Seed

- Often cheapest and easiest for producing large numbers of plants (corn, lettuce, beans)
- Usually only method to produce new varieties or cultivars
- May be only way to propagate some species
- Most common for annuals, biennials, vegetables and some perennials
- Difficult for many woody ornamentals
- Major method used by nature
- Widely used method for cultivating plants

Propagation by Seed.....

- Start with *quality* seed
- Select varieties suitable for your zone
- Freshness / purity important (packaged for current year)
- Saving seeds from nature – purity may be an issue
- Best to <u>not</u> save hybrid seeds -
- Hybrids sold to plant, not cultivate seeds; genetic segregation occurs

Propagation by Seed.....

- Use air-tight, moisture-proof containers
- Store in 40º-50^0 F (*i.e., store seeds in refrigerator*)
- Ideal 4-6% moisture content
- 20-25% RH (Relative Humidity)
- Common self-pollinated, non-hybrid seeds, or pure-bred annuals are excellent candidates (lettuce, beans, peas, herbs, heirloom tomatoes)

Saving Seeds Saves Money

Seed Germination

All seeds need water, oxygen, and proper temperature to germinate

Some seeds require light, some full light, others darkness

Seeds remain dormant or inactive until conditions are right

Photo credit:
J. Revell, EMG

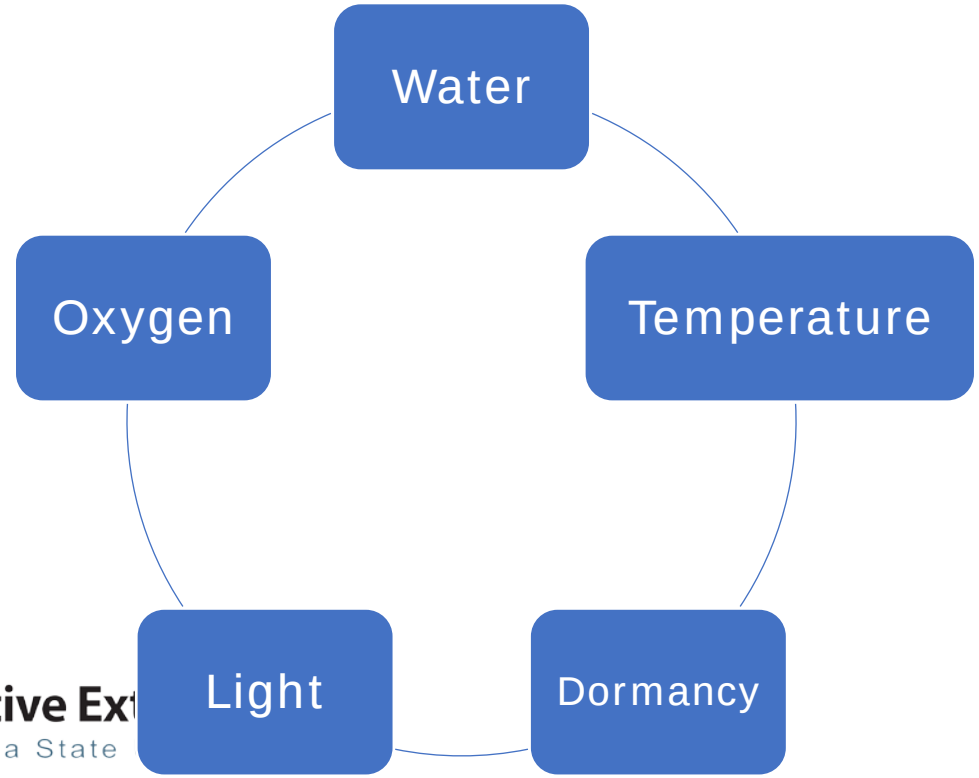

Photo credit:
J. Revell, EMG

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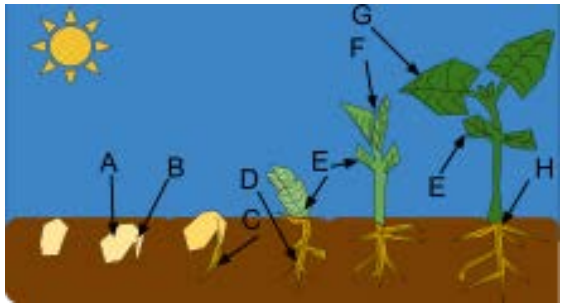
Seed Germination – Water/Moisture

Sunflower seedling.
Photo credit: Wikipedia

- Most seeds have low water content and require moisture to generate the development process
- Nature of the seed and seed coat with availability of moisture governs germination
- Seeds vary greatly in amount of water needed
  Cucurbits (melons, cucumbers) and cole crops (broccoli, cabbage) will germinate in soil with relatively low moisture
  Celery – requires soil to be well hydrated



Stages of germination.
Photo credit: Wikipedia

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Seed Germination – Oxygen

- Seeds must respire (breathe) to remain viable
- Oxygen is necessary for the respiration process
- Oxygen is involved in the initial reactions to start germination
- Note: Heavy soils (i.e., clay) that have limited oxygen supplies have very poor germination rates

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Seed Germination – Temperature

Photo credit

- Plants can be grouped by how their seeds germinate
  - Only low/cool temperatures
  - Only high/warm temperatures
  - Over a relatively wide range of temperature
- Temperature preference of plants usually indicates which category
  - Cool: Lettuce, carrots, broccoli, Coleus, (avg 55º-65º)
  - Warm: Corn, tomatoes – >50º F (65º-75º); beans, peppers, cucurbits - >60º F (68º-80º)
  - Most plants 65º-75º F
- Best germination 10º difference between day and night

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Seed Germination – Light

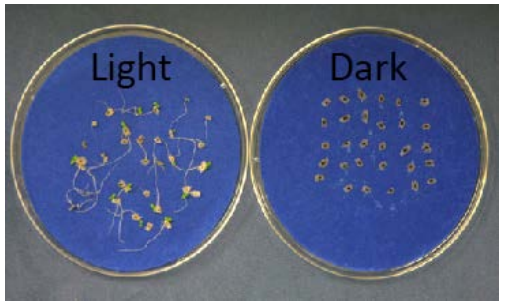

Photo credit

Seed that either require light or dark conditions to germinate are considered photo-dormant. It is a form of endogenous, non-deep physiological dormancy.

Light sensitivity in seeds is a phytochrome reaction. Phytochrome is a chemically reactive pigment plants use to sense light or dark conditions (see photoperiod). Many small seeded plants require light to germinate.

Most species are non-specific or don't care; however, if small seeds were to germinate in deep soil, plants may exhaust food supply before reaching the surface.

Photo credit

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Photodormancy

Seed Germination – Dormancy

Dormancy is a period in a seeds life cycle when growth and development are temporarily stopped. This minimizes metabolic activity and therefore helps an organism to conserve energy. Dormancy tends to be closely associated with environmental conditions.

Dormancy must be broken before germination can occur.

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Types of Dormancy

- Physical (hard seed coat) – impervious to H_2O
- Chemical – some seeds contain abscisic acid which inhibits germination
- Morphological embryo – not fully developed when seed is disseminated from plant
- Physiological – seeds have specific environmental requirements

Methods to Overcome Dormancy

Scarification

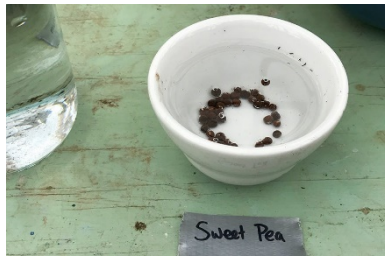
- Breaking, scratching or softening seed coats for moisture take-up
- Mechanical – file, sandpaper, hammer
- Hot water – placing seeds in water 170º-210º F; upon cooling may soak for 12-24 hours
- Acid (concentrated sulfuric acid)

Mechanical and hot water methods most commonly used by home gardener

Stratification

- "Chill hours" – period of time to chill the embryo (ripen)
- Accomplished by moist, sterile growing medium, tightly sealed cover, placed in refrigerator (38º-45º F)
- Time is dependent on plant species

Some seeds may require both scarification and stratification



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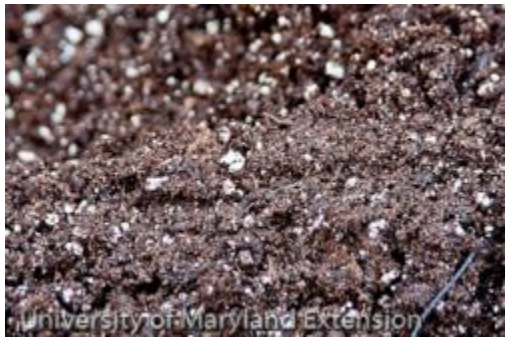
Starting Seeds Indoors

Medium

- Well-drained – sterile – loose – porous – fine textured
- Many commercial types available; most contain peat moss vermiculite and perlite
- Fine grade vermiculite alone works well
- Others: Mineral wool cubes and Oasis® are two synthetic materials

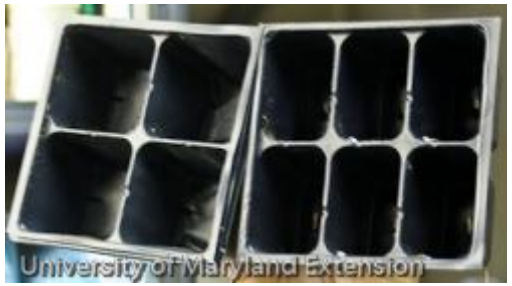
Containers

- Almost any type will do if shallow and good drainage
- Must be clean – 10% bleach, soap and hot water
- Peat pots / pellets / cow pots



Soilless potting media that contains perlite
Photo credit

Photo credit



Cell pack

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Starting Seeds Indoors….

Planting Time / Schedule

- Frost dates
- Days to germinate
- Generally 4-12 weeks depending on plant species

Depth of Planting

- Generally depends on seed size and light requirements
- Rule of thumb – seeds that do not require light, cover with medium 1 ½ to 2 times their diameter

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Starting Seeds Indoors….

Water Temperature Light

- Water
  Mist or light irrigation – always warm water

- Temperature
  Most annuals and veggies prefer day temp 65º-70º F, night temp 60º-65º F

- Light
  Bright, indirect
  Fluorescent fixtures (40 watt cool white, warm)
  14-18 hours per day

Photo credit: J. Revell, EMG

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Starting Seeds Indoors….

How to Sow Seeds

1) Fill container with medium to ¼” - ¾” below top of container
2) Wet with hot water
3) Drain excess water
4) Level gently, firm medium
5) Make shallow rows, depressions, holes
6) Lightly sprinkle with sand (builders’ grade works well)
7) Cover with medium according to light requirements
8) Mist the medium
9) Label (very important)
10) Cover container with clear plastic
10) Place to get proper light/temp
11) Monitor daily
12) When seedlings emerge, remove cover (rule of thumb, when 75% germination)
13) Adjust light – as seedlings grow, maintain 6” height
14) Keep humidity high with covers, misting)
15) After first set of leaves, start fertilization – dilute, then to full strength as plants grow; organic or synthetic, your choice

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Starting Seeds Indoors....

How to Transplant

1) After first set of true leaves appears
2) Sterile mix / container
3) Handle seedlings by leaves, not by stem
4) Make proper size hole
5) Gently tease roots (pencil or chopstick works well)
6) Gently place or push roots into hole, lightly packing medium down around roots
7) Plant seedlings same depth, neither higher nor lower
8) Water
9) Fertilize – ½ strength on second watering after transplanting; or wait 7-10 days for full strength
10) Maintain proper lighting
11) Hardening off
    - Lower temperature
    - Reduce watering
    - Reduce fertilizing – use low nitrogen

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#1 Enemy to Seed and Vegetative Propagation

"Damping Off" (caused by several different pathogens)

- Causes sudden death
- Problem worldwide
- Occurs in most soils
- Temperate to tropical climates and in greenhouses
- Affects seeds and seedlings
- Caused by fungi – soil-borne, favors cool wet soil
- May attack seed prior to germination

- Seeds become soft, mushy, turning brown to black in color, eventually disintegrates
- Seedlings usually attacked at or below soil line

Damping-off.
Photo credit

Infection of seedling stems by the damping off fungi results in thin wiry rotted stems that cannot support the seedling.

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“Damping Off”

Controls

- Watering – do not keep wet
- Mist/water with warm water
- Maintain soil temps ≥60º F
- Sterile planting medium
- Can purchase treated seed
  (Captan, Thiram)
- Others:
  ….clove oil
  ….fungicide
  ….course sand

Damping-off of snapdragon seedlings caused by Rhizoctonia. Photo credit

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Asexual means of propagation (vegetative)

Used to produce clones or exact genetic copies of parent plant

Several advantages:

- More convenient
- More economical
- Less time to get suitable transplant vs. seed
- Allows reproduction of difficult plants (seeds are sterile or poor germination rates)
- Shortens time to reproductive maturity (fruit trees, small fruits)

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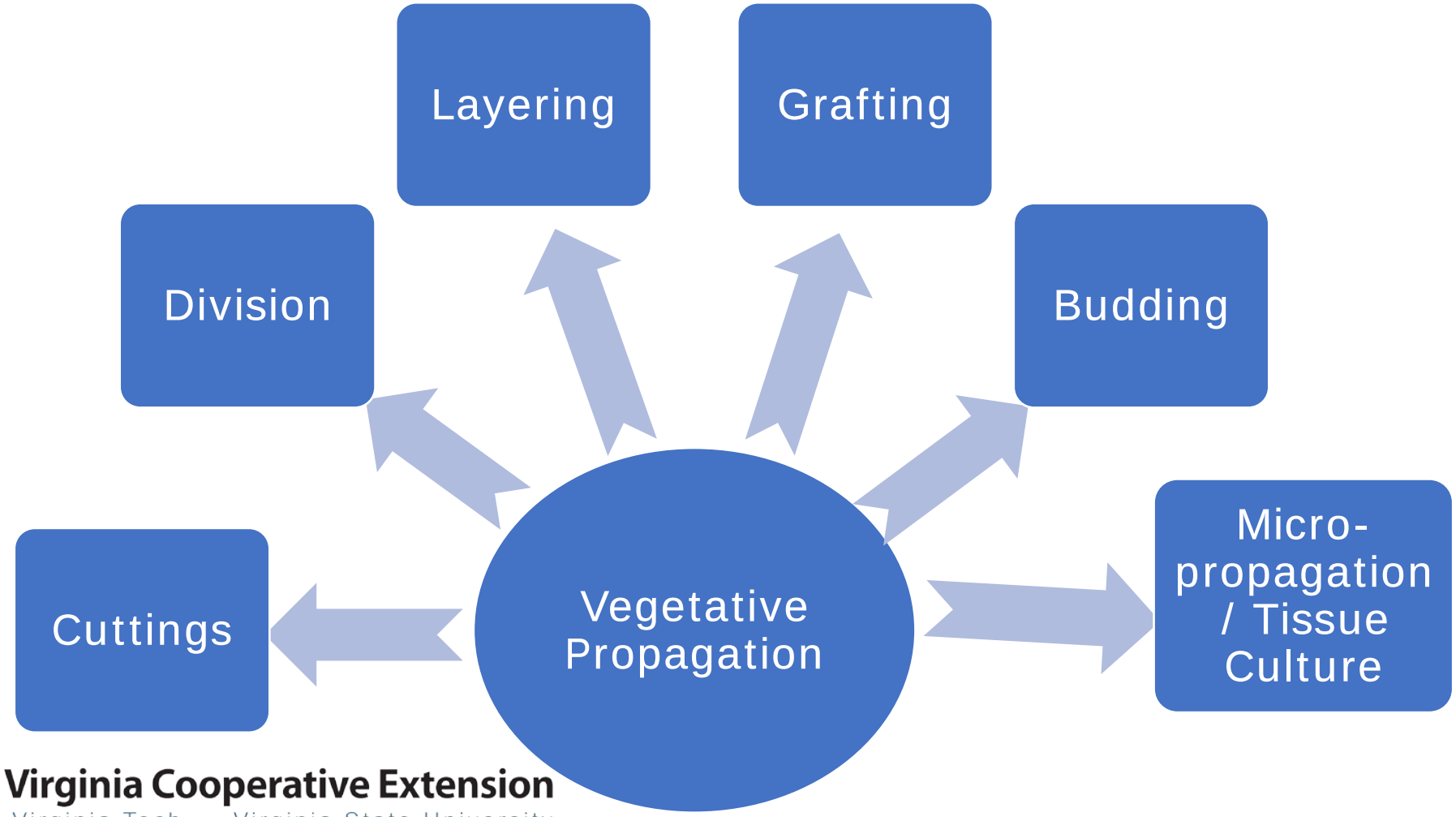
Vegetative Propagation



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Propagation by Cuttings

- “A cutting is a vegetative plant part which is severed from the parent plant in order to regenerate itself, thereby forming a whole new plant.” (VA EMG Training Handbook)
- Used by commercial greenhouses and nurseries (simple, quick, inexpensive)
- Great for home gardeners (reproduce that favorite plant!)

Important rules using cuttings:

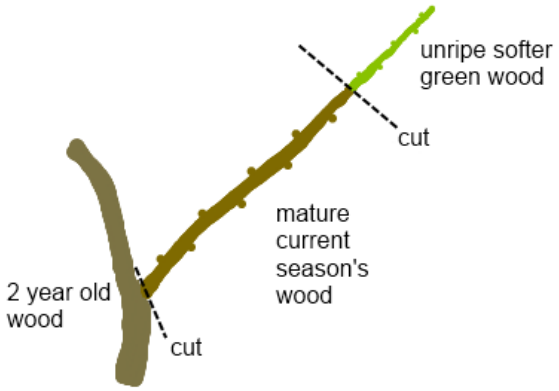
- Polarity – roots at proximal end; shoots at distal end
- Buds – include several in the cutting

Types of Cuttings

Hardwood

- Take from woody plants during dormancy (Nov-Feb) – previous year's growth
- Deciduous woody plants (Rose, Willow, Poplar, Honeysuckle, Forsythia)
- Mature dormant wood ¼"-1" in diameter; minimum 2 nodes
- Use rooting hormone

Photo credit



Semi-hardwood

- Partially mature wood from current season's growth (generally late summer)
- Many ornamental shrubs – Rhododendron, Holly, Euonymus
- 3"-6" long cuttings, leaves retained upper half
- Critical to minimize water loss
  - Plastic covering
  - Regular misting

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Types of Cuttings….

Softwood

- New growth in current season
  - Spring growth of deciduous and evergreen species
  - Many ornamental shrubs (Lilac, Forsythia)
  - Roots easier; requires more attention and equipment (misting to prevent drying; bottom heat)
  - High humidity
  - Indirect light
  - Soil temps 70º-80º F (most cuttings)

Herbaceous

- Non-woody plants such as perennials and house plants
  - Geranium, Coleus, Chrysanthemum
  - Needs attention similar to softwood cuttings

Photo credit: Tekura School NZ

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Photo credit

Types of Cuttings....

Stem Cuttings

- Xylem and phloem cells plug the tubes – callus forms (acts as a dam preventing the loss of precious fluids)
- These cells re-organize to form adventitious roots
- Most commonly used method to produce house plants
- Very popular with plants that exhibit cane-type growth (Dieffenbachia)

Video: Propagation by Cuttings and Grafting

- ***How to do a stem cutting:***
  - ① Use stem 2”-6” in length (4”-6” preferred) with 2-3 leaf nodes
  - ② Remove leaves at nodes to be below rooting medium
  - ③ Make ¼” cut below a leaf node
  - ④ Use rooting hormone to encourage vigorous roots
  - ⑤ Rooting medium needs to be porous but hold moisture. *Do not let medium dry out.*
  - ⑥ Cover (keeps humidity and moisture levels constant)

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Propagating Plants by Cuttings

Rooting Hormones: Auxins

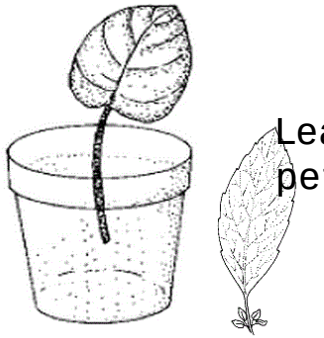
- Increases rooting success; speeds up process; helps in uniformity
- IAA naturally occurs in leaves and buds – destroyed by light
- Synthetic auxins: IBA, NAA
  - Talc / powder forms
  - Liquid / quick-dip types
  - Shelf life approximately 1 year
- Wounding plant material
  - More surface area
  - May stimulate natural auxins
  - Ex., Rhododendron Junipers

Types of Cuttings: Leaf; Leaf Bud; Root

Leaf Cuttings

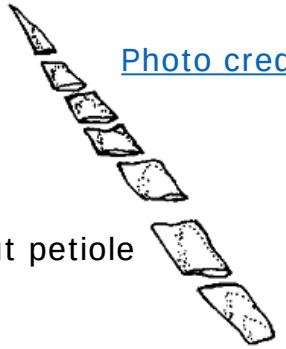
- Leaf blade with or without petiole (thin stem supporting the blade of a leaf)
- Ex., African Violet, Begonia, Snake plant
- May take several months to produce a transplant

- **Leaf Bud Cuttings**
  - Leaf and single node with a bud
  - Ex., Blackberry, Hydrangea



Leaf with petiole

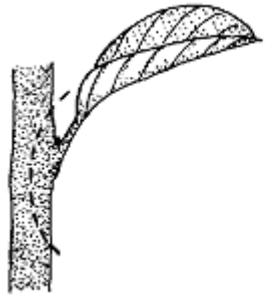
Photo credit



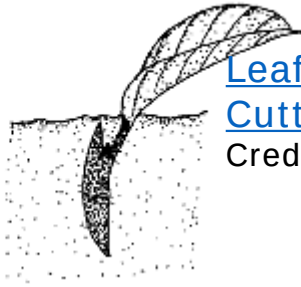
Leaf without petiole

- **Root Cuttings**
  - Obtained from roots of young plants, late winter or early Spring
  - Best not taken in late Spring during rapid plant growth
  - Ex., Acanthus, Horseradish, Oriental Poppy, Raspberry, Anemone, Phlox
  - Polarity very important

Root cuttings. Photo credit



Leaf bud cutting



Leaf, Cane & Root Cuttings.Photo Credit

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Types of Cuttings….

Recap: **Success with Cuttings**

1) Healthy stock
2) Proper age, growth stage, time of year – varies with species
3) Soil
   - Well-drained but retains moisture
   - Porous (oxygen)
4) Moisture

   Softwood and Herbaceous:
   - Misting
   - Polytents, covers
   - Irrigation
5) Temperature
   - Warm bottoms (60º-80º F)
   - Cool tops (50º-65º F)
6) Light
   - Bright indirect for Herbaceous
   - Low light for woody cuttings
7) Nutrition (fertilizer)
   - None if no roots
   - Once roots form, slow release or liquid

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Propagation by Division

- Runners – Specialized stem, grows horizontally, forms new plants at its nodes (Ex., strawberry, Spider plant)
- Stolons – Modified stem, grows horizontally, produces mass of stems (Ex., mint, Ajuga)
- Crown – Herbaceous perennials, shoots form at base of old stem (most perennials, Day Lily), plant lifted, divided by hand, knife, or shovel into shoots containing roots; generally best to discard older/center portions; shrubs divided this way best done when dormant

Propagation by Division

Photo credit: ufl.edu

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Propagation by Division

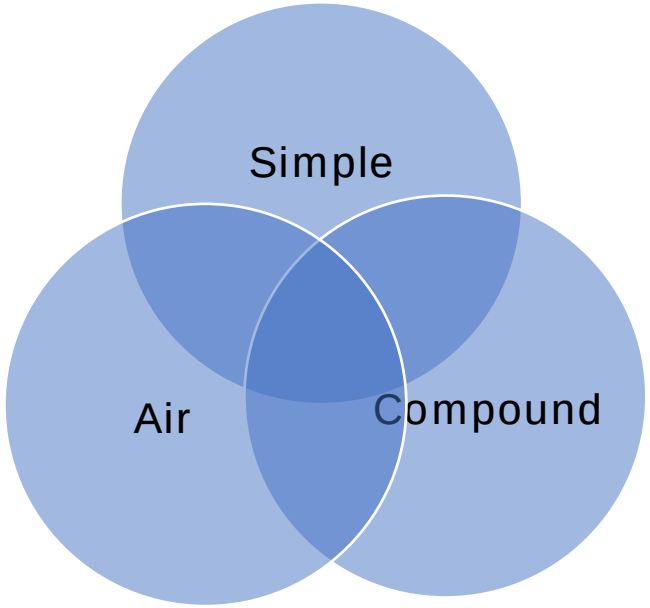
- Bulbs – Specialized underground stem for storage and reproduction:
  - Tunicate bulbs (Onion, Tulip, Daffodil)
  - Non-tunic bulbs (Lilies)
- Corms – Swollen base of stem axle with distinct nodes and internodes (Cormel ex., Gladiolus, Crocus)
- Tubers – Swollen modified stem for underground storage (potatoes)

Photo credit

Propagation by Layering

"Stems still attached to their parent plants may form roots where they touch rooting medium. Severed from the parent plant, the rooted stem becomes a new plant." (VA EMG Training Handbook)

Types of Layering



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Types of Layering - Simple

- Indoors or outdoors
- Bend branch low enough to touch ground
- Cover with soil (2”-3” works well)
- To speed the process, wound and dust with rooting hormone
- Fasten to maintain contact with soil (may naturally occur)
- Early spring, dormant one year shoots
- Keep soil moist
- Mulching is helpful
- Best to cut new growth the following spring, transplant to new permanent home
- Ex., Dieffenbachia, Honeysuckle, Spirea, Carnation, Forsythia

Layering

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Video: Propagation by Layering

Types of Layering - Compound

- For plants with long flexible shoots, i.e., Clematis, Grapes, Honeysuckle
- Actually Simple method repeated several times
- Wounds made on lower side, ground side of each curve
- Following Spring, branch is cut in rooted segments and transplanted

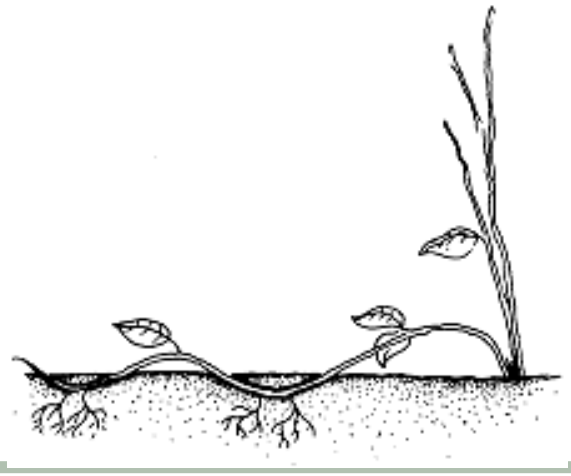

Photo credit.

Types of Layering: Air

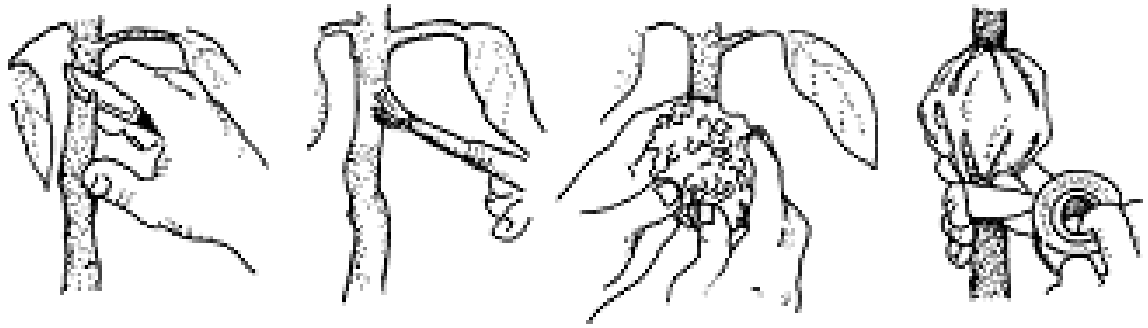

Photo credit

- Popular method for house plants
- Occurs above ground
- Made at any point on mature stem
- On many plants, best location 12” from tip
- Remove leaves several inches from rooting site
- Make slanting cut upward one inch or more about 1/2 way through branch
- Alternate (remove ½”-1” wide strip of bark)
- Apply rooting hormone
- If cut method used, insert small piece of wood; (i.e., toothpick) to prevent healing over. Cover with moist packing material (sphagnum moss), wrap in clear plastic to allow roots to be seen
- Takes a month depending on plant species

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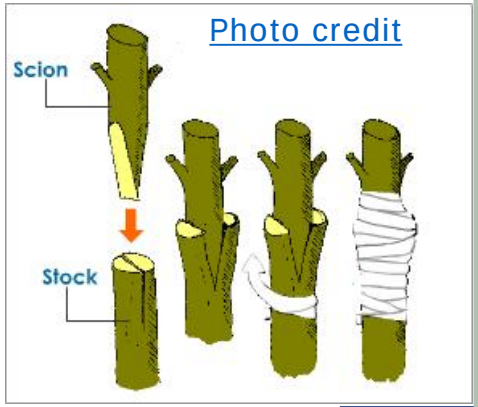
Propagation by Grafting

- Definition – act of joining two plants (or their parts) together:
  - Understock (stock, or root stock) The root plant or seedling (contains the roots)
  - Scion small branch or shoot of plant to be grafted onto the root stock

- Reasons for grafting
  - Obtaining benefits of root stock (faster growth, hardy root system)
  - Reproductive maturity (shorter time before fruiting)
  - Reduce production time (nurseries)
  - Propagate clones (not easily propagated by cuttings)



Propagation by Grafting

Successful grafting

- Cambium of scion and root stock must align as close as possible
- Cambium tissue (located between wood and bark of tree or shrub) is a single layer of cells, actively dividing to produce new cells
- Polarity is important
- Compatible root stock and scion
- Graft union kept moist
- Proper after-care
  - low light / indirect light
  - temperature (55º-75º F)
  - moisture level maintained
- Proper care after union
  - planted in ground soil / pots
  - maintain moisture, light, fertilization
  - after one year, transplant to permanent location

Types of Grafting

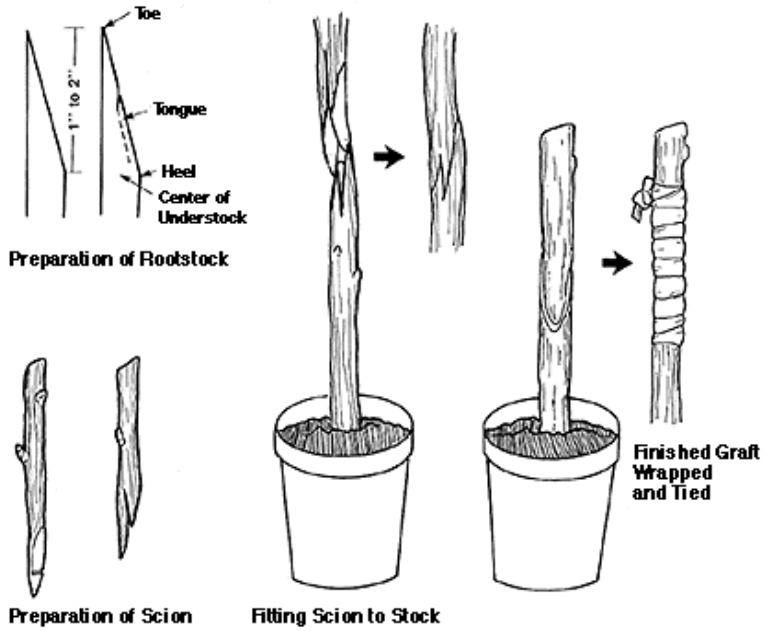
Whip, Whip & Tongue, Bench Grafting

- Same diameter, root stock, scion
- Preference ¼”- ½” diameter
- Root stock (plant growing or
- dormant root stock)
- Scion should be year-old wood
- Single smooth sloping cut 1”- 2 ½” depending on thickness of material
- Tongue length ½”
- Cambium areas must match
- Wrap graft with grafting tape,
- rubber bands, plastic adhesive
- tape, masking tape

Grafting

- Cover to prevent drying out (grafting wax, plastic wrap)
- Cut material approximately one month after growth begins

Photo credit



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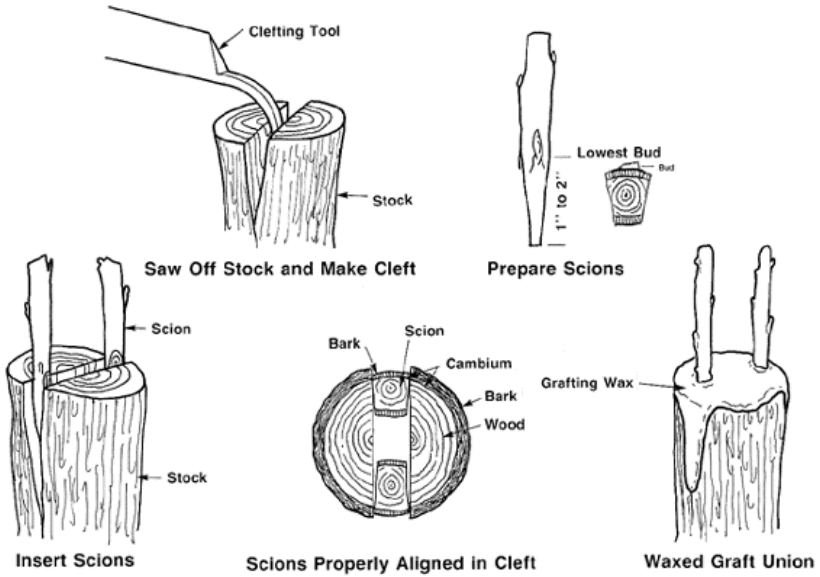
Types of Grafting….**Cleft Grafting**

- Most commonly used to “top work” a tree
- To change tree from one variety to another
- Can be young or mature trees
- Young trees grafted on trunk
- Older trees grafted on branches less than 2 ½” diameter
- Use grafting compound to protect tissue from drying out

Photo credit



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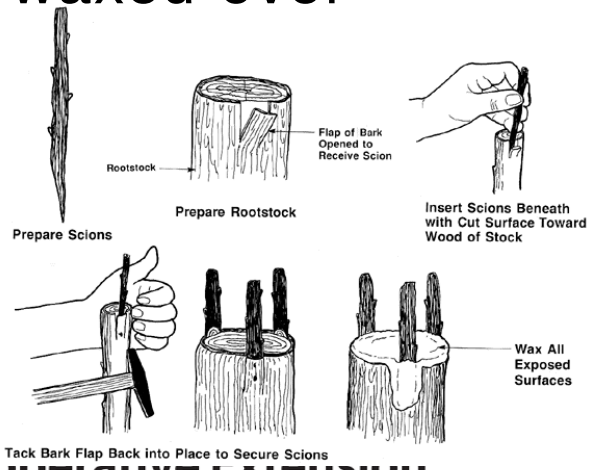
Types of Grafting....

Bark Grafting

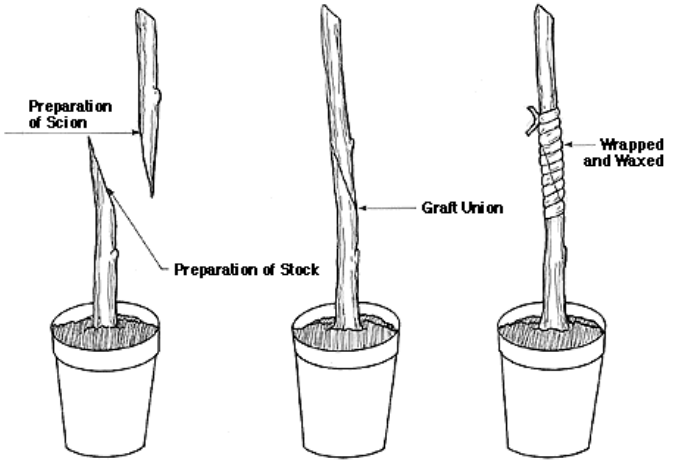
- Usually used on branches 1” and larger
- Bark is lifted, scion inserted
- Electric tape, masking tape
- Graft should be waxed over



Side (Stub) Grafting

- Suitable for plants too large for Whip grafting
- Used when not large enough for a Cleft or Bark graft
- Stock 1”–2” in diameter
- Scion ¼” in diameter
- After several weeks scion has started to grow, stock should be cut close to graft

Photo credit



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Propagation by Budding

Definition: Method where scion is a single bud with small section of bark
When / where applicable: Most frequently used to multiply a variety that cannot be produced by seed: Fruit trees and some woody ornamentals

Types of Budding

- T-bud – faster, higher % of success, well adapted to plant shoots less than 1” diameter
- Patch (slower, more difficult than T-bud)
- Chip

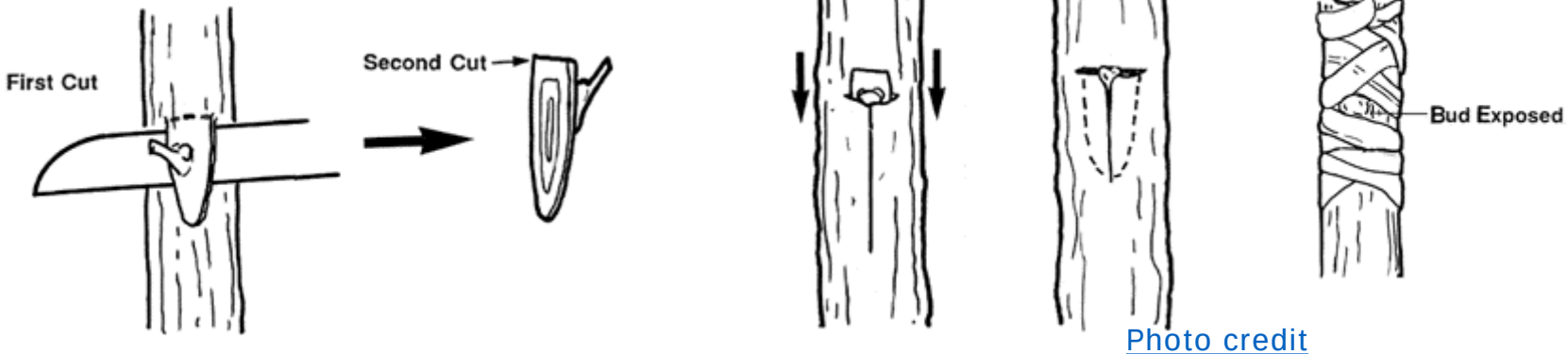

Photo credit

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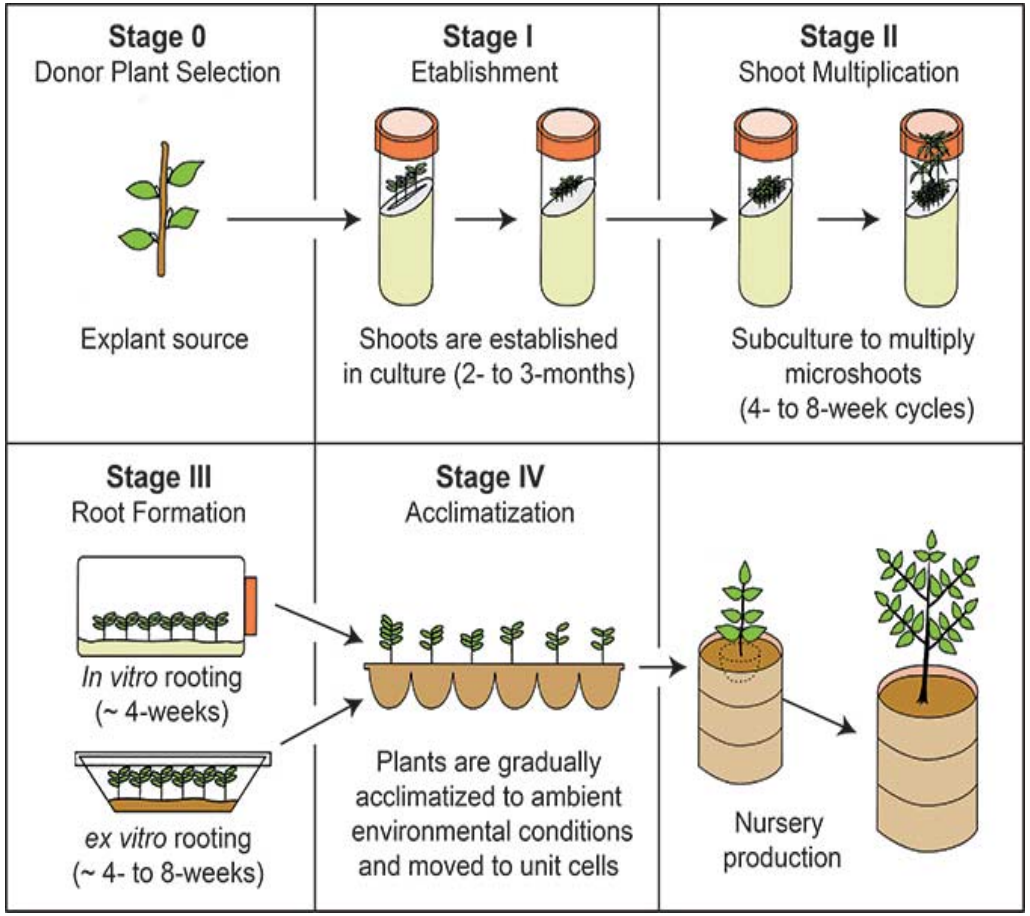
Micro-propagation/ Tissue Culture

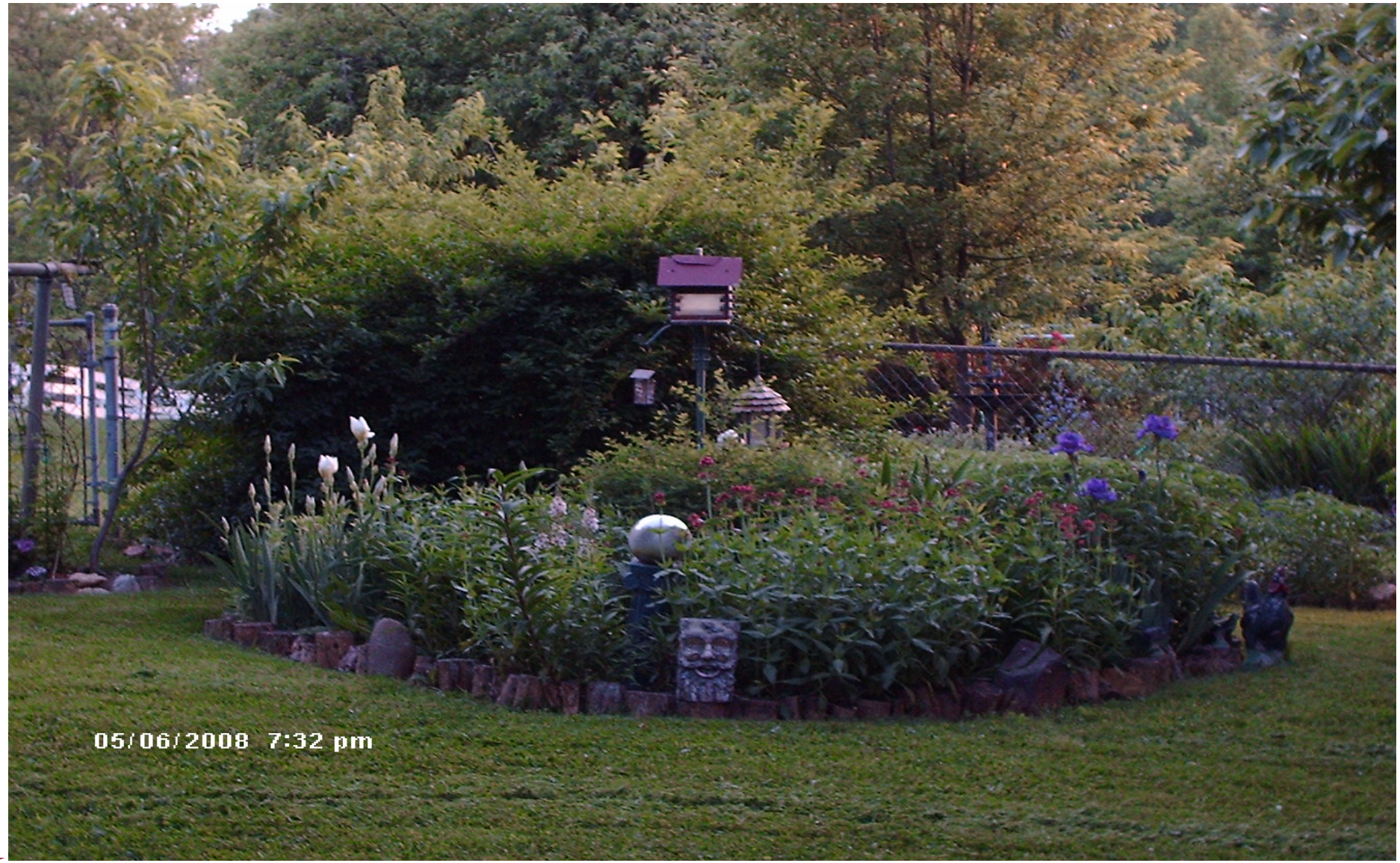
Photo credit



Definition

- Tissue Culture – art and science of propagating plants *in vitro* (“within the glass”)
  - Very small plant parts (totipotent plant cells carry genetic code to produce exact copy)
  - Propagation tube/dish with sterile agar medium containing sugars, nutrients, hormones
- Benefits
  - Mass production - thousands of new plants from single bud, leaf or stem in short time
  - Production of pathogen-free plants
  - Year-round production
- Limitations
  - Requires specialized equipment
  - Results dependent on skill of technician
  - Growing requirements vary greatly

Growth in Plants



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End of Slide Set

You can continue to next slide: ‘Suggested Readings’

OR

Click on the house below to return to the Navigation Page

Test Your Knowledge

Seeds: Truth or Fiction

Can You Answer These Five Questions?

My Propagated Plants Died Why?

Help Desk Questions

Apply What You Have Learned

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Suggested Readings

- Plant Propagation by Stem Cuttings

- Plant Propagation

Apply What You Have Learned

1. Test germination of a seed in a damp paper towel. How long did it take to sprout? How does that compare with what the 'literature' says?

2. Calculate the indoor planting time for a seed you could plant in your yard/garden in the spring or summer

3. Name a plant in your yard/garden that is best propagated by hardwood cutting

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Can You Answer These Five Questions?

Answers on next slide

1. What is the #1 enemy of seed and vegetative propagation?
2. Which allows greater genetic diversity – asexual or sexual propagation?
3. Why is saving seed from F1 hybrids generally not a good idea?
4. For seed germination, name five factors you need to be aware of?
5. When propagating by cuttings, what is one major rule you need to remember?

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Answers to Five Questions

1. What is the #1 enemy of seed and vegetative propagation?

   Answer: Damping off

2. Which allows greater genetic diversity – asexual or sexual propagation?

   Answer: Sexual

3. Why is saving seed from F1 hybrids generally not a good idea?

   Answer: Non-uniform characteristics in progeny

4. For seed germination, name five factors you need to be aware of.

   Answer: oxygen, water, temperature, dormancy, light

5. When propagating by cuttings, what is one major rule you need to remember?

   Answer: polarity (roots proximal end); shoots distal end

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My Attempts at Propagation Failed. Why didn't they work?

1. I put my new Beautyberry cuttings in small pots in the sun. They died. Why?

2. I put my azalea cuttings in the cool dim basement to protect them from the light. They died. Why?

3. I separated my Daylilies and used the center portion to grow a new one. It didn't grow. Why?

4. I cut up moss parts in my blender and put them in a dish with sugar and plant nutrients (micropropagation?). They molded and died. Why?

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My Attempts at Propagation Failed. Why didn't they work?

1. I put my new Beautyberry cuttings in small pots in the sun. They died. Why?
   Answer: New cuttings should have only indirect light, no direct sun.
2. I put my azalea cuttings in the cool dim basement to protect them from the light. They died. Why?
   Answer: They do need light, but not bright light. They need a warmer temperature 70-80 degrees soil temp.
3. I separated my Daylilies and used the center portion to grow a new one. It didn't grow. Why?
   Answer: Center portions and older portions should not be used; less likely to live.
4. I cut up moss parts in my blender and put them in a dish with sugar and plant nutrients (micropropagation?). They molded and died. Why?
   Answer: Micropropagation needs a sterile environment, specialized equipment, and a skilled technician. Not a home project.

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Help Desk Questions

Answers on next slide

1. Halifax cantaloupes: Can I plant seeds and get the same cantaloupe?

1. Peach trees bought 4 - 5 years ago, labeled the same. One has nice peaches great to eat. Other is twice as tall as first; peaches are hard, shiny apple style skin, turn spotty red, & drop off; inedible. What to do to make second tree produce like first tree?

1. I took cuttings from my lilac shrub in June. They didn't grow. Why?

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Help Desk Questions

1. Halifax cantaloupes: Can I plant seeds and get the same cantaloupe?
   Answer: Probably will not get the same cantaloupe since Halifax's are hybrid.
2. Peach trees bought 4 - 5 years ago, labeled the same. One has nice peaches great to eat. Other is twice as tall as first; peaches are hard, shiny apple style skin, turn spotty red, & drop off; inedible. What to do to make second tree produce like first tree?
   Answer: Sounds like either the graft of second peach tree died and it is now growing from the root stock or the trees are not the same. Look carefully at the graft point on the trees.
3. I took cuttings from my lilac shrub in June. They didn't grow. Why?
   Answer: Wrong time of year. Woody plant cuttings should be taken from November through February

Click to return to Test Your Knowledge

Are the Following Statements About Seeds True of False?

Two seed leaves come from a monocot seed	T or F
Seeds are the most economical way to grow plants	T or F
Most vegetables are grown from seed	T or F
Woody ornamentals are easily grown from seed	T or F
Seeds saved from hybrid plants will not have same uniform characteristics as parent	T or F
Seeds from heirloom tomatoes will not grow to be the same as the parent plant	T or F
Some seeds should not be covered by soil when planted	T or F
Different seeds prefer different temperatures to germinate	T or F
Most vegetable and flower seeds prefer a germination temperature around 65-86 degrees	T or F
Consistent day and night temperature is best for seed germination	T or F
A small seed planted very deeply may exhaust its food supply before growing to the surface	T or F
Soaking seeds in hot water to break dormancy is known as stratification	T or F
Proper watering and use of sterile planting medium are important to prevent 'damping-off'	T or F

Seeds: True or False Answers

Two seed leaves come from a monocot seed	F
Seeds are the most economical way to grow plants	T
Most vegetables are grown from seed	T
Woody ornamentals are easily grown from seed	F
Seeds saved from hybrid plants will not have same uniform characteristics as parent	T
Seeds from heirloom tomatoes will not grow to be the same as the parent plant	F
Some seeds should not be covered by soil when planted	T
Different seeds prefer different temperatures to germinate	T
Most vegetable and flower seeds prefer a germination temperature around 65-86 degrees	T
Consistent day and night temperature is best for seed germination	F
A small seed planted very deeply may exhaust its food supply before growing to the surface	T
Soaking seeds in hot water to break dormancy is known as stratification	F
Proper watering and use of sterile planting medium are important to prevent 'damping-off'	T

Click here to return to 'Test Your Knowledge'

COPY OF PLANT PROPAGATION QUIZ

1. All seeds require light to germinate: a. True b. False
2. Seeds may germinate poorly in heavy clay soils due to:
   a. Weight of soil on seeds b. Poor water retention c. Poor oxygen supply d. Poor nutrition
3. Stratification consists of:
   a. Breaking the seed coat b. Soaking seeds in hot water c. Soaking seeds in acid solution d. Chilling the embryo
4. Garden soil is the best medium to start seeds indoors: a. True b. False
5. A rule of thumb for depth of planting seeds that don't need light to germinate is:
   a. One inch b. ¼ inch c. 1 ½ to 2 times the diameter of the seed d. Same as diameter of seed
6. Most annuals and veggies started indoors prefer a daytime temperature of:
   a. 65-75 degrees b. 75-85 degrees c. 85-95 degrees d. 45-55 degrees
7. When should seedlings be transplanted?
   a. As soon as they emerge b. When they are three inches tall c. After first set of true leaves appear
   d. Whenever you want to
8. Which one of the following may be used to prevent damping off?
   a. Keep wet b. Keep very dry c. Cool soil d. Sterile soil
9. Asexual propagation shortens time to reproductive maturity: a. True b. False
10. Making a small cut into a branch, adding rooting hormone, covering with sphagnum moss and clear plastic is which of the following types of propagation?
    a. Air layering b. Cutting c. Grafting d. Micro propagation
11. The type of propagation by budding with the highest percent success rate, good for shoots less than 1 inch diameter is:
    a. Three bud b. T-bud c. Chip d. Patch