

Plant Propagation

Plant propagation...

“the art and science of multiplying plants by sexual or asexual means.”

- **Sexual methods - seed propagation**
- **Asexual methods**
 - **rooting cuttings**
 - **layering; air layering**
 - **grafting**
 - **specialized structures**
 - **tissue culture; micropropagation**

Asexual propagation...

“vegetative reproduction, i.e., multiplication that does not involve the seed cycle - clonal propagation.”

Benefits of asexual propagation...

- Some plants produce few (if any) viable seeds.
- Clonal progeny are highly uniform in all characters.
- Outcrossing plants produce highly variable progeny.
- Plants may have extended juvenile period.
- Seeds may have lengthy and complex dormancies.

Cutting propagation...

- **Cutting capable of regenerating roots (or shoots) from adventitious meristem.**
- **Cuttings defined by size and location on parent plant:**
 - **stem tip**
 - **root**
 - **leaf**
- **Cuttings also defined by condition of growth:**
 - **softwood, semihardwood, hardwood, herbaceous**

Conditions required for rooting cuttings...

- **Hardwood and root cuttings require well drained medium, but little moisture control.**
- **Leafy cuttings require high humidity to prevent excessive dehydration:**
 - **intermittent mist systems.**
 - **poly tents or cold frames.**
 - **fog.**
- **Medium into which cuttings are stuck must be disease free, well drained, and light.**
- **Auxin application now standard treatment.**

Examples of cutting propagation...

Species	Cutting Type
African violet, begonia	leaf cuttings
Many woody shrubs	stem tip cuttings (softwood)
brambles	root cuttings
Willow, poplars	dormant hardwood cuttings

Grafting and budding...

“The vascular cambium can regenerate the vascular connections between the scion and rootstock resulting in a complete plant composed of more than one genotype.”

- **Can graft scion cultivar onto size controlling rootstock.**
- **Many difficult to root plants are graft compatible.**
- **Grafting defined by season and type of tissue.**
 - budding (T-budding, inverted T, patch)
 - wedge, veneer, whip and tongue, cleft, etc.
- **Scion cultivar may be changed on mature trees (top working)**

Grafted and budded plants...

Species

Graft/bud Type

apples

chip, T-bud, cleft

conifers

side veneer

pecans

patch

roses

T-bud (shield)

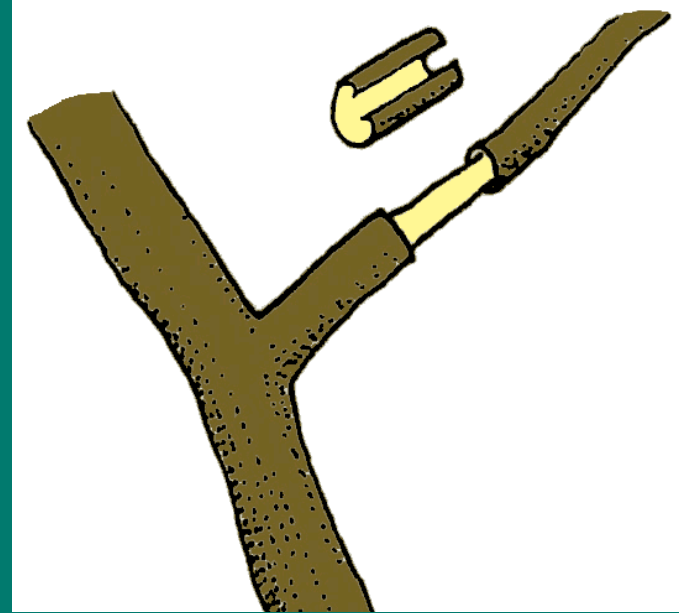
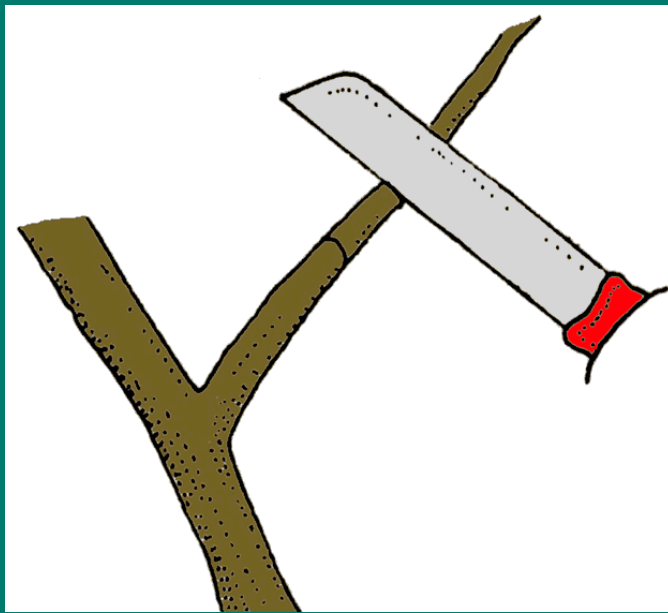
grapes

modified wedge

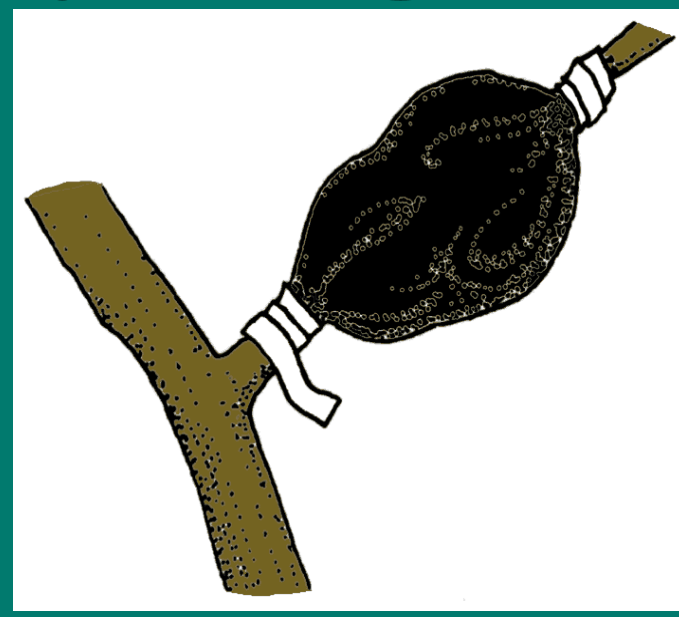
Layering...

“Layering involves inducing roots on an intact (or nearly so) plant .”

- **Air layering - interrupt cambium and cover wound with moistened medium. *Ficus elastica, Magnolia***
- **Simple layering - low hanging branch covered with soil (with or without wounding) - many shrubs**
- **Tip layering - tips of plants (brambles) at certain times of year (rat-tail condition) develop roots where they touch the soil Blackberries, raspberries**
- **Mound layering - soil mounded to cover base of specially pruned young tree (also referred to as stool layering) Apple rootstocks**



Air Layering



Specialized Structures

Modified Stems

bulb, corm, tuber, rhizome

pseudobulb, runner

Modified Roots

tuberous root



Propagation by specialized structures...

Species

Structure

tulip, onion, Easter lily

bulb

potato, Jerusalem artichoke

tuber

***Iris*, lily-of-the valley**

rhizome

Gladiolus*, *Crocus

corm

strawberry, *Ajuga*

runner

***Dahlia*, sweet potato**

tuberous root

Micropropagation...

“Micropropagation has many synonyms - tissue culture, mass propagation, in vitro culture, *cloning*.”

- Micropropagation is rapid, continuous, and efficient.
- Specialized equipment, facilities, and technically trained personnel are required.
- Steps can be taken to obtain and maintain certified pest-free plants.
- Cost effective if large numbers of a given clone are produced.
- Widely used for orchids, ferns, many interior foliage plants, rootstocks, etc.

Plants amenable to micropropagation...

Flowering pot plants - *Begonia*, African violets, orchids

Interior foliage plants - ferns, *Syngonium*, *Ficus*,
Diffenbachia

Woody ornamentals - red maples, *Rhododendrons*,
Nandina

Forest trees - Poplar, birch, loblolly pine

Fruit trees - apple, cherry, pear (many rootstocks)

Vegetable crops - potato, celery, tomato, onion (male
sterile)

Plantation crops - banana, date palm, coffee

Propagation by seeds...

“Propagation by seeds is the major method by which plants reproduce in nature and one of the most efficient and widely used propagation methods for cultivated crops.”

Hartmann and Kester

- **Seeds are widely available, inexpensive, and easy to handle.**
- **Hybrid seeds are more expensive, but may have production benefits that offset the cost.**
- **Large scale agriculture (including vegetable crop production) is dependent upon seed propagation.**
- **Seeds (especially seeds of woody plants) may have complex dormancies that impede germination.**

THANK YOU