

# Propagation

UofA

**DIVISION OF AGRICULTURE**  
**RESEARCH & EXTENSION**

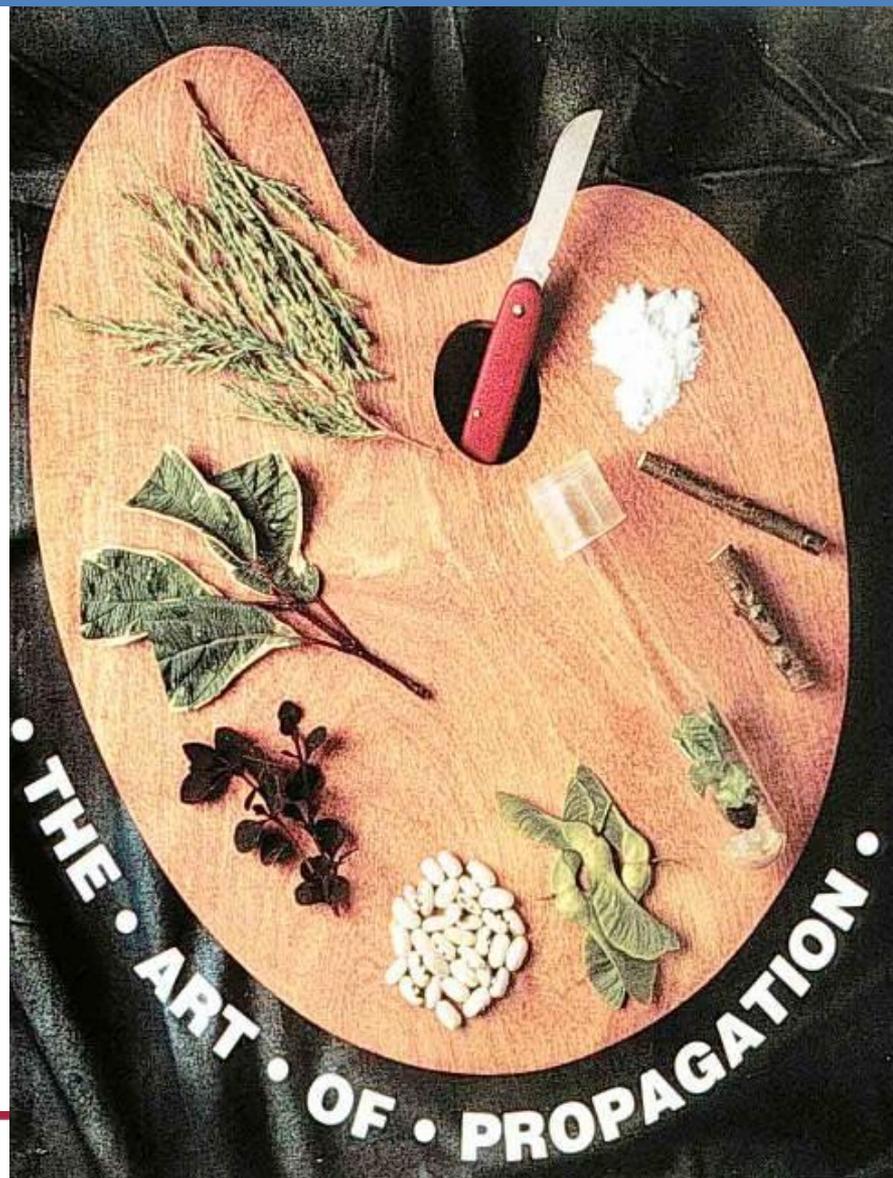
*University of Arkansas System*



**This is NOT the focus of this talk!**



Plant propagation is as much an art as it is a science.



# Two Broad Categories of Plant Propagation:

- Asexual/vegetative:
- Sexual:





**Asexual propagation is basically the heart and soul of horticulture.**

# Cutting Terminology:

## 1. Source of the cutting

a. leaf

b. stem

c. root

## 2. Type/age of stem wood

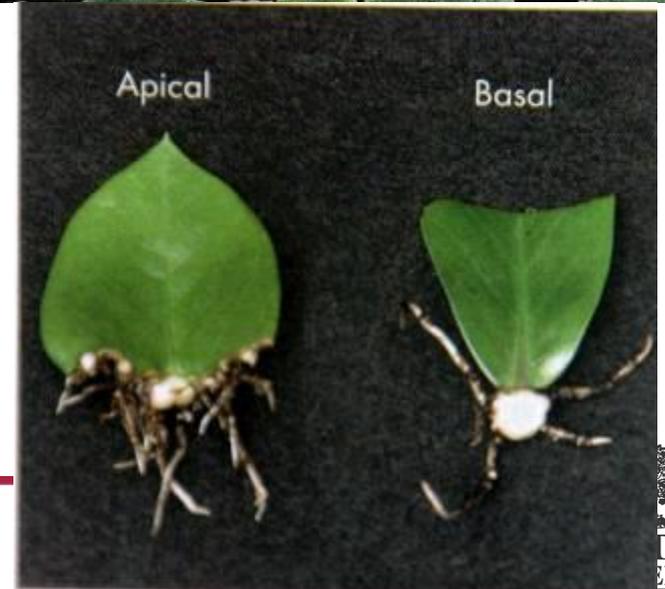
a. softwood

b. semi-hardwood

c. hardwood



# Leaf Cutting





# Root Cutting



# Root cuttings sprouting



# Stem Cuttings

# Types of cutting

- The terms ‘softwood’, ‘semi-hardwood’, and ‘hardwood’ are used to describe the relative amount of woody tissue in a stem.
- Softwood- 3-4 weeks
- Semi-hardwood 6-9 weeks

# Softwood Stem Cuttings

- The term herbaceous cuttings is used for non-woody plants like geranium, coleus, chrysanthemum.



# Softwood Cuttings

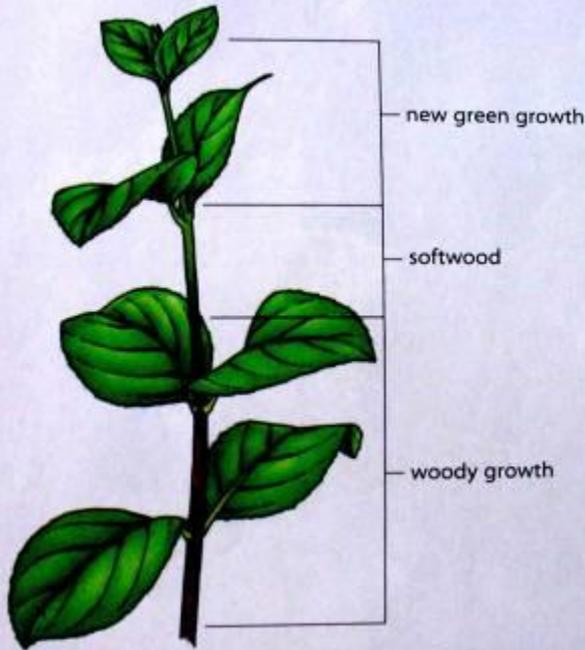
- **Softwood cuttings** are soft, succulent, new growth of woody plants
- just as it begins to harden (mature). Shoots are ready when they can be snapped easily when bent
- For most woody plants, this stage occurs in May, June, or July.



# Softwood Cutting

## Softwood is neither green nor woody

Softwood is the term used to describe the stage of growth on a deciduous woody plant that's neither the new, green growth at the end of a shoot nor the stiff, woody growth near the base of the stem. The softwood lies between the two. The best way to know if a shoot has reached the softwood stage is to bend it. If the softwood snaps, the shoot is ready to be taken as a cutting. If the shoot is very flexible and doesn't snap, it's too green. If the shoot is not flexible at all, it is too far gone.



## Semi-hardwood Cutting



**This Viburnum was stuck in a pure sand bed on July 22, treated with rooting hormone, and rooted by August 25!**

# Hardwood – dormant,

- wisteria,
- spirea,
- crape myrtle
- roses



# Hardwood Cutting

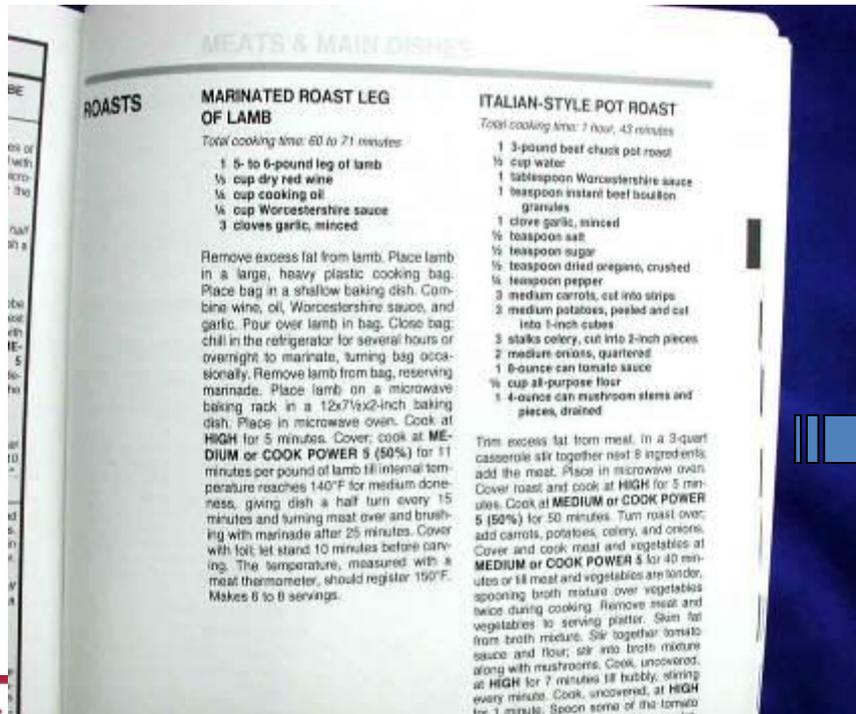


# Time of year to take cuttings?

\*for broadleaf plants (dogwoods, forsythia, Viburnum, spirea) , in general, the best time is following a spring flush

• for evergreen plants (spruce, junipers, arborvitae) , in general, the best time is after exposure to cold temperatures (late fall/winter)

# Today, plant propagation is just like cooking. Books and the internet are full of ‘recipes’ for propagating plants by seed and cuttings. These recipes are helpful in deciding when to propagate and what is required.



tion of Acers by cuttings. *The Plant Propagator* 12(1):4-6 (1966).

## ***Acer barbatum*** (A. *floridanum*) Florida Maple

**SEED:** See *Acer saccharum*. The Florida maple has many characteristics common to sugar maple. Since it is found wild in the Coastal Plain, there is inherent heat tolerance. Fall color is akin to that of sugar maple and for that reason it is a valuable small tree where excessive summer heat limits successful culture of sugar maple.

## ***Acer buergeranum*** Trident Maple

**SEED:** Exceedingly easy. Collect in October (when wings are yellow-brown) and sow outside or stratify for 2 to 3 months at 40°F. Some seeds generally germinate in bag. Seeds are virtually 100% sound and percentages will be high. Senior author's research has indicated this is an easy species to grow from seed. One report noted that extremely dry seed imported from Korea was soaked, cold stratified and germinated only 20%. However, the following spring, germination was very heavy.

**CUTTINGS:** Successful cutting propagation has been elusive. Cuttings taken from a mature tree in late June and treated with either 2.0% ppm IBA or 25% chloromone, fine sand, 60 and 36% rooting. Trees were at least 4 to 5 years old. Late June. 3 to 4 nodes, tip pair removed, wound, 8000 ppm IBA-talc, 9 perlite: 1 peat, mist, 70°F bottom heat, rooted 95%. Five cultivars rooted 75 to 95% with same treatment. No mention was made as to the age of stock trees. Senior author has had no success with cuttings from mature trees even with high IBA (1% solution). There are definitely superior selections that could be made.

**GRAFTING:** Cultivars can be pot grafted on seedling understock (see grafting section for details). Several cultivars exist and Vertrees' book serves as a good reference. Some cultivars have been rooted successfully (see cuttings above).



Best choice

**Given a preference, choose the terminal cutting on the right that has not set a flower bud. IF all shoots have flowers/flower buds, simply remove prior to sticking cutting.**

# Rooting Media

- In general terms, we are want:
- sterile,
- well drained,
- and provides for adequate aeration.



# Rooting Media

- The most common components would be: coarse perlite, coarse vermiculite, peatmoss, or sand.



Vermiculite & Perlite





perlite



peatmoss



# Favorite media recipes:

- ✓ 50% coarse perlite: 50% peatmoss
- ✓ 50% coarse perlite: 50% coarse vermiculite
- ✓ 100% coarse perlite (well drained!)
- ✓ 100% sterilized, coarse sand

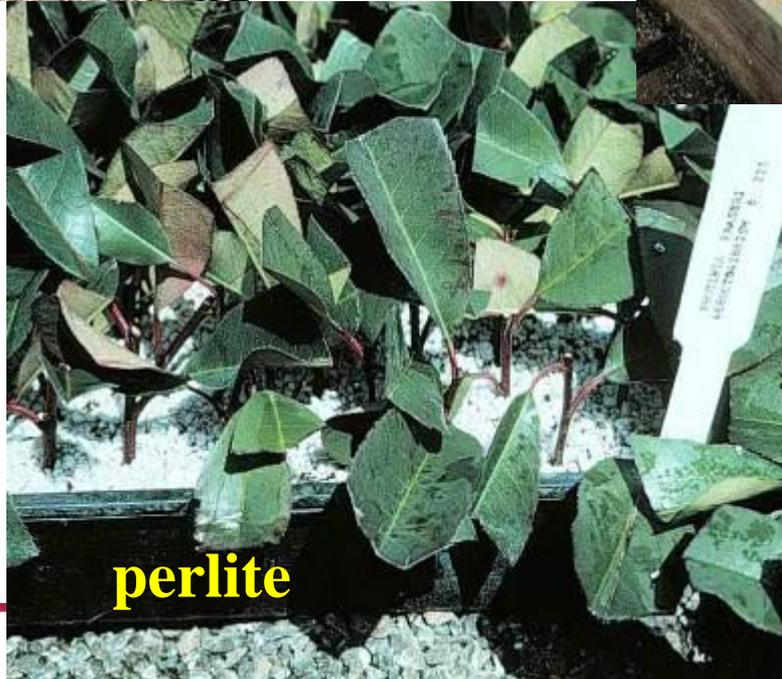




**pumice**

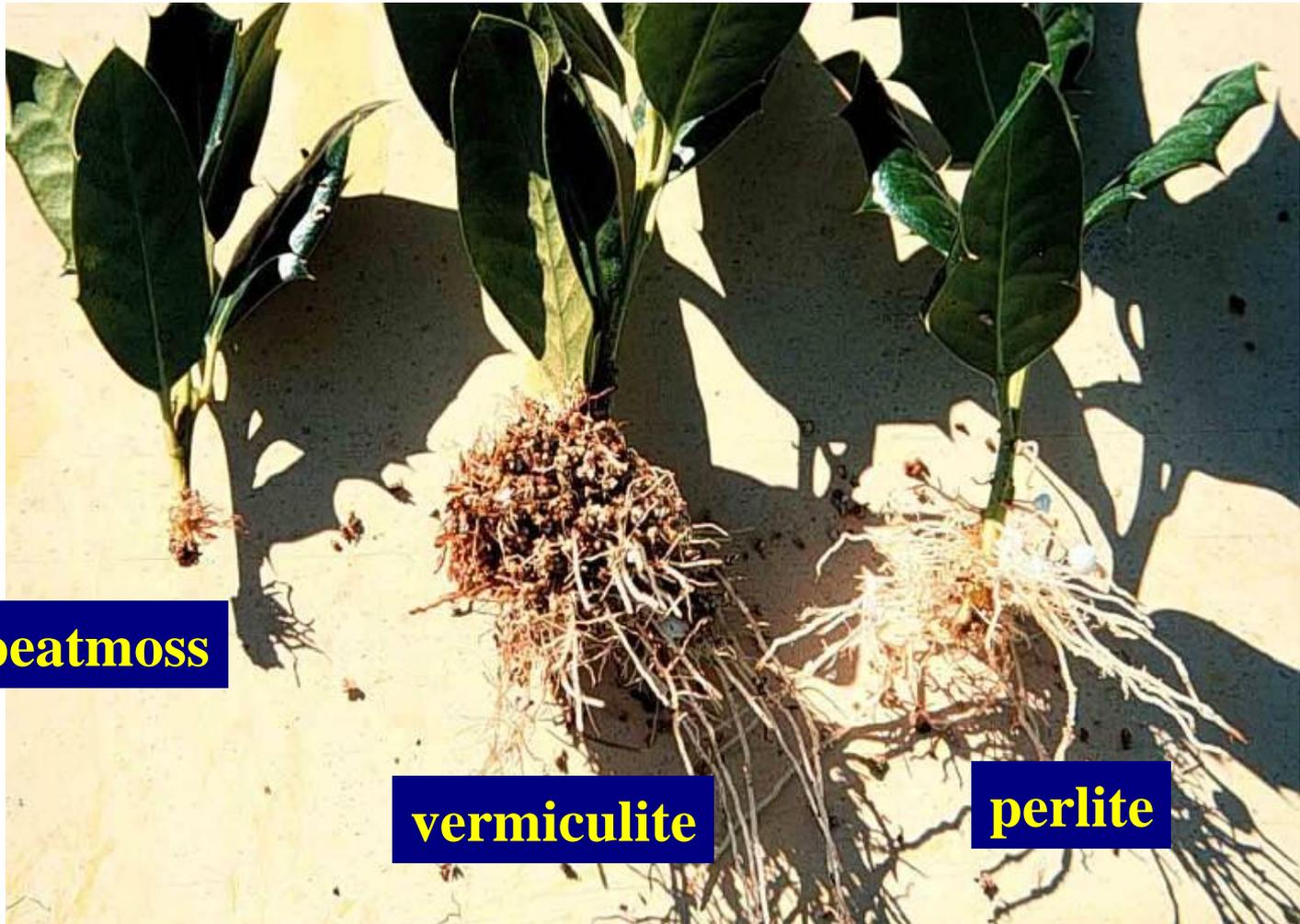


**Oasis™**



**perlite**

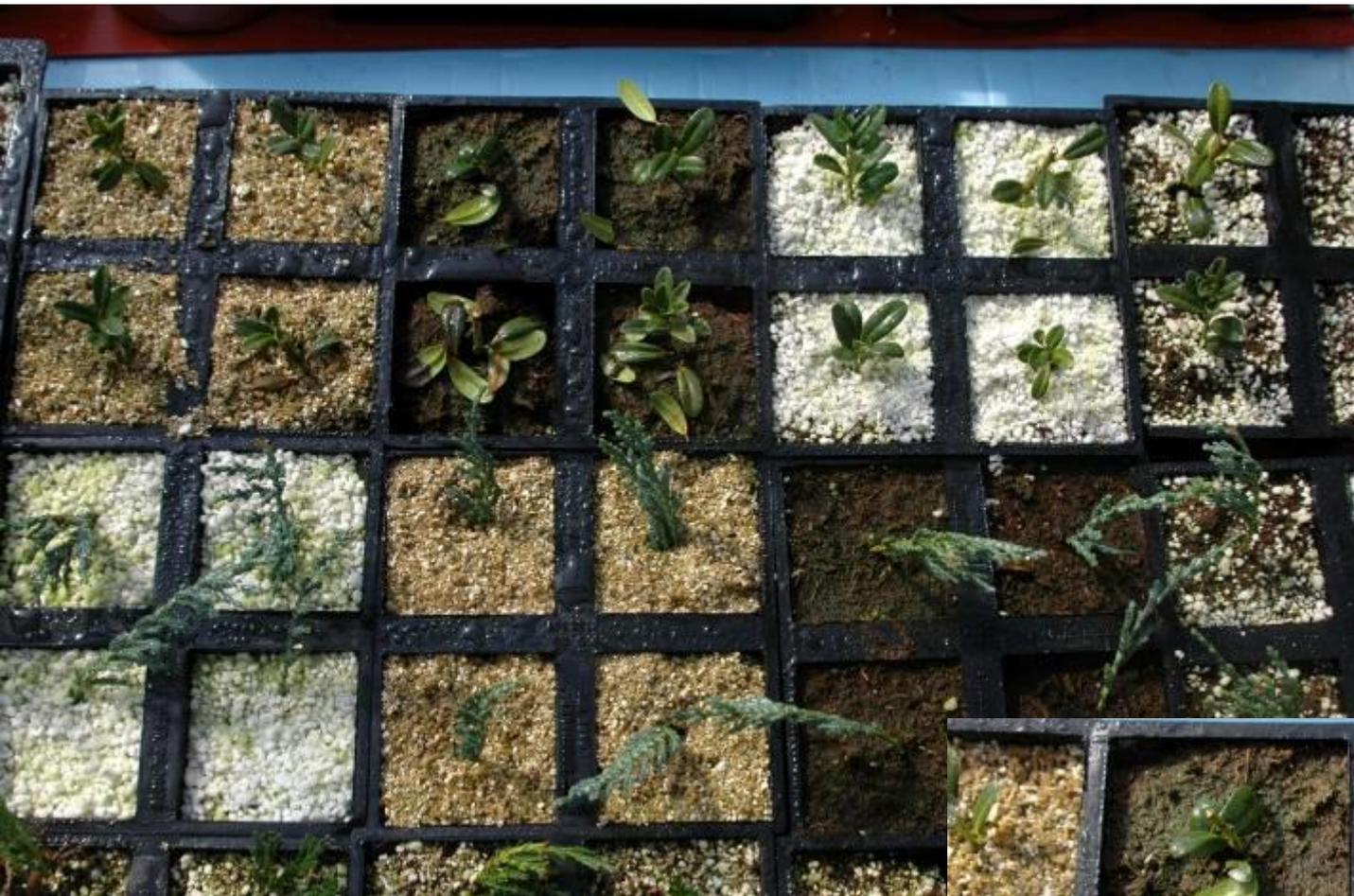
# Effect of media type on rooting



**peatmoss**

**vermiculite**

**perlite**







# Callus

- Callus is the white tissue that forms on cut surfaces of the cutting
- It is from callus that roots form.



# Typical relationship rooting to top growth



# Environmental Considerations for Rooting

- Moisture
- Temperature
- Light



# Moisture - air



- Except for dormant cuttings, protect water loss from the leaves.
- Keep the atmosphere around the leaves near 100% humidity.
- Either trap moisture from the media or ‘mist’ the air.

# Moisture - media

- **Moist, but not too wet!**
- **A media that holds some moisture but provides for good aeration is ideal.**



# Temperature



- For most cuttings, rooting media (65-75° F) than the air temp. (55-65° F).
- promote rooting in the media, but minimize stress on the leaves/stem

# Light

- While some sunlight is necessary
- too much can 'burn' the leaves.
- Keep cuttings out of direct light.



**Remember that until the stem forms new roots it cannot replace water lost through leaves or stems. Low humidity or high temperatures around the cutting can accelerate the water loss process—and stop rooting.**



**Mist is simply micro-droplets of water**

# Many choices

Inverted tray for shade



Simply trapping soil moisture

# other options:







## Bottom heat:



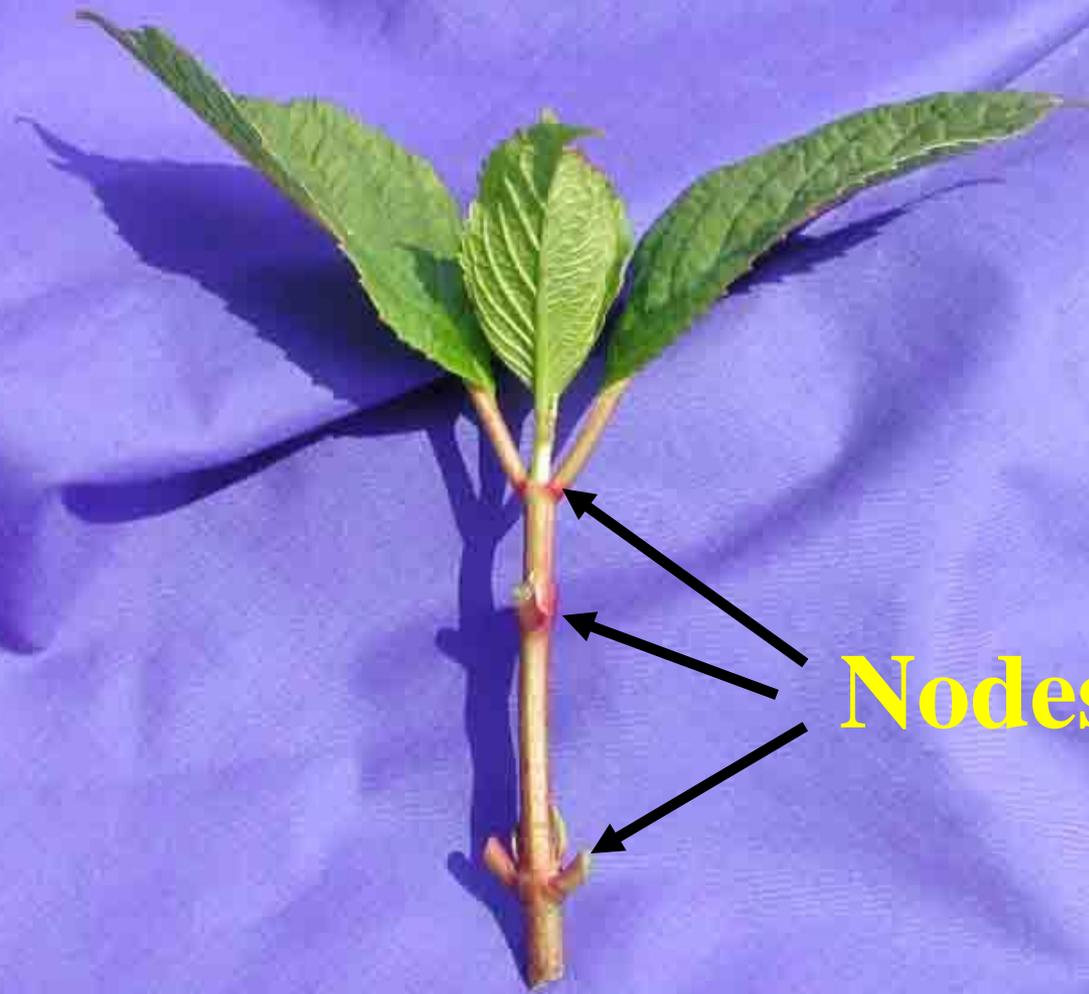


# Transporting Cuttings





**Typical semi-hardwood terminal cutting**



**Nodes** (3 node cutting)

**Leaves removed to reduce water loss**



**Base will be inserted  
below media**

**Dip cutting in hormone talc**

# Stick cuttings



Place in rooting chamber to elevate moisture around cutting. Avoid direct sunlight.



**Air layering:  
root the stem while  
it is still attached to  
the plant.**





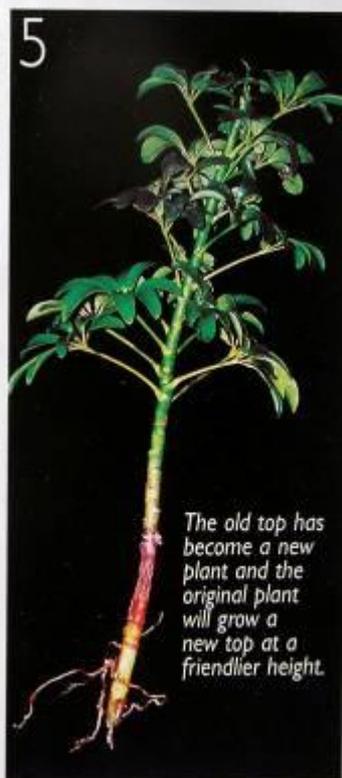
1  
The first step in air layering an overgrown houseplant is to remove the outer layer of tissue.



2  
Next, moist long fiber sphagnum is packed against the cut to retain moisture and humidity—critical for proper rooting.



3  
After several weeks the new roots can be seen through the clear plastic wrap. When they are several inches long, the top of the plant is ready to be removed.



5  
The old top has become a new plant and the original plant will grow a new top at a friendlier height.



4  
After several weeks, gently remove the plastic and peat to expose the newly formed roots.

# Seed



# Seed Propagation

- **primary method to propagate annuals & vegetables; some perennials**
- **Seed propagation is also used to propagate some woody trees and shrubs.**
- **Advantages include:**
  - access to large numbers of propagules
  - ease of harvest/storage.
- **The primary limitation is that many plants do not come true from seed.**



# Natural variability from seeds



**Similar to cutting propagation, there are many very complete ‘recipe’ books available. These books outline in detail when to harvest the seed, how to store the seed, how to sow the seed, and post-germination issues.**

BURPEE

SEED

STARTER

a growing guide for starting

flower, vegetable, and herb seeds

indoors and outdoors

Maureen



son. Space seedlings 6–10 inches apart within the rows, and space the rows 2–3 feet apart.

**Indoor Germination Temperature:** 70–75°F

**Days to Germination:** 21–25

**Growing On Temperature:** 60°F

**Garden Needs:** Plant in full sun in deeply dug and well-prepared, light, rich, moist to wet soil. The vegetable needs a long growing season, so it is best to plant as soon as the soil can be worked. Keep the soil very moist throughout the growing season and fertilize the plants every 2 weeks with a complete fertilizer.

**Days to Maturity:** 80–140

**Harvesting Tips:** Harvest stalks by cutting the base at soil level with a knife.

**Recommended Cultivar:** ‘Tall Utah 52–70 R Improved’ produces super-crunchy stalks. Matures: 105 days.

## COLLARD AND KALE

*Brassica oleracea*

**Sowing Directions:** To get a jump on the season, sow seeds indoors in late winter and transplant the seedlings into the garden in early spring. For

ing on. F  
spring or

**Indoor C**  
70°F

**Days to G**

**Growing**

**Garden**  
fertile, lo  
soil is p  
when t  
height.  
evenly m

**Days to**

**Harvest**  
harvest  
long. Pi  
the you  
center) t  
fresh o  
improve

**Recom**

‘Dwarf  
is a  
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‘Georgi  
mer  
very

**CORN**

# Collection/harvest of seed:

- Consult books for time and method for harvesting seed.
- In many cases, the pulp/flesh of certain fleshy fruits is removed before storage or sowing the seed.



# Scarification

Scarification typically involves soaking the seeds in concentrated acid or hot water, or, by mechanical etching using a file or sand paper.

Use of the acid method is recommended only for professionals !



# Scarification

- rub small seeds between layers of sand paper or use a file on larger seeds.

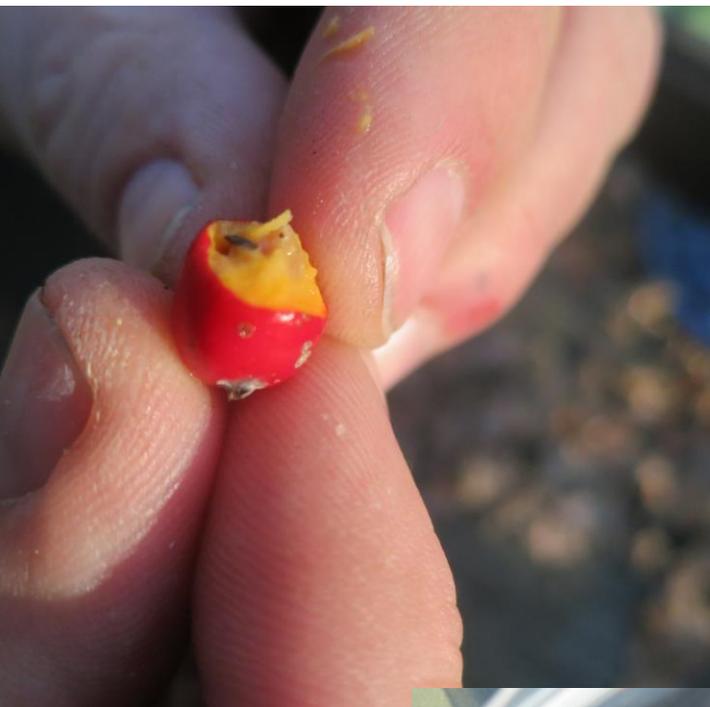




# Stratification



- Stratification : Cool, moist storage period.
- mimicking Mother Nature.



# Oak seed (acorns) in a stratification tray



# Seed Germination



- Again, consult ‘recipe’ books for specific requirements (light, temperature) for your type of seed.

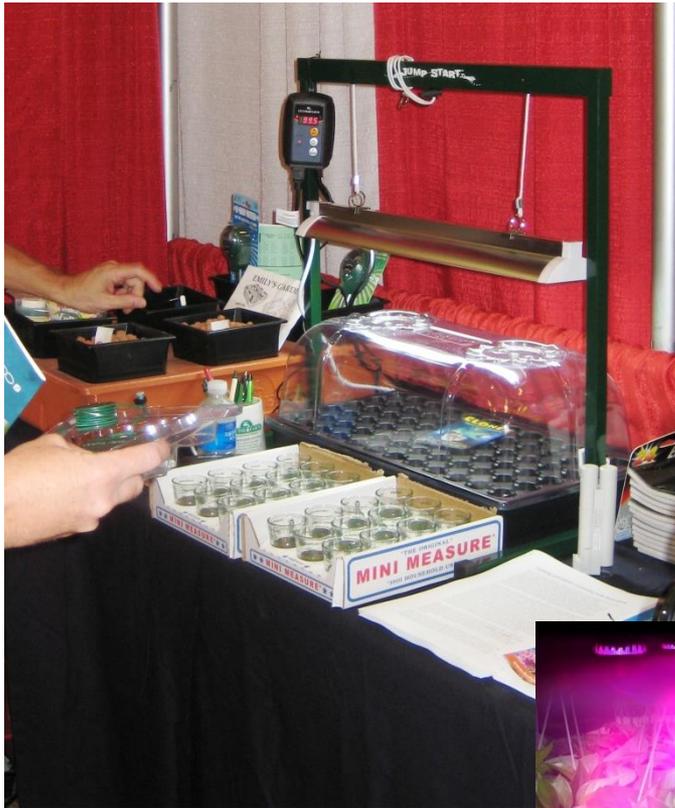
# Covering seed. depth of planting, etc.



# Germination chamber



# Light requirements



**Success!**



**First true leaves**

**Cotyledons ('seed leaves'); 2 cotyledons so a dicot**

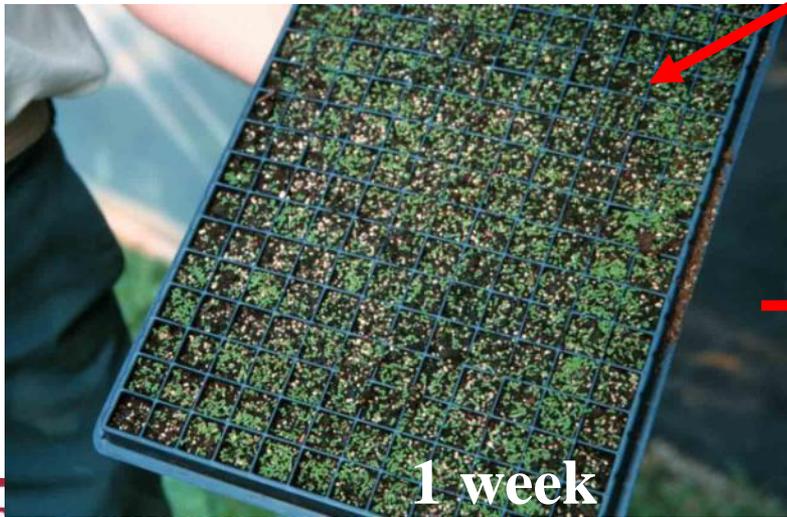
# Woody Plant example: Oakleaf Hydrangea



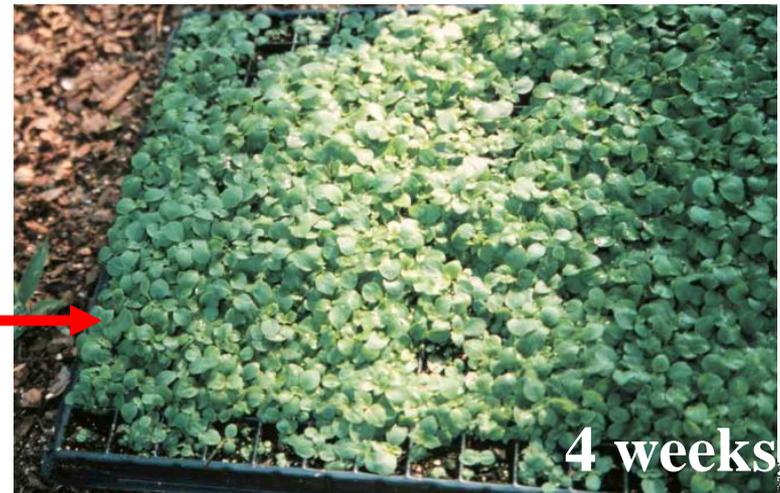
Harvest seed



Sow seed



1 week



4 weeks

# Asexual Propagation

- Grafting, budding, division
- Used to maintain traits of the parent plant.



# Dividing Perennials

- Divide spring bloomers in the fall
- Divide fall bloomers in the spring
- Summer bloomers can be divided spring or fall.



# Division

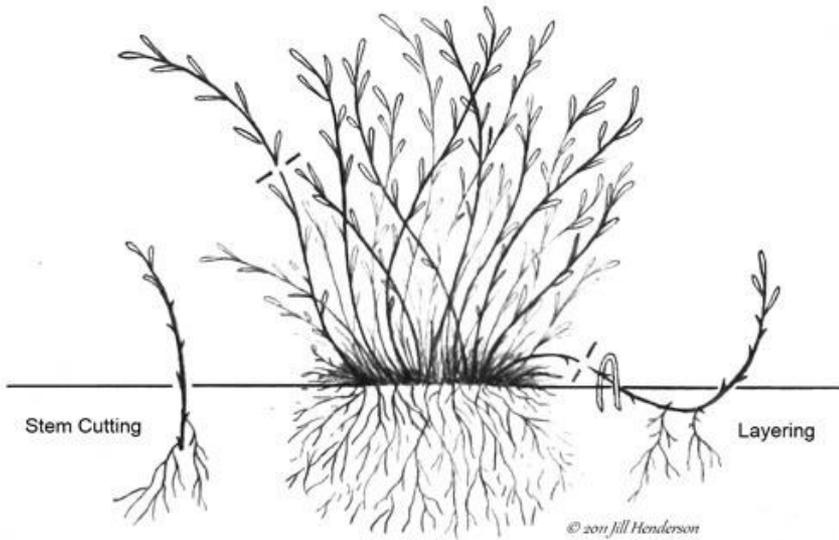
Form of vegetative propagation.  
Common for daylilies, hosta, iris, etc.



**Divide rhizome ('fan')**



# Layering



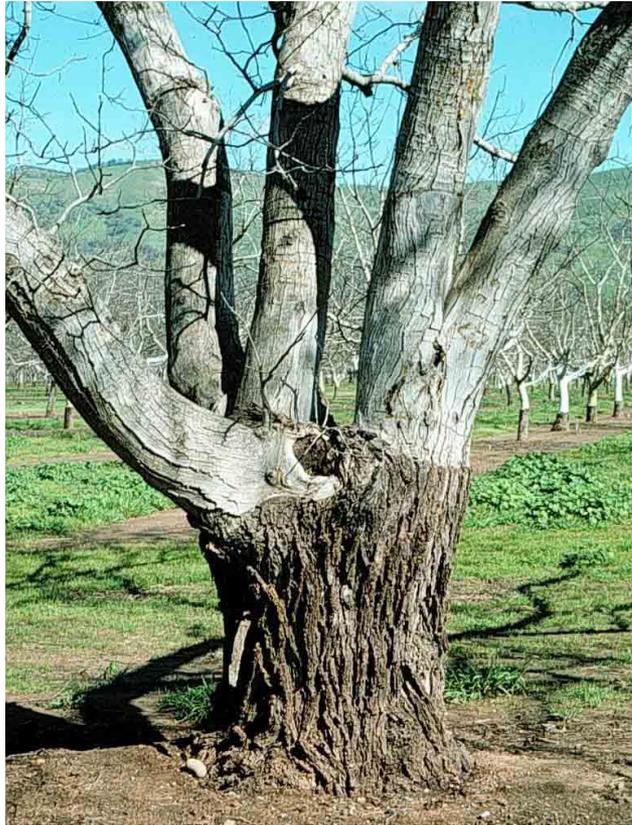
# Grafting

- more expensive and difficult
- commonly used in the production of most fruit and ornamental trees

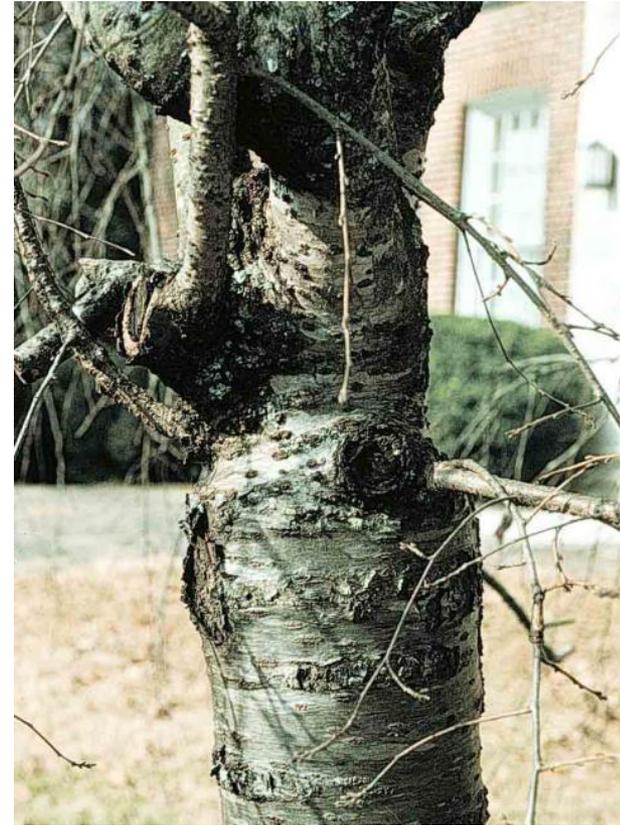


# Grafted Trees

## English Walnut



## Weeping Cherry



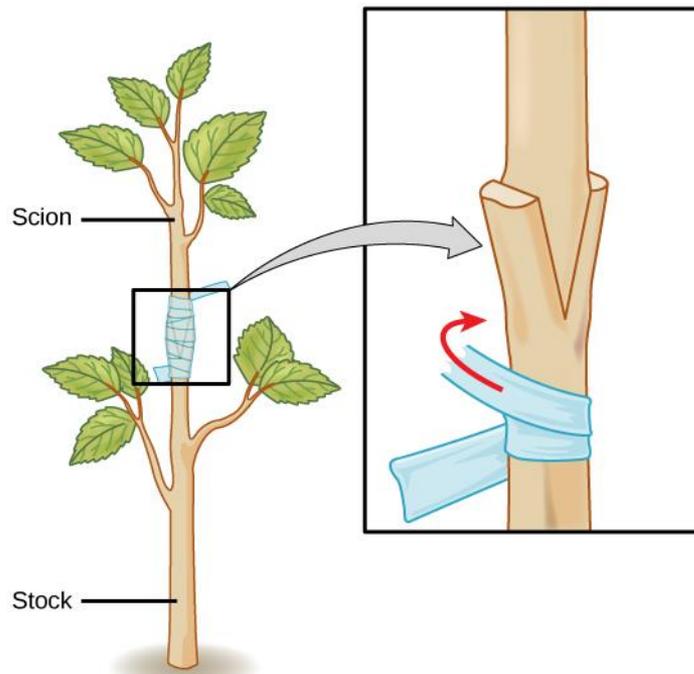
# Side-veneer grafting: **Step #1**

- Slice a vertical slit through the 'bark' of the rootstock.
- Across the top of that slit, make another short slice.
- Basically a 'T' cut.



# Side-veneer grafting: **Step #2**

Fold 'bark' back to form a pocket



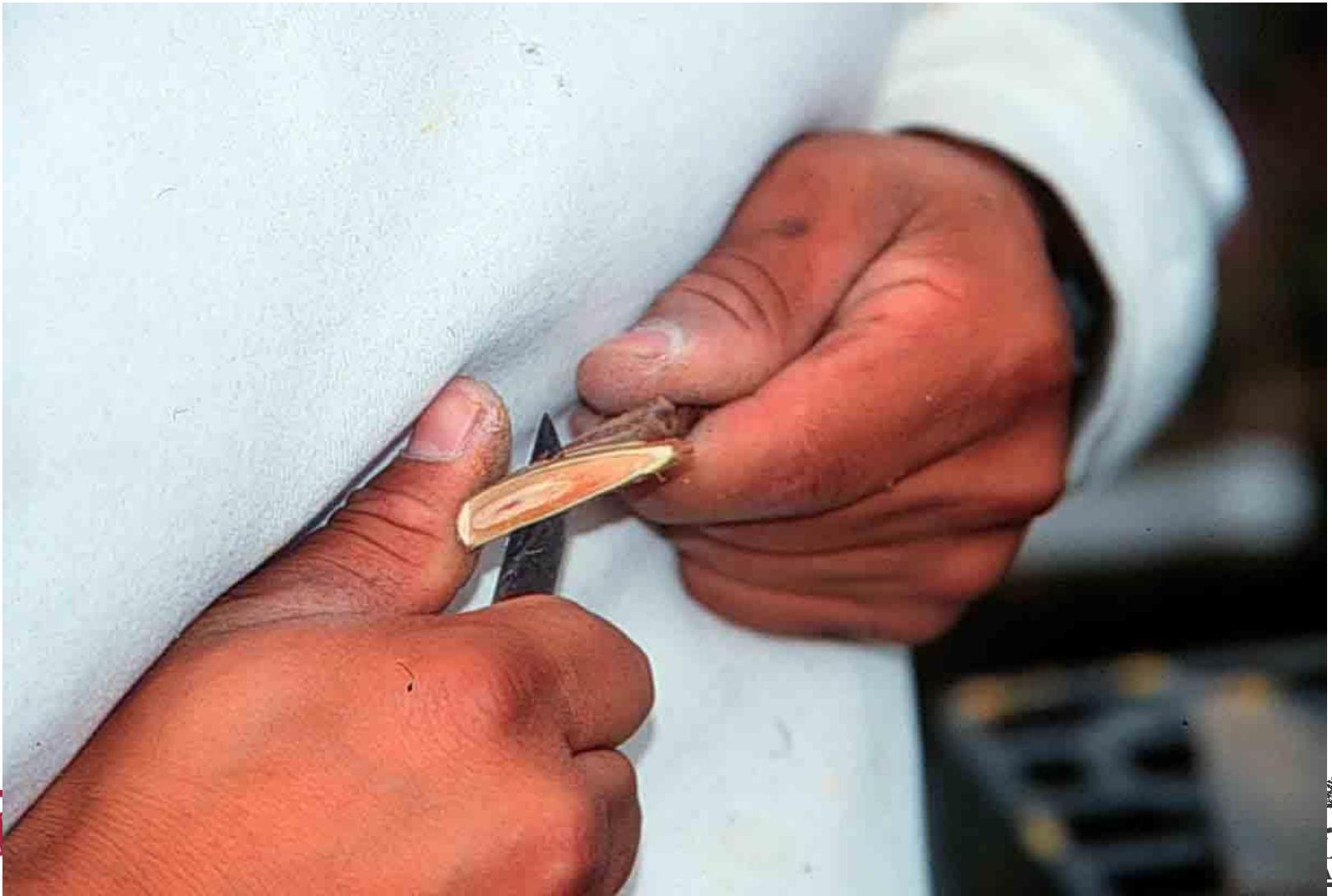
# Side-veneer grafting: **Step #3**

Prepare scion. In this case we are grafting a weeping tree (scion wood) onto the rootstock of the same species that grows



# Side-veneer grafting: **Step #4**

Prepare scion wood by slicing to form a flat faced point.



# Side-veneer grafting: **Step #5**

Insert scion into pocket in rootstock. Concerned about good fit.



# Side-veneer grafting: **Step #6**

Wrap union with grafting tape to hold pieces together until union forms.



# Success!

