



**Mt. San Antonio College**  
Agricultural Sciences Department  
AGOR 2 - Plant Propagation

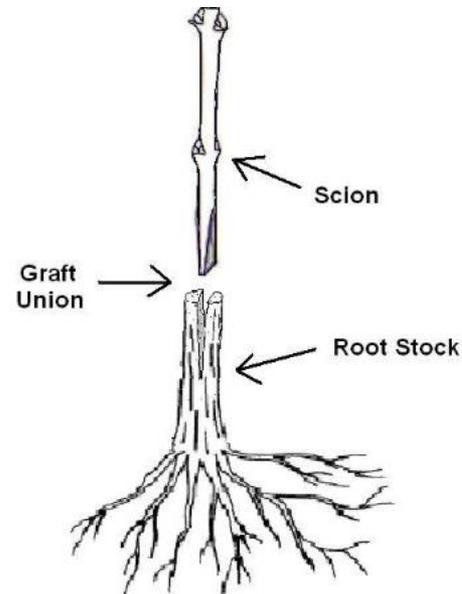
# 10.- GRAFTING & BUDDING

# Definitions

- ▶ Grafting: is the art of connecting two parts of living plants together, so that they will unite and grow as one.
- ▶ Budding: is similar to grafting except only one bud is used.
- ▶ Scion: is the upper part - Will form the stem branches and leaves of the new plant.
- ▶ Stock: is the lower portion which will develop the root system. Sometimes the scaffold branches.



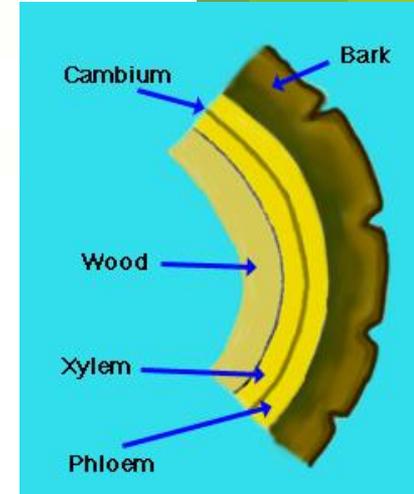
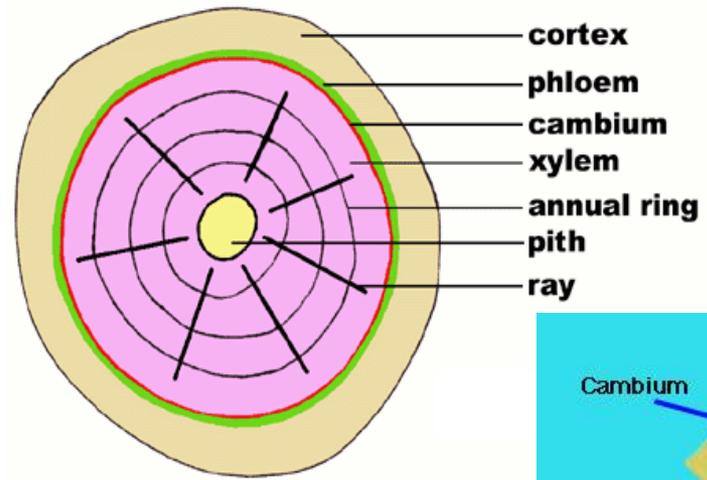
Grafting



Budding

# Definitions pg1.

- ▶ Interstock: : - Sandwich graft - inserted in between.
- ▶ Cambium: - Between phloem and xylem - cells are meristematic capable of dividing and forming new cells. Any successful graft union requires the cambium of the stock coming in close contact with the cambium of the scion.
- ▶ Callus: Mass of parenchyma cells that develops from around wounded plant tissue.





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# Reasons for grafting and budding

# Reasons for Grafting and budding pg2

1. Perpetuation clones that can not be readily propagated or maintain by other asexual means. Ex: Avocados, liquidambar, bronze loquat, evergreen pear, Japanese maples, magnolias.

2. Obtaining the benefits of certain rootstocks.

- ✓ Heavy soils - avocados G-7 resistant to root rot.
- ✓ Disease resistance - Nemagard for peaches.
- ✓ Dwarfing - Poncirus trifoliata.
- ✓ Vigorous growth- Roses Dr. Huey (ugly flower - disease resistant).
- ✓ Cold hardiness - roses - Manett.

► Types of Rootstock:

— Seedling - Will lead to variability.

- ✓ Some will have more vigorous roots..
- ✓ Virus free (poncirus trifoliata, slow decline)
- ✓ Don't graft onto weak seedlings.

— Clonal - Propagated vegetatively.

- ✓ Duke 7 - Avocado
- ✓ Malling Apple

# Reasons for Grafting and budding pg1.

## 3. Obtaining the benefits of interstock.

- ✓ Avoid incompatibility - California walnut, Carnelian Walnut, English Walnut. (English not compatible with black).
- ✓ Apples - Malling "9" is used to dwarf the tree, on both a vigorous root and vigorous stem.

## 4. Changing cultivar of established plants.

- ✓ Top working - limes on lemons.
- ✓ Grafting a pollinator in cherries plums. Stella cherry needs Bing cherry as pollinator.

## 5. Having several varieties on one tree.

- ✓ Cocktail tree - Valencia in summer, Navel in winter.

## 6. Hastening maturation of seedlings for new selections.

- ✓ Camellias (usually 7 - 10 to flower). We grow seedling then graft.
- ✓ *Syringa laciniata* (Cutleaf Lilac) x *Syringa vulgaris* (Common Lilac). Chinese lilac seedlings not vigorous, will die - graft on to *Syringa Japonica*.

### ▶ Can stored up to six months.

- ✓ Scion 1 year old wood - last years wood.
- ✓ Collect scion on height of dormancy is deciduous or dormant (bud are dormant).
- ✓ Evergreen - Lateral buds need to be dormant.
- ✓ 1-2 day could stored.

# Reasons for Grafting and budding pg2.

## 7. Develop Special Forms.

- ✓ Junipers Tolleson's weeping Junipers grafted on to robusta.
- ✓ Tree roses (Dr. Huey → La Griffe → Desired Rose)
- ✓ Weeping Cherries
- ✓ Rhamphiolepis – Tree grafted on to Eriobotrya Majestic beauty.

## 8. Repair Damaged Trees.

- ✓ Bridge Grafting (Disneyland).
- ✓ Inarching – Navel orange, Camphor tree, Wine grapes.

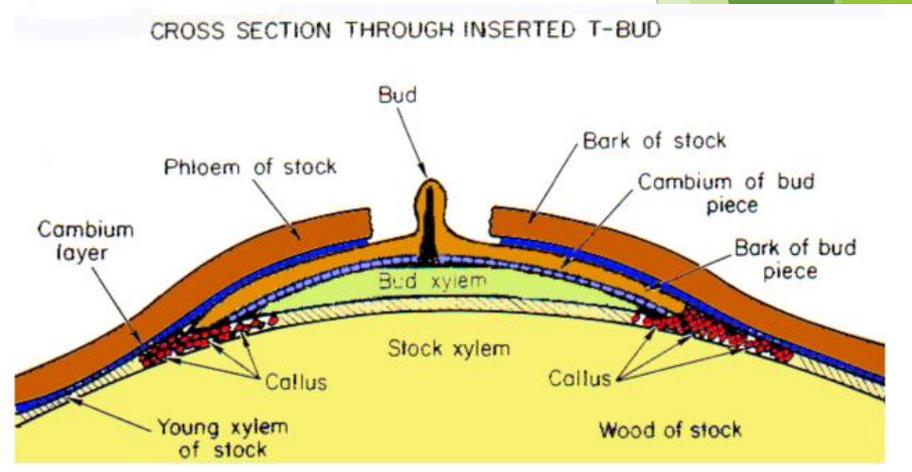
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# Historical Significance of Grafting and budding

- ❖ Chinese as early as 1,000 B.C. practice grafting.
- ❖ Aristotle 384 - 322 B.C. wrote quite a bit about grafting.
- ❖ Mentioned in the bible by Paul the apostle Romans 11: 17-24
- ❖ 1500 grafting was widespread throughout England used especially on fruit trees realize the benefits of strong rootstocks.
- ❖ Spread throughout Europe.
- ❖ Used in Japan on weeping cherries.
- ❖ Liberty Hyde Bailey in the nursery book (1891) described and illustrated the methods of grafting, very little change up to date.

# Formation of the Graft Union

1. Establishment of initial contact of a considerable amount of the cambium regions of both stock and scion under favorable environmental conditions 40 - 90° F.
  - ✓ Watch body oils (don't put in mouth).
  - ✓ Keep from moving - A tight fit.
2. The outer exposed layers of cambium of both stock and scion produce parenchyma cell which intermingle and interlock forming callus tissue.
3. Thru the development of callus bridge a new cambium layer and connection is formed between stock and scion..
4. Once the new cambium is formed then new xylem and phloem.



# Factor Influencing the Healing of Graft Union

1. Kind of plant - Oaks, Eucalyptus all don from seed, the can't graft.
2. Environmental conditions:
  - ✓ Temperature 40 and 90° F
  - ✓ Humidity and moisture - sweat tent, jars.
3. Growth activity of stock.
  - ✓ Callus proliferation - Occurs most during bud break in the spring and diminishes thru the summer and fall.
  - ✓ Excessive sap flow will interfere with cambium match.
4. Polarity.
  - ✓ Younger the stock more chance of success.
  - ✓ Bring stock plants into greenhouse before grafting in the height of winter.
  - ▶ Effects of the Rootstock on scion.
    1. Size Dwarf.
    2. Fruit development - Vigorous growing.
      - ▶ Rootstock can cause earlier development.
      - ▶ (Some peaches will ripen earlier)
    3. Size, quality of fruit. Sometimes no affect.

# Limits of Grafting

- ▶ The more closely plants are related botanically the better the chances are for the graft union to be successful.
- ✓ Grafting within a variety - Navel onto Navel.
- ✓ Grafting between varieties - Navel onto Valencia.
- ✓ Grafting between species within a genus - Navel onto Lemon.
- ✓ Grafting between genera (genus) - Fortunella onto Poncirus trifoliata Rubidoux.
- ✓ Grafting between families - Impossible.
- ▶ Chances of grafting diminishes as we go down the line.

# Graft Incompatibilities

- ▶ The inability of the scion and stock to develop a new cambium bridge. Symptoms:
  1. Major symptom is a breaking off of trees at the point of union, specially after many years and the break is clean and smooth, and not rough or jagged.
  2. Overgrowth bellow or above the graft union - Kumquats, Walnuts.
  3. Yellowing foliage early in the season; premature defoliation - *Acer palmatum* and other Acers.
  4. Premature death of trees live a year or two - Eucalyptus.
  5. Failure to form a successful grafting in a high % of cases - Mangoes, Oaks.