

# Plant Propagation



# What is plant propagation?

It is increasing plant population.

There are two methods of plant propagation: Sexual (seed or grain) and Asexual (organs; root, bud tissue, etc)



# Propagation by seeds...

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“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 impact germination.**

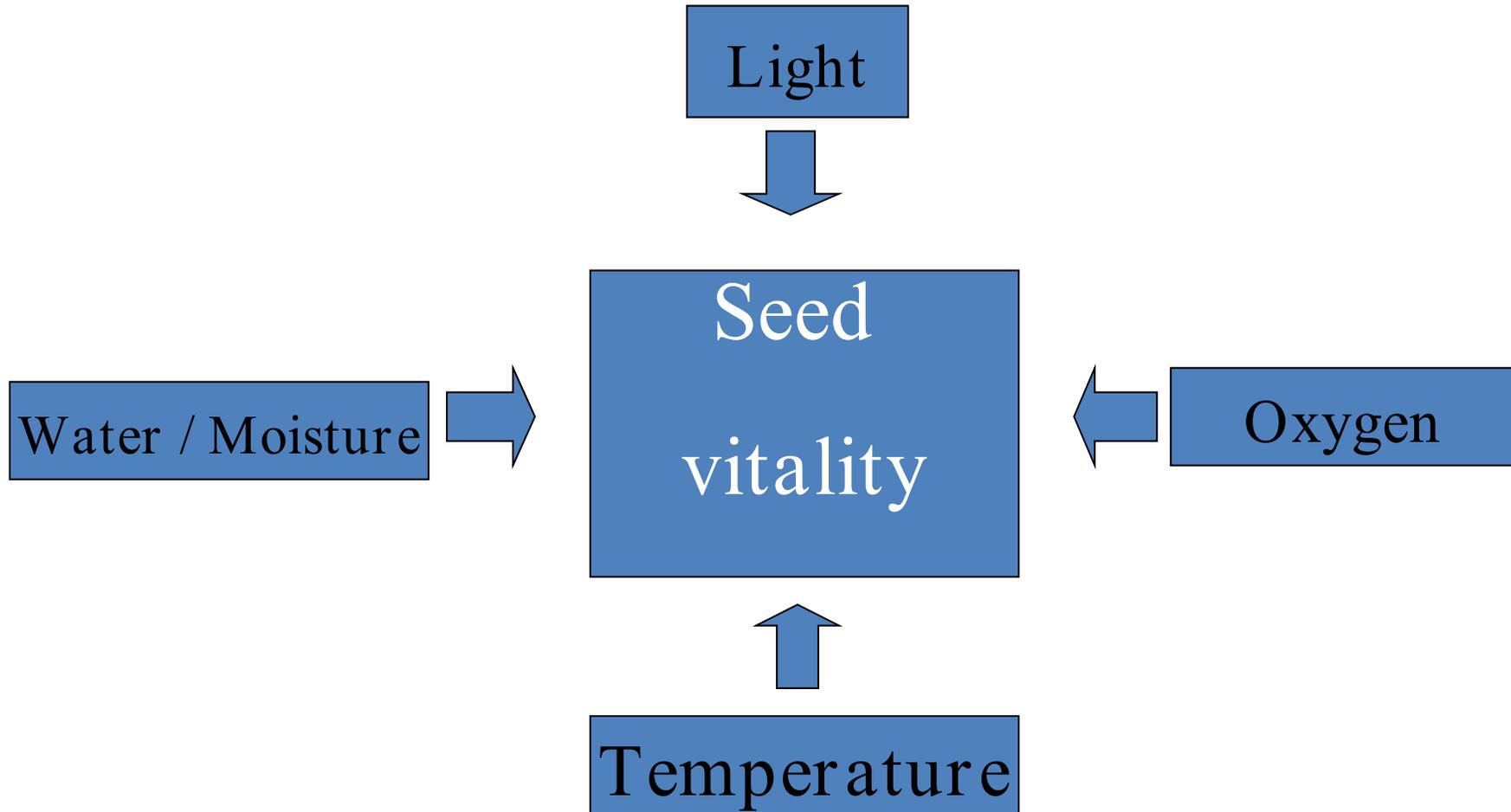
# Growing from Seed

1. Some plants have very tiny or weak seeds so they need intensive care in the first stage of their life cycle.
2. Easy to control plant quantity (can plan for how many seedlings we would like to have)
3. Seedlings have similar age and growth (easy when it grow in real plots)

# Sexual

- Grain (seeds)
  - Strengths
    - Long life, volume, strong
    - New Characteristic plants (better?)
    - Good for root stock (tap roots)
    - Easy to get and inexpensive
    - Sexual propagation best for certain fruit trees such as papaya
  - Weaknesses
    - Changing characteristics and yield
    - Long time before can produce fruit
    - Because of longer time (higher maintenance cost)

# Seed germination



# Propagation by seed in trays

1. Trays must have good drainage. If tray has big holes or too many holes, cover the holes with drainable materials such as paper or leaves.



2. Add potting soil, make level a little lower than the top of the tray

Potting soil must be light, hold adequate moisture, and drain well. It must contain the nutrition that the seedlings will need. For example:

- Rough sand and Coconut husk (1:1)
- Rough sand and biochar (1:1)
- Soil : Manure : Sand (2:1:2)



3. Broadcast desired seeds over the soil surface of trays or beds and cover the seed with soil.



4. Cover the surface with straw or newspaper to help with germination and retaining moisture for the seedling.



# Asexual Plant propagation

Encourage a plant to produce new roots or shoots and replant these as a separate plant

there are a few methods of Asexual plant propagation:

Cuttings, Air layering, Grafting, Budding, Topping, and Tissue culture.



# Cuttings

Take a: leaf, branch, stem, or root and place in a good growing medium. Roots and shoots will develop and become a new plant.

## Cutting method

1) cut a branch 6–10” (depend on kind of plant). Cut at  $45^{\circ}$  –  $60^{\circ}$  one side lower than other side (see picture)



2) place the parts in potting materials at about  $45^{\circ} - 60^{\circ}$   
(the cutting surface must be up straight)



## Maintenance

At the first stage (moisture is very importance) plant part will loose water. Watering 2-3 times a day is very helpful.

# ***Air Layering***



A method that encourages branches to develop roots while still connected to the tree

## Strong points

1. New plant contains all of mother plant characteristic
2. More roots than cuttings
3. Greater transplant survival than cuttings
4. Tree will not grow high, easy for management and harvest

## Weaknesses

1. No Tap root (easier to fall)
2. Big size, transportation not easy or takes a lot of room
3. Compared per tree, less propagation potential than cuttings
4. More complicated than cutting
5. Requires more labor

## Material for Air Layering

- 1) Air Layering Knife (Convenience)



## Materials continued

2) Coconut husk, peat moss etc.; 60% moisture, Sun light protection

3) Root encouragement such as hormone, Honey, Fish-paste. (put around cut area)



## Method

1) Select branch, brown-green color  
branch (faster root development)

2) Open (Bark removal)

Make two separate cuts all the way  
around the stem about 1-1.5” apart,  
then remove all the bark between  
these two round cuts



3) Put on root encouragement material (hormone, Honey or Fish-paste) around upper cut, let it dry out .



4) Wrap the exposed wood with the moistened coconut husk, then cover completely with the plastic and tie securely above and below the cut section.



5.) Cut the branch when the roots have developed. Roots should be brown with green tips. Take care of the branch in the nursery for several months before transplanting it to the field



# Grafting

Grafting is the process of connecting two plants (Scion and Stock) together in such a way that they will unite and continue to grow as one plant

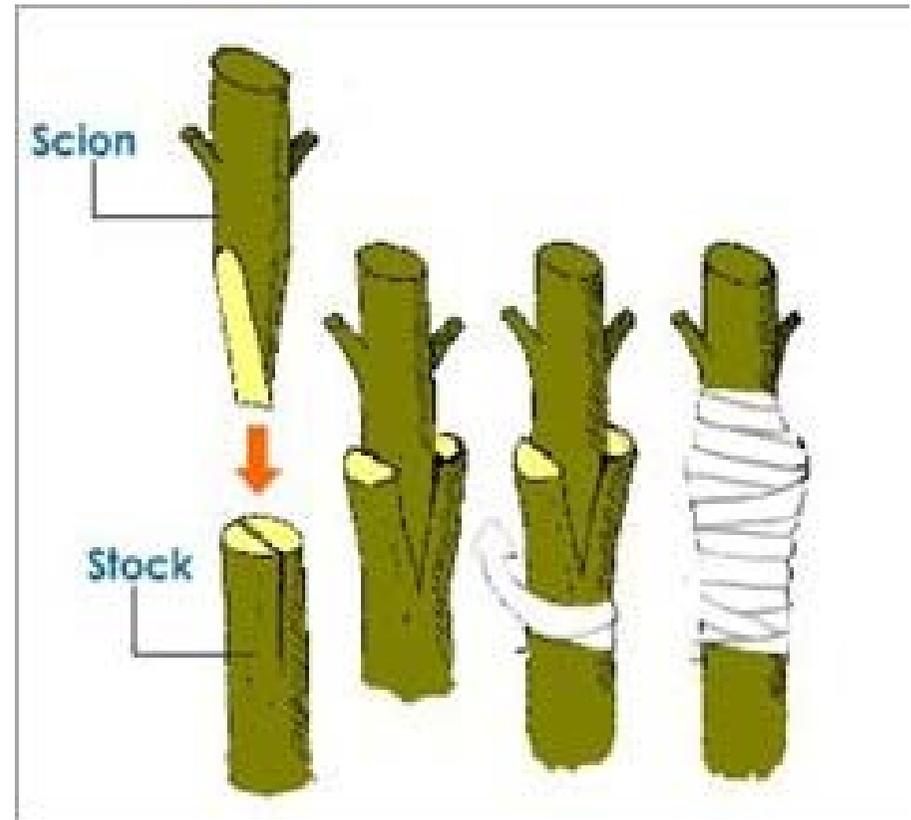
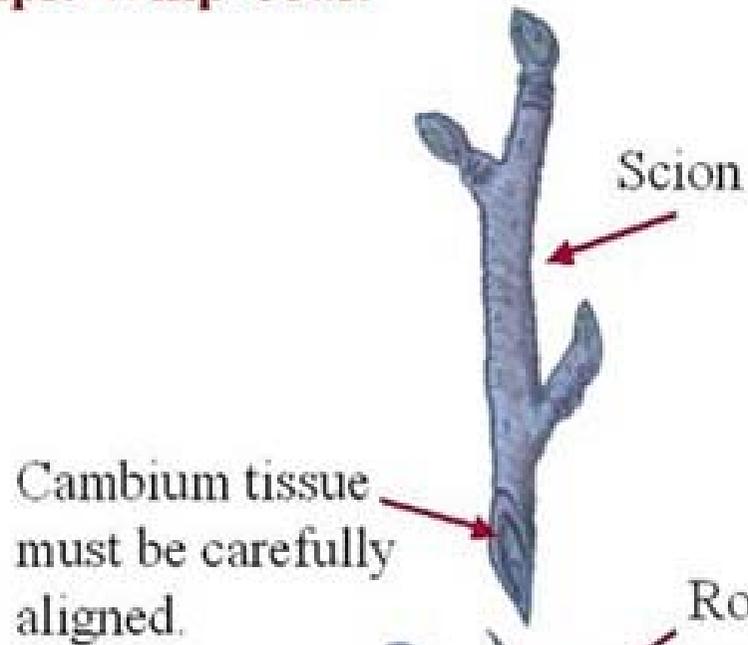
Graft: root stock (grown from seed) tissue and Scion (desired tree) tissue

Benefits

1. Enhances the ability of a local variety grown from seed to provide a desirable product (like fruit)
2. Strong tap root strong plant



## Simple Whip Graft



# Method 1 (cut Stock to rooted good Scion)

## 1. Stock preparation

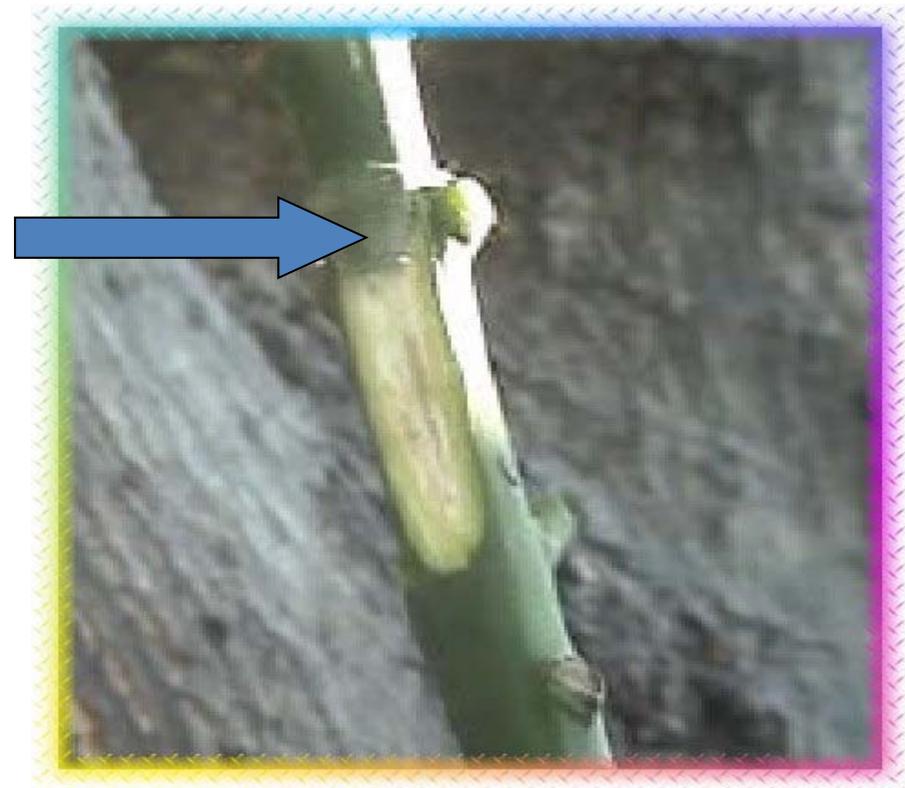
Must be about a year old. Make 45 degree, 2" long angled cut, about 6" from soil.



## 2. Scion stock

select a healthy one year old branch (green-brown)

Measure 2" from a branch section and slide cut from there back to the section.  
Angle cut to remove the cutting part (40 degree)

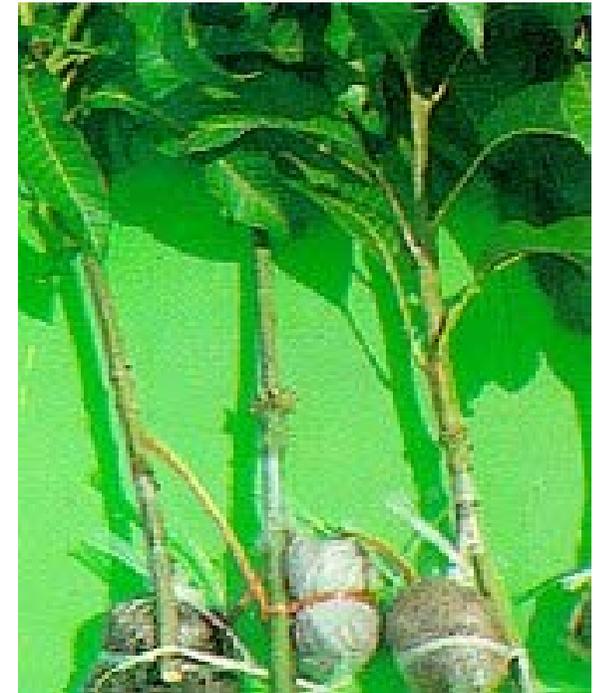


### 3. Graft Stock and Scion

1. Insert the stock into the Scion (make sure both growth tissues are matching)
2. Wrap tightly with plastic tape
3. Wrap the stock with the Scion branch.



About week 6-7 most tissue has merged and root from stock has developed and turned green-brown. Cut the grafting branch off from Scion stock.



5. Nurse the branch in potting bag in nursery for a couple months before transferring to the field.



## Grafting Method 2 (cut good Scion on rooted stock)

like budding but replace bud with top  
part of branch (good Scion to stock)

- Prune the tree before grafting
- Cut scion branch (only top part) with 2-4 buds



## Stock preparation

Make 2-3 inch parallel cuts (the same size as the scion branch) and an angled cut at the top to remove the bark.



Parallel cut



Angle upper cut



Bark removal

## Scion stock preparation

Front cut: slide cut the Scion branch 2-3 inches.

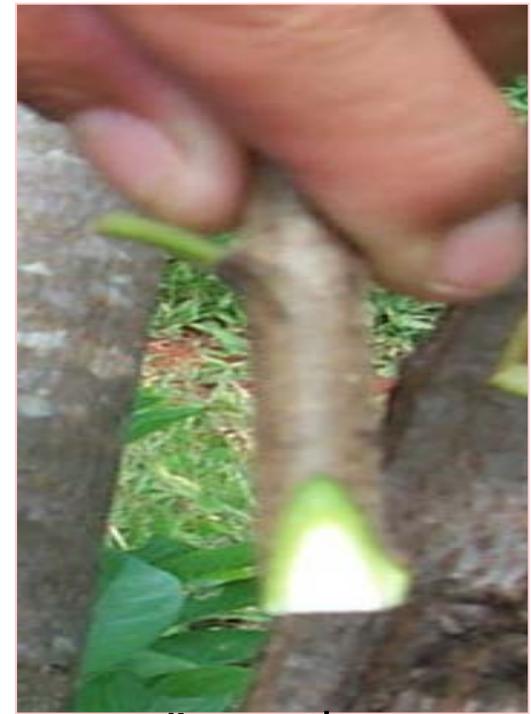
Back cut: flip the branch and do a small angled cut on the other side



Front cut



Back cut



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# Attaching

Match the Scion cut to the Stock cut. Wrap with plastic tape from the bottom up.



Attaching



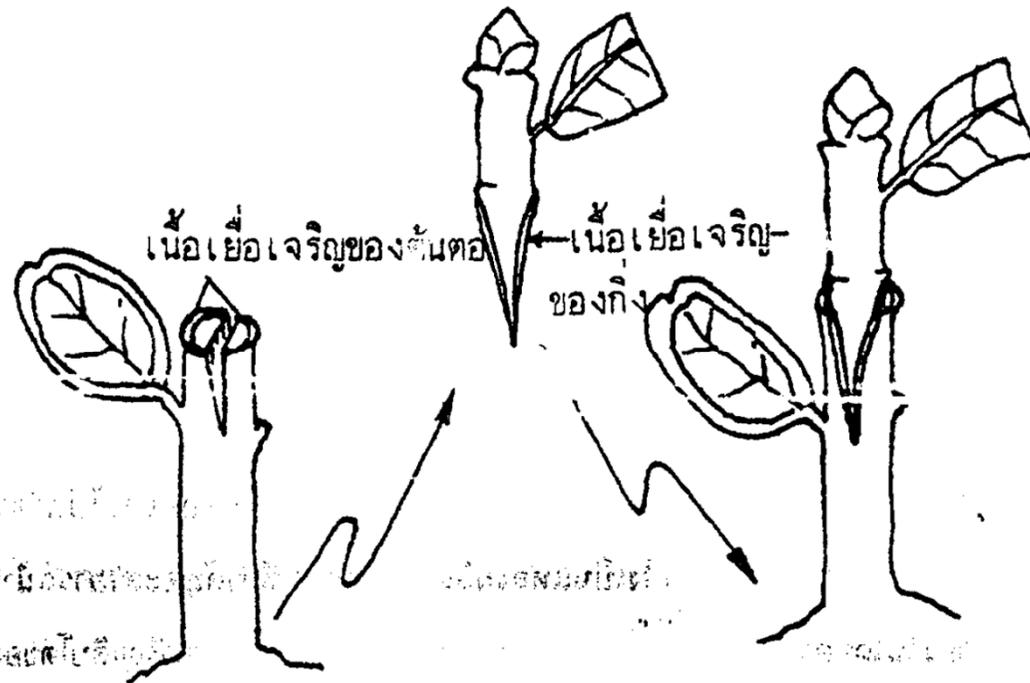
Wrapping



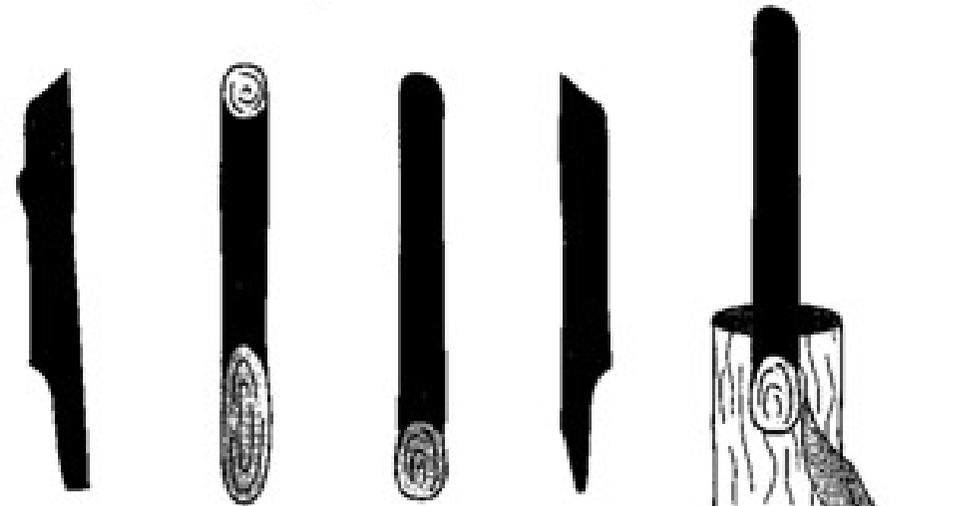


New branch growing on  
stock branch.

# Cleft Graft

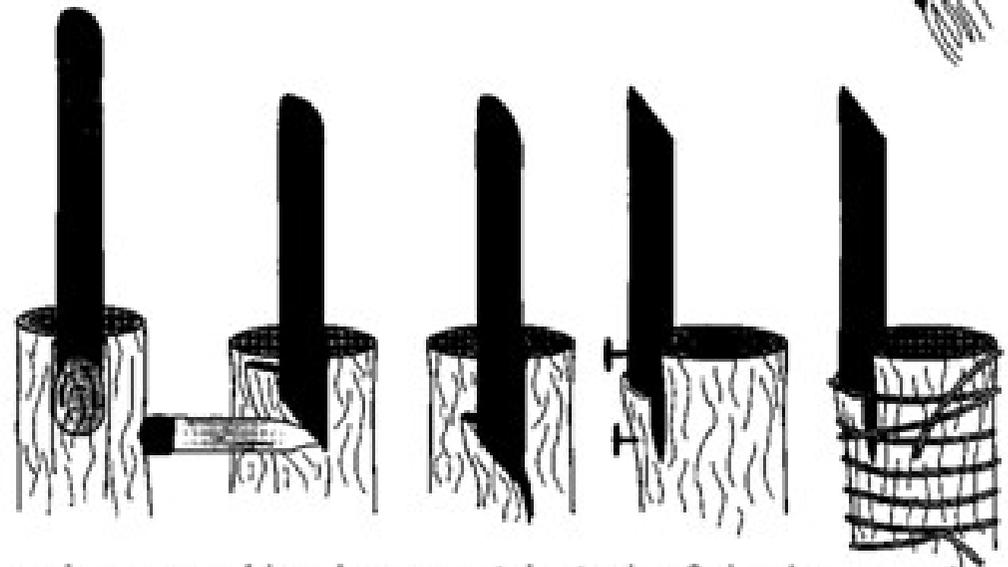


# Bark grafting



Shaping the scion to fit the stock

Split bark



Place scion so cambium layers match stock

Scion is secured

# *Buddi*

Attaching a desired tree bud on the same plant variety. The bud will develop and become a desired tree as a new branch on the stock tree.



Budding Knife

## Materials



Plastic tap

## Budding Method (3 methods)

### 1. T -budding

Popular for flowers such as rose, and some fruit trees such as Tangerine and Jujube

## 2. Patch budding

Cut stock tree in rectangle shape and replace with the bud that has the same shape size. Suitable for thick barked trees such as mango and rubber tree

## 3. Chip budding

Suitable for bark that is difficult to remove such as Grape and Rambutan.

## T- budding

**1. Stock: Cut a T – Shape 1.5 – 2 inches long on the stock.**

**2. Scion bud: cut from above the bud to below the bud 2-2.5 inches then make it fit to the T-shape.**



**3. Bud attaching.** Insert the bud into the T-Shape (make sure the bud is placed right at the middle of the T).



#### **4. Wrapping**

Wrap with plastic tape. Wrap from the bottom up. Make sure both growth tissues are well connected. Remove the plastic when the bud is developed trying to push through the plastic tape.



# Propagation by specialized structures...

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## Species

tulip, onion, Easter lily

potato, Jerusalem artichoke

*Iris*, lily-of-the valley

*Gladiolus*, *Crocus*

strawberry, *Ajuga*

*Dahlia*, sweet potato

## Structure

**bulb** (หัว เหง้า)

**tuber**(หัวใต้ดิน)

**rhizome**

**corm**

**runner**

**tuberous root**