

Grafting Tropical Fruit Trees

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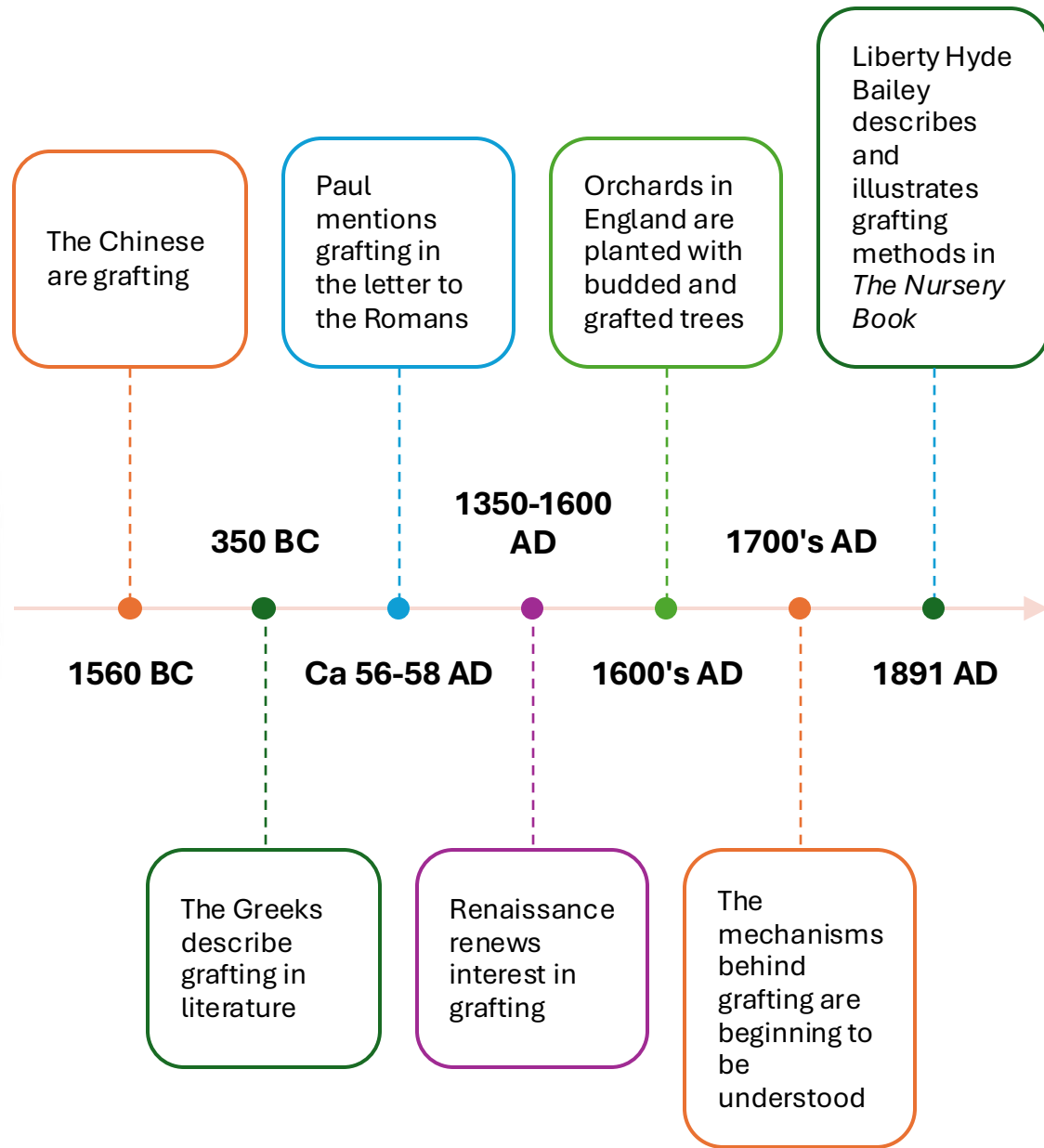
2025



Pooktre Tree Shaping



History



Biblical References to Grafting

Romans 11:11-24

John 15:5

Isaiah 60:21



Grafting

The joining of two pieces of plant tissue so that they will combine and develop as a single plant.



Budding

A form of grafting that joins a single **bud** from the budwood/**budstick** to a **rootstock**

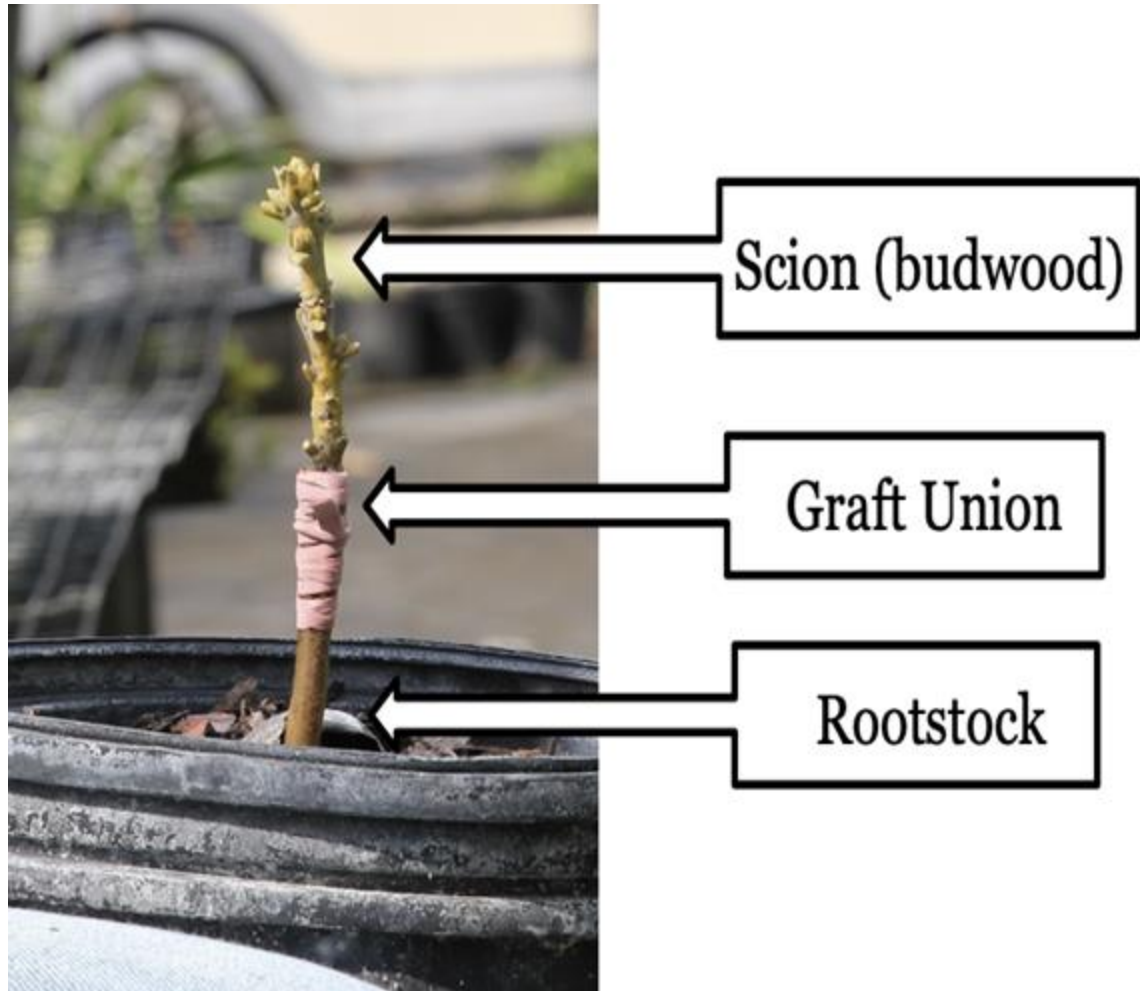


Grafting Terms

Scion (Budwood): A short piece of detached shoot containing several dormant buds which, when united with the rootstock, comprises the upper portion of the graft from which will grow the stem or branches of the grafted plant

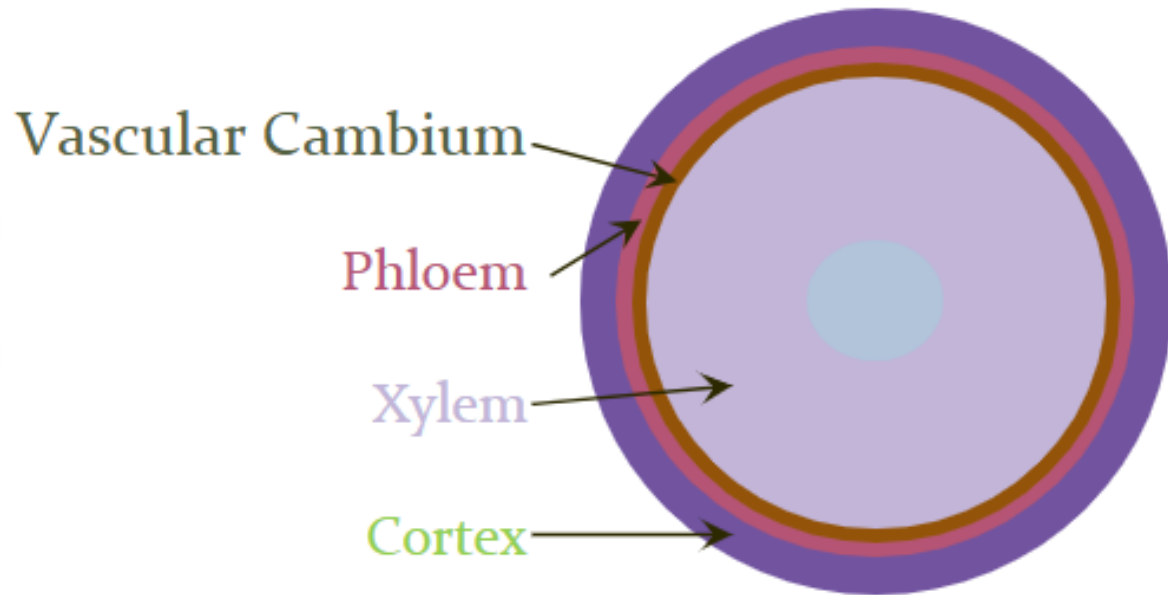
Graft Union: The physical scar where the plant was cut to connect the budwood and rootstock

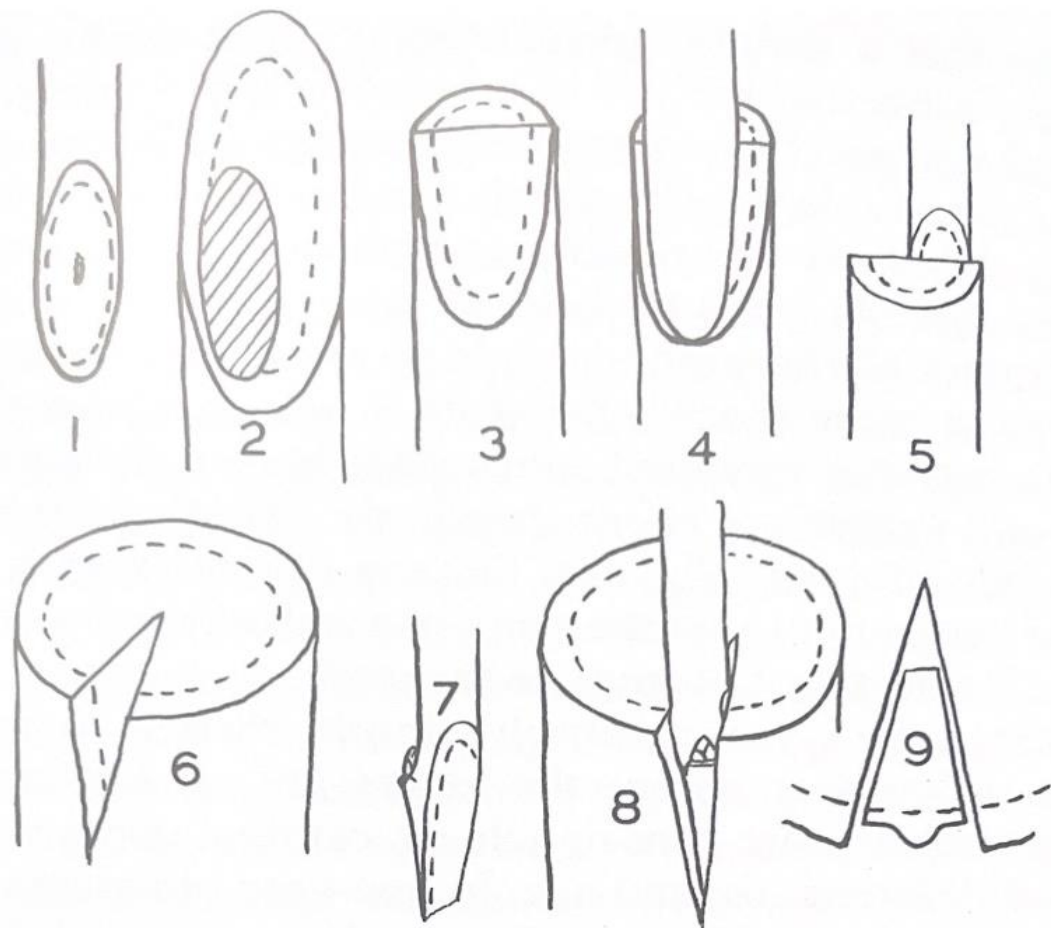
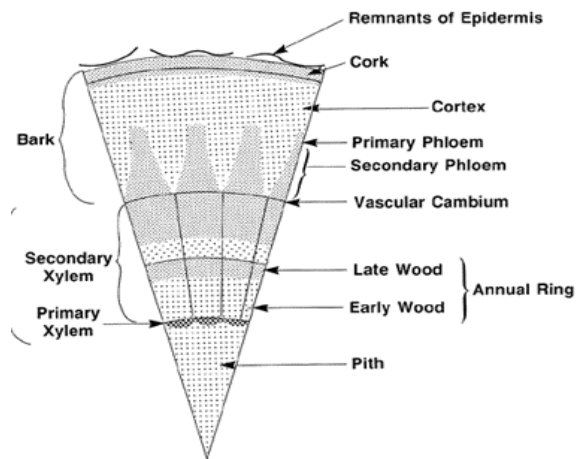
Rootstock: The lower portion of the grafted plant, being almost entirely made up of the root system



Vascular Cambium

A thin layer of cells between the phloem and xylem that is capable of cell division (produces new xylem and phloem tissue) and is what combines when the stock and the scion are joined together. A good match and close contact between these tissues on the scion and stock is critical for a successful graft.





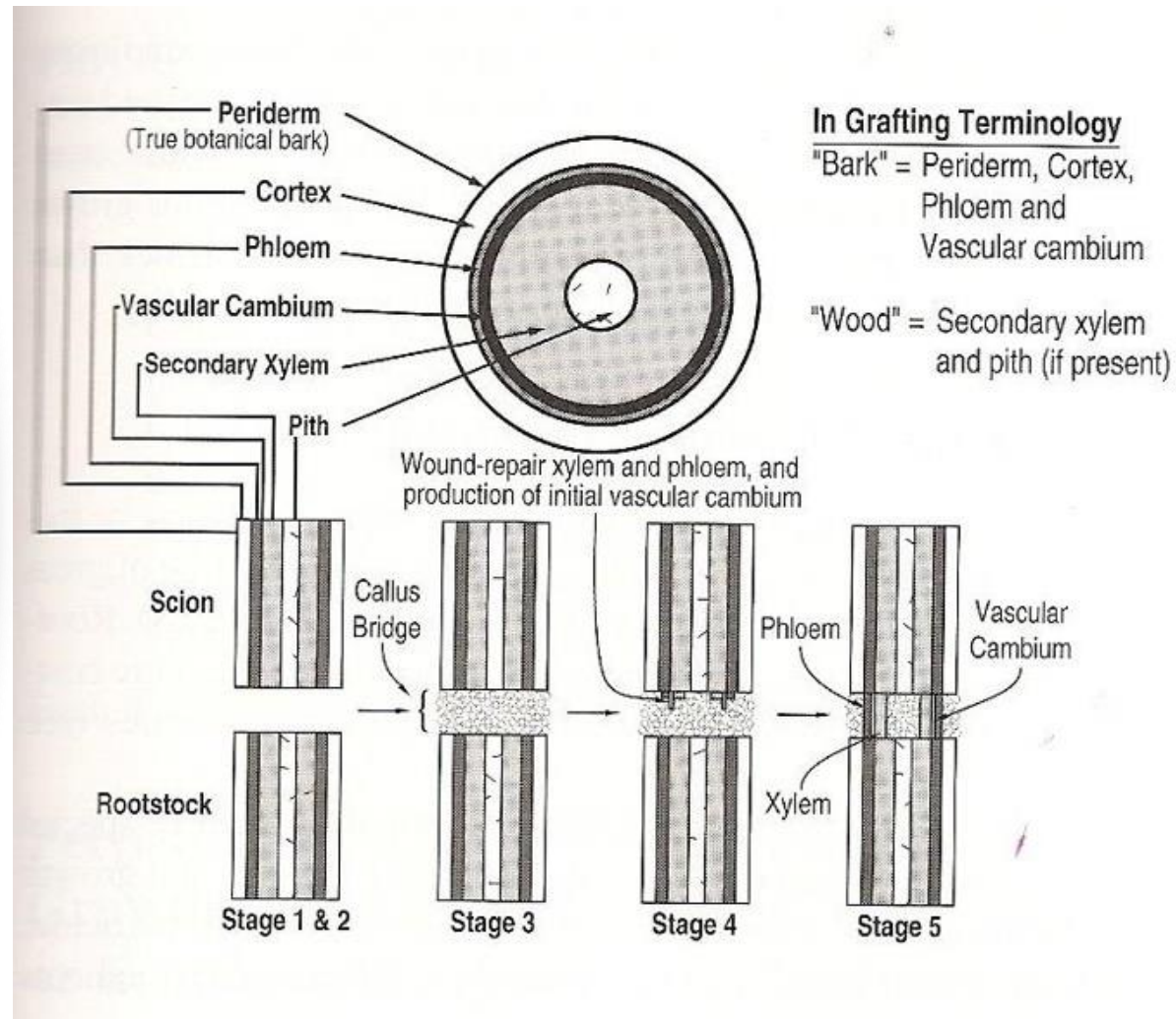
Development of a Compatible Graft

Three major steps:

Adhesion of the rootstock and scion (The action of grafting)

Proliferation of callus cells at the cambium layer

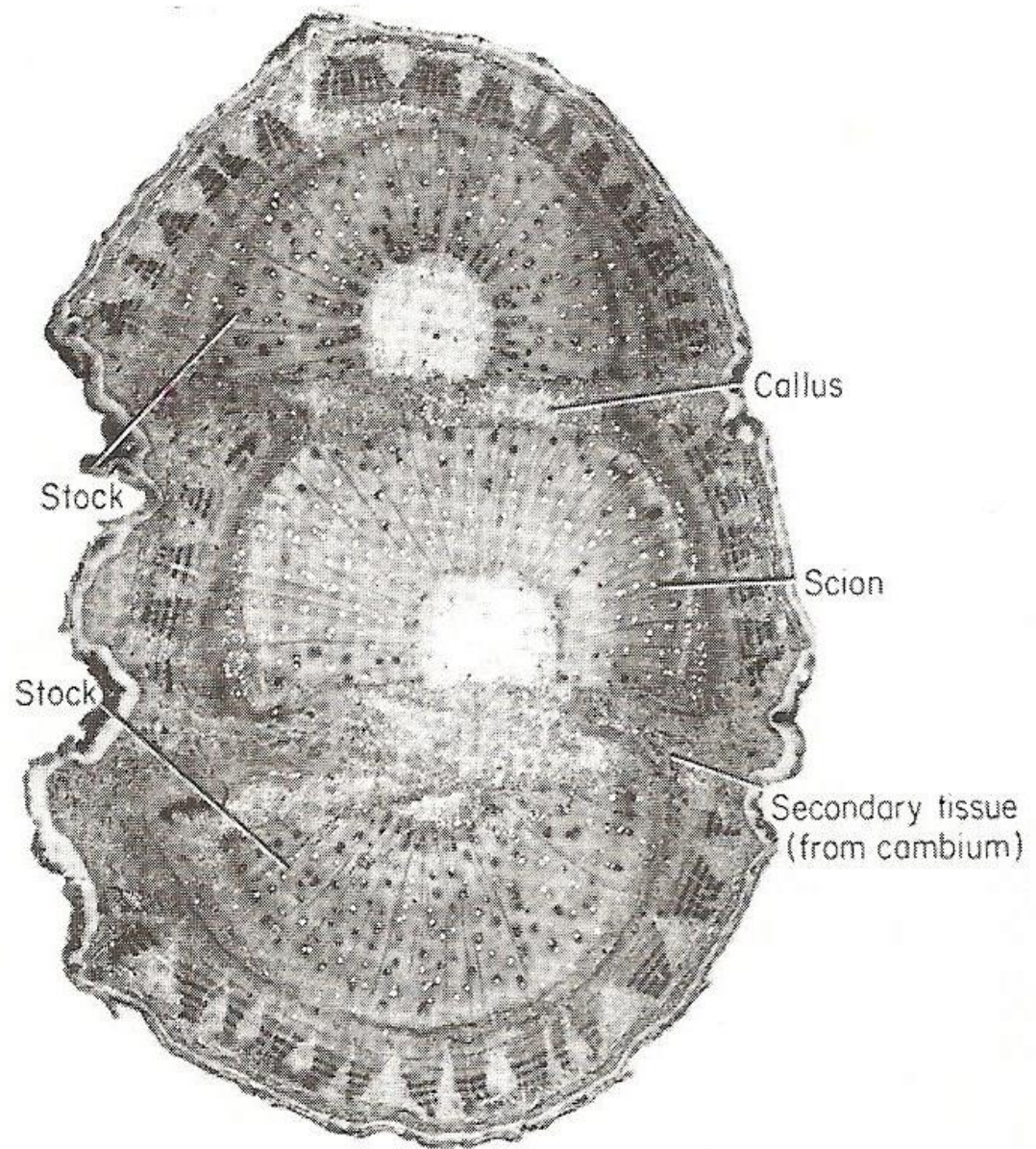
Vascular differentiation across the graft union



Internal View of a Healing Graft Union

"Cross section of a *Hibiscus* wedge graft showing the importance of callus development in the healing of a graft union. Cambium activity in the callus has resulted in the production of secondary tissues that have joined the vascular tissues of the stock and scion X10."

(K. Esau, *Plant Anatomy*,
John Wiley & Sons, Inc., New
York, 1953.)



Stages of Graft Formation in a Citrus T-Bud

What is happening during
"graft care"?

Stage of Development		Approximate time after budding
First cell division		24 hours
First callus bridge		5 days
Differentiation of cambium		
a) in the callus of the rootstock		10 days
b) in the callus of the bud		15 days
First occurrence of xylem tracheids		
a) in the callus of the rootstock		15 days
b) in the callus of the bud		20 days
Lignification of the callus completed		
a) in the rootstock		25-30 days
b) in the bud		30-45 days



Why Graft?

Why Graft?

Combines the best of the root system and branches

Rootstock qualities

- Taproot
- Disease resistance
- Dwarfing
- Fruit quality

Scion qualities - Influence of adult wood

- Cultivar
- Growth habit
- Tree size control
- Earlier fruit production

Note “double working” potentials - intermediate graft



A Case Study: Mukibat Grafting

“Mukibat grafting is an example of horticultural innovation by a peasant subsistence farmer. In 1958, a farmer named Mukibat, living on the island of Java, Indonesia, took an extension grafting course and shortly thereafter began to experiment with grafting of cassava, which is an important food crop in Indonesia and many other tropical countries. He grafted an inedible relative of cassava, the Ceara rubber tree (*Manihot glaziovii*), onto a cassava (*Manihot esculenta*) stock (De Foresta et al. 1994). The resulting yield of cassava tubers was dramatically increased, on the order of 30% to 100% or more, compared to ungrafted cassava”

(De Bruijn and Dharmaputra 1974)



Budwood Selection

Take budwood from healthy trees known to give good fruit.

Budwood should be hardened off, not tender and prone to drying out.

The buds are swollen but have not broken.

Each species has its own budwood particularities



atas del Mundo Guatemala

erday at 6:19pm · 🌐

er, Jorge Rodriguez, shows budwood of jackfruit selected
ction of the ECHO propagation manager. Two weeks later
rafts.



Aftercare

Proper aftercare is critical to the survival of a graft.

Keep the scion from drying out

Keep grafts in the shade, under a plastic bag, under parafilm, under mist or in a poly propagator

Do not let the rootstock plant dry out.

Suppress the rootstock

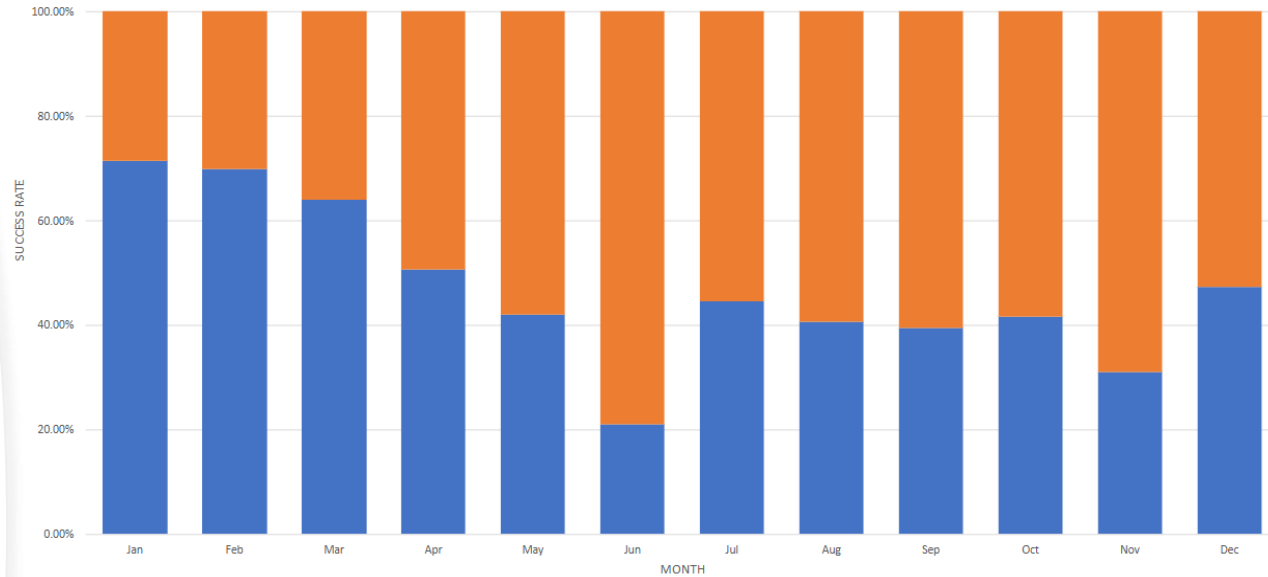
Cut off or bend the main trunk to promote growth of the scion

Remove rootstock shoots – this is an ongoing process, but especially critical in the first year.



Timing and Seasons

Please add graft method to your comments on your graft tags from now on. This will allow us to collect graft data on particular grafting methods on specific species over the next several years!



Coordinating the best times for rootstock and budwood



Temperature affects the rate of graft union healing

Major Grafting Methods used at ECHO NA RIC

Micro-Cleft

- Stock and Scion are equal diameter
- Stock is newly sprouted seedling
- Budwood is young and green
- No leaves are left below the graft union

Cleft

- Stock and scion are equal diameter
- Stems are often still tender
- Budwood and rootstock are often both young and green
- Leaves are left below the graft union

Side Veneer

- Rootstock diameter is greater than the scion
- Rootstock is woody
- Leaves are left above the graft union, but not below

Chip Budding

- Rootstock is woody
- Use buds that are beginning to push

T-Budding / Inverted T-Budding

- Second season growth is often used as budwood
- Grafted after a flush of growth when the bark on the rootstock still slips

Approach Graft

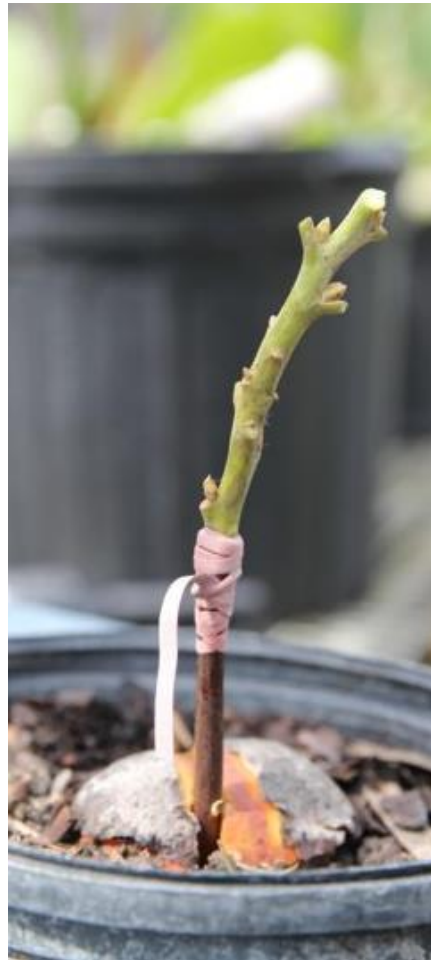
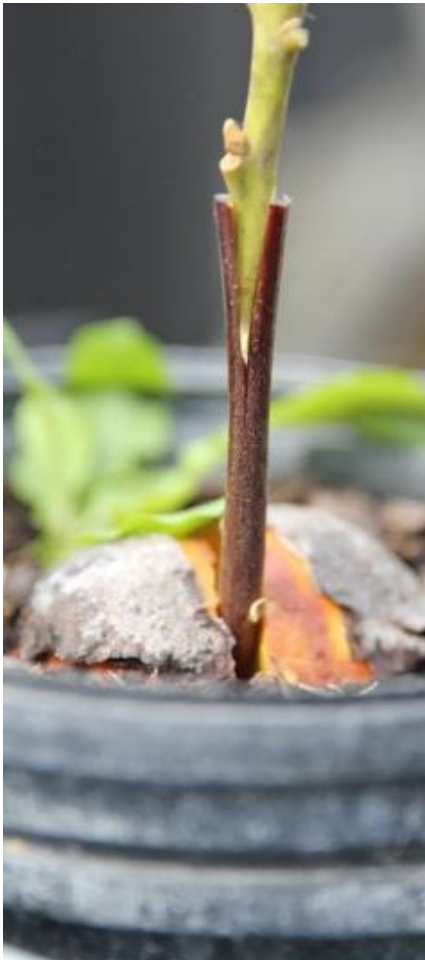
- Used on difficult-to-graft species
- Both parts of the graft (budwood and rootstock) remain on their own root systems until the union is healed

Major Grafting Methods used at ECHO NA RIC By Species

	Cleft	Side Veneer	Chip Bud	T- Bud	Approach Graft
Mango	X	X	X	X	X
Sapodilla	X	X			
Guava		X	X	X	
Jujube	X				
Citrus			X	X	
Persimmon			X	X	
Annona		X			
<u>Canistel</u>	X	X			
Loquat	X	X			
Jackfruit	X	X			
Carambola	X	X	X		
Avocado	X				
Black Sapote	X	X			
White Sapote	X	X			

Micro-Cleft Graft on Avocado

[Video Link](http://edn.link/avocado-time-lapse): <http://edn.link/avocado-time-lapse>



Cleft Graft

Image from Propagating Plants: An Organic Approach.
Fambidzanai Permaculture Center, 1998. Livai Matarirano,
Director



Cut the scion
20 cm long.
Make two sloping
cuts 2-5 cm long.

PREPARING THE SCION



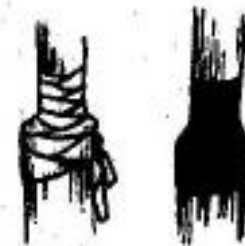
Cut off the top of the
rootstock 20-40 cm
above the soil.
Make one straight cut,
the same length as the
cuts on the scion.

PREPARING THE ROOTSTOCK



Push the scion
firmly into the
cut on the
rootstock.

INSERTING THE SCION INTO THE ROOTSTOCK

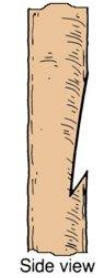


Tie and wax the graft.

Side Veneer Graft on Mango



Chip Bud on Citrus



T-Budding

Image from Propagating Plants: An Organic Approach.
Fambidzanai Permaculture Center, 1998. Livai Matarirano,
Director



Starting about 1 cm below the bud make a slicing cut under and about 2 cm beyond the bud.

PREPARING THE BUD



About 3 cm above the bud, make a horizontal cut through the bark and into the wood. Remove the bud piece



Make a vertical cut about 2 cm long in the rootstock.

PREPARING THE ROOTSTOCK



Make a horizontal cut through the bark about one-third the distance around the stock. Give the knife a slight twist to open the two flaps of bark.



Insert the bud by pushing it downward under the two flaps of bark.



Push down the bud until the horizontal cuts on the bud and the rootstock are in line.



Tightly tie the bud union with tape or waxed cloth. Do not cover the bud.

INSERTING THE BUD INTO THE ROOTSTOCK

Inverted T-Budding on Citrus

T-budding



Inverted T-budding



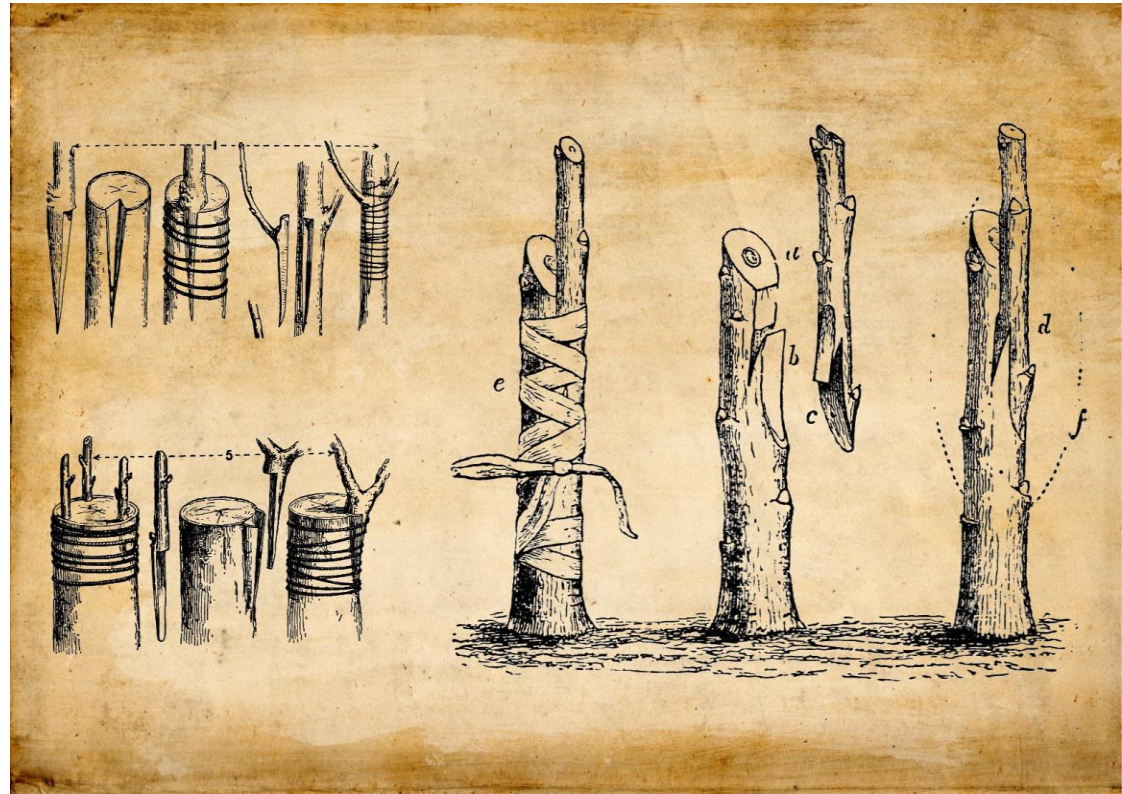
Approach Grafting on Mango



Less Used Grafting Methods at ECHO NA RIC



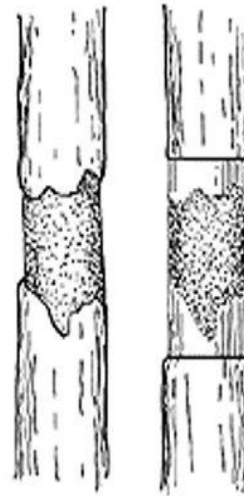
Whip and Tongue



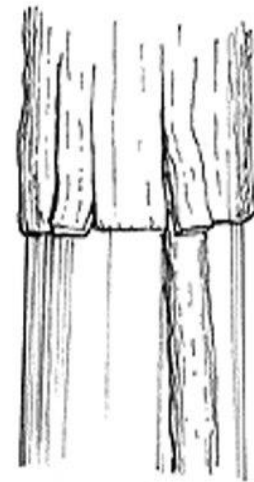
Bridge Grafting



Preparation of Scions



Preparation of Stock

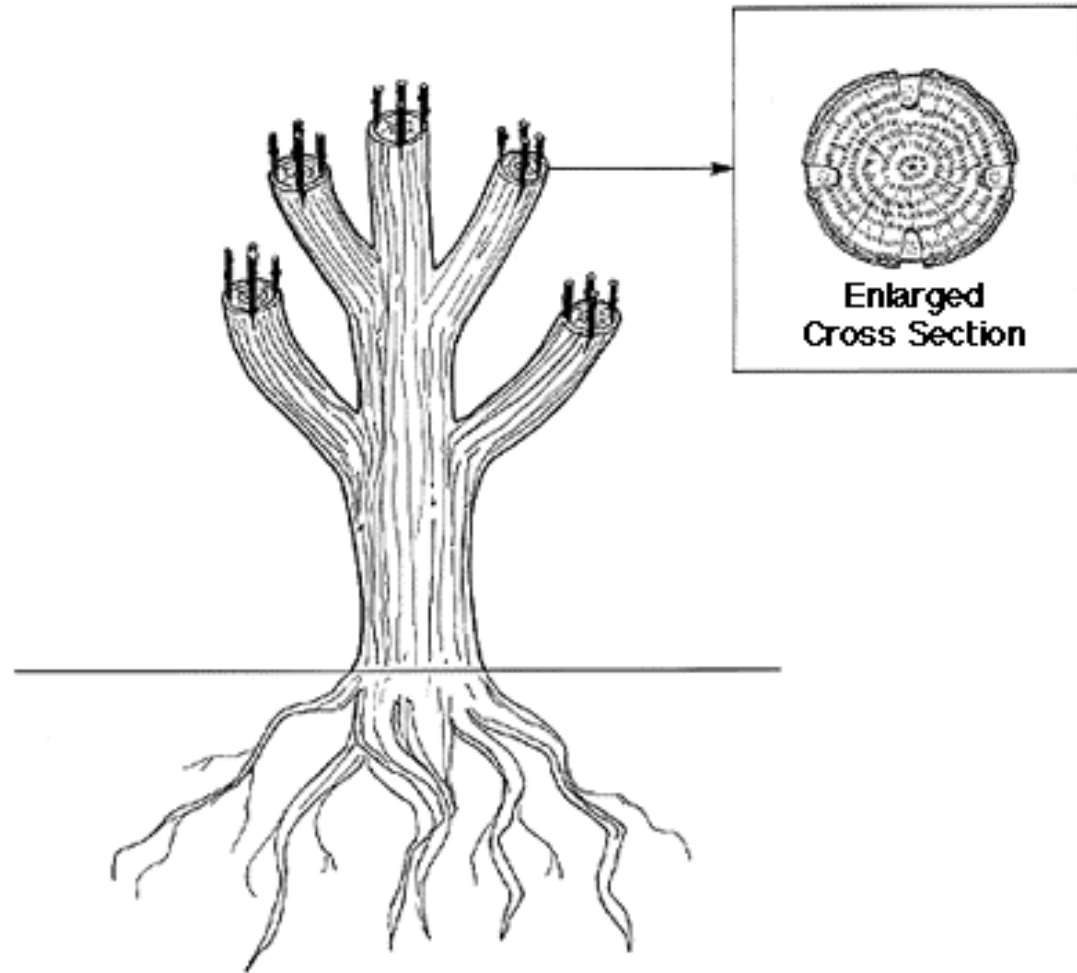


Insertion of Scions



Finished Bridge

Top Working



Bark Grafting

