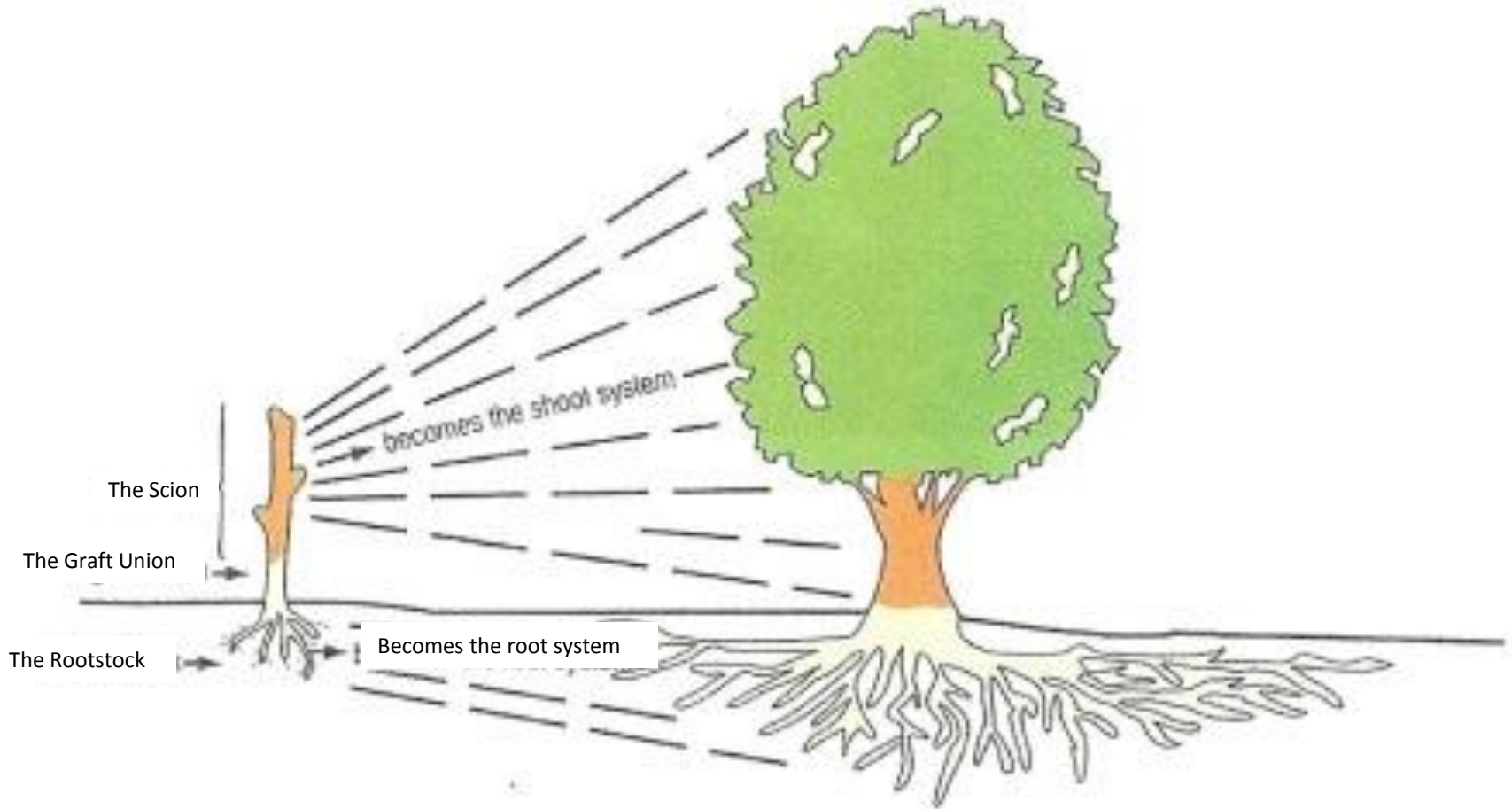


ART OF GRAFTING

GRAFTING TROPICAL FRUIT TREES AND OTHER PLANTS

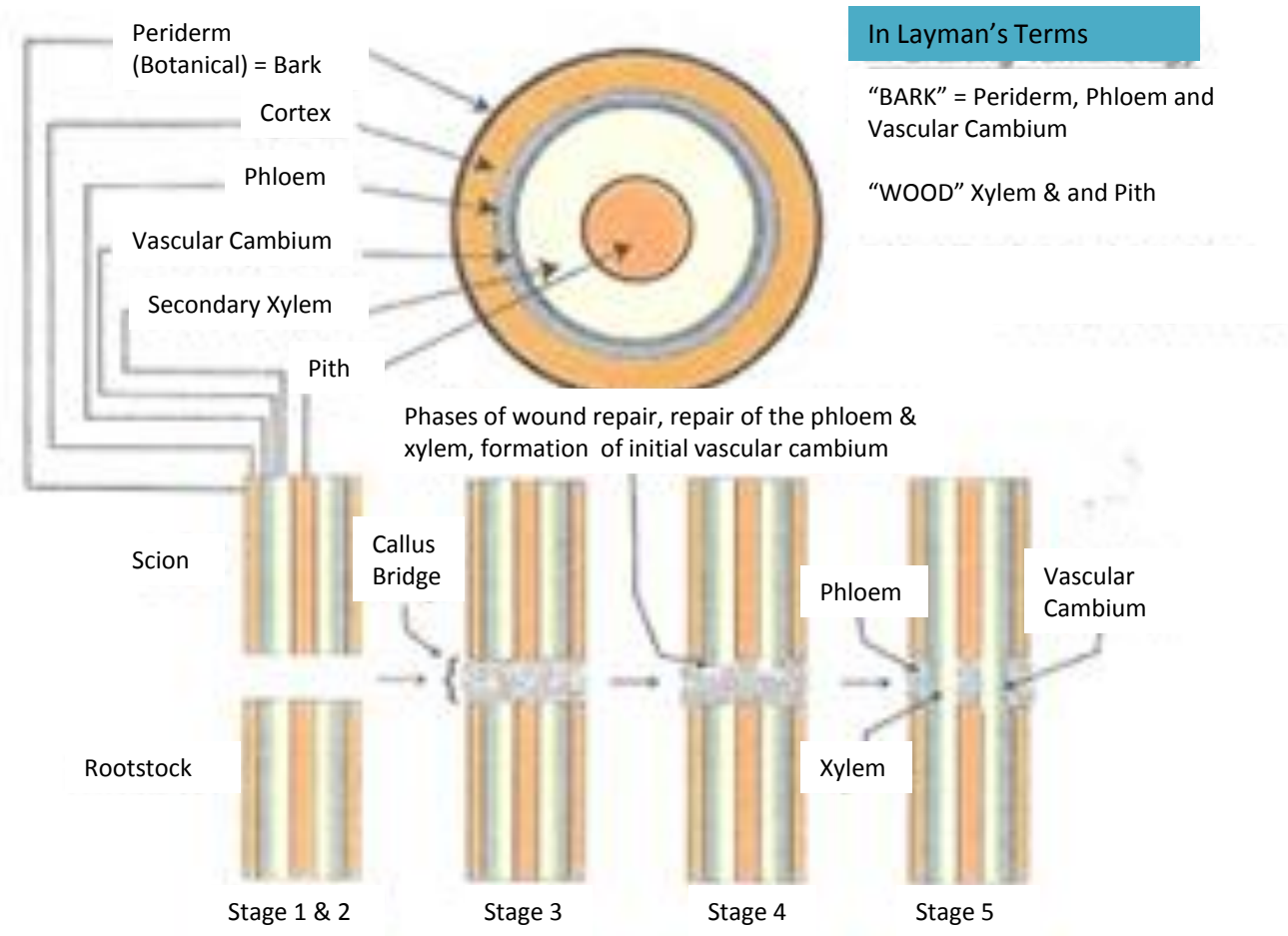
Created and presented by:
Richard Karamatsu and Steve Oshiro,
Oahu Master Garden Association Members

From Scion to Tree



Source: Hartmann & Kester's Plant Propagation Principles and Practices, page 418

CRITICAL ALIGNMENT OF THE CAMBIUM LAYERS



Source: Hartmann & Kester's Plant Propagation Principles and Practices, page 418
 UH MASTERGARDENER STATEWIDW CONFERENCE, MAUI, GRAFTING

METHODS OF PLANT PROPAGATION

SEXUAL: by Seed, relatively easy, but in many cases, you don't know exactly what you're going to get. Not all plants readily produce seeds (seedless navels, grapes, various trees)

VEGETATIVE:

- by Grafting: Today's session is about the art of grafting.
- by Cutting: relatively easy, but not all plants can be, or are easily propagated from cuttings.
- by Layering: (air layer, mound, serpentine, trench, others)
- by specialized stems and roots: (bulbs, corms, rhizomes, others)
- by Micro-propagation: can generate many plants from a small stock, however requires special skills and facilities and longer growing process (similar to growing from seed)

WHAT IS GRAFTING?

- Grafting is plant propagation by physically joining two pieces of plant tissue together in such a way that they will unite and subsequently grow and develop as one composite plant.
- The top is called the scion which carries most of the desired characteristics of the future composite plant.
- The bottom is the root stock which can allow for environment, disease resistance, dwarfing and other variances from the normal mother plant.

WHY GRAFT?

- We know what (fruit or plant) we are going to get.
- We can get a mature plant faster than from seed.
- We can combine multiple cultivars on one plant.
- We can graft a pollinator to our desired cultivar
- The advantages that the root stock can provide was covered on the previous slide.

WHAT ARE SOME GRAFTING LIMITATIONS?

- We are normally limited to grafting within the same **compatible** species. Crossing between plant species or families are virtually always unsuccessful.
- Graft and citrus to a citrus, mango to a mango, avocado to an avocado, hibiscus to a hibiscus. You may graft a tomato to a potato (same vegetable family), but those grafts are a bit more difficult, but in many cases, possible.
- Interstock graft for incompatible scion & rootstock
- Our Hui has not yet tried to graft within the same vegetable/fruit family.

THE SCIENCE OF GRAFTING SIMPLIFIED

THIS IS NOT ROCKET SCIENCE

- BE SAFE, KNIVES ARE SHARP! DO NOT HURT YOURSELF OR OTHERS.
- Stick within the species, and possibly within the same family; the scion and rootstock need to be botanically compatible!
- Get them at the right time-physiology, ensure that they are healthy. Make sure that there are nodes/buds on the scion, without a point for new growth, your grafted scion will not easily flush (grow).
- TAKE YOUR TIME, DO A GOOD JOB!
- Match up the cambium layers of the scion to the rootstock.
- Make sure your scion is NOT upside-down, don't rush. Be safe and don't cut yourself.
- Get a tight fit between scion & rootstock, minimize air gaps.
- Minimize transpiration of the scion by wrapping with wax/parafilm.
- Tag (identify) and take care of your grafted plant

GRAFTING TECHNIQUES

- Whip or Splice Graft
- Whip & Tongue Graft
- Side & Side Veneer Grafts
- Cleft Graft
- Saddle Graft
- Bridge, Inarching, Bark, Chip Bud, Bud Grafts

GRAFTING TECHNIQUES

Whip or Splice Graft

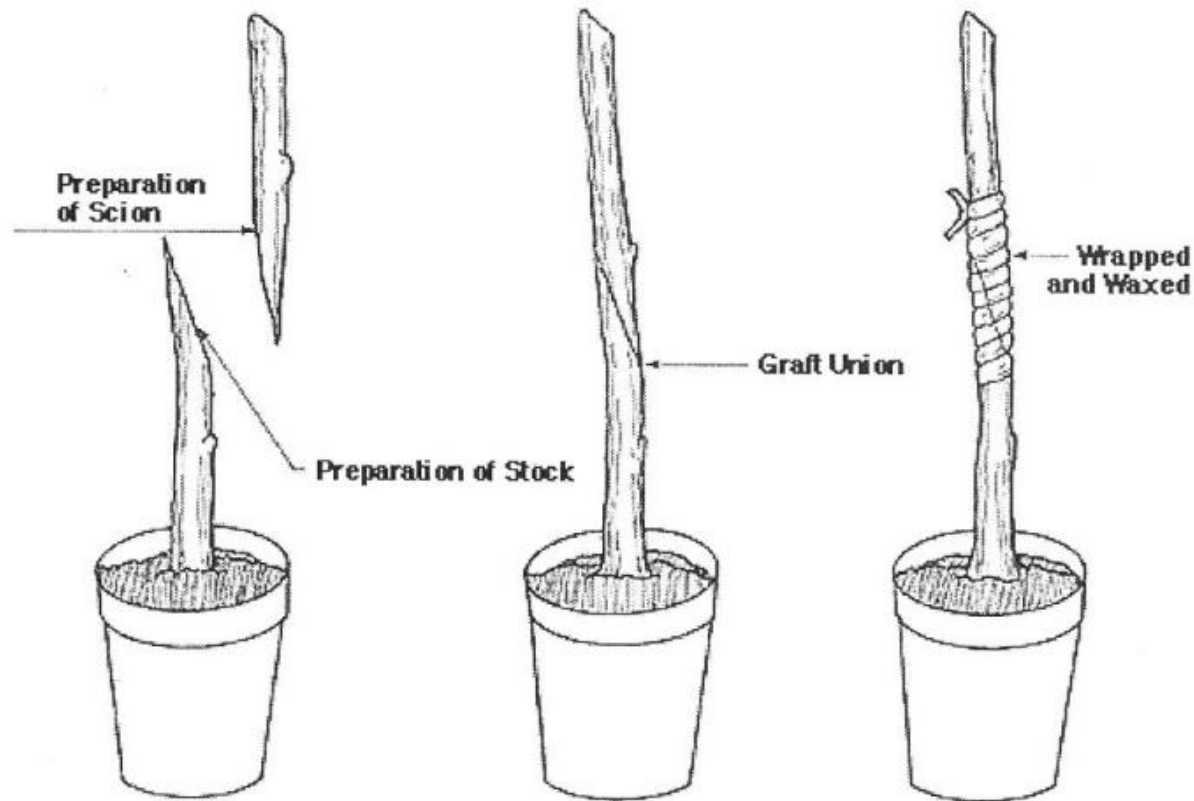


Figure 5. Splice graft.

Source: North Carolina Cooperative Extension Service #AG-396, Page 6

GRAFTING TECHNIQUES

Whip & Tongue Graft

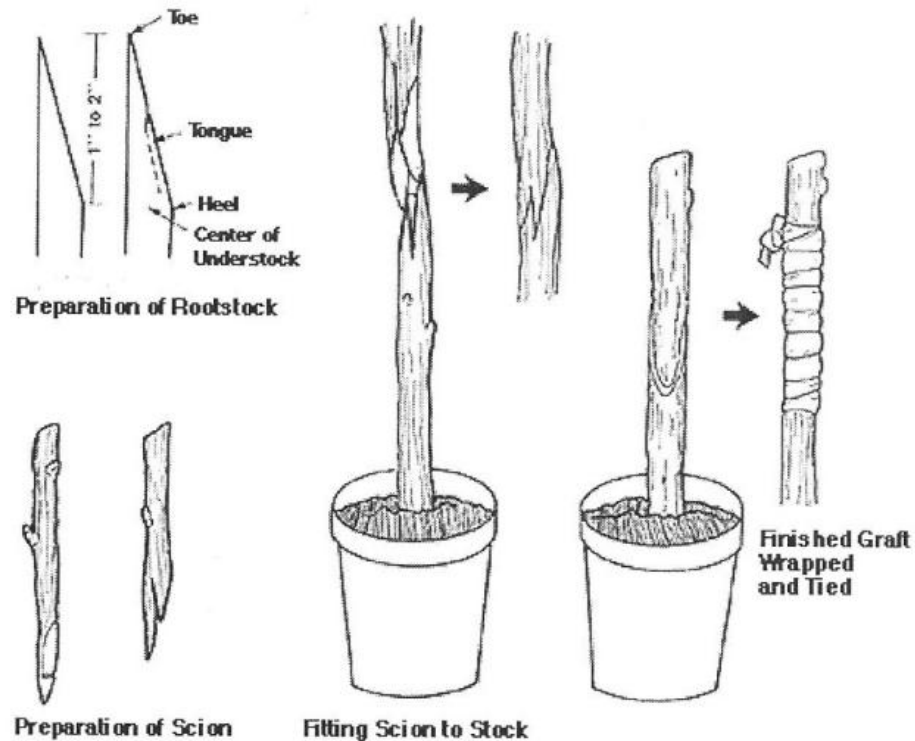


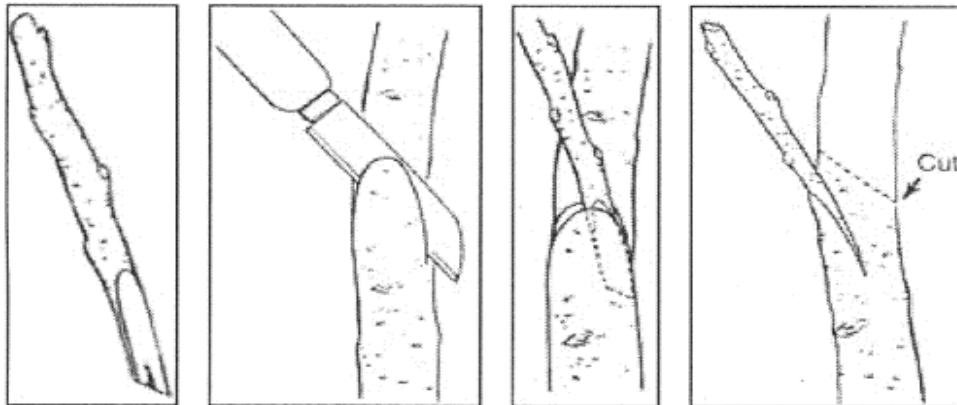
Figure 6. Whip and tongue graft.

Source: North Carolina Cooperative Extension Service #AG-396, Page 7

GRAFTING TECHNIQUES

Side & Side Veneer Grafts

Figure 4
Side graft



Source: University of Missouri Extension #G6971 Grafting, page 9

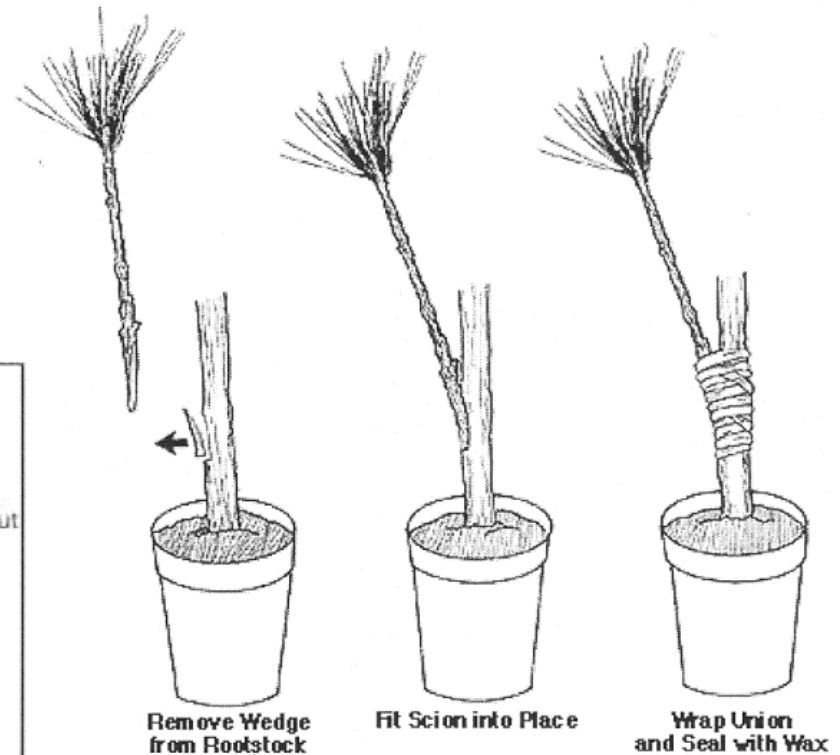


Figure 4. Side veneer graft

Source: North Carolina Cooperative Extension Service #AG-396, Page 5

GRAFTING TECHNIQUES

Cleft Graft

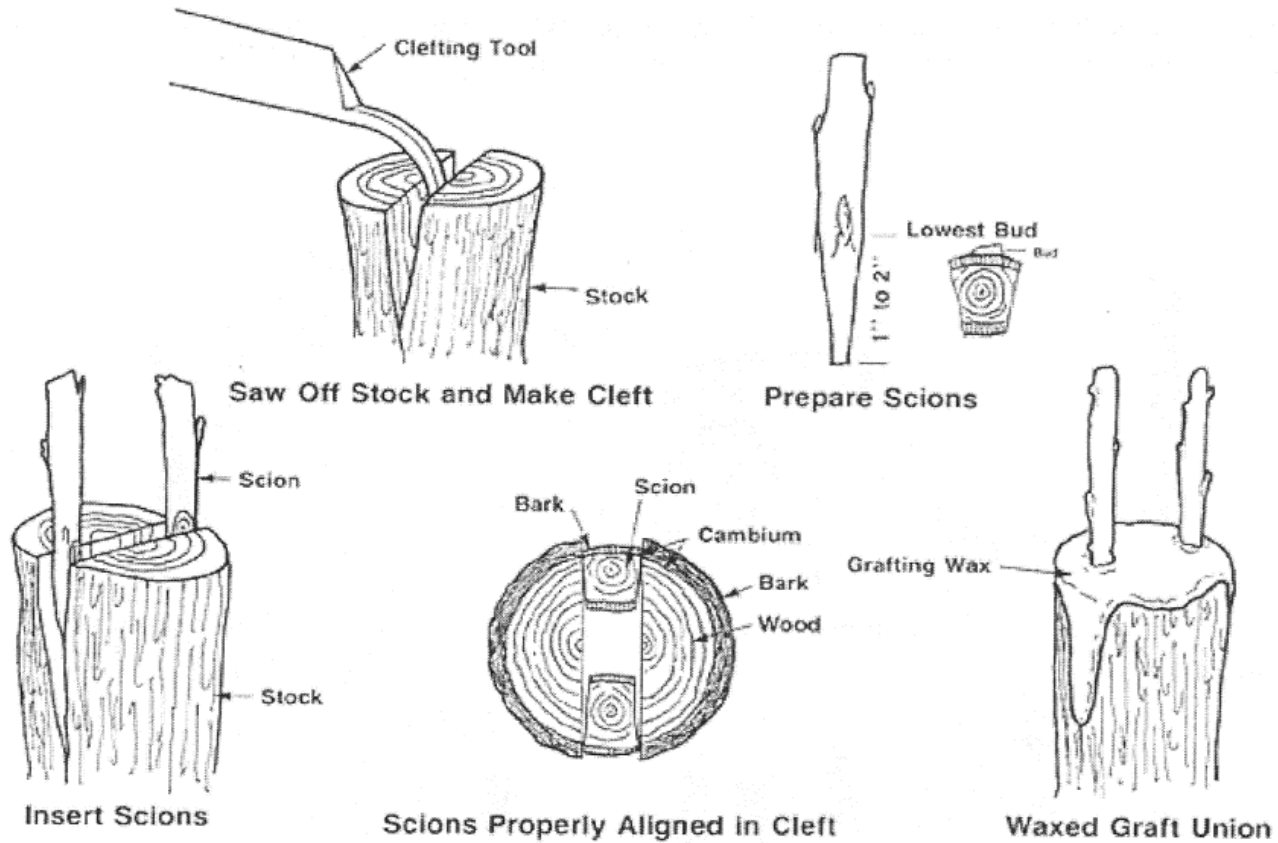


Figure 2. Cleft graft.

Source: North Carolina Cooperative Extension Service #AG-396, Page 3

GRAFTING TECHNIQUES

Saddle Graft

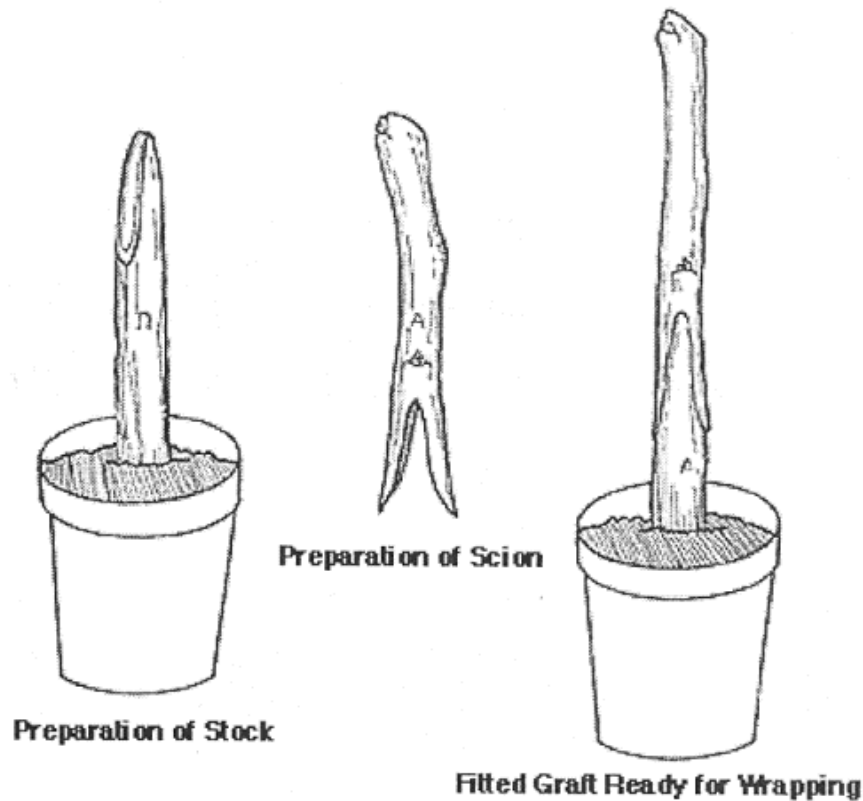


Figure 7. Saddle graft.

Source: North Carolina Cooperative Extension Service #AG-396, Page 8

GRAFTING TECHNIQUES

Bridge, inarching, bark, and bud Grafts

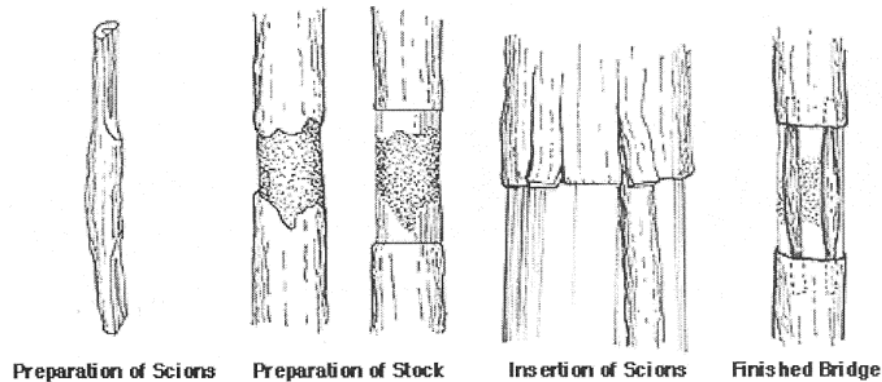


Figure 8. Bridge graft.

Source: North Carolina Cooperative Extension Service #AG-396, Page 9



budding

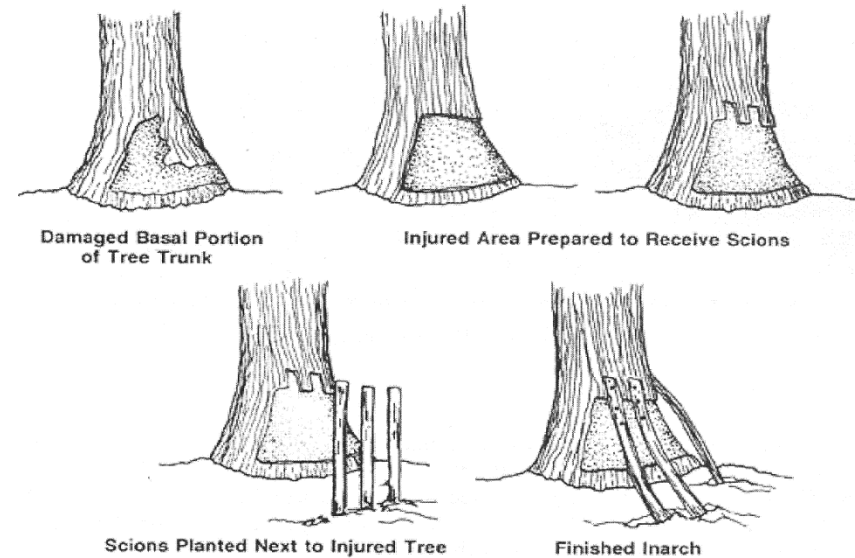


Figure 9. Inarch graft.

Source: North Carolina Cooperative Extension Service #AG-396, Page 10

SOME REASONS WHY GRAFTS FAIL

- The scion and rootstock were incompatible
- Rootstock was unhealthy
- Scions were not vigorous
- Scions were old and dry
- Scion was upside down
- The cambium of the scion and rootstock were not aligned
- Scion not properly wrapped and dried out
- Graft union got diseased (improper wrap or dirty tools)
- The scion (graft) was disturbed by wind or a bump.
- New growth was killed by birds or pests (aphids, etc)
- The graft union was girdled because the grafting tape was not removed.

PREPARING FOR A GRAFTING SESSION

The Plants:

- Grow the rootstock from seed or cutting.
- Prepare planting pots, media, fertilizer
- Transplant rootstock from seedling to larger pot(s)-sometimes a multi-transplant procedure with citrus
- Care & fertilize (energize) rootstock and mother/scion plant (weeding, quick acting & time release fertilizer, and pest control). We need to have both root stock and scion healthy and energized.

PREPARING FOR A GRAFTING SESSION

The Nursery:

- Mist system for seed germination & cutting propagation.
- Transplant area (tables, media, fertilizer, pots, etc.)
- Watering system and area for rootstock and grafted plants.
- Grafting tables (probably same as transplant area)

PREPARING FOR A GRAFTING SESSION

GRAFTING TOOLS AND MATERIAL



PREPARING FOR A GRAFTING SESSION

Locating your scion supply:

- Scions **MUST** have buds or nodes, preferably fat and ready to flush.
- Citrus and hibiscus are almost year around.
- Avocado and mangos are seasonal (buds are available limited time in a year)
- Select healthy scions and rootstock.

WHAT IS A GOOD SCION?



Good – Buds
Plump and
Ready to Flush

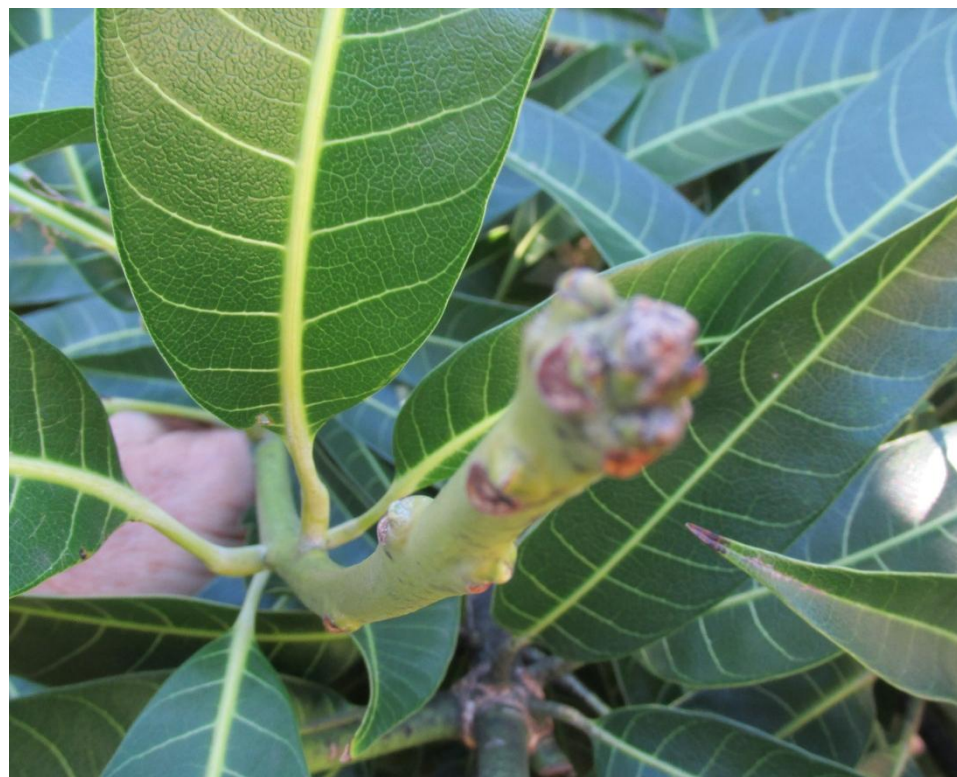
CITRUS

Not Good
(Scion too
Immature)



WHAT IS A GOOD SCION?

MANGO



Good – Buds
Plump and
Ready to Flush

WHAT IS A GOOD SCION?

AVOCADO

Good – Buds
Plump and
Ready to Flush



PREPARING FOR A GRAFTING SESSION

- Clean the grafting table and area.
- Set up material and sterilize your grafting tools
- Match your rootstock with your scion
- Start grafting!

YOUR GRAFTING SESSION

- All preparations made, grafting area clear and clean.
- Matching rootstock and scion available, remove all leaves and leaf petioles from the scion. Should have at least 2 buds on the scion.
- Grafting technique (whip, side, cleft, etc) determined
- Determine where on rootstock to graft, confirm match of scion, sterilize your tools.
- Make cut on your rootstock
- Make appropriate matching cut on your scion
- Attach your scion tightly to the rootstock with grafting tape.
- Wrap your scion with anti-transpiration parafilm (you can do this before attaching the scion to the rootstock) (personal preference)
- Identify & date your graft (your name, scion & rootstock ID, date of graft)- use a soft lead pencil.
- Fertilize your plant, attach to drip line
- Clean your grafting tools, clean your grafting area.

TAKING CARE OF YOUR GRAFTED PLANT

- Feeding, watering, weeding, and getting rids of pests are basically common sense items. Do some research and take care of your grafted plant
- Getting rid of suckers or growth from the root stock is not so obvious. Grafting is a forced adoption (union) to a mother plant (rootstock). If you do not get rid of the new growth (below the graft) from the rootstock, the mother plant will give her new growth 90% of her nutrients, and your graft will stagnate, and eventually wither and probably die.
- Remove the grafting tape after the second flush to prevent girdling of the tree. Remove as much of the parafilm from the scion at the same time.
- How long does it take the scion to flush? From < month to 3-4 months. As long as your scion is green, it is still alive!

SUCCESSFUL MULTIPLE GRAFTS



CITRUS – 5 GRAFTS



HIBISCUS – 10 GRAFTS

SUCCESSFUL STUDENT GRAFTS



GRAFTING SESSION



SEEDLING TRAY-READY FOR TRANSPLANT



NEW MANGO GRAFTS



GRAFTED AVOCADO



SUCCESSFUL SPLICE GRAFT



FLOWERING CITRUS GRAFT



MISTING AREA



GRAFTED CITRUS & ROOTSTOCK



URBAN GARDEN CENTER CITRUS ORCHARD



ART OF GRAFTING

- ANY QUESTIONS?
- GRAFTING DEMONSTRATION
- HANDS-ON SESSION