ART OF GRAFTING

GRAFTING TROPICAL FRUIT TREES AND OTHER PLANTS

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From Scion to Tree

Source: Hartmann & Kester’s  Plant Propagation Principles and Practices, page 418
CRITICAL ALIGNMENT OF THE CAMBIUM LAYERS

Periderm (Botanical) = Bark
Cortex
Phloem
Vascular Cambium
Secondary Xylem
Pith

Phases of wound repair, repair of the phloem & xylem, formation of initial vascular cambium

Scion
Callus Bridge
Phloem
Vascular Cambium

Rootstock

Stage 1 & 2 Stage 3 Stage 4 Stage 5

In Layman’s Terms
“BARK” = Periderm, Phloem and Vascular Cambium
“WOOD” Xylem & and Pith

Source: Hartmann & Kester’s Plant Propagation Principles and Practices, page 418
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 in 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
• Whip or Splice Graft
• Whip & Tongue Graft
• Side & Side Veneer Grafts
• Cleft Graft
• Saddle Graft
• Bridge, Inarching, Bark, Chip Bud, Bud Grafts
Whip or Splice Graft

Figure 5. Splice graft.

Source: North Carolina Cooperative Extension Service #AG-396, Page 6
Whip & Tongue Graft

Figure 6. Whip and tongue graft.

Source: North Carolina Cooperative Extension Service  #AG-396,  Page 7
Side & Side Veneer Grafts

Figure 4. Side veneer graft

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

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

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

![Diagram of saddle graft process]

**Figure 7. Saddle graft.**

Source: North Carolina Cooperative Extension Service  #AG-396,  Page 8
Bridge, inarching, bark, and bud Grafts

Figure 8. Bridge graft.

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

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:

• Misting 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
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.
Feeding, watering, weeding, and getting rid 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
MISTING AREA
GRAFTED CITRUS & ROOTSTOCK
URBAN GARDEN CENTER CITRUS ORCHARD
ART OF GRAFTING

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