Benefits of grafted trees vs. seedlings

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Cacao classification

CRIOLLO

FORASTERO

TRINITARIO
History of cacao propagation

- Productive seedlings selected as parents due to lack of long-term breeding programs (Schnell et al 2005)
- These seedlings were cross-bred to create F1 hybrids
Many F1 hybrid seedlings are still observed to be relatively unproductive (Schnell et al. 2005)

~3% of F1 seedling trees produced 60% of the yield (Goenaga et al. 2009)

Lots of variability; further selection is required
• Majority of Hawaii cacao orchards are planted with seedlings
  ○ In Uganda, studies of Trinitario found that 52% of mature trees contributed 96% of the farm yield (Mabey 1964)

• Important to identify high yielding, quality plants

• Perpetuate identical genetics of selection/variety via clonal propagation

In-ground planting and field-grafting
Grafting

- The process of joining two plants together to grow as one.
- The upper part of the combined plant is called the **scion** and the lower part is called the **rootstock**.
Bark

Vascular cambium layer

Bark
Why graft?

Main reasons:

- Increase the productivity of certain horticultural crops; dwarfing
- Maintain clonal material - uniformity and predictability
- Pest and disease tolerance/resistance
- Change varieties or cultivars

PC: Scot Nelson
When to graft

● Grafting can be done at any time

● Helpful tips:
  ○ Early spring through summer
  ○ When trees (scion) are actively growing and about to flush
  ○ Rootstock seedling stems about pencil diameter width (4-6 months old)
  ○ Avoid times of cold, drought and excessive rain
Tools for grafting

- Grafting knife, specific tools
- Disinfectants - alcohol, torch, etc.
- Sealants - parafilm, wax
- Tying and bonding support - grafting tape, rubberband, electrical tape, etc.

*Clean plant materials, sterile tools and surfaces*
Types of grafts

Cleft graft

Splice graft
- Whip and tongue
- Side veneer
- Bark
- Stump/top-work
- Approach
Grafting success

- Compatibility of the scion and rootstock
- Cambium alignment and pressure
- Proper care of scion, graft, graft union and plant
- Patience

Skip is pointing to a successful cacao graft union.
Where can you get scion material for grafting?

● Select from your own trees
  ○ High yield, flavor appeal, disease resistance, tree vigor, etc

● Germplasm collection (USDA, UH CTAHR, etc.)

● Follow all USDA PPQ & HDOA PQ regulations
  ○ Risk introducing devastating pests and diseases; citations and fines
In summary

- History of cacao propagation of seedling and clonal has changed over time.
- Grafting is a simple way to propagate clones.
- Grafting is good for reliable productivity, changing varieties, pest and disease tolerance.
- Can graft anytime of year, but the best luck in late spring and early summer.
- It’s important to use the right tools and supplies for grafting.
- There are many different types of grafts, the side wedge and top wedge (cleft) work well for cacao.
- After grafting to get good success it is important to be patient. Disturbing the trees will not help.
- Inquire UH, USDA, and your orchard for high quality clonal material.
References

