Propagation of Fruit & Nut Trees

Richard Heerema
Extension Pecan & Pistachio Specialist
Extension Plant Sciences Department
New Mexico State University
Why Graft?

• Propagation
  
  – Seeds - every tree will be different!
  
  – Clonal Propagation by cuttings, layering, grafting or budding.

Hartmann et al, 1997
Why Graft?

• Rootstocks can confer their own benefits:
  – Size control/vigor
  – Disease resistance
  – Nematode resistance
  – Insect pest resistance
  – Salinity tolerance
  – Poor drainage tolerance
  – Freeze tolerance
  – Fruit quality
Why Graft?

- Size control of apple rootstocks

Super Dwarfing
<8 feet tall

Dwarfing
<10 feet tall

Semi Dwarfing
<12 feet tall

Semi Vigorous
<16 feet tall

Vigorous
<20 feet tall

Very Vigorous
>20 feet tall

Source: Westwood, 1993

Figure 5-13. Relative size of apple trees on different rootstocks.
Why Graft?

• Other reasons:
  – To repair an injured tree
  – To change the cultivar in an existing orchard
  – To create multi-cultivar trees:
    • Pollination
    • Space conservation
  – To create interesting aesthetic effects
    • Usually not fruit/nut trees
Grafting Biology: The Cambium

Hartmann et al., 1997
Graft Compatibility

• Only related plants can be grafted together.
  – Different clones within a species can *usually* be grafted together.

  – Sometimes different species in the same genus can be grafted successfully.
    • Examples: *Prunus, Citrus, Juglans*

  – Different genera in the same family occasionally may be grafted together.
    • Examples: *Pyrus on Cydonia, Citrus on Poncirus*
Some Basic Grafting Supplies
Whip Graft

• Used for **small diameter** material (1/4-1/2”).

• Scion wood:
  – Should have **similar diameter** to rootstock.
  – Should be previous-season wood collected during dormancy.
  – Should have 2-3 buds.

• Grafting is usually done in late winter/early spring prior to rootstock’s second growing season.
Whip Graft

• Vascular cambium should match on 1 or 2 sides.

• Advantages:
  – Does not require bark to be slipping.
  – Heals quickly.
  – Forms strong union.
  – Does not require holding scion while tying/sealing.
  – May be used for most tree species.
Whip Graft

• Several buds may grow— thin to only one shoot.

• Nursery trees are often dug when rootstock is two years old and scion is one year old.
Four-Flap ("Banana") Graft

• Good for topworking trees or on younger rootstocks.

• Rootstock and scion should be ≤1” diameter and must be about the same caliper.

• Scion wood is collected during dormancy and stored. Scion should have ~3 buds.
Four-Flap Graft

- Grafting is done in early season when rootstock bark begins to slip.

- Simple, easy graft for beginners.

- Most popularly used for pecans.
Four-Flap Graft

More information: Guide H-635
(www.cahe.nmsu.edu)
4 year old ‘Pawnee’ tree grafted onto ‘VC1-68’ rootstock

‘Kanza’ branch was four-flap grafted onto ‘Pawnee’ branch back in April.

Date of photos: 11-11-13
Cleft Graft

• Used to topwork trees
  – Either in trunk of a small tree or scaffold branches of larger trees.

• Rootstock branch stubs should be 1”-4” diameter.
Cleft Graft

• Scion wood:
  – Wood from previous season’s growth.
  – Should be collected when fully dormant and stored.
  – Should be 3/8”-1/2” diameter.
  – Should have 2-3 buds.

• Grafting should *ideally* be done in early spring when rootstock buds are just beginning to swell.
Cleft Graft

Source: Hartmann et al., 1997.
Wedge Graft

• Similar to cleft graft.

• V-shaped wedges made with heavy knife or saw.

• Two or three scions may be used per rootstock stub.
Wedge Graft

Source: Hartmann et al., 1997.
Bark Graft and Inlay Bark Graft

• Use rootstock stubs 1”-4” diameter.

• Scion wood:
  – Collected during dormancy.
  – ¼” – ½” diameter.
  – 2-3 buds.
Bark Graft and Inlay Bark Graft

• Usually done early in growing season.
  – First month or so.
  – Rootstock’s bark must be slipping.

• Inlay bark graft is better than regular bark graft for thicker-barked trees (e.g., walnut, pecan).
Inlay Bark Graft

Source: Hartmann et al., 1997.
Budding

- Uses a single bud instead of a “stick” with buds.
- Useful in nursery propagation and topworking.
- Budding results in a very strong union.
- Simple—even for the novice.
Budding

• Budwood (scion wood) for patch and T budding:
  
  – Consists of “current-season” shoots, 3/8” or larger in diameter.
  
  – Usually collected shortly before budding is to be done.
  
  – Leaves removed (if present).
  
  – Stored in plastic bag with wet paper towel. (ice chest is good).
Budding

• Rootstock:
  – Bud to current season shoots ¼”- 1” in diameter.

• Timing:
  – Patch and T-budding require that bark be slipping.
  – Chip budding used for dormant material.
  – Three times for budding:
    • Fall Budding (mid-July thru September)
    • Spring Budding (March or April)
    • June Budding (May thru early June)
Budding

**First year**

**Spring**
- **JUNE BUDDING**
  - T-buds inserted in late May or early June.
- Seedlings grow during the spring.
- T-buds inserted from late July to early September. Buds remain inactive until spring.
- Seedlings grow during the spring.

**Summer**
- New tops develop from inserted bud through the summer.
- T-buds inserted just as growth starts in the spring.
- Seedlings grow during the spring.

**Fall**
- Trees ready to dig by fall-1 year top, 1-year root.
- T-buds inserted just as growth starts in the spring.
- Seedlings cut back above bud.

**Second year**

**Spring**
- New top develops from inserted bud.
- Seedlings cut back above bud two weeks later.
- New top develops from inserted bud.
- Tree is ready to dig by fall-1 year top, 2 root.

**Summer**
- Tree is ready to dig by fall-1 year top, 2 root.

**Fall**
- Tree is ready to dig by fall-1 year top, 2 root.

Hartmann et al, 1997
Patch Budding

Source: Texas Pecan Growers Handbook

More information: Guide H-624
(www.cahe.nmsu.edu)
American Plum Borer (*Euzophera semifuneralis*)
T-Budding
T-Budding
T-Budding
Graft or bud union of one of the 100 year old pecan trees at the NMSU Fabian Garcia Horticulture Center
Sources & Further Reading:

- Texas Pecan Growers Handbook (McEachern and Stein, 1997)
- NMSU Cooperative Extension Publications H-613 and H-634.

Online Videos:

- Patch Budding Pecans, Southwest Yard & Garden
  - http://aces.nmsu.edu/ces/yard/howtovideo/patchbudding.html

- Grafting Jujube Trees, NMSU ACES YouTube Channel
  - http://www.youtube.com/watch?v=fFLwOWe0KQ4