

Budding, Grafting, and Other Propagation Methods for Fruit Trees

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Definitions

Grafting is the joining together of two separate plants, usually different genotypes of the same species (or genera), so that they function as a single plant.

Budding is a specific type of grafting where a single bud is inserted into a rootstock.

Introduction

Many fruit trees are propagated by one of several asexual procedures collectively known as grafting and/or budding.

What are some other asexual methods used to propagate plants?

What are some advantages of asexual propagation?

Introduction

- Scion (cion) – The portion of a grafted plant which consists of the upper trunk, branches, leaves, and reproductive or fruit-bearing structures.
- Rootstock – the portion of a grafted plant which consists of the lower trunk and roots.

Reasons for Grafting

Some fruit species are difficult to root.
Especially before the use of mist beds and
synthetic plant rooting hormones.

Reasons for Grafting

Grafting can result in plants that have beneficial characteristics of both the scion and the rootstock.



Grafting and budding enable use of rootstocks

- Rootstocks can impart many beneficial characteristics to a grafted or budded plant.
- Grafting or budding are needed to take advantage of rootstocks.



Some common beneficial effects of rootstocks

- Insect, nematode and disease tolerance.
- Drought tolerance
- Size control
- Fruiting at an earlier age
- Increased fruit yield
- Increased fruit quality
- Increased cold hardiness
- Salt tolerance

Other reasons to graft fruit trees

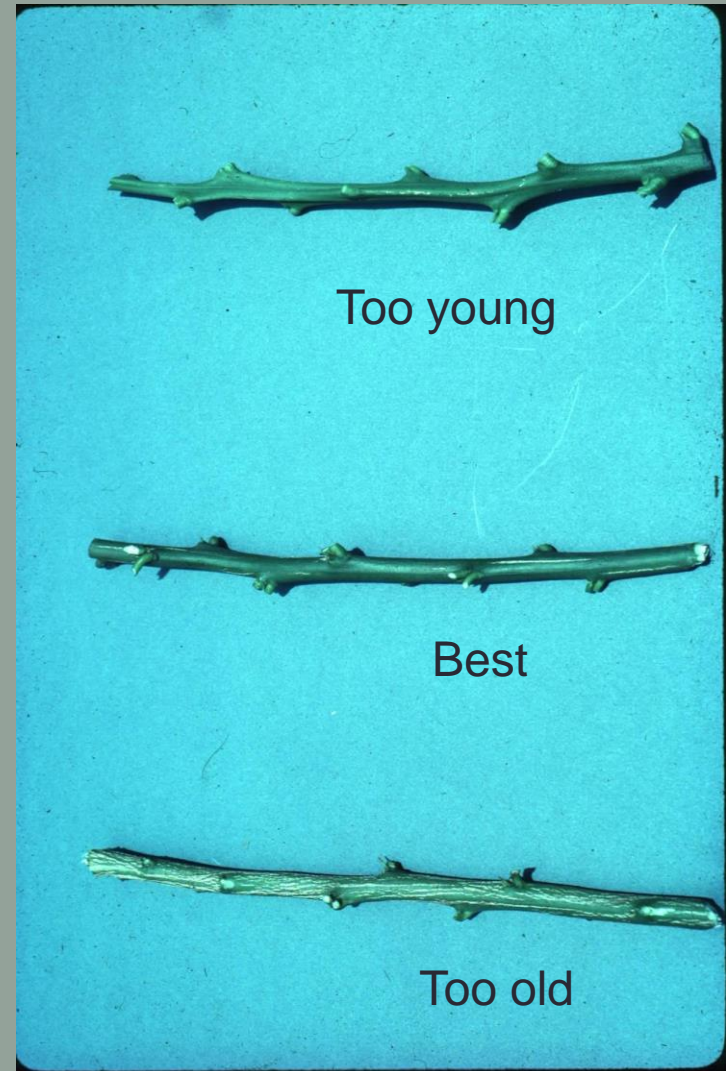
- Repair damaged tree – inarching (rare)
- Change existing cultivar – topworking
- Grow more than one cultivar on a single plant – “fruit salad tree”

Factors for successful grafting and budding

- Condition of plant material
 - Proper stage of growth and development of scion and rootstock.
 - Healthy, disease-free, plant material.
 - Fresh budwood.
 - Rootstock plants must not be stressed before or after budding or grafting.

Selecting Budwood

- Budwood should be at the proper stage of maturity
- For example, citrus budwood should be from the second or third growth flush back from the terminal and about the diameter of a pencil (center stick).



Collecting Budwood

- Healthy, non-stressed, plants of a known cultivar the morning of budding if possible.
- If budwood must be collected ahead of time, store under moist, cool, conditions.
- Some procedures require dormant budwood. This wood should be collected before growth begins in the spring and stored under refrigeration.
- Budwood should be labeled and tied in bundles.

Tools

- The required tools will depend on the procedure.
- Common tools are – hand pruners, sharpening stone, very sharp knife, budding tape, budding rubbers, and labels.



T-Bud

- The T-bud, also known as the shield bud, is commonly used for propagation of many fruit trees.
- This procedure is done during the growing season when bark on the rootstock is “slipping” (separates easily from the wood).
- A modification of the T-bud is the “inverted T-bud” which is commonly used on citrus.

T-bud

- A bud is removed from the bud stick by making a shallow cut just into the wood and passing under the bud.
- The cut surface must be smooth.



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T-bud

- A second cut is made through the bark and slightly into the wood to meet the first cut above the bud.



T-bud

- The bark and bud are removed from the bud stick leaving the thin sliver of cut wood behind.
- The bark contains the dormant bud that will be transferred to the rootstock.



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T-bud

- The dormant bud and associated tissue is slipped under the bark flaps on the rootstock that were created by the “T” incision.
- The bark must be slipping for this procedure to work.



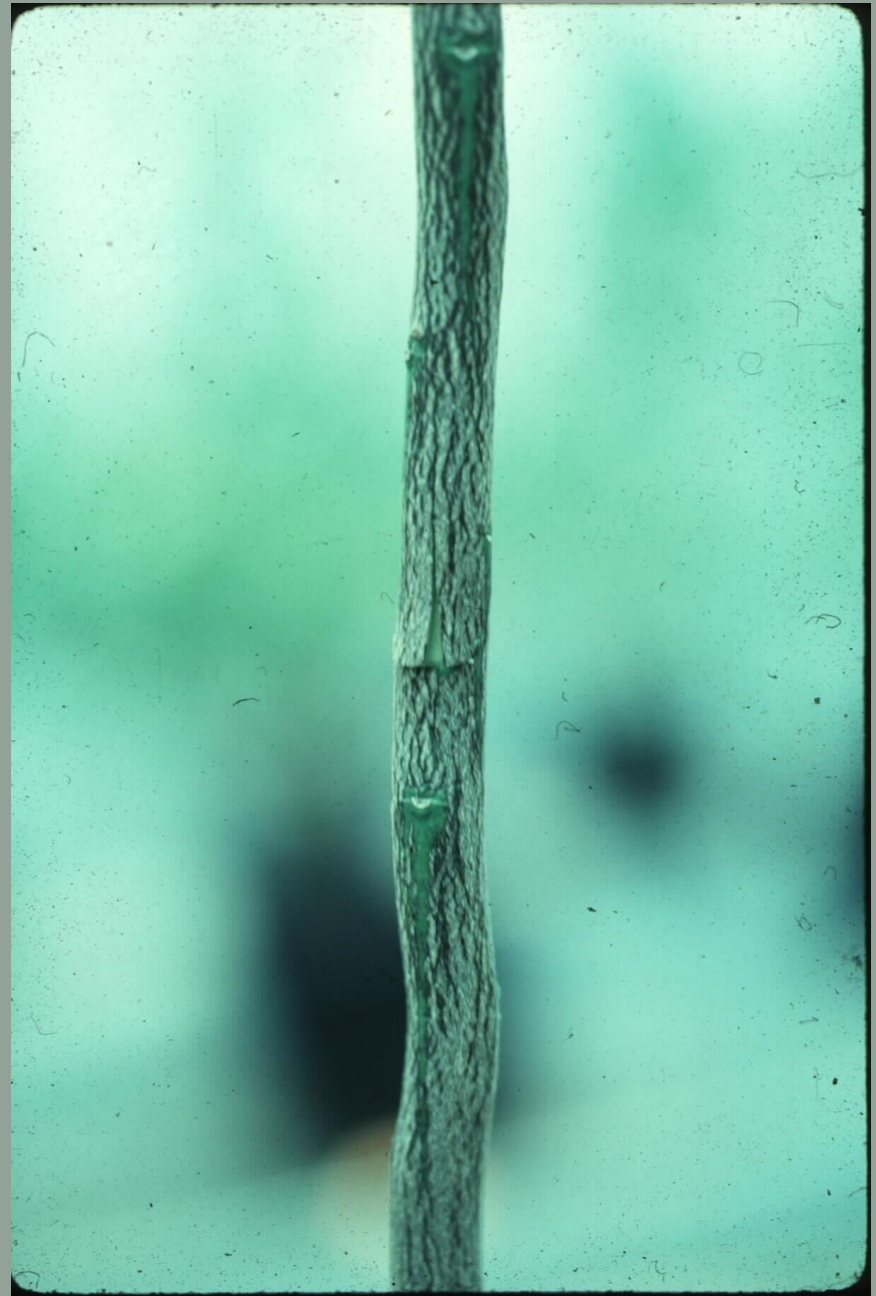
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T-Bud – on large limb



Inverted T-Bud

- Vertical cut through the bark but not deep into the wood beneath.
- Horizontal cut that intersects the first cut.



Inverted T-Bud

- A bud is removed from the bud stick by making a shallow cut just into the wood and passing under the bud.
- The cut surface must be smooth.



Inverted T-Bud

- The bark is gently separated from the wood where the two cuts intersect.
- The bud is slipped completely under the bark.



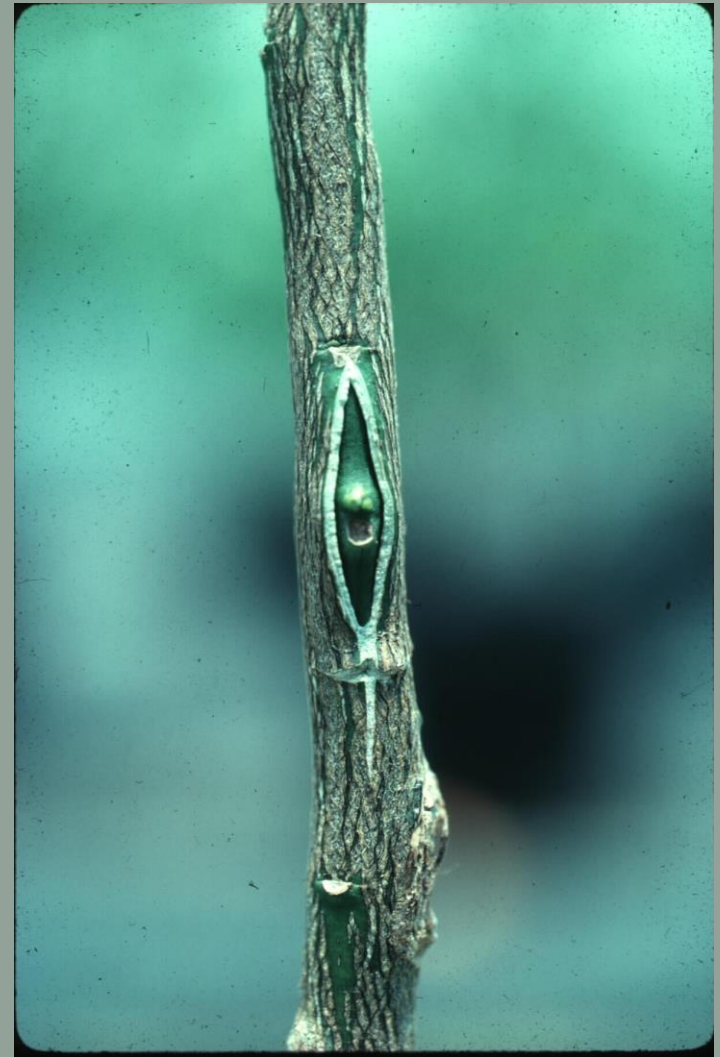
Inverted T-Bud

- The bud is tied firmly in place with budding tape.
- Tying prevents moisture loss and holds the bud firmly against the rootstock.

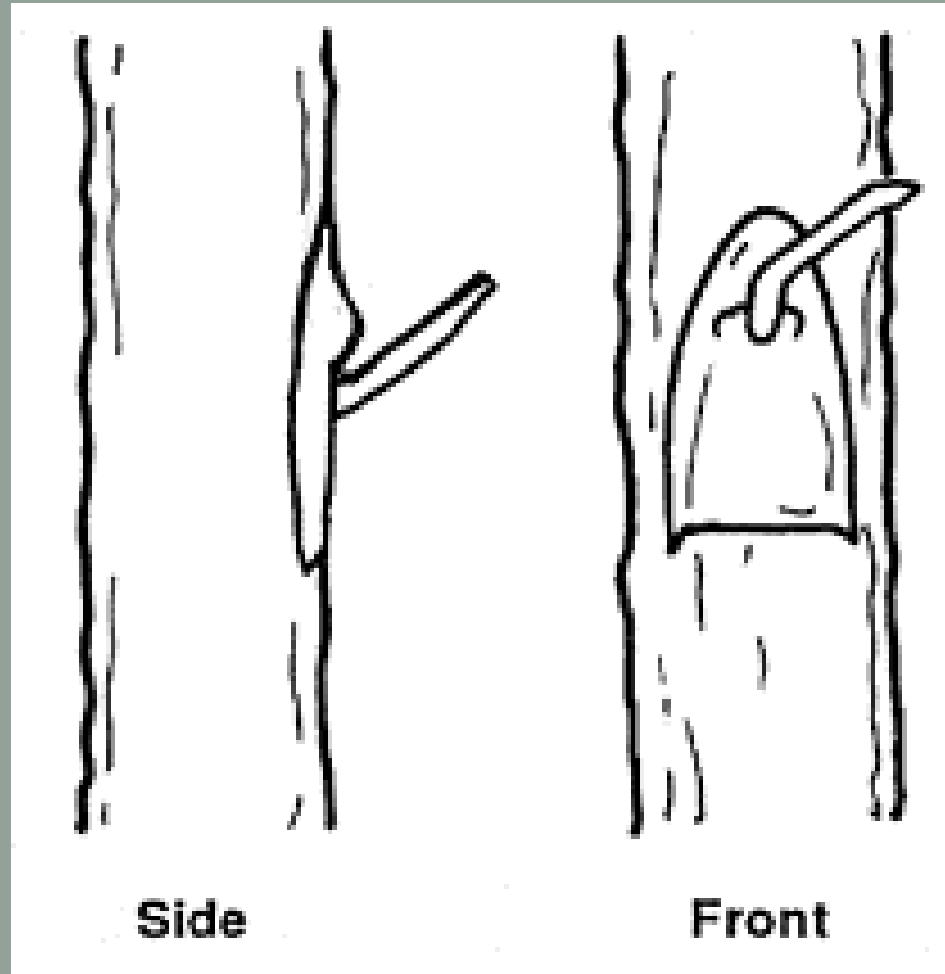


Inverted T-Bud

- Plants should be well watered and placed in semi-shade.
- Remove the budding tape after 18 to 21 days.

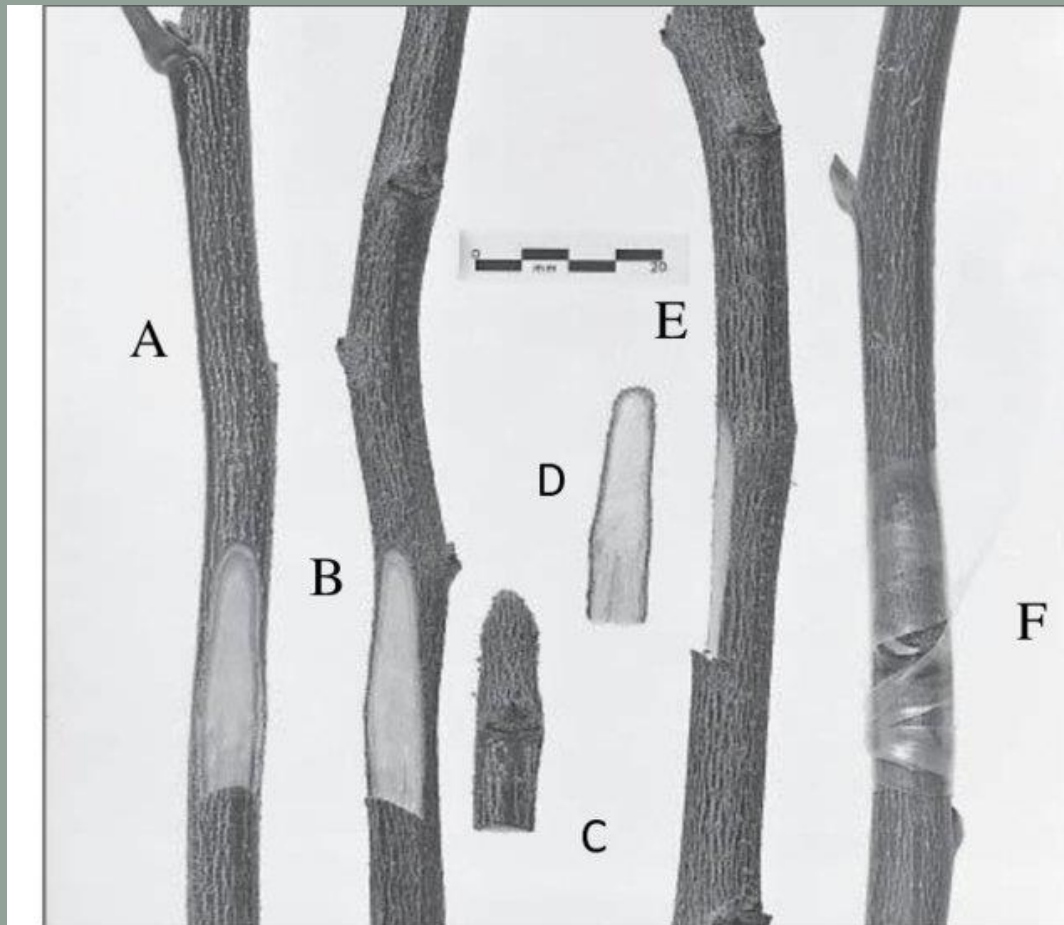


Chip bud



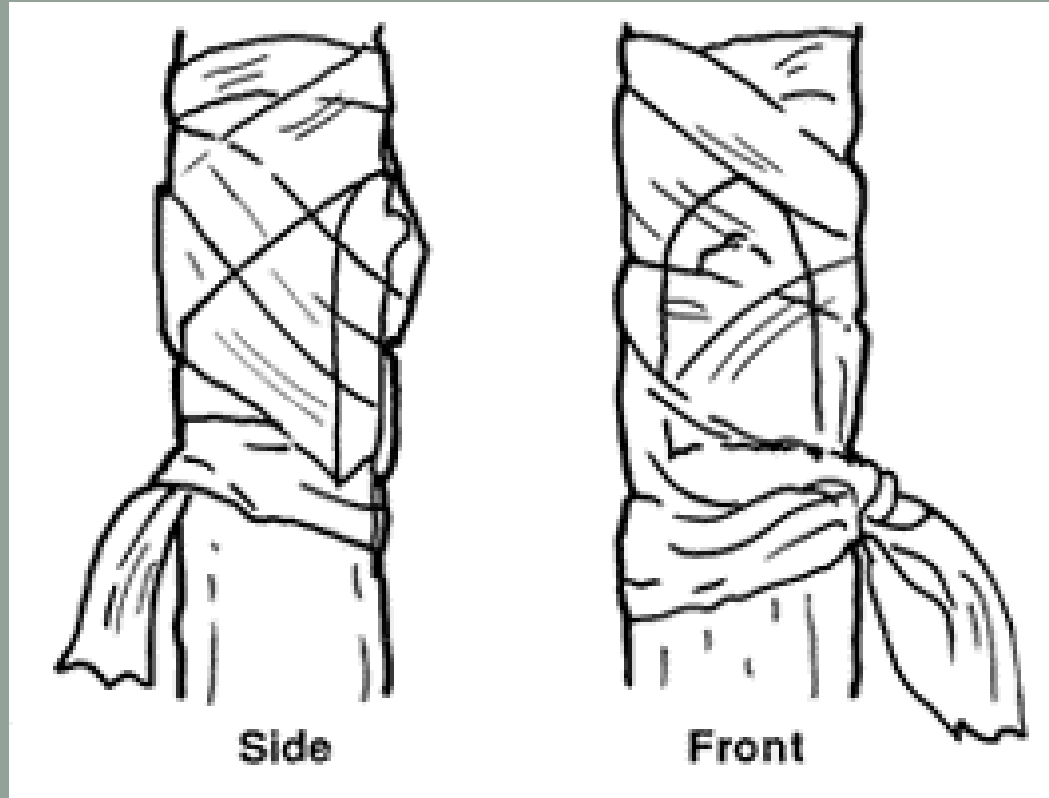
<https://content.ces.ncsu.edu/grafting-and-budding-nursery-crop-plants>

Chip Bud



https://www.researchgate.net/profile/Youssef-Sassine/publication/322832053/figure/fig2/AS:588878536773633@1517410992270/Patch-Budding-Lewis-and-Alexander-2008-A-Rootstock-prepared-for-ship-bud-B-Bud_W640.jpg

Chip bud – wrapped



<https://content.ces.ncsu.edu/grafting-and-budding-nursery-crop-plants>

Chip Budding

- <https://propg.ifas.ufl.edu/06-grafting/03-buddingtypes/02-grafting-budchip.html>

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Whip Grafting

- Whip grafting is a common technique for propagating many fruit trees such as apple and pear.



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Whip Grafting

- The cambium layers of the rootstock and scion must be aligned. If wood of different diameters is used, align one side.

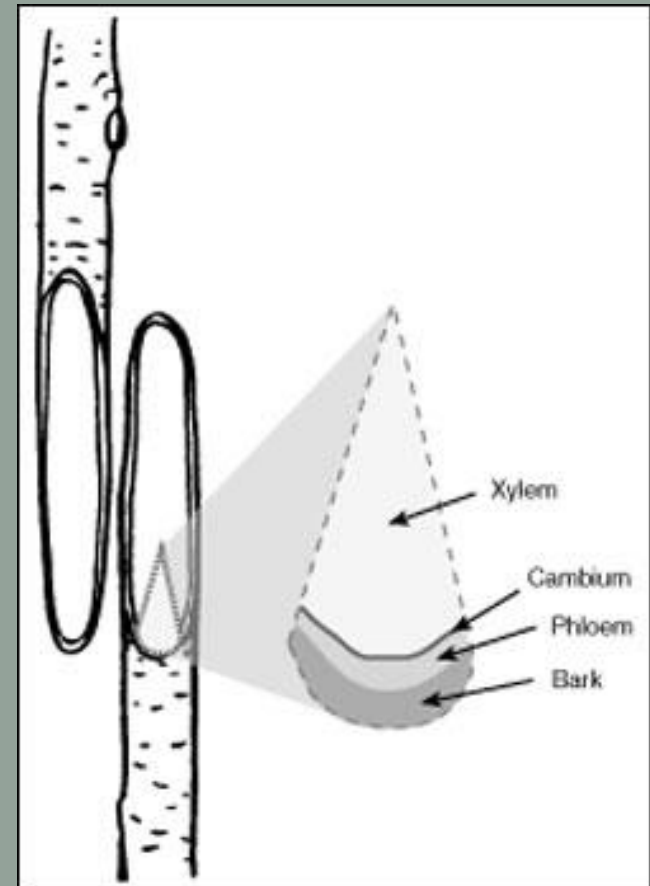


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Whip Grafting

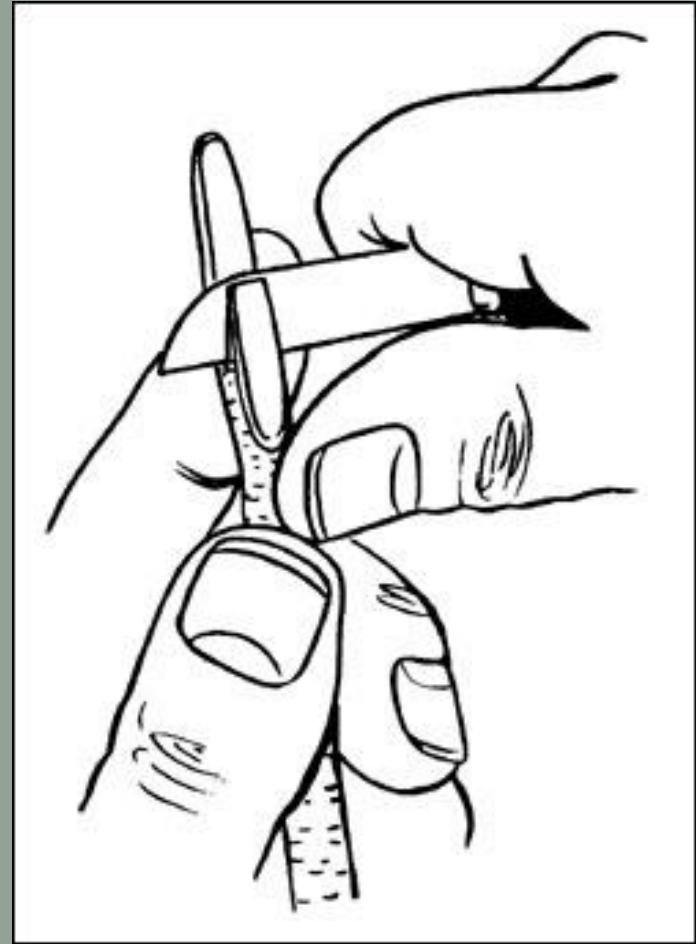
- Make a smooth, slanting cut through the scion.

Make a similar cut through the rootstock, smooth and complete.



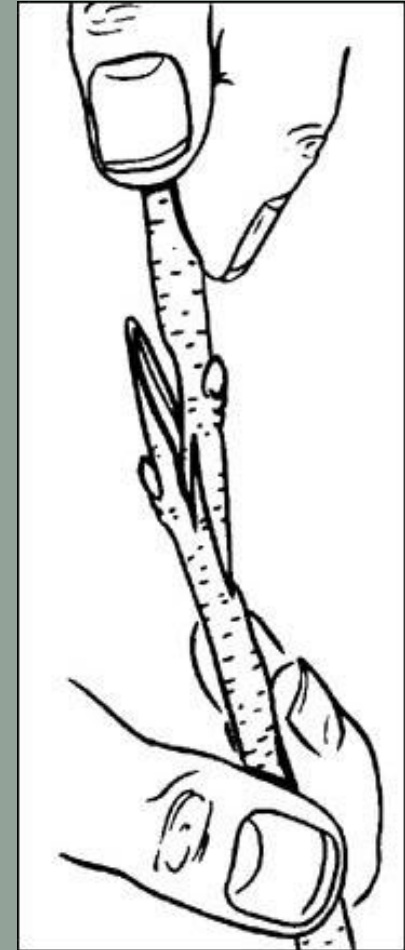
Whip Grafting

- Make a cut in half way through the previous cut.



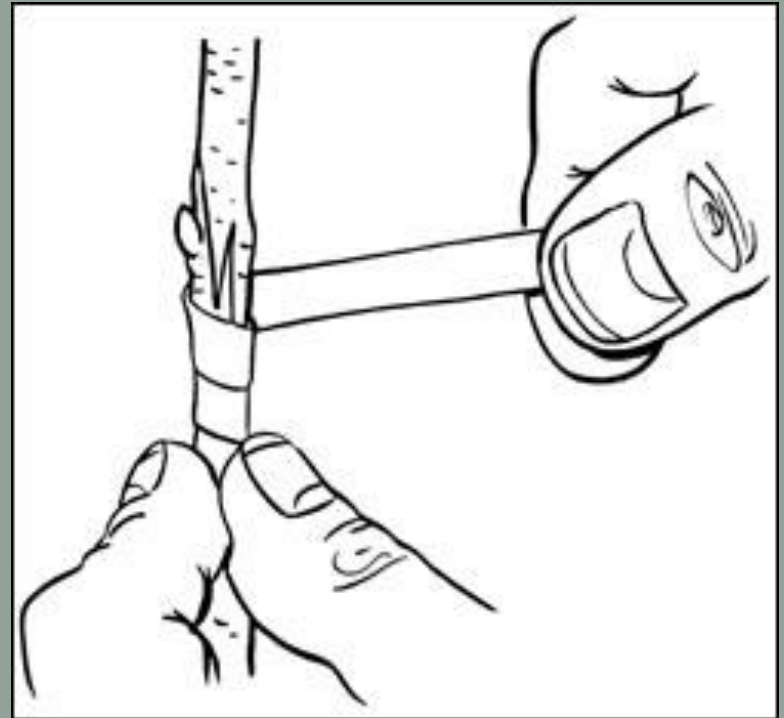
Whip Graft

- Insert scion and rootstock together.
- Align scion and rootstock so that cambium matches between the scion and rootstock on at least one side.



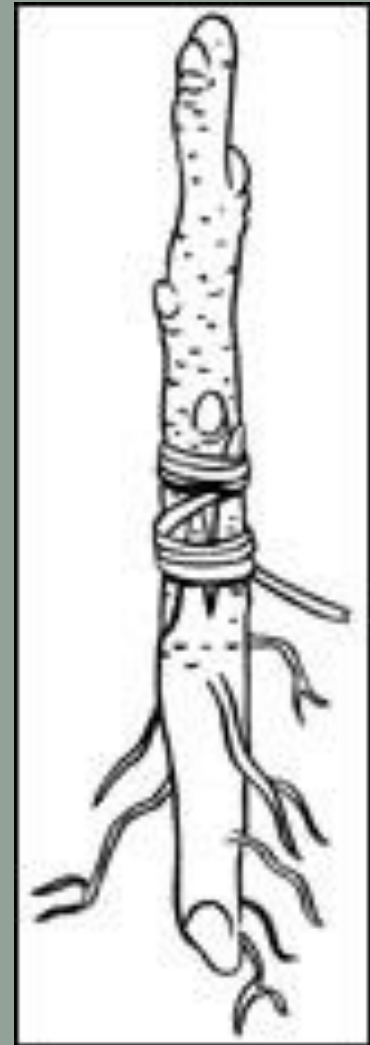
Whip Graft

- Wrap to secure the union. Overlap the wraps to prevent dying out.



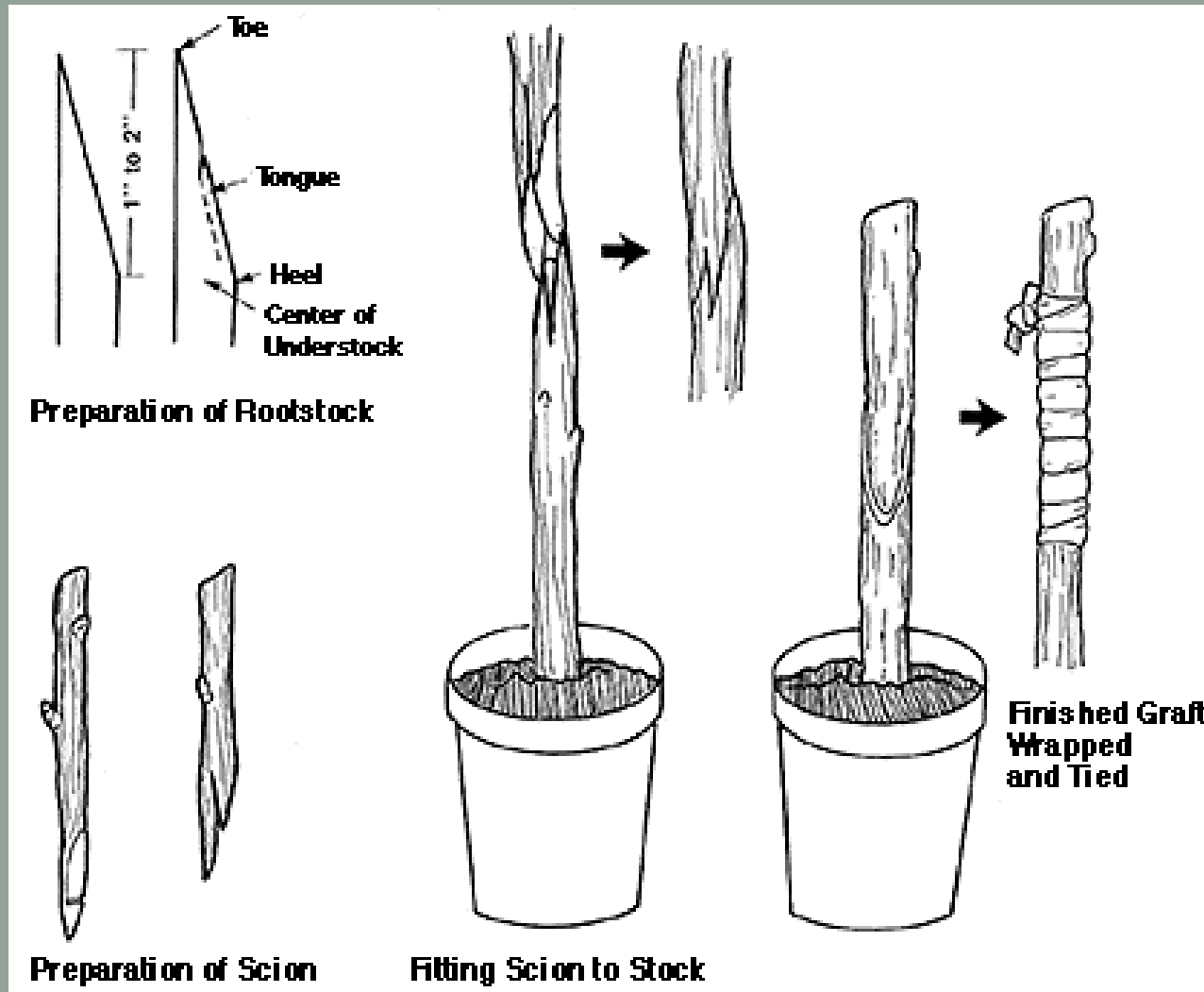
Whip Graft

- Rubber ties or wax-coated twine can be used on some species that do not dry out readily.



<https://extension.missouri.edu/publications/g6971>

Whip graft



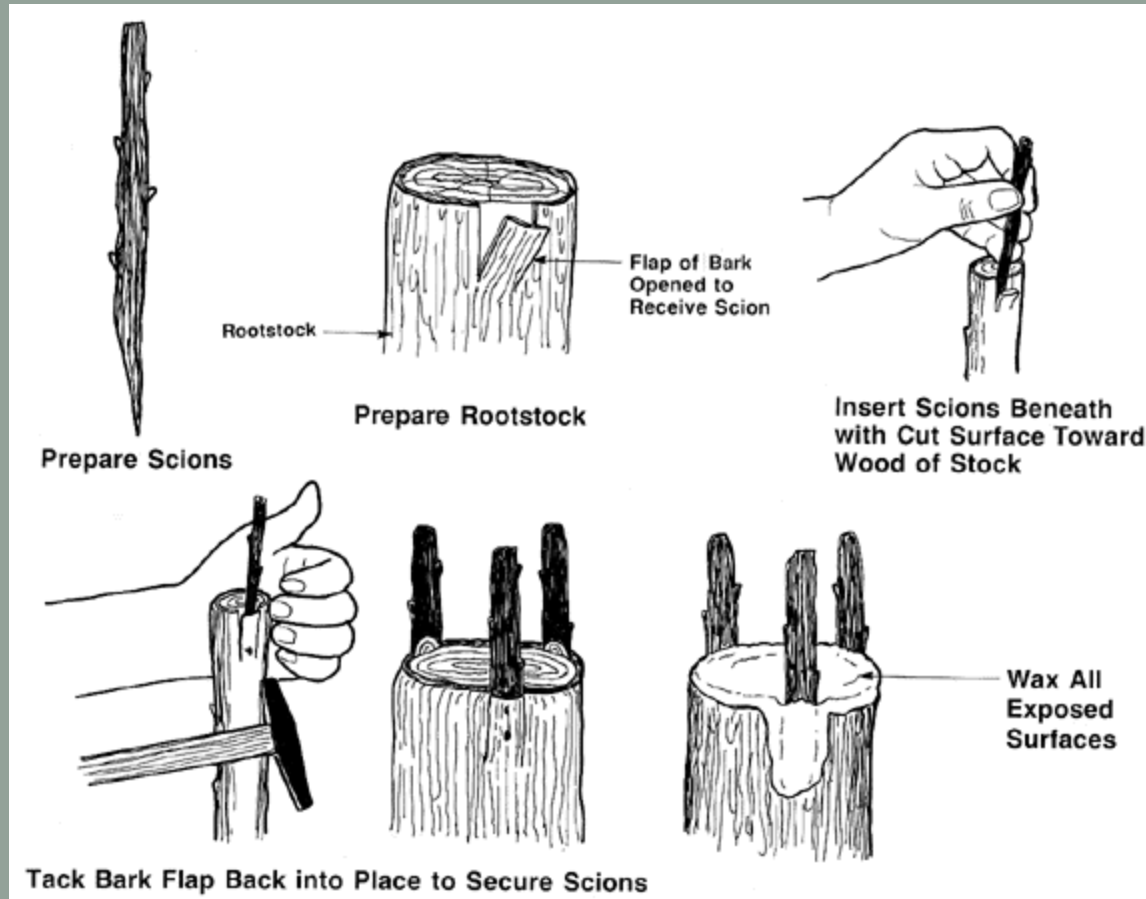
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Whip and Tongue Graft

- <https://propg.ifas.ufl.edu/06-grafting/02-graftingtypes/18-grafting-whipandtongue.html>

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Bark Graft



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Bark Grafting

- Bark grafting is commonly used on large limbs of trees such as pecan. This technique is sometimes used when topworking orchards.



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Bark Grafting

- The base of the scion is cut to a point. One side is tapered more than the other.
- The cuts must be smooth to increase contact between the scion and rootstock.



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Bark Grafting

- Two vertical cuts are made through the bark on the limb of the rootstock and a flap of bark the same width as the scion is pulled back from the wood.



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Bark Grafting

- The scions are inserted under the bark flaps. Two scions can be placed on each limb to increase the chances of a successful union between rootstock and scion. One can be removed later if necessary.



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Bark Grafting

- The scions are secured with adhesive grafting tape.



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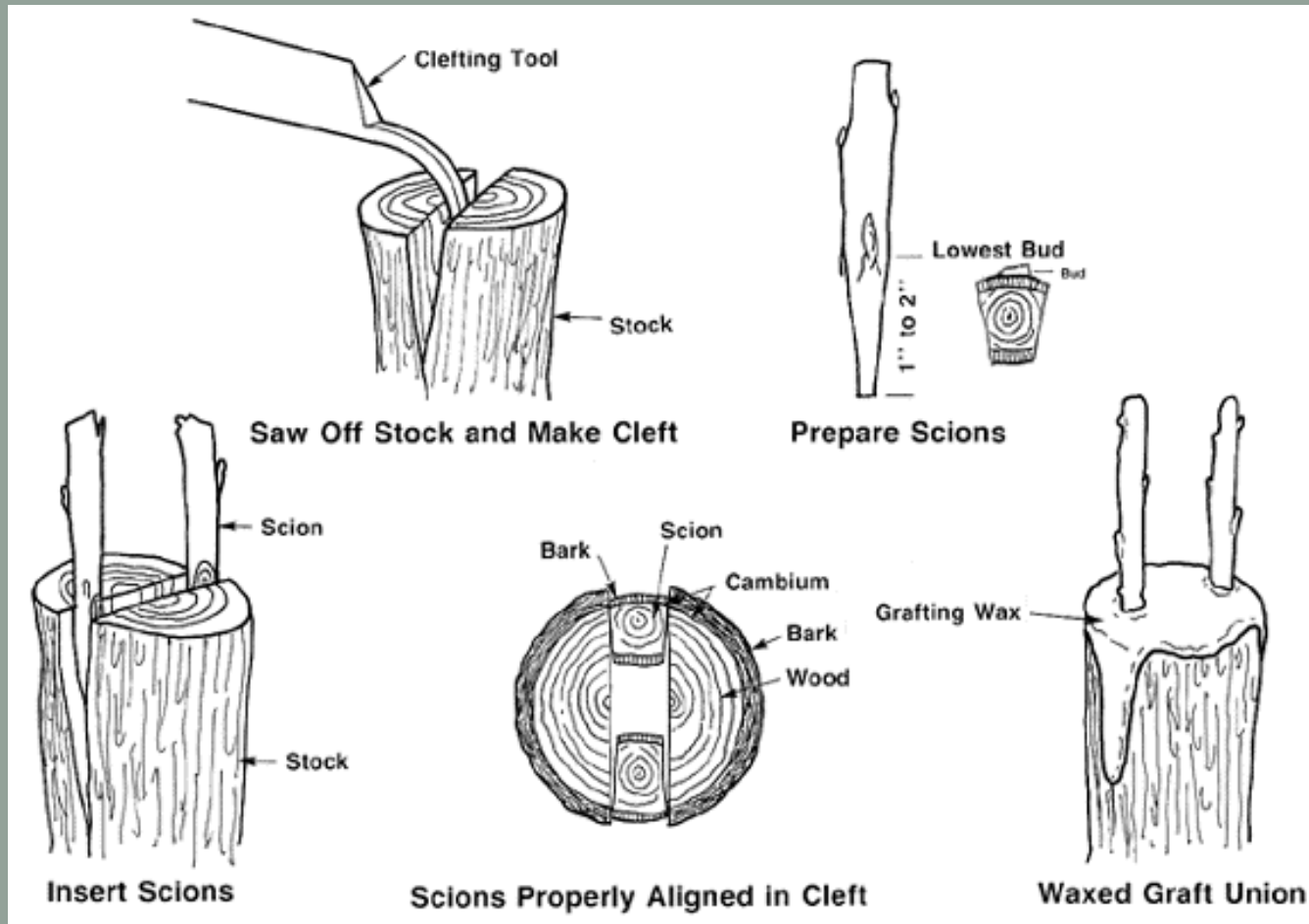
Bark Grafting

- The area where the scion and rootstock are joined and the cut surface of the limb are sealed with grafting wax to prevent drying of the tissues before a connection is formed between the scion and the rootstock.



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Cleft graft



<https://content.ces.ncsu.edu/grafting-and-budding-nursery-crop-plants>

Cleft Graft

- <https://propg.ifas.ufl.edu/06-grafting/02-graftingtypes/06-grafting-cleft.html>

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Cleft graft – wrapped

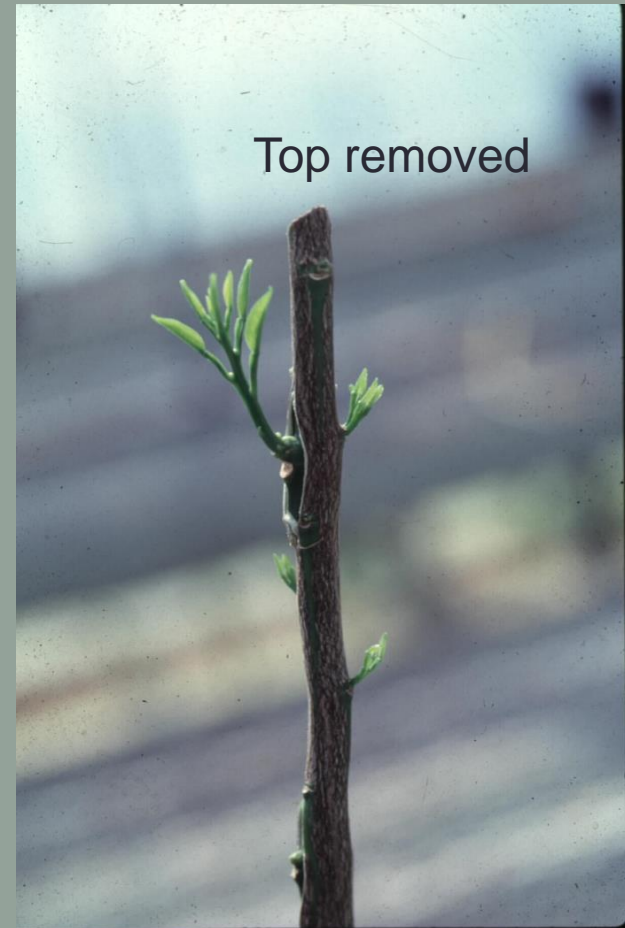


Forcing the Scion Bud

- Apical dominance inhibits growth of inserted scion buds.
- Altering apical dominance and allowing growth of scion buds is known as “bud forcing”.
- Forcing is done soon after buds are unwrapped.

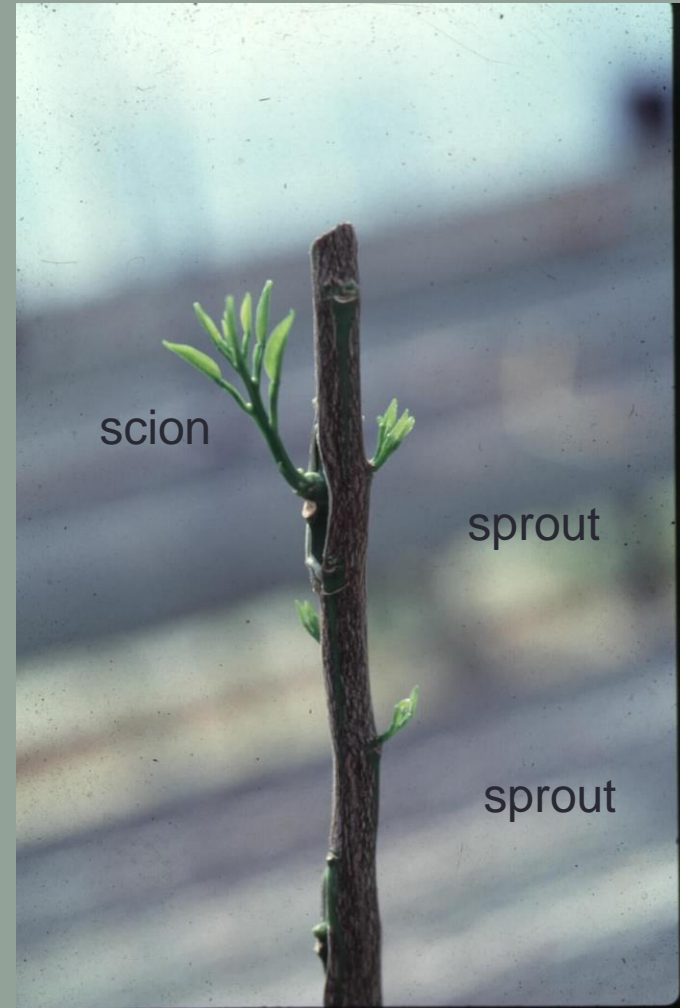
Bud Forcing

- There are several procedures used to force scion bud growth.
 - Cutting off (shown)
 - Lopping
 - Bending



Aftercare

- Rootstock sprouts should be removed as soon as they appear to prevent competition with the scion bud (upper left).



Aftercare

- Avoid all stresses during the healing period.
- Usually, semi-shade or filtered sunlight is better than full sun or heavy shade.
- Plants should be well watered, but roots should not be excessively wet.
- When forcing a bud (T-bud or chip bud), water use by the plant is reduced (especially when cutting—off the rootstock above the scion bud). Irrigation should be adjusted accordingly to prevent over-watering.

Unusual techniques to repair damaged trees

Bridge grafting



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Unusual techniques to repair damaged trees

Inarching



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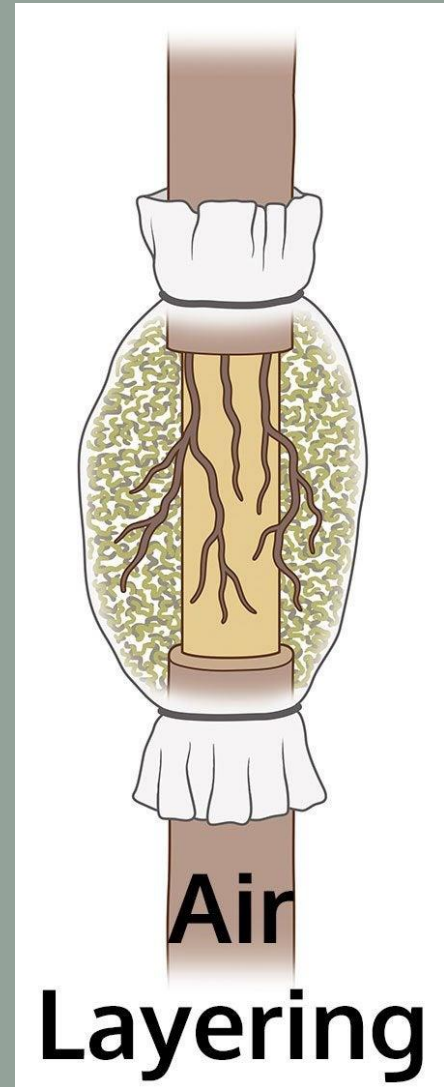
Air layering

Useful for crops that are
Difficult to root and do not
Require a rootstock.



<https://propg.ifas.ufl.edu/images/08-layering/layeringair/image1.jpg>

Air layering



<https://www.gardeningknowhow.com/wp-content/uploads/2014/03/Air-Layering.jpg>

Air layering



<https://adamaskwhy.files.wordpress.com/2014/05/20140519-195949-71989247.jpg?w=750>

Clonal apple rootstocks are propagated in stool beds



Roots form under the soil surface



Summary and Review

- Goals and objectives of grafting and budding fruit trees.
- Benefits of rootstocks.
- Importance of proper tools and plant materials.
- Technical aspects of commonly used budding and grafting procedures.

Acknowledgments

- The images on slides 15 -18, slides 29-30, slides 40 – 45, and slides 54-55 were taken from *Propagating Deciduous Fruit Plants Common to Georgia* (Pub. B 818), Cooperative Extension Service, College of Agriculture, University of Georgia, Athens, Ga.

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