

Unit C: Maintaining the Fruit and Nut Tree

Lesson 1: Advantages and Disadvantages of Asexual and Sexual Propagation in Fruit and Nut Production

Terms

- Asexual propagation
- Budding
- Cross-pollination
- Cuttings
- Fertilization
- Gametes
- Grafting
- Hybrids
- Layering
- Pollination
- Seed
- Self-pollination
- Sexual reproduction
- Tissue culture

I. Plants reproduce in two ways- sexual and asexual. Both forms are beneficial to fruit and nut production but asexual is more widely used.

A. Sexual reproduction occurs when the male sperm carried in the pollen unites with the female egg within a flower.

1. Most plants reproduce their own kind in nature by seeds that are the result of sexual reproduction.

a. The male sex cell (sperm) and the female sex cell (egg) are known as ***gametes***.

b. The union of the gametes produces the ***seed*** that contains the embryo plant and stored food.

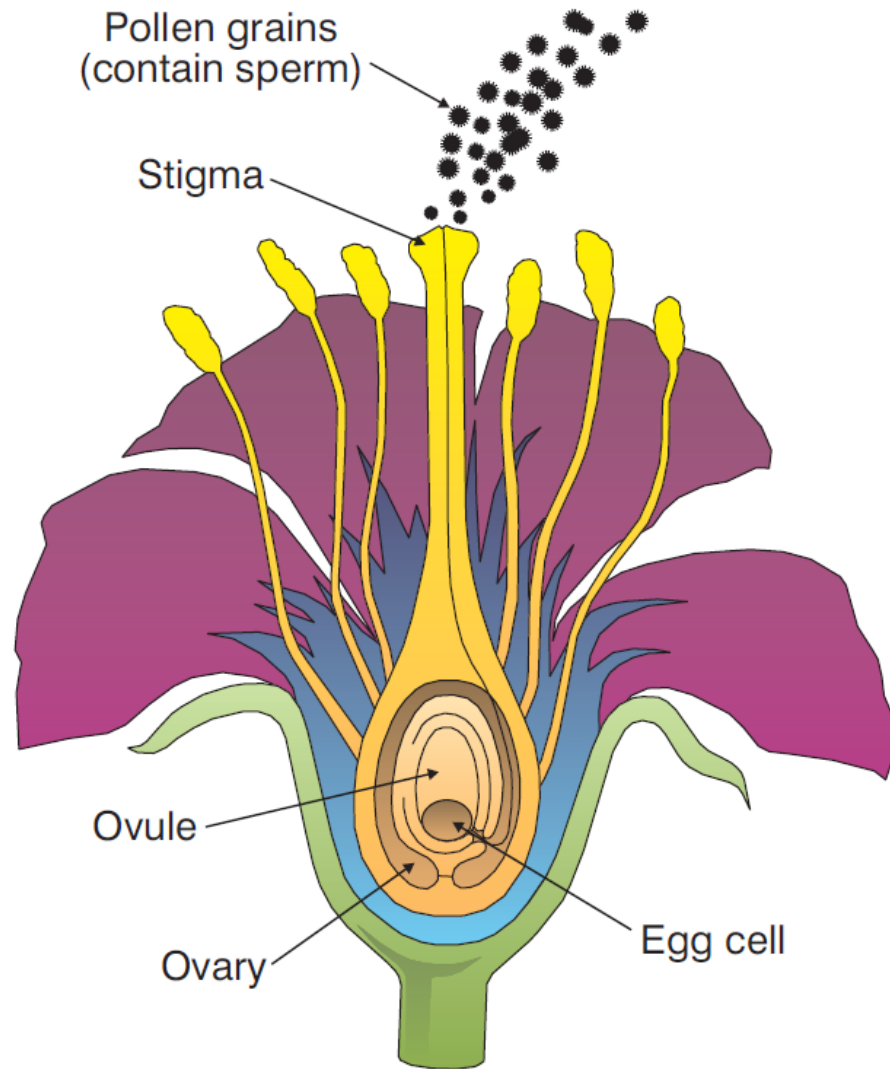


2. Both the male sperm and female egg contribute genetic information to the new embryo plant.
 - a. The union of sperm and egg results in new combinations of genetic information.
 - b. These combinations produce new traits that add to the vigor of the offspring.
3. The offspring that result from this new combination of genes are known as ***hybrids***.
 - a. People have greatly improved agricultural crops through hundreds of years of hybridization.



4. **Fertilization** unites the single chromosome in the sperm nucleus with the single chromosome in the egg nucleus.
5. **Pollination** is the transfer of the male sperm carried in the pollen to the female part of the flower, the stigma.
 - a. Plants rely on wind and water to transfer the pollen to the stigma.
 - b. In addition, plants depend on animals to help with pollination.
 - c. Birds, insects, bats and other animals are attracted to brightly colored, scented flowers.
 - d. These animals transfer pollen from the anthers of the flowers they visit to the stigmas of other flowers.

6. When the pollen of a plant pollinates a flower on the same plant, it is called ***self-pollination***.
7. Many plants have this ability to self pollinate, others like fruit trees do not.
 - a. When the pollen of a plant pollinates the flower on another plant of the same species, it is said to be ***cross-pollination***.



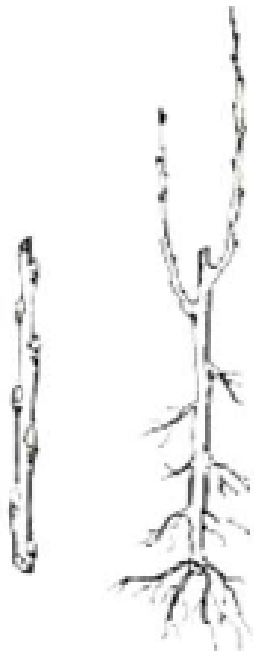
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B. Asexual propagation in plants involves the reproduction of new plants using only the vegetative parts (stem, leaf and root) of the parent plant.

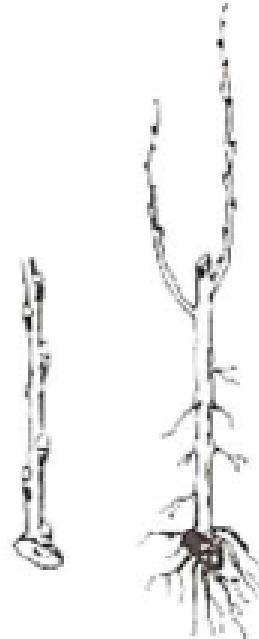
1. This is possible because many plants have the ability to regenerate or grow not only the vegetative part of the plant, but also missing plant parts.

2. Asexual propagation consists of many methods.
 - a. **Cuttings**- a portion of a plant is removed and made to form roots. This is commonly used to propagate shrubs and house plants.

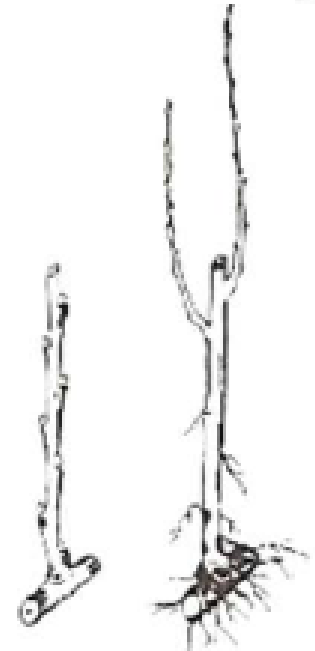
Simple cutting



Torn cutting



Hammer cutting



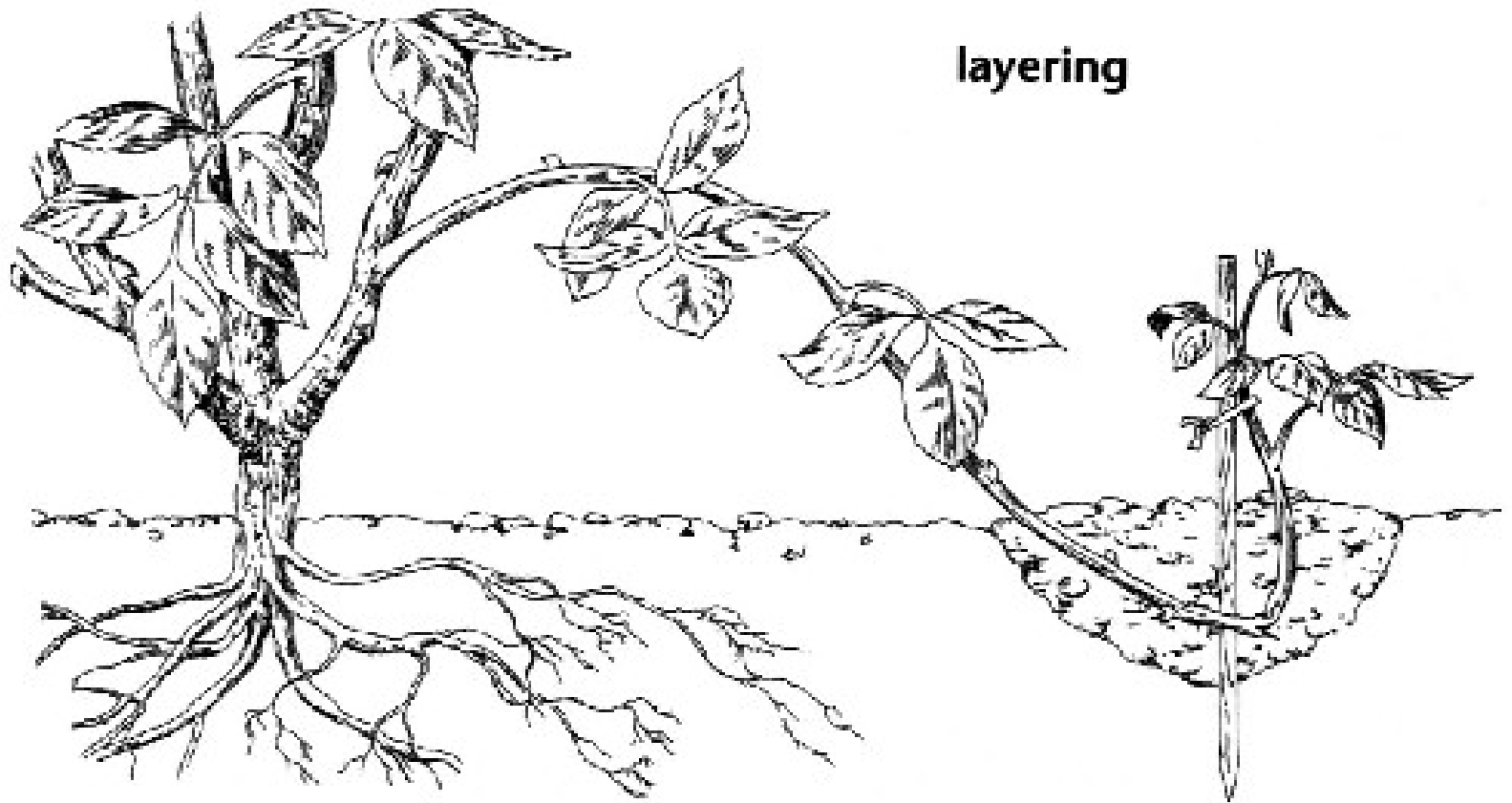
b. **Grafting**- a shoot or scion is removed from the desired plant and placed on another plant (the stock). This method is used with some fruit and nut trees.



c. **Budding**- a bud is removed from the desired plant and placed on the stock. This method is used with some fruit trees and ornamentals such as roses



d. **Layering**- a portion of an attached shoot is partially buried underground where roots develop. The new plant may then be separated from the parent plant. Figs, raspberries, and many ornamentals can be propagated this way.



e. **Division-** plants that grow in clumps are then dug and cut apart to form new plants.



f. **Tissue culture** (micropropagation)-
using very small pieces of plant tissue
and growing it on a sterile nutrient
media under aseptic conditions in a
small glass container.



II. Sexual, or seed propagation, is not commonly used in fruit and nut production but has advantages and disadvantages.

A. Advantages

1. Diverse progeny possible.
 - a. Cross pollination between varieties can produce hybrids.
2. Many cultivated plants are from naturally occurring varieties that are cultivated for specific traits.
 - a. These traits are the result of seed diversity.
3. Usually less labor and materials involved than in vegetative propagation.

B. Disadvantages

1. Diseases and Insects

- a. Seeds are not immune to insect and diseases which can cause germination problems.

2. Storage

- a. To keep a seed's viability it must be kept in low temperature and low humidity.

3. Diverse progeny

- a. The resulting plant will probably not be true-to-type.

4. Length of production time needed.
 - a. Because trees are growing from seed it will increase the amount of time until mature fruit can be harvested.
5. Seed provenance
 - a. Seed should be collected from the area it is to be grown in, at least within the same hardiness zone. Although not trouble free, this practice will help insure plant hardiness.
6. Uncertain germination.
 - a. When a seed is planted, its germination is never guaranteed.
7. Cross pollination with other species
 - a. This is required for some fruits like apples.
 - b. Planting the seeds from these apples will not result in an apple similar to that which the seed came from.

III. Asexual or vegetative propagation is very useful to the fruit and nut industry for many reasons.

A. Advantages

1. The offspring are genetically identical and therefore advantageous traits can be preserved.
2. Only one parent is required which eliminates the need for special mechanisms such as pollination, etc.
3. It is faster.

4. Vegetative propagation is especially beneficial to the agriculturists and horticulturists. They can raise crops like bananas, sugarcane, potato, etc that do not produce viable seeds. The seedless varieties of fruits are also a result of vegetative propagation.

5. The modern technique of tissue culture can be used to grow virus-free plants.
 - a. Asexual propagation enables the production of plants that would otherwise be difficult or impossible because the plant does not produce viable seed or the seed is difficult to germinate.

- b. Asexual reproduction is also used when plants will not breed true and when it is necessary to maintain certain genetic forms of the plant.
 - i. This important benefit of asexual reproduction produces plants that are genetically identical to the parent plant; therefore, they have the same traits of the parent plant.
 - ii. The existence of many valuable crop plants depends upon our ability to reproduce them asexually.

- c. Asexual propagation may be faster than propagation by seed.
 - i. Germination and growth of seedlings is often slow compared to propagation by cuttings.
 - ii. It may also be more economical to produce plants asexually and in many cases it is easier.

B. Disadvantages

1. Asexual propagation may increase disease and insect susceptibility
 - a. Clones lack the genetic diversity found in seed produced plants.
2. Can be expensive and time-consuming
 - a. Requires proper tools and knowledge to achieve a successful graft.

Review/Summary

1. What are the differences between sexual and asexual growth cycles of plants?
2. What are the advantages and disadvantages of sexual or seed propagation?
3. What are the advantages and disadvantages of asexual or vegetative propagation?