

Reproduction – Sexual and Asexual

Lesson 7: Reproduction – Sexual and Asexual

Plant Reproduction

The controlled reproduction of plants is called plant propagation. These are two kinds of plant propagation: sexual and asexual. Sexual plant propagation uses seeds for producing new plants. Asexual plant propagation is the reproduction of plants using a vegetative part of the plant.

The Flower

Flowers contain the reproductive parts of plants involved in sexual reproduction. Flowers can have either male floral structures, female floral structures, or both. On some plant species, both male and female flowers can be found on the same plant. Plant flowers with male and female parts on the same plant are known as monoecious plants. Corn is an example of a monoecious plant with tassels (male flower) on top and silks on each ear (female flower). Dioecious plants have male and female flower parts on separate plants. Date palms and asparagus are examples of dioecious plants.

There are four parts of a flower: sepals, petals, stamens, and pistils. Sepals and petals are the vegetative parts of the flower. The stamens and pistils are the reproductive parts of the flower. Figure 7.1 illustrates the four parts of the flower as well as the parts that make up each stamen and pistil.

Sepals: When the flower bud is closed, an outer, scale-like covering is formed by the sepals. All of the sepals together are called the calyx. The function of the sepals is to protect

the petals, stamens, and pistils when the flower is in the bud stage.

Petals: The petals are usually brightly colored to attract pollinators (usually insects). All of the petals together are called the corolla. The petals protect the stamens and pistils in the bud stage.

Stamens: The stamen is the male reproductive part of the flower. Each stamen consists of two parts: the anther and the filament. The anther produces pollen grains, and the filament supports the anther.

Pistil: The pistil is the female reproductive part of the flower. The pistil consists of the ovary, stigma, and style. The ovary is the enlarged portion at the base of the pistil. The function of the ovary is to produce ovules. Ovules that are fertilized become seeds. The stigma receives and holds the pollen grains. The style connects the stigma with the ovary. Pollen grains travel through the style to reach the ovary. The style supports the stigma.

Complete and Incomplete Flowers

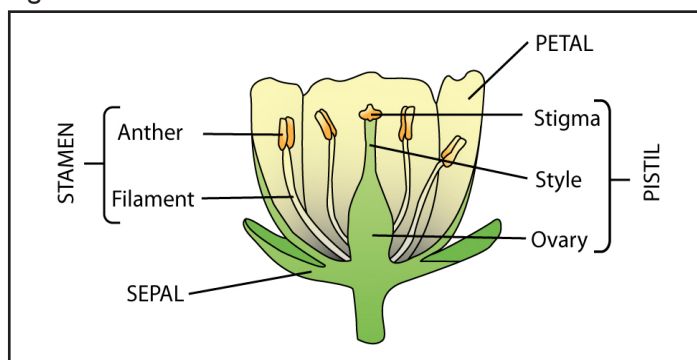
A complete flower has all four main parts: sepals, petals, stamens, and pistils. An incomplete flower is missing one or more of the main parts of a flower.

Pollination and Fertilization

Pollination is the transfer of pollen from the anther of the stamen to the stigma of the pistil. The process of pollen transfer is the first step in pollination. Pollination can happen by either self-pollination or cross-pollination. In self-pollination, pollen is transferred from the anther to the stigma of the same flower or to other flowers on the same plant. Examples of plants that self-pollinate are oats, barley, wheat, and soybeans. In cross-pollination, pollen is transferred from the anther of one plant to the stigma of another plant. Examples of plants that cross-pollinate are alfalfa, red clover, and rye.

Fertilization is the union of male and female cells to form the first embryonic cell and the first endosperm cell. Fertilization is the final step in sexual reproduction. There are four steps in fertilization:

Figure 7.1 – Flower Parts



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1. Pollen sticks to the moist stigma, which provides favorable conditions for pollen germination.
2. As the pollen germinates, a long structure known as the pollen tube grows downward through the style into the ovary, contacting the egg cell.
3. As the pollen tube breaks open, one sperm cell unites with one egg cell, resulting in production of the zygote, or fertilized egg. This is the beginning of the embryo.
4. A second sperm cell unites with two other nuclei (polar nuclei), forming the endosperm.

Conditions for Pollination and Fertilization

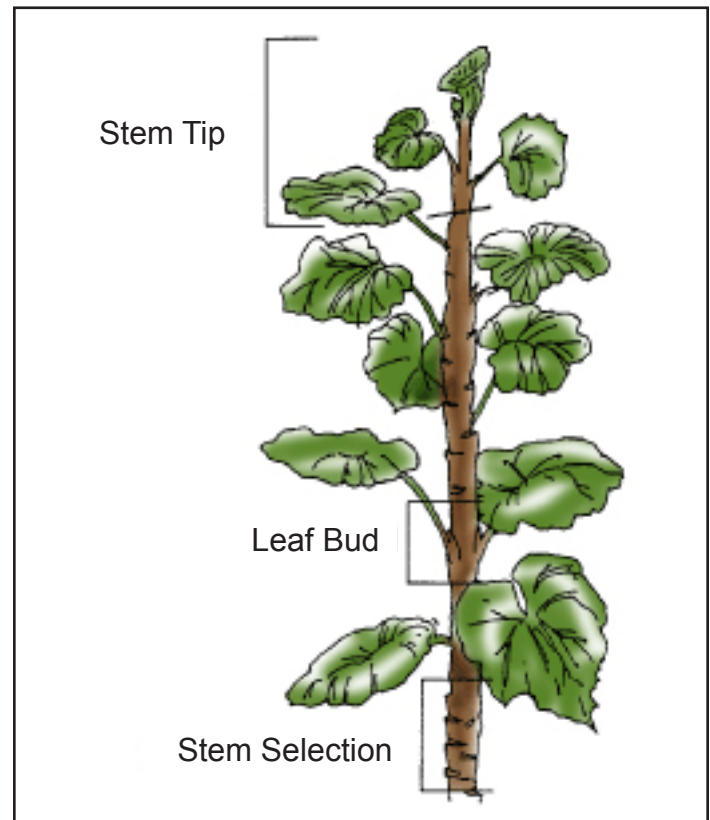
Pollination and fertilization occur when the plant reaches the proper stage in its life cycle and when the conditions are right. In self-pollination, the pollen must fall from the anther of the flower to the stigma of the same flower or another flower on the same plant. Gravity aids in self-pollination; however, favorable weather conditions are helpful. Weather conditions can either help or hinder pollination and fertilization. Favorable weather conditions with air movement (wind) can assist the transportation of pollen. Pollinators such as insects aid in the pollination process when they travel from flower to flower, seeking nectar. Favorable weather conditions and insects are crucial in cross-pollination, since the pollen must be transferred between plants.

Asexual Propagation

Asexual propagation of plants involves using plant parts to produce another plant. The plant parts used in asexual propagation are stems, leaves, and roots. Methods most commonly used in asexual plant propagation are cuttings, division, layering, budding, grafting, and tissue culture.

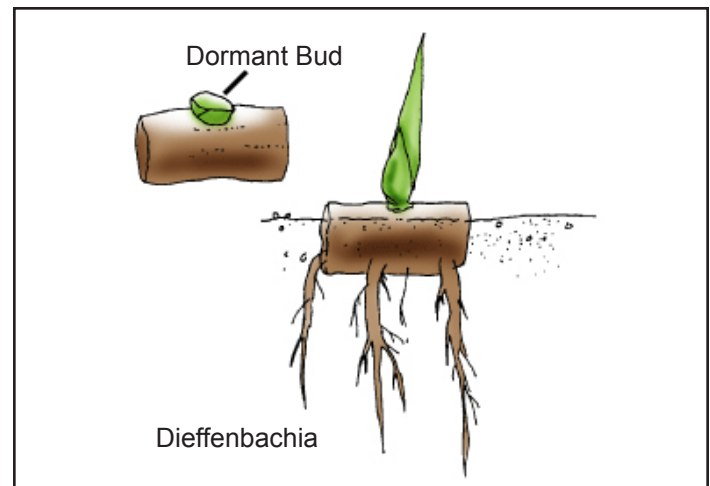
Cuttings: Cuttings are plant pieces that are “cut” from the parent plant and rooted to form new plants. Cuttings may be taken from stems, leaves, and roots. There are four types of cuttings: stem tip, leaf, leaf and bud, and stem section. Figure 7.2 illustrates the location of stem tip, leaf bud, and stem section cuttings on a typical plant. Figure 7.3 shows a stem cutting. Figure 7.4 shows examples of leaf cuttings. Figure 7.5 is an example of a leaf and bud cutting.

Figure 7.2 – Cutting Locations



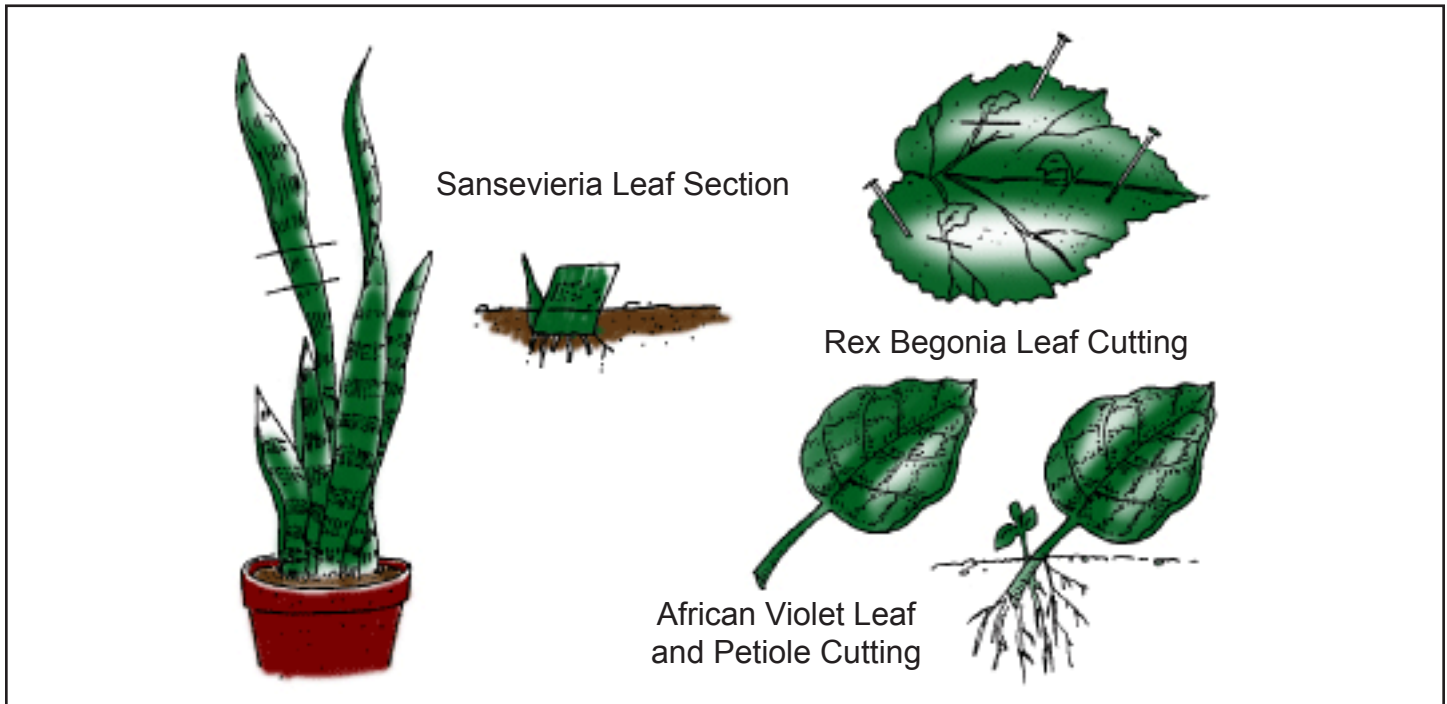
Division: Division is a way to propagate plants by separating clumps of plants into smaller groups. Each small group would have roots, stems, and leaves or the potential to develop these parts. Division is the easiest way to propagate plants that produce offsets, basal shoots, or a multiple crown. See Figure 7.6.

Figure 7.3 – Stem Cutting



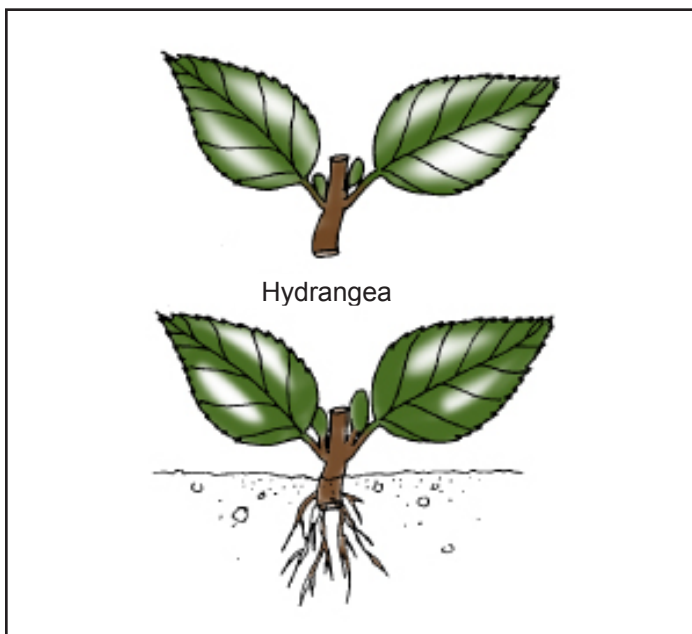
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Figure 7.4 – Leaf Cuttings



Layering: Layering is a method of rooting a new plant while the stem is still attached to the parent plant. Types of layering include simple, tip, compound, mound, trench, and air. Simple and air layering are the most frequent types of layering used in greenhouses. Figure 7.7 illustrates simple layering. Figure 7.8 illustrates air layering.

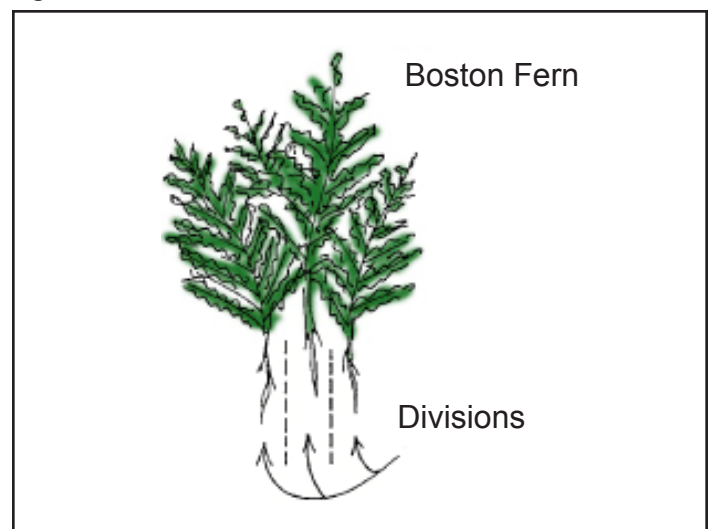
Figure 7.5 – Leaf and Bud Cutting



Grafting: Grafting is a method of propagating plants by inserting buds, twigs, or shoots from one plant onto the stem of another plant. Grafting is used mainly to produce fruit trees.

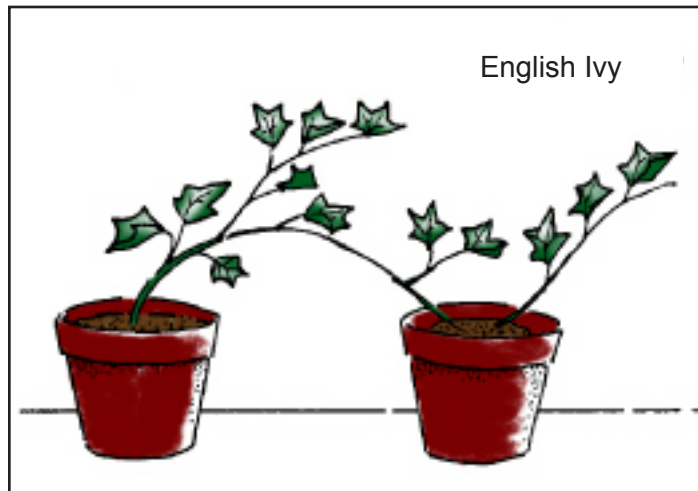
Budding: Budding is a special form of grafting that uses a single bud, which is inserted into the bark of another variety. Budding is used on fruit trees, nut trees, and rose plants.

Figure 7.6 – Division



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Figure 7.7 – Simple Layering

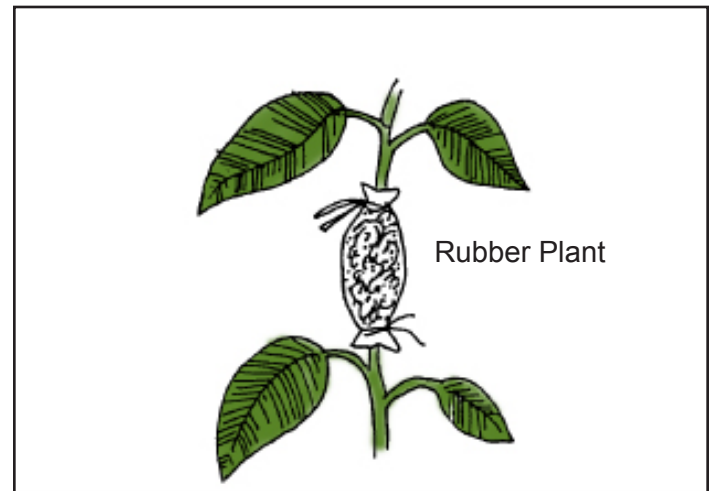


Tissue Culture: Tissue culture is a relatively new propagation technique in which a single cell or a small piece of plant tissue called the explant is taken from the meristematic tissue to produce a new plant. The explant is placed in a germ-free growing medium in a closed, sterile container. Plant vitamins and hormones are used to control root and shoot growth. When the plants are large enough to be handled, they are transplanted into individual pots and placed in a greenhouse.

Summary

There are two kinds of plant propagation: sexual and asexual. Sexual plant propagation involves each stage of the plant's life cycle: pollination, fertilization, the formation of seed, and germination of the seed to produce another plant. Asexual

Figure 7.8 – Air Layering



plant propagation involves the use of plant parts to produce another plant. The methods of asexual plant propagation are cuttings, division, layering, grafting, budding, and tissue culture.

Credits

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