

Unit E: Plant Propagation



Lesson 2: Propagating Plants Sexually

Terms



- ⌘ Direct seeding
- ⌘ Dormant
- ⌘ Embryo plant
- ⌘ Germination
- ⌘ Hybrid
- ⌘ Indirect seeding
- ⌘ Medium
- ⌘ Planting date
- ⌘ Scarification
- ⌘ Seedling plant
- ⌘ Sexual reproduction
- ⌘ Stratification
- ⌘ Turgor
- ⌘ Viability
- ⌘ Vigor
- ⌘ Zygote

How Does the Ability to Sexually Produce Seeds Benefit a Plant?

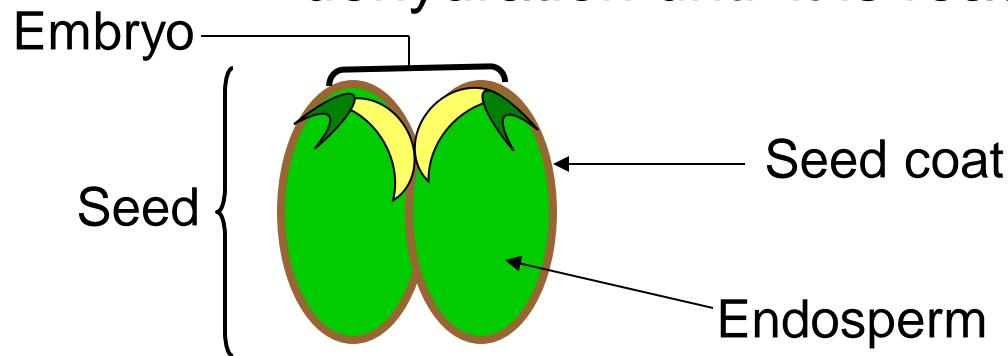


- ⌘ Sexual reproduction in plants involves the union of the male pollen with the female egg and results in the formation of a seed
 - ▣ This type of reproduction enables a plant to produce new combinations of genetic information that may add vigor to the developing young plant
 - ▣ The seed is a living entity that serves as a bridge between generations of a plant

⌘ The ***embryo plant*** is a little plant that eventually grows and develops into a mature plant

↗ The embryo along with the endosperm (stored food) is inside the seed

✖ It is protected by a seed coat from injury and dehydration until it is ready to germinate





❖ The embryo plant within a seed is the result of a fertilized egg or **zygote**

- ◻ The zygote is the combination of genes from the male sperm and the female egg
- ◻ The plant resulting from this new combination of genes is known as a **hybrid**
- ☒ Horticultural crops have been greatly improved through hundreds of years of hybridization
 - Today's crops have larger flowers, longer lasting flowers, and more flower colors than years ago

What Is Germination and What Conditions Are Necessary for Growth?



- ⌘ When a seed is not growing, it is said to be ***dormant***
- ⌘ **Germination** is the process by which an embryo plant grows into a seedling
 - ↗ It occurs at the end of the dormancy stage when conditions are favorable for plant growth
 - ↗ The seedling plant has a root system, stem and leaves to produce food necessary for the young, actively growing plant

⌘ Many important crops are grown from seed

- ⌘ Maize, cotton, bedding plants, vegetables, and many greenhouse crops
- ⌘ A high percentage of germination is important

Maize



Cotton

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- ⌘ Some plants produce seeds which germinate immediately, others produce seeds that remain dormant, perhaps for years, until the conditions are correct
 - ⌘ The optimal conditions needed for plant growth include proper temperature, moisture, light and oxygen

Germination Conditions

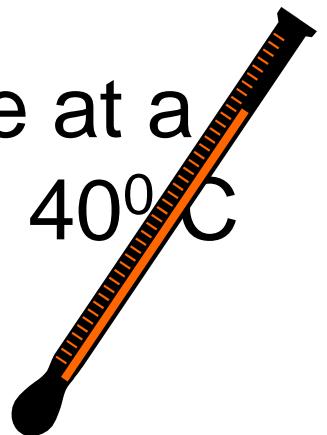


- ❖ The first important step in germination is usually the absorption of water
 - ◻ Water enters the seed by osmosis
 - ◻ It causes the seed to expand and create pressure within the seed
 - This pressure is known as **turgor** and it causes the seed coat to rupture
 - ◻ Through this split in the seed coat, the radicle or primary root will emerge and form the root system of the new plant

- ↗ Water also stimulates the production of plant hormones that begin the process of digestion to provide energy for the embryo
 - ☒ These hormones also cause mitosis (cell division) to occur
 - This produces the radicle in order to absorb more water and nutrients for the new plant

⌘ Seeds of different species germinate at a range of temperatures from 0°C and 40°C

- ↗ The optimum range for most plant seeds is between 18° to 26° C



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- ⌘ All seeds need oxygen to germinate
 - ☑ Oxygen is necessary for aerobic respiration that is required for the growth and development of the embryo
 - ☑ It is important for the soil to not be too wet
 - ☒ This will prevent oxygen from entering the soil which will result in the death of the embryo
 - ⌘ Seeds of some plants need exposure to light before they will germinate; Others do not



⌘ There are two additional mechanisms affecting germination in certain plant seeds:

◻ A) ***stratification*** – this process requires a period of cold temperatures

☒ It is especially important for plants that produce their fruit in the fall such as apples, pears, roses, and lilies

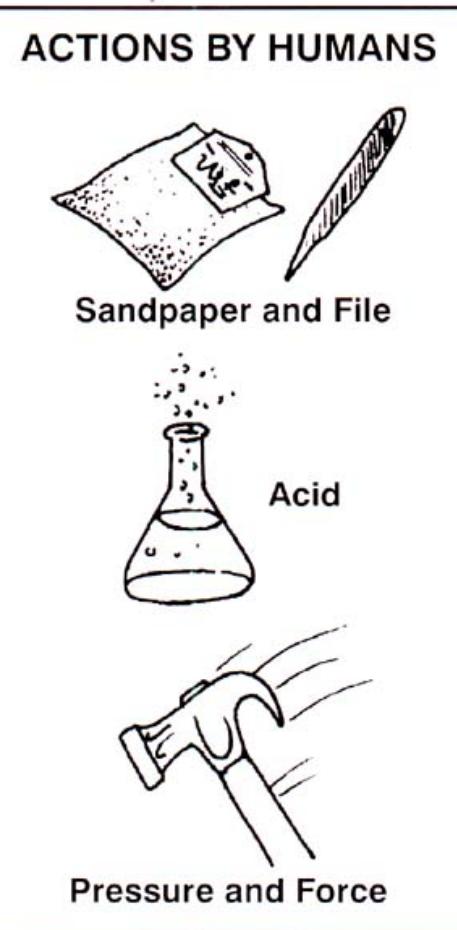
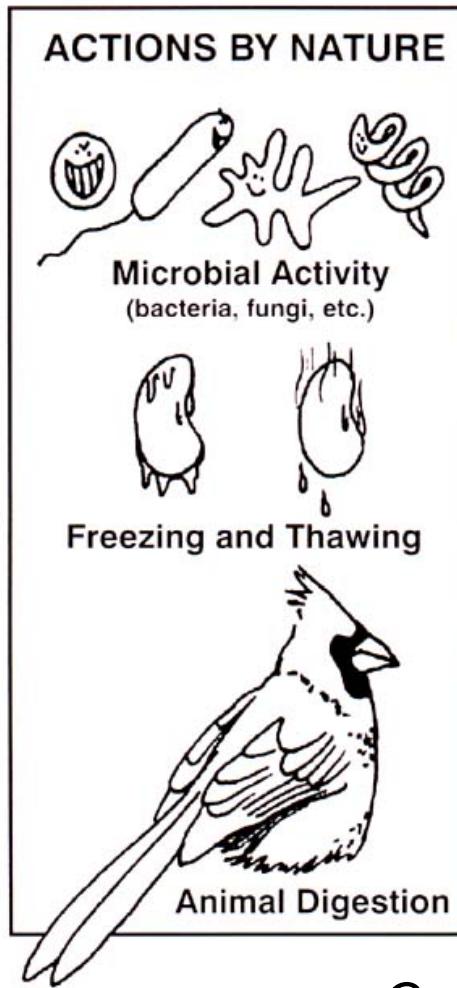
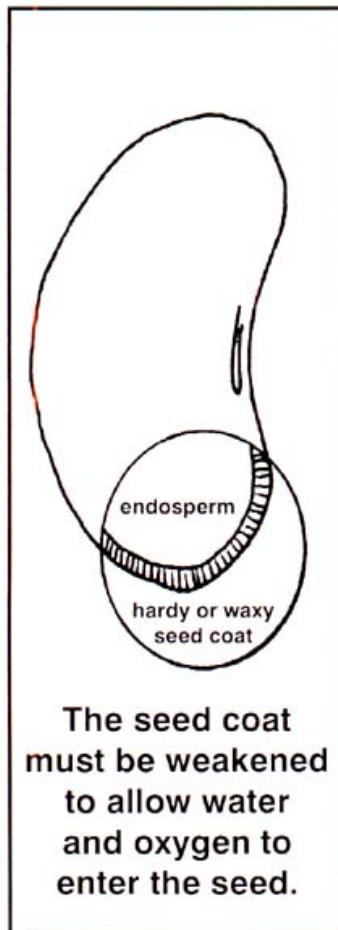
- If their seeds immediately germinated, they will die from the cold winter temperatures
- Instead, their seeds remain dormant until the warmer temperatures of spring



B) *scarification* – results from the breaking down of the seed coat

- ☒ Normally the tough protective coat prevents diffusion of both water & oxygen into the seed, so the coat needs to be broken
- ☒ Some seed coats are broken down by the stomach acid of an animal which eats the seeds
- ☒ Other methods of breaking the coat include continuous freezing & thawing, chewing, soil micro organisms, being stepped on, etc
- ☒ Examples of plants requiring scarification include geraniums, lupine, and canna

Scarification Methods



What Factors Are Necessary for Growing Plants Indoors?



- ⌘ Seeds can be planted indoors until they grow into seedlings which are then transplanted into larger containers or their permanent growing areas
 - ↗ This is known as *indirect seeding*
 - ↗ Moisture, temperature, light and oxygen affect the growth of these plants indoors



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- ⌘ It is important to start with a good quality seed; This will ensure that the desired plant will be produced
 - ↗ It should be clean or free of dirt and weed seeds
 - ↗ Seed quality also includes viability and vigor
 - ✖ **Viability** = the ability of seeds to germinate under optimum conditions
 - ✖ **Vigor** = the ability of seeds to germinate under different conditions and still produce healthy seedlings

⌘ Seeds can be planted indoors to increase the length of the growing season, increase production and for economy of space

- └─ They may be planted in flats or containers of germinating media
 - └─ Germinating **medium** is the material which is a source of nutrients and holds the roots in place for the growing plant



Steps in Planting Seeds Indoors



- # 1. Start with clean containers having drainage holes
- # 2. Fill with media & level it
- # 3. Moisten the media so it is damp but not soaked
- # 4. Plant the seeds according to the depth on the package
- # 5. Label the flat with the seed variety & date of sowing
- # 6. If using flats, sow the seeds in rows to reduce disease
- # 7. Maintain proper temperature. This is usually between 12 and 21°C.
- # 8. Water the seeds lightly from the top using a sprayer or mister
 - ▣ Use warm not hot or cold water
- # 9. Cover the seeds with plastic or glass to maintain high humidity; remove it when the seeds germinate

Indirect Seeding Continued



- ⌘ The developing seedlings require higher amounts of oxygen, therefore, the media must be porous (having air spaces)
- ⌘ Avoid over-watering because this reduces the amount of oxygen available to the seedling
- ⌘ When the seedling has developed its first true leaves, it should be transplanted to a larger container
 - ▣ Take care in handling the seedlings. They should be held by their leaves not the stem

Transplanting Process



- ⌘ Transplanting is a shock to the plant seedling and should be done soon after the first true leaves develop
 - ↗ 1. Make a hole in the new media with a dibble, stick, or forefinger and place the seedling in the hole at the depth slightly below the former depth
 - ↗ 2. Compress the media lightly around the roots and stem of the seedling
 - ↗ 3. Water and place the seedling in the shade to help prevent wilting
 - ↗ 4. After recovery, the seedling should be placed in proper lighting and watered to promote good health

What Factors Affect the Growth of Direct Seeded Plants?



- ❖ Many flowers, vegetables and grass seeds are planted directly into the soil outdoors in their permanent location
 - This is known as ***direct seeding***
 - Factors that should be considered for this process include site selection, seed bed preparation, planting date, planting depth & spacing and care of the seedlings

Direct Seeding Factors



- ⌘ 1. The site should have sufficient light for the plants to grow
 - ▣ Soil drainage is important and water should drain from the soil surface after a rainfall

- ⌘ 2. The soil needs to be loose, fine textured, and not compacted to allow for adequate moisture and aeration in seed germination and growth
 - ▣ The beds should also be free of weeds that would compete with the seeds for oxygen, water and light



⌘ 3. The ***planting date*** is the date to plant seeds based on optimal soil temperature for seed germination

- └─ The date is also influenced by the time of maturity, harvest dates of vegetables and peak bloom dates of flowers

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- ⌘ 4. Seeds should be sown at recommended planting depths and spacing
 - ▣ A general rule, if the planting depth is unknown, is to plants seeds at a depth of three to four times their greatest thickness
 - ▣ Some commercial crops require specific spacing
 - ▣ Example, maize is planted in rows 76 to 101 cm apart
 - ⌘ 5. New seedlings will need a sufficient supply of water, oxygen and light
 - ▣ It is also important to control weeds

Summary



- # How is sexual reproduction beneficial to plants?
- # What is another name for a fertilized egg?
- # Define hybrid.
- # When a seeds is not germinating, what stage is it in?
- # How is a seedling plant different from an embryo plant?
- # Define germination
- # What is turgor?

Summary Continued



- # What factors affect the rate of germination?
- # What is the difference between stratification and scarification?
- # Contrast viability and vigor.
- # Describe how to indirectly seed a plant.
- # What factors affect the direct seeding of a plant?