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| Sexual propagation involves the union of the pollen (male) with the egg (female) to produce a seed. The seed is made up of three parts: the outer seed coat, which protects the seed; the endosperm, which is a food reserve; and the embryo, which is the young plant itself. When a seed is mature and put in a favorable environment, it will germinate, or begin active growth. In the following section, seed germination and transplanting of seeds will be discussed. |
|  | **Seed**TopTo obtain quality plants, start with good quality seed from a reliable dealer. Select varieties to provide the size, color, and habit of growth desired. Choose varieties adapted to your area which will reach maturity before an early frost. Many new vegetable and flower varieties are hybrids, which cost a little more than open pollinated types. However, hybrid plants usually have more vigor, more uniformity, and better production than non-hybrids and sometimes have specific disease resistance or other unique cultural characteristics. |
|  | Although some seeds will keep for several years if stored properly, it is advisable to purchase only enough seed for the current year’s use. Good seed will not contain seed of any other crop, weeds, seeds, or other debris. Printing on the seed packet usually indicates essential information about the variety, the year for which the seeds were packaged, and germination percentage you may typically expect, and notes of any chemical seed treatment. If seeds are obtained well in advance of the actual sowing date or are stored surplus seeds, keep them in a cool, dry place. Laminated foil packets help ensure dry storage. Paper packets are best kept in tightly closed containers and maintained around 40° F in a low humidity. |
|  | Some gardeners save seed from their own gardens; however, such seed is the result of random pollination by insects or other natural agents, and may not produce plants typical of the parents. This is especially true of the many hybrid varieties. (See Vegetables chapter for information on saving vegetable seed.) Most seed companies take great care in handling seeds properly. Generally, do not expect more than 65% to 80% of the seeds to germinate. From those germinating, expect about 60% to 75% to produce satisfactory, vigorous, sturdy seedlings. |
|  | **Germination**TopThere are four environmental factors which affect germination: water, oxygen, light, and heat. |
|  | **Water**The first step in the germination process is the imbibition or absorption of water. Even though seeds have great absorbing power due to the nature of the seed coat, the amount of available water in the germination medium affects the uptake of water. An adequate, continuous supply of water is important to ensure germination. Once the germination process has begun, a dry period will cause the death of the embryo.Factors affecting Germination of seeds |
|  | **Light**Light is known to stimulate or to inhibit germination of some seed. The light reaction involved here is a complex process. Some crops which have a requirement for light to assist seed germination are ageratum, begonia, browallia, impatiens, lettuce, and petunia. Conversely, calendula, centaurea, annual phlox, verbena, and vinca will germinate best in the dark. Other plants are not specific at all. Seed catalogs and seed packets often list germination or cultural tips for individual varieties. When sowing light-requiring seed, do as nature does, and leave them on the soil surface. If they are covered at all, cover them lightly with fine peat moss or fine vermiculite. These two materials, if not applied too heavily, will permit some light to reach the seed and will not limit germination. When starting seed in the home, supplemental light can be provided by fluorescent fixtures suspended 6 to12 inches above the seeds for 16 hours a day. |
|  | **Oxygen**In all viable seed, respiration takes place. The respiration in dormant seed is low, but some oxygen is required. The respiration rate increases during germination, therefore, the medium in which the seeds are placed should be loose and well-aerated. If the oxygen supply during germination is limited or reduced, germination can be severely retarded or inhibited. |
|  | **Heat**A favorable temperature is another important requirement of germination. It not only affects the germination percentage but also the rate of germination. Some seeds will germinate over a wide range of temperatures, whereas others require a narrow range. Many seed have minimum, maximum, and optimum temperatures at which they germinate. For example, tomato seed has a minimum germination temperature of 50oF and a maximum temperature of 95o, but an optimum germination temperature of about 80o. Where germination temperatures are listed, they are usually the optimum temperatures unless otherwise specified. Generally, 65o to 75oF is best for most plants. This often means the germination flats may have to be placed in special chambers or on radiators, heating cables, or heating mats to maintain optimum temperature. The importance of maintaining proper medium temperature to achieve maximum germination percentages cannot be over-emphasized. |
|  | Germination will begin when certain internal requirements have been met. A seed must have a mature embryo, contain a large enough endosperm to sustain the embryo during germination, and contain sufficient hormones or auxins to initiate the process. |
|  | **Methods of Breaking Dormancy**TopOne of the functions of dormancy is to prevent a seed from germinating before it is surrounded by a favorable environment. In some trees and shrubs, seed dormancy is difficult to break, even when the environment is ideal. Various treatments are performed on the seed to break dormancy and begin germination. |
|  | **Seed Scarification**Seed scarification involves breaking, scratching, or softening the seed coat so that water can enter and begin the germination process. There are several methods of scarifying seeds. In acid scarification, seeds are put in a glass container and covered with concentrated sulfuric acid. The seeds are gently stirred and allowed to soak from 10 minutes to several hours, depending on the hardness of the seed coat. When the seed coat has become thin, the seeds can be removed, washed, and planted. Another scarification method is mechanical. Seeds are filed with a metal file, rubbed with sandpaper, or cracked with a hammer to weaken the seed coat. Hot water scarification involves putting the seed into hot water (170o to 212oF). The seeds are allowed to soak in the water, as it cools, for 12 to 24 hours and then planted. A fourth method is one of warm, moist scarification. In this case, seeds are stored in non-sterile, warm, damp containers where the seed coat will be broken down by decay over several months. |
|  | **Seed Stratification**Seeds of some fall-ripening trees and shrubs of the temperate zone will not germinate unless chilled underground as they overwinter. This so called "after-ripening" may be accomplished artificially by a practice called stratification. |
|  | The following procedure is usually successful. Put sand or vermiculite in a clay pot to about 1 inch from the top. Place the seeds on top of the medium and cover with 1/2 inch of sand or vermiculite. Wet the medium thoroughly and allow excess water to drain through the hole in the pot. Place the pot containing the moist medium and seeds in a plastic bag and seal. Place the bag in a refrigerator. Periodically check to see that the medium is moist, but not wet. Additional water will probably not be necessary. After 10 to 12 weeks, remove the bag from the refrigerator. Take the pot out and set it in a warm place in the house. Water often enough to keep the medium moist. Soon the seedlings should emerge. When the young plants are about 3 inches tall, transplant them into pots to grow until time for setting outside. |
|  | Another procedure that is usually successful uses sphagnum moss or peat moss. Wet the moss thoroughly, then squeeze out the excess water with your hands. Mix seed with the sphagnum or peat and place in a plastic bag. Seal the bag and put it in a refrigerator. Check periodically. If there is condensation on the inside of the bag, the process will probably be successful. After 10 to 12 weeks remove the bag from the refrigerator. Plant the seeds in pots to germinate and grow. Handle seeds carefully. Often the small roots and shoots are emerging at the end of the stratification period. Care must be taken not to break these off. Temperatures in the range of 35o to 45oF (2o to 7oC) are effective. Most refrigerators operate in this range. Seeds of most fruit and nut trees can be successfully germinated by these procedures. Seeds of peaches should be removed from the hard pit. Care must be taken when cracking the pits. Any injury to the seed itself can be an entry path for disease organisms. |

What is a HYBRID seed/plant?

Hybrids are bred to improve the characteristics of the resulting plants, such as better yield, greater uniformity, improved color, disease resistance,(these are called phenotypes) and so forth. Today, hybrid seed production is predominant in agriculture and home gardening. A hybrid, as apposed to inbred pollination, are usually specific and controlled, to combine the DNA of its parents for the attributes for each, and then the offspring is inbred to

To produce hybrid seed, elite inbred varieties are crossed with well-documented and consistent phenotypes (such as yield) and the resulting hybrid seed is collected.



Biological conditions affecting germination and growth:

A biological condition is the conditions of seed, the plant and what may affect its health. Consider the genetics of its parents, wether the seed is right for the conditions it would grow in. Resistance to certain environmental factors, diseases, hybrids etc.

*Biological conditions* include viable seed, plant type, plant material, and plant health.

*Environmental conditions* include water, oxygen, warmth, bottom heat, high humidity, time of year, and light.

Task:

Produce a potting shed poster that demonstrates Sexual propagation techniques for a seed/plant you have selected.

Your chart must, using flow diagrams, images, text:

* Describe sexual propagation (what is Sexual propagation?)
* **Describe each of the steps** used to carry it out (like a step by step recipe) and **explain why each step is necessary**.
* The **biological conditions** needed for successful carrying the technique out
* The **environmental conditions** needed for successfully carrying it out.
* Explain why this type of propagation suits the plant you have chosen over other types.

Exemplar: (for ASEXUAL PROPAGATION)

