

SEXUAL PROPAGATION

Introduction

Plant propagation is the increase in number of individuals of a species, usually accompanied by their spread over a given area. We also noted that propagation may be accomplished by either sexual or asexual means. Up to this point, we have focused our attention on asexual, that is vegetative, means of crop propagation. Beginning in today's lecture and in following lectures, we will turn our attention to basic principles of sexual propagation of crop plants. For the purposes of this class, we will put most of our time and effort into more practical aspects of sexual propagation, specifically dealing with topics such as seed testing, seed quality, and the development of hybrid crop varieties.

Note: In the sexual propagation of crop plants, a seed is produced in a flower. The formation of a seed is a complex process involving a number of steps as shown in the diagram provided. In the lecture, fill in the blanks in the questions, as well as the appropriate blanks in the diagrams provided.

1. Sexual propagation of crop plants involves sexual reproductive structures known as flowers, as shown in the diagram provided. The stem bearing the flower is called the *pedicel*. The tip of the *pedicel* which bears the floral organs is called the *receptacle*.

2. On the center of the receptacle are found one or more organs known as *carpels*. Each *carpel* has at its base a structure known as the *ovary*, generally considered to be the female organ of the flower. The *ovary* contains small structures known as *ovules*. (Sometimes there is only one *ovule*, as in strawberry). Inside each *ovule* is found a single female gamete or egg. Above

the ovary is a stalk like structure known as the *style*. On top of the *style* is a sticky, somewhat enlarged region called the *stigma*.

3. Around the carpels are arranged the *stamens*, generally referred to as the male organs of the flower, because they produce the male gametes, known as *pollen grains*. Each *stamen* consists of a slender stalk called the *filament*. On top of the *filament* is the *anther*, which contains the pollen grains.

4. In sexual reproduction in flowering plants (angiosperms), a male gamete, commonly known as the pollen grain fertilizes the female gamete, known as the egg, to form the *zygote*. The *zygote* eventually develops into an embryo, which is a potential new plant. Over time, a seed coat develops to cover and protect the embryo, and a seed is formed. The seed then becomes the means of propagation of the species.

5. In the stage of flowering known as full bloom or *anthesis*, the anthers, the structures containing the pollen, ruptures, and pollen is shed.

6. One of the important events that precedes the fertilization of the egg is the transfer of pollen from the male organ, specifically from the *anther*, to the female organ, specifically to the *stigma*. This transfer of pollen from the anther to the stigma is known as *pollination*.

7. If the transfer of pollen, pollination, takes place from the anther to a stigma in the same flower, or between flowers on the same plant, it is known as *self-pollination*. Examples of crops that normally *self-pollinate* are *citrus fruits, wheat, barley, oats, and peas*. If the transfer of pollen is between different flowers on different plants of different cultivars, it is known as *cross-pollination*. Examples of crops that usually require *cross pollination* are *apple, blueberries, some grapes*.

8. A plant that is able to use its own pollen to fertilize its own eggs is known as a *self-fertile* plant. If it cannot produce seed with its own pollen it is known as a *self-sterile* plant. In some plants that are *self-sterile* the plants' own pollen has some kind of incompatibility factor that prevents it from reaching the egg.

Note: An interesting, and to some people irritating, side effect of some pollen grains is that they produce an allergenic response which can be quite objectionable.

9. How is pollen transferred from the anther to the stigma?

Note: In crop production, or more specifically in crop breeding, breeders manipulate the processes leading to seed production, such as pollination, to produce plants with desired characteristics. As with other fields of science and technology, in the field of crop breeding a specialized terminology has developed. It is important for people working with crops to know some of the specialized 'language' of the crop breeder.

10. One term commonly used in referring to crop plants is the term *cultivar*. In many instances this term is used synonymously with the term variety. In giving the complete scientific name for a crop, it is sometimes necessary to include the *cultivar* or variety name, if there is one. For example, the name for a *cultivar* of corn known as Golden Wonder, would be *Zea mays* var. Golden Wonder. Give a definition for cultivar or variety.

Guiding Questions

1. There are two main categories of cultivars, *clones* and *lines*.

2. What is a clone?

3. What is a line?

4. Crop producers and home gardeners will commonly use terms like inbred, hybrid, hybridizing, and hybrid vigor, and F1 hybrid. Give a brief definition of each of these terms.