



Seed: A Basic Introduction

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A seed is the reproductive unit of a flowering plant, encapsulating the potential to grow into a new plant. It serves as a natural package that contains the embryo, along with a food source and a protective outer covering. Seeds are crucial for the survival and propagation of plant species. They play a fundamental role in agriculture, horticulture, and the ecosystem at large. This introduction provides a comprehensive overview of seeds, their structure, types, germination process, and their significance.

1. **Seed in Biology:** In biology, a seed is a reproductive structure produced by plants. It contains an embryo along with a food source and protective coating, enabling the embryo to develop into a new plant under suitable conditions. Seeds are typically dispersed by wind, water, or animals and serve as a means of plant propagation and dispersal.
2. **Seed in Agriculture:** In the context of agriculture, a seed refers to a mature, fertilized ovule that has the potential to grow into a new plant. Seeds are fundamental to agriculture as they are sown in the soil to initiate crop cultivation. They serve as the starting point for the growth of plants, providing the necessary genetic material and nutrients for germination and subsequent development.

❖ Meanings of Seed

1. General meaning of seed is anything that can be sown, or any part of the crop from which a new crop can grow.
2. Agronomically, seed or seed material is any living organs of the crop in rudimentary form that is used for propagation.
3. Botanically, seed is a fertilized ovule with an intact embryo, stored food and seed coat which is viable and having capacity to germinate. The formation of the seed is part of the process of reproduction in seed plants, the spermatophytes,
4. A seed is an embryonic plant enclosed in a protective outer covering, along with a food reserve. The formation of the seed is a part of the process of reproduction in seed plants, the spermatophytes, including the gymnosperm and angiosperm plants.
5. Seed refers to the fertilized, matured ovule that contains an embryonic plant, stored material and a protective coat or coats. A seed is a mature ovule that comprises an embryo or a miniature undeveloped plant and food reserves, all enclosed within a protective seed coat.
6. The seed is the embryonic stage of the plant life cycle. Most seeds consist of three parts: embryo, endosperm, and seed coat. The embryo is a tiny plant that has a root, a stem, and one or more leaves.

- ❖ **Seed Formation:** Seeds are formed as a result of sexual reproduction in plants. The process involves the transfer of pollen from the male reproductive organ (stamen) to the

female reproductive organ (pistil) of a flower. This fertilization event leads to the development of seeds within the ovary, which eventually matures into a fruit.

❖ **Structure of a Seed:** A typical seed consists of three main parts:-

- a) **Seed Coat:** The outermost layer of a seed is called the seed coat or seed coat. It provides protection to the embryo inside and helps prevent desiccation (drying out) and damage.
- b) **Embryo:** The embryo is the young, undeveloped plant within the seed. It contains the embryonic root (radicle), embryonic stem (plumule), and one or two seed leaves (cotyledons) depending on the type of plant.
- c) **Endosperm:** In some seeds, there is a tissue called the endosperm that surrounds the embryo. The endosperm is a source of stored nutrients, such as starch, oils, and proteins, which the developing embryo uses for growth until it can establish photosynthesis.
- d) **Cotyledons:** Cotyledons are the first leaves of the plant, emerging from the embryo. They store nutrients and provide nourishment to the developing seedling until it can produce its own food through photosynthesis.
- e) **Embryo Axis:** The embryonic shoot (plumule) and embryonic root (radicle) together make up the embryo axis. The plumule gives rise to the above-ground parts of the plant, while the radicle develops into the root system.
- f) **Micropyle:** A small pore in the seed coat through which water and gases can enter during germination.

❖ **Types of Seeds:** Seeds can be categorized into various types based on different characteristics:-

- A. **Monocotyledonous Seeds:** These seeds have a single cotyledon (seed leaf), such as corn, wheat, and rice.
- B. **Dicotyledonous Seeds:** These seeds have two cotyledons, like beans, apples, and sunflowers.
- C. **Orthodox Seeds:** These seeds tolerate desiccation (drying out) and can be stored for extended periods, including many crop plants.
- D. **Recalcitrant Seeds:** These seeds are intolerant to desiccation and cannot be stored for a long time, often found in tropical plants like mangoes and avocados.
- E. **Epigeal Seeds:** These seeds germinate above the ground, and the cotyledons emerge, such as in beans and peas.
- F. **Hypogeal Seeds:** These seeds germinate below the ground, and the cotyledons remain beneath the soil, like in peanuts and oak trees.
- G. **Angiosperms:** The majority of plant species fall into this category. Angiosperm seeds are enclosed within a fruit and are typically more diverse in terms of size, shape, and structure.
- H. **Gymnosperms:** These seeds are found in cone-bearing plants like conifers. They are not enclosed within a fruit and are often exposed.

❖ **Seed Dispersal:** Plants have evolved various mechanisms to disperse their seeds, allowing them to colonize new areas and reduce competition with parent plants. Some common methods of seed dispersal include:-

- A. **Wind Dispersal:** Seeds with adaptations like wings, parachutes, or feathery structures are carried by the wind to distant locations.
- B. **Animal Dispersal:** Seeds may have hooks, barbs, or fleshy fruit that attract animals. These animals eat the fruit and pass the seeds through their digestive systems, depositing them elsewhere through their feces.
- C. **Water Dispersal:** Some seeds have adaptations to float on water, enabling them to be transported by rivers, streams, or ocean currents.

- D. Self-Dispersal: Certain plants have specialized mechanisms that cause their seeds to be explosively ejected or mechanically released when touched or triggered by external factors.
- ❖ **Germination:** Germination is the process by which a seed begins to grow and develop into a new plant. Several conditions are essential for germination to occur, including water, oxygen, suitable temperature, and sometimes light. The following steps generally occur during germination:-
- A. Imbibition: The seed absorbs water, causing it to swell and activate metabolic processes.
 - B. Activation of Enzymes: Enzymes within the seed are activated, initiating biochemical changes that break down stored nutrients, such as starch or oils, into forms that can be utilized by the growing embryo.
 - C. Root and Shoot Emergence: The radicle, or embryonic root, emerges first from the seed, anchoring the plant into the soil. It is followed by the shoot, which develops into the stem and leaves.
 - D. Development of Photosynthesis: As the shoot emerges, it produces leaves that can carry out photosynthesis, enabling the plant to produce its own food.
- ❖ **Importance of Seeds:** Seeds are of immense significance to plant life and human civilization. They ensure the continuation of plant species, enable genetic diversity, and play a critical role in food production, agriculture, and horticulture. Farmers and gardeners rely on seeds to grow crops, and plant breeders utilize seeds to develop new and improved plant varieties.