Plant Reproduction and Development_SLFAB2

PLANT DEVELOPMENT

The **endosperm** divides by mitosis and becomes multicellular. Membranes and walls form between nuclei. In dicots, endosperm material is transported to the **cotyledons** (seed leaves) even before the seed completes development. The dicot seed therefore, lacks endosperm.

EARLY PLANT EMBRYO DEVELOPMENT INSIDE A SEED

Embryo development is initiated by mitosis which splits the zygote to a *basal cell* and a *terminal cell* (Figure 3.12). The basal cell divides continuously and forms part of the suspensor. The *suspensor* anchors the embryo to the integuments and transfers nutrients to it. A *spherical proembryo* is formed by multiple mitosis of the terminal cell. The embryo is attached to the suspensor cells and later, cotyledons or seed leaves become obvious in the embryo. Dicots form a heart-shaped embryo. Between the cotyledons, the **apical meristem** of the embryonic shoot can be identified and at the opposite end, the embryonic root apex can be located. Both have meristematic cells. Three primary meristems namely, **protoderm**, **ground meristem** and **procambium** will give rise to the basic tissue layers of the plant – the **dermal**, **ground** and **vascular tissue**, respectively.

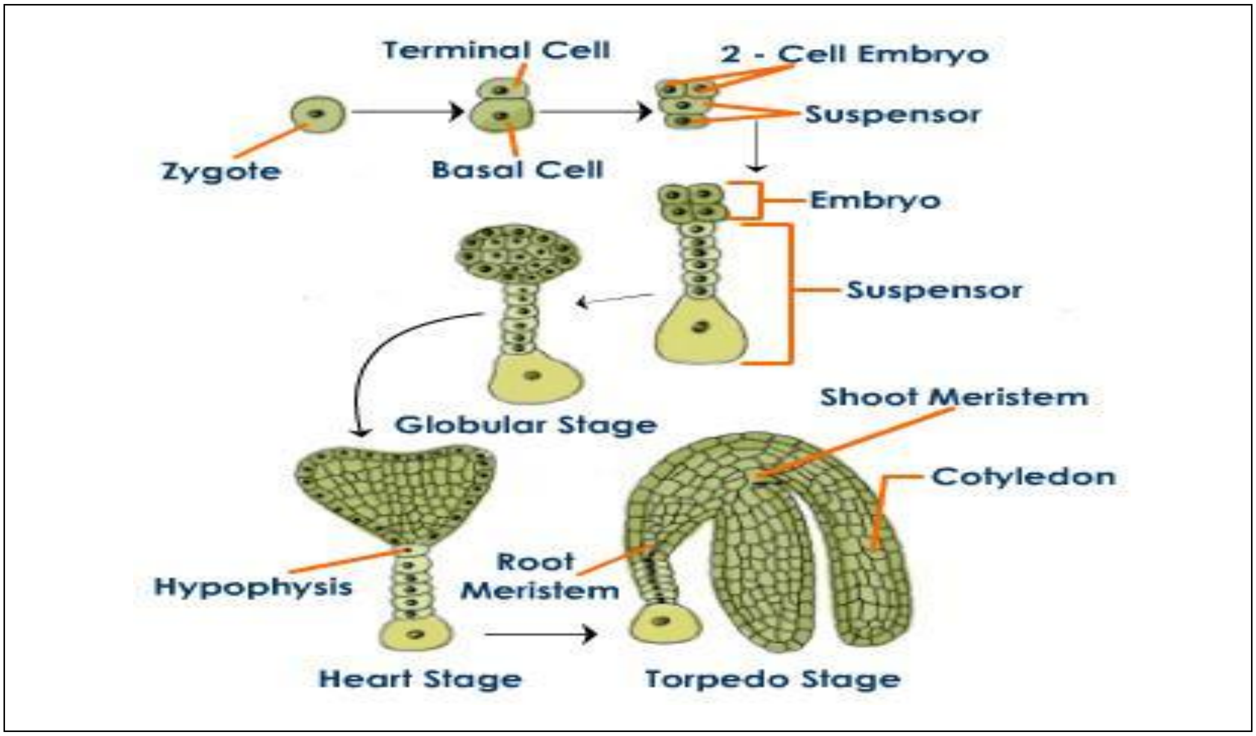


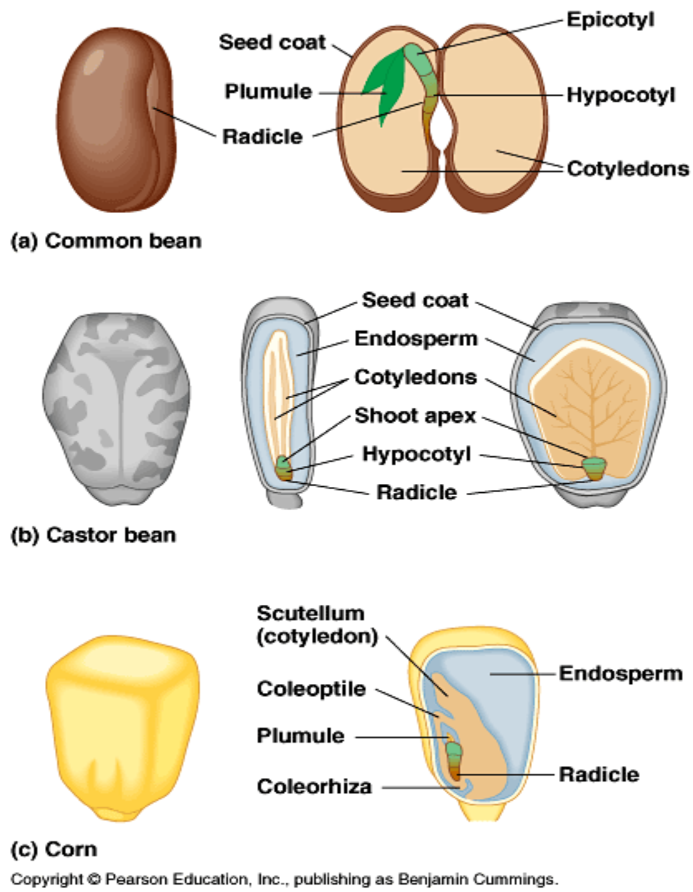
Figure 3.12 Stages in the development of early plant embryo. (http://biology.tutorvista.com/plant-kingdom/plant-embryogenesis.html)

The **ovary** of a flower develops into the **fruit** which encloses **seeds** for later dispersal. Seeds are derived from the ovules. Other floral parts may fuse and with hormonal changes, cause the ovary to grow tremendously. The thickened wall of the ovary becomes the **pericarp**, the fleshy part that we eat like in chico, *kaimito* or apple. Flowers that are not pollinated just wither away.

The cereal grains of grasses, rice and corn are not seeds; each is a fruit with a dry pericarp. Grains and nuts are also examples of dry fruits [illegible] shy (*eg.* pear, chico). A *simple fruit* is derive[illegible] ary. The strawberry is an *aggregate fruit*, resu[illegible] e flower with multiple carpels. Another commo[illegible] pineapple, which is a **multiple fruit** developi[illegible] of flowers called an *inflorescence*. Each "ey[illegible] e represents a single flower. Walls of ovarie[illegible] to become one fruit. Fruit ripening is made [illegible] onal interactions. It also signals that the s[illegible] pletely developed. The edible fruits around u[illegible] of selective breeding. They function for seed [illegible] ispersal. With hooks, wings, hairs or sticky [illegible] h animal wastes, seeds are scattered in new places. They may remain dormant for some time but given proper conditions, seeds germinate to form new plants.

SEED STRUCTURE

A new plant life begins with a seed. The **embryo** inside and the **endosperm/cotyledon** is surrounded by a tough **seed coat** derived from the integuments in the ovule (Figure 3.13). In the dicot bean seed, the embryo is elongated usually found at the center of the two cotyledon(s). At the middle part of the embryo, the **hypocotyl** can be found. Tracing downwards, it terminates in an embryonic root called the *radicle*. On the other end is the more upper portion, the **epicotyl** terminating to a **plumule**, a structure already having a pair of miniature leaves.



(http://www.bio.miami.edu/dana/226/226F09_4.html)

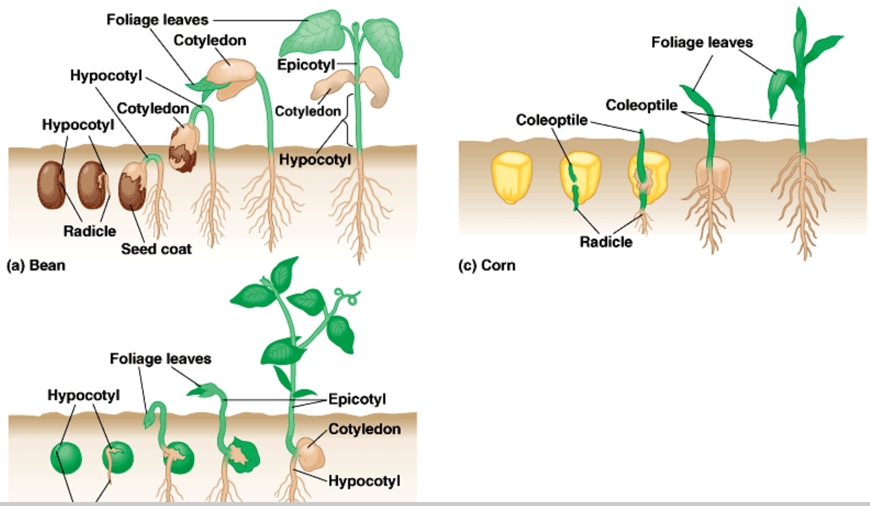
Figure 3.13 Seed structures.

A single corn kernel is the best example of a **monocot seed.** It has a single cotyledon, called the *scutellum*, different from the endosperm which transports nutrients to the scutellum during development. The monocot embryo has a radicle and a plumule. A tissue layer, the **coleorhiza**, covers the root while a sheath, the **coleoptile** protects the shoot.

SEED GERMINATION

For days, weeks or even decades, a seed may be dormant. With low metabolic rates, it may not grow and develop until favorable environmental conditions allow it to break seed dormancy. Environmental factors such as temperature, light, day length, oxygen and water influence **seed development. Seed germination** is triggered by absorption of water, a process

With repeated cell divisions, a seedling is produced with a **primary root.** From the germinating seed, the radicle emerges followed by the shoot tip. In the bean seed, the hypocotyl lifts the cotyledons above the ground. With light stimulation, the hypocotyl raises the cotyledons and the epicotyl.



making its own food by photosynthesis. The germinating embryo has consumed the food reserves in the cotyledon which dry up and fall. In the corn, there is a different method in germination. The coleoptile is pushed upward first through the soil; then the shoot tip grows upward.

The developing plant responds to environmental cues due to the action of hormones. A specific hormone affects growth and development of target tissues. *Auxins*, found at the tip of the coleoptile or the shoot promote stem elongation. This allows the plant to bend towards a light source. *Gibberelins* also promote stem elongation. *Cytokinins* stimulate cell division and promote leaf expansion. *Abscisic acid* promotes seed and bud dormancy. It makes possible for stomata to close during hot or dry conditions to prevent dessication. *Ethylene* (*kalburo*) is a popular hormone that promotes ripening of fruits. Other hormones inhibit lateral growth or apical dominance and promote flowering.