7. The ovary develops into a fruit adapted for seed dispersal
8. Evolutionary adaptations of seed germination contribute to seedling survival
7. The ovary develops into a fruit adapted for seed dispersal

• As the seeds are developing from ovules, the ovary of the flower is developing into a fruit, which protects the enclosed seeds and aids in their dispersal by wind or animals.

• Pollination triggers hormonal changes that cause the ovary to begin its transformation into a fruit.

• If a flower has not been pollinated, fruit usually does not develop, and the entire flower withers and falls away.
• The wall of the ovary becomes the pericarp, the thickened wall of the fruit, while other parts of the flower wither and are shed.

• However, in some angiosperms, other floral parts contribute to what we call a fruit.

• In apples, the fleshy part of the fruit is derived mainly from the swollen receptacle, while the core of the apple fruit develops from the ovary.

Fig. 38.12
• The fruit usually ripens about the same time as its seeds are completing their development.

• For a dry fruit such as a soybean pod, ripening is a little more than senescence of the fruit tissues, which allows the fruit to open and release the seeds.

• The ripening of fleshy fruits is more elaborate, its steps controlled by the complex interactions of hormones.

  • Ripening results in an edible fruit that serves as an enticement to the animals that help spread the seeds.
  
  • The “pulp” of the fruit becomes softer as a result of enzymes digesting components of the cell walls.
  
  • The fruit becomes sweeter as organic acids or starch molecules are converted to sugar.
• By selectively breeding plants, humans have capitalized on the production of edible fruits.

• The apples, oranges, and other fruits in grocery stores are exaggerated versions of much smaller natural varieties of fleshy fruits.

• The staple foods for humans are the dry, wind-dispersed fruits of grasses, which are harvested while still on the parent plant.

• The cereal grains of wheat, rice, maize, and other grasses are easily mistaken for seeds, but each is actually a fruit with a dry pericarp that adheres tightly to the seed coast of the single seed within.
8. Evolutionary adaptations of seed germination contribute to seedling survival

- As a seed matures, it dehydrates and enters a dormancy phase, a condition of extremely low metabolic rate and a suspension of growth and development.

- Conditions required to break dormancy and resume growth and development vary between species.
  - Some seeds germinate as soon as they are in a suitable environment.
  - Others remain dormant until some specific environmental cue causes them to break dormancy.
• Seed dormancy increases the chances that germination will occur at a time and place most advantageous to the seedling.

• For example, seeds of many desert plant germinate only after a substantial rainfall, ensuring enough water.

• Where natural fires are common, many seeds require intense heat to break dormancy, taking advantage of new opportunities and open space.

• Where winters are harsh, seeds may require extended exposure to cold, leading to a long growing season.

• Other seeds require a chemical attack or physical abrasion as they pass through an animal’s digestive tract before they can germinate.
• The length of time that a dormant seed remains viable and capable of germinating varies from a few days to decades or longer.
  • This depends on species and environmental conditions.
  • Most seeds are durable enough to last for a year or two until conditions are favorable for germinating.
  • Thus, the soil has a pool of nongerminated seeds that may have accumulated for several years.
  • This is one reason that vegetation reappears so rapidly after a fire, drought, flood, or some other environmental disruption.
• Germination of seeds depends on imbibition, the uptake of water due to the low water potential of the dry seed.

• This causes the expanding seed to rupture its seed coat and triggers metabolic changes in the embryo that enable it to resume growth.

• Enzymes begin digesting the storage materials of endosperm or cotyledons, and the nutrients are transferred to the growing regions of the embryo.
• The first organ to emerge from the germinating seed is the radicle, the embryonic root.

• Next, the shoot tip must break through the soil surface.

• In garden beans and many other dicots, a hook forms in the hypocotyl, and growth pushes it aboveground.

• Stimulated by light, the hypocotyl straightens, raising the cotyledons and epicotyl.
• As it rises into the air, the epicotyl spreads its first foliage leaves (true leaves).
  • These foliage leaves expand, become green, and begin making food for photosynthesis.
  • After the cotyledons have transferred all their nutrients to the developing plant, they shrivel and fall off the seedling.
• Light seems to be main cue that tells the seedling that it has broken ground.

  • A seedling that germinates in darkness will extend an exaggerated hypocotyl with a hook at its tip, and the foliage leaves fail to green.

  • After it exhausts its food reserves, the spindly seedling stops growing and dies.
• Peas, though in the same family as beans, have a different style of germinating.
  • A hook forms in the epicotyl rather than the hypocotyl, and the shoot tip is lifted gently out of the soil by elongation of the epicotyl and straightening the hook.
  • Pea cotyledons, unlike those of beans, remain behind underground.

Fig. 38.14b
• Corn and other grasses, which are monocots, use yet a different method for breaking ground when they germinate.

• The coleoptile pushes upward through the soil and into the air.

• The shoot tip then grows straight up through the tunnel provided by the tubular coleoptile.

**Fig. 38.14c** (c) Corn
• The tough seed gives rise to a fragile seedling that will be exposed to predators, parasites, wind, and other hazards.

• Because only a small fraction of seedlings endure long enough to become parents, plants must produce enormous numbers of seeds to compensate for low individual survival.

• This provides ample genetic variation for natural selection to screen.

• However, flowering and fruiting in sexual reproduction is an expensive way of plant propagation especially when compared to asexual reproduction.