

# Seeds and Fruits

Plants in the division Anthophyta (angiosperms) have evolved complex mechanisms to provide for protection and dispersal of their offspring. The two key features of this system are the production of embryos within seeds, and the enclosing of these seeds in ovaries which mature into fruits. Both the hard seed coat and internal nutrient supplies of seeds, and the hard or fleshy fruit create an effective buffer preventing harsh environmental conditions from causing damage to the enclosed embryo. In addition, both seeds and fruits often include specific mechanisms to facilitate seed dispersal.

## Seeds

In angiosperms, seeds consist primarily of the external **seed coat**, the **embryo**, and a nutritive tissue called the **endosperm**. The embryo consists of a primary root (**radicle**) one or two embryonic leaves (**cotyledons**), a stem-like portion below the cotyledons (the **hypocotyl**), and a stem-like portion above the cotyledons (the **epicotyl**). Plants in the class Monocotyledones (**monocots**) contain just one cotyledon; plants in the class Dicotyledones (**dicots**) contain two cotyledons. In many of the monocots, the epicotyl and any developing leaves it bears are surrounded by a protective sheath called a **coleoptile**; the radicle is surrounded by another protective sheath called a **coleorhiza**.

The endosperm results from divisions of a **primary endosperm nucleus**. This nucleus arises when the two polar nuclei of the megagametophyte fuse with a sperm nucleus, a process which occurs simultaneously with the fusion of the egg with the other sperm nucleus. In the seeds of some plants, such as corn (a monocot), the endosperm forms a large portion of the mature seed and serves as the major source of nutrition for the embryo during seed germination. In the seeds of other plants, such as pea and bean (dicots or eudicots), the endosperm has been almost entirely consumed by the time the seed is mature. In these seeds the cotyledons are enlarged and fleshy and serve as the major nutrient source during germination.

## Fruits

Fruits are formed when an ovary undergoes changes, becoming either dry and hardened or enlarged and fleshy. This maturation process is generally triggered by hormonal signals accompanying seed formation. The nature of the fruit in a particular plant will depend, to a large extent, on the nature of the ovary from which it develops. For example, the placentation of the ovules carried in a particular ovary will determine the eventual placement of seeds within the fruit. Also, the number of locules in the ovary will be apparent in the fruit. There are several key features which are used to classify fruits. These include:

- 0. 1. The **composition** of the fruit. A **true fruit** is one that forms from ovary tissue alone, while an **accessory fruit** is one that includes modified tissue of other floral parts (usually the receptacle).
- 0. 2. The **origin** of the fruit. A **simple fruit** is one that forms from a single ovary; an **aggregate fruit** (e.g. the raspberry, the strawberry with its development from flower to fruit) forms from several ovaries of a multipistillate flower; a **multiple fruit** (e.g. the pineapple) forms from the ovaries of several different flowers within an inflorescence.
- . 3. The **texture** of the fruit. Some fruits are dry, whereas others are fleshy.

**The following is a key to some specific fruit types.**

**I. Dry fruits**

- . A. **Indehiscent fruits** (these are fruits which do not open at maturity)
  - 0. 1. **Achene** - a small, dry, hard, indehiscent fruit, one-seeded, nut-like, often mistaken for a seed. Examples: sunflower, lettuce, strawberry, buttercup.
  - . 2. **Caryopsis (grain)** - an achene in which the ovary wall and seed coat are inseparable. Examples: wheat, corn.
  - . 3. **Nut** - a large, indehiscent achene, commonly one-seeded. Examples: chestnut, acorn of oak.
  - . 4. **Samara** - a winged achene or nut. Examples: maple, elm, ash.
- 0. B. **Dehiscent fruits** (these are fruits which do open at maturity to shed their seeds)
  - 0. 1. **Follicle** - derived from one carpel, several seeded, opening along one side at maturity. Examples: milkweed, proboscidea, larkspur.
  - . 2. **Legume** - derived from one carpel, usually several-seeded, opening along two sides at maturity. Examples: bean, pea.
  - . 3. **Capsule** - developed from a pistil of two or more united carpels, each opening at maturity. Examples: lily, iris.

**II. Fleshy or partly fleshy fruits**

- A. **Berry** - ovary wall becomes fleshy throughout, one to many seeds. Examples: grape, eggplant, persimmon, tomato, carambola, kiwi fruit.

- B. **Pepo** - an accessory berry, in which the ovary wall and floral tube are adherent, with a hard rind. Applied to fruits of the gourd family. Examples: cucumber (also cucumber in c.s.), squash, pumpkin, cantaloupe.
- C. **Hesperidium** - a modified berry, in which the outer part of the ovary wall becomes leathery. Applied to fruits of the citrus family. Examples: grapefruit, lemon.
- D. **Drupe** - a fruit from a single carpel, in which the outer wall of the ovary has become fleshy and the inner part stony at maturity. Often termed a "stone fruit". Examples: plum, peach, almond, cherry.
- E. **Pome** - an accessory fruit derived from a compound pistil of several carpels, parts of which are stony or membranous and parts of which are fleshy; the whole permanently enclosed in the fleshy floral tube or receptacle. Examples: pear, apple, quince, hawthorn.