

Garden Terms: Reproductive Plant Morphology — Seeds, Flowers, and Fruits

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Seeds

Seeds are a plant reproductive structure, containing a fertilized embryo in an arrested state of development, surrounded by a hard outer covering. They vary greatly in color, shape, size, and texture (*Figure 1*). Seeds are dispersed by a variety of methods including animals, wind, and natural characteristics (puffball of dandelion, wings of maples, etc.).



Figure 1. A seed is a small embryonic plant enclosed in a covering called the seed coat. Seeds vary in color, shape, size, and texture.

Seed Formation

Pollination is the transfer of pollen from an anther to a stigma. This may occur by wind or by pollinators.

- ❖ **Cross pollinated** plants are fertilized with pollen from other plants.
- ❖ **Self-pollinated** plants are fertilized with pollen from their own flowers.

Fertilization is the union of the (male) sperm nucleus from the pollen grain and the (female) egg nucleus found in the ovary. If fertilization is successful, the ovule will develop into a seed and the ovary will develop into a fruit.

Seed Characteristics

Seed coats are the hard outer covering of seeds. They protect seed from diseases, insects and unfavorable environmental conditions. Water must be allowed through the seed coat for germination to occur.

Endosperm is a food storage tissue found in seeds. It can be made up of proteins, carbohydrates, or fats.

Embryos are immature plants in an arrested state of development. They will begin growth when environmental conditions are favorable.

Germination is the process in which seeds begin to grow.

Seed Dormancies

Seed coat dormancy is a physical condition in which the seed coat is impermeable to water and oxygen. In order to break seed coat dormancies, the seed coat needs to be softened or cracked. Methods used to break seed coat dormancy include sand paper, hot water, weathering, fire, microorganisms, and passage through the digestive system of animals. The process of physically breaking the seed coat dormancy is called scarification. Examples of plants having seed coat dormancy include honeylocust, Kentucky coffeetree and linden.

Embryo dormancy is a physiological condition of the embryo. This type of dormancy requires a specific period of cold or heat treatment in order for germination to occur. This temperature treatment is called stratification. Examples of plants having embryo dormancy include elm, witch hazel, and dogwood.

Double dormancy is when the seed has both seed coat and embryo dormancy. An example is redbud seed.

Germination

Germination is the resumption of active growth of the embryo. Prior to any visual signs, the seed must imbibe water through the seed coat. The seed must also be in proper environmental conditions; that is, exposed to oxygen, favorable temperatures, and in some cases, light.

Flowers

Flowers contain the sexual reproductive parts of the plant (*Figure 2*). Plants are often grown for flower color and fragrance.

Flower Characteristics

Sepals are leaf-like structures that protect the flower bud. They are usually green and collectively are called the calyx. Sometimes they are highly colored and similar in appearance to petals.

Petals are usually the highly colored structures of the flower. They are collectively called the corolla.

Tepal is the collective term used for sepals and petals when they are not easily distinguishable.

Pistil is the female part of the flower, usually made up of a stigma, style, ovary(s) and ovule(s).

- ❖ **Stigmas** are at the top of the style and receive pollen. They are commonly flattened and sticky.
- ❖ **Styles** are long stalks that connect the stigma and ovary.
- ❖ **Ovaries** develop into fruit after fertilization and contain ovules.

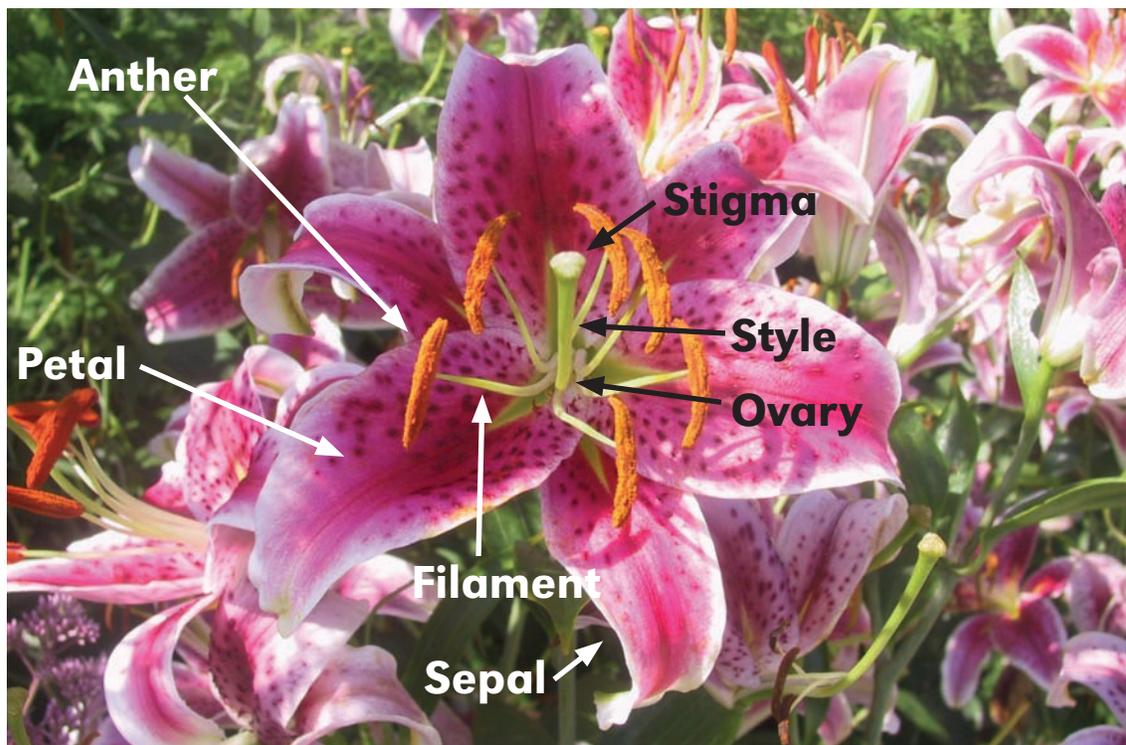


Figure 2. The reproductive structure of a plant is found in its flower.

- ❖ **Ovules** are located in the ovary and are unfertilized, immature seed which contain genetic information from the maternal (female) parent plant.

Stamen is the male part of the flower, usually made up of anthers and filaments.

- ❖ **Anthers** are the pollen producing organ.
- ❖ **Filaments** are long supporting stalks for the anthers.
- ❖ **Pollen** is a fine, powder-like reproductive structure containing genetic information from the paternal (male) parent plant.

Receptacle is the base of the flower.

Pedicel is the stalk that directly supports a flower or fruit (*Figure 3*).

Peduncle is the primary stalk supporting a single or cluster of flowers or fruits.

Inflorescence refers to how flowers are arranged on a floral stem. The most common floral arrangements are solitary, spike, raceme, composite, and umbel (*Figure 4*).

Flower Types

Complete flowers contain the stamen, pistil, petals, and sepals. Flowers are called “incomplete” if they have one or more of these parts missing.

Perfect flowers contain both the male and female flower parts within each flower. If either the male or female flower parts are missing, the flower is called “imperfect.”

Pistillate (female) flowers are those which possess a functional pistil or pistils but lack stamens.

Staminate (male) flowers are those which possess functional stamens but lack a pistil.

Plant Types

Monocious plants have separate male and female flowers on the same plant. Examples are oak and corn.

Dioecious plants have male and female flowers on different plants. Examples are buffalograss (*Figure 5*) and holly.

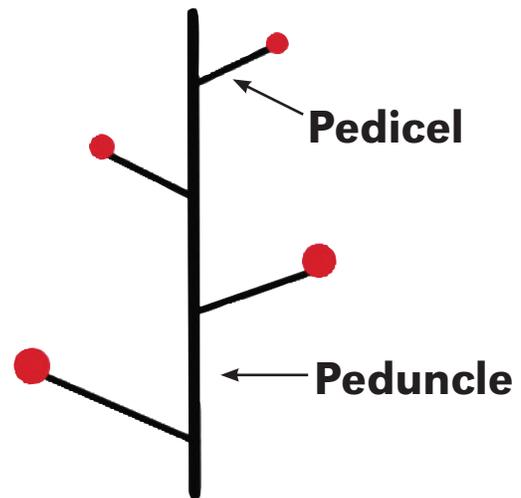


Figure 3. The pedicel is the stalk that directly holds the flower or fruit, while the peduncle is the primary stalk that supports a single or cluster of flowers or fruits.

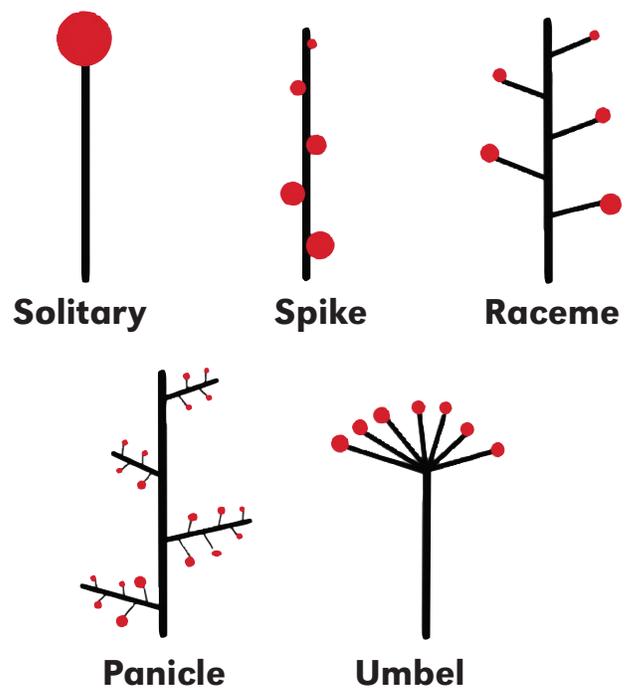


Figure 4. The most common inflorescence types include: solitary — a single flower with the pedicel attached to the stem; spike — stalkless flowers; raceme — a cluster of flowers on individual stalks (pedicels); panicle — a cluster of flowers on flower stalks that have repeated branching; and umbel — a cluster of flowers that have stalks that radiate from the same point at the top of the peduncle.



Figure 5. Male (a) and female (b) buffalograss flowers grow on separate plants, indicating it is a dioecious plant.

Fruits

Fruits are the ripened ovaries of flowers. They can vary in size, color, form and texture.

Dry fruits (Figure 6) have fruit walls that become papery or leathery as they mature and may become quite hard.

- ❖ **Dehiscent** fruits split or open at maturity. Examples include legumes (bean family), capsules (euonymus), follicles (milkweed), and siliques/silicles (mustards) (Figure 6a-6d).
- ❖ **Indehiscent** fruits do not open at maturity. Examples include samaras (maple), nuts (oak), achenes (sunflower), and schizocarps (dill) (Figure 6e-6g).

Fleshy fruits (Figure 7) are usually soft and juicy. Examples include drupes (prunes and peaches), pomes (pears and apples), berries (tomatoes), pepos (melons), and hesperidium (citrus).

Simple fruits develop from a single ovary.

Aggregate fruits (Figure 8) develop from a single flower which has many ovaries. The flower appears as a simple flower with one corolla, one calyx, and one stem but with many pistils (Figure 9). The ovaries are fertilized separately and independently. Examples include strawberry, raspberry, and blackberry.

Multiple fruits are derived from a tight cluster of separate, independent flowers borne on a single structure. Each flower will have its own calyx and corolla. Examples include pineapple, fig, and mulberry.

Cones are the “fruit” of gymnosperms. They are not true fruits because they do not develop from an ovary. Seed found in cones are therefore said to be “naked.” Seeds of gymnosperms are found inside near the base of the cone scales. In some gymnosperms, such as junipers and yews, the seed is found inside a fleshy cone known as an aril. In ginkgo, the seed is found inside a fleshy covering that is messy and malodorous. For these reasons, only male ginkgo trees should be used in landscapes (Figure 10).

Dehiscent Fruits



Legume



Capsule



Follicle



Silicle

Indehiscent Fruits



Samara



Nut



Achene

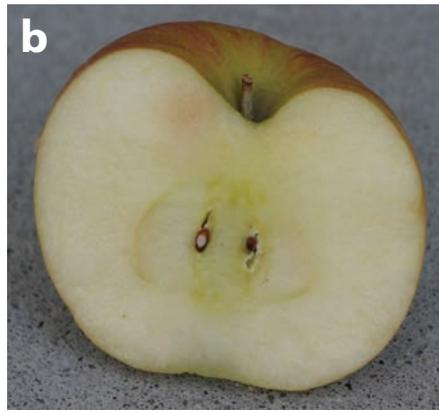


Schizocarp

Figure 6. Dry fruits are classified as either dehiscent or indehiscent, depending on whether they split open at maturity. Legumes (a) contain several seeds and open along two sides. They are found in the bean family (*Fabaceae*). Capsules (b) contain many seeds and split along more than two sides and often contain separate compartments. Follicles (c) contain several seeds and open along one seam. Siliques/silicles (d) leave a thin partition in which seeds are attached after the fruit opens. Siliques/silicles are found in the mustard family (*Brassicaceae*). Samaras (e) are winged fruits. Nuts (f) are hard, one-seeded fruits. Acorns, walnuts, and chestnut are examples of nuts. Achenes (g) are one-seeded fruits without wings. Schizocarps (h) split to form one-seeded segments.



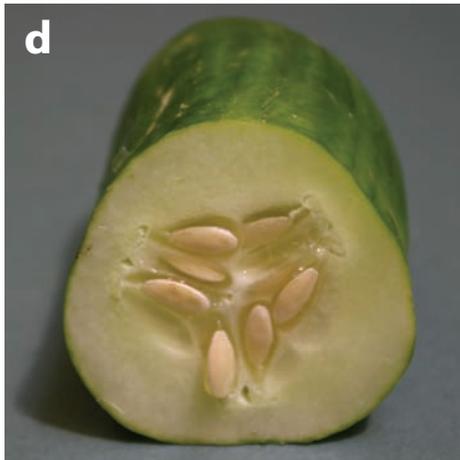
Drupe



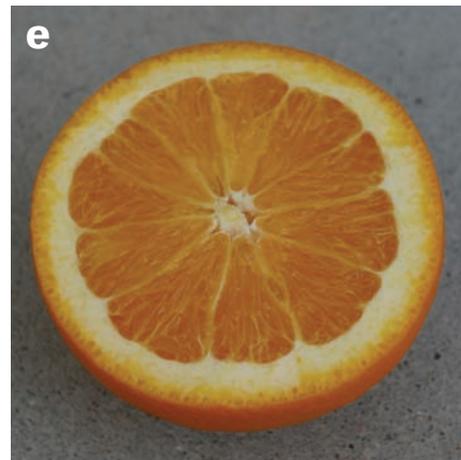
Pome



Berries



Pepos



Hesperidiums

Figure 7. Drupes (a) contain one seed which is surrounded by a hard stony layer (pit) and an outside fleshy layer (plum, cherry, viburnum). Pomes (b) have several seeds that are contained near the center of the fruit (apple and pear). Berries (c) have two or more seeds that are found in a fleshy layer that comprises the entire fruit (tomato). Pepos (d) are specialized berries with a hard rind enclosing a fleshy interior containing several seeds (cucumber, melons, squash). Hesperidiums (e) are specialized berries with a leathery rind and several juicy sections in the interior (citrus).



Figure 8. Aggregate fruits form from a single flower. Examples of plants with an aggregate fruit include: (a) tuliptree (aggregate of samaras); (b) blackberry (aggregate of drupes); (c) sweetgum (aggregate of capsules).



Figure 9. The strawberry flower has many pistils, which are located in the center of the flower and are surrounded by several stamens (a). The fruit is an aggregate of achenes (tannish-orange structures) which are held in a fleshy red enlarged receptacle (b).

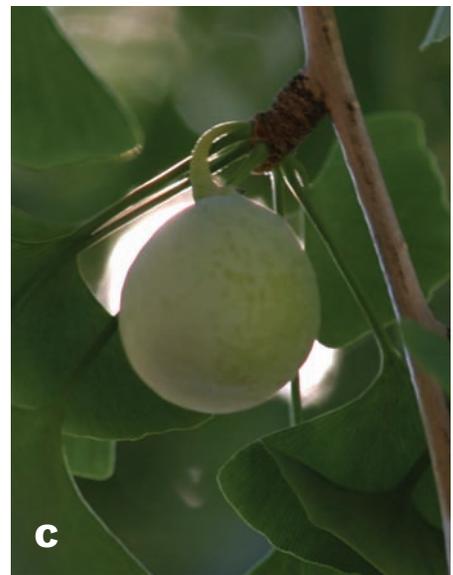


Figure 10. Cones and naked seeds are the “fruit” of gymnosperms. Examples include a cone from ponderosa pine (a); an aril from yew (b); and a seed from ginkgo (c).