

Lesson C4–3

Examining Flowers and Fruits

Unit C. Basic Principles of Agricultural/Horticultural Science

Problem Area 4. Identifying Basic Principles of Plant Science

Lesson 3. Examining Flowers and Fruits

New Mexico Content Standard:

Pathway Strand: Plant Systems

Standard: II: Address taxonomic or other classifications to explain basic plant anatomy and physiology.

Benchmark: II-A: Examine unique plant properties to identify/describe functional difference in plant structures including roots, stems, flowers, leave and fruit.

Performance Standard: 1. Identify plant structures (e.g., seeds). 2. Describe physiological functions of plants. 3. Describe germination process and conditions. 4. Explain the processes of photosynthesis and respiration.

Student Learning Objectives. Instruction in this lesson should result in students achieving the following objectives:

1. Identify the major parts of flowers and explain the functions of the parts.
2. Describe the types of flowers.
3. Explain the processes of pollination and fertilization.
4. Describe the purposes and kinds of fruit.
5. Explain the structure and kinds of seed.

List of Resources. The following resources may be useful in teaching this lesson.

Recommended Resources. One of the following resources should be selected to accompany the lesson:

Biondo, Ronald J. and Jasper S. Lee. *Introduction to Plant and Soil Science and Technology*, Second Edition. Danville, Illinois: Interstate Publishers, Inc., 2003. (Textbook and Activity Manual, Chapters 3 and 4)

Lee, Jasper S. and Diana L. Turner. *AgriScience*, Third Edition. Danville, Illinois: Interstate Publishers, Inc., 2003. (Textbook and Activity Manual, Chapter 8)

Schroeder, Charles B., et al. *Introduction to Horticulture*, Third Edition. Danville, Illinois: Interstate Publishers, Inc., 2002. (Textbook and Activity Manual, Chapter 4)

Other Resources. The following resources will be useful to students and teachers:

Herren, Ray V. *Exploring Agriscience*. Albany, New York: Delmar Publishers, 1997.

Schooley, James. *Introduction to Botany*. Albany, New York: Delmar Publishers, 1997.

Schraer, William D. and Herbert J. Stoltze. *Biology: The Study of Life*. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1995.

List of Equipment, Tools, Supplies, and Facilities

Specimen flowers, fruit, and seed

Writing surface

Overhead projector

Small dissection kit for flowers

Eye safety goggles

Terms. The following terms are presented in this lesson (shown in bold italics):

Complete flower

Cotyledons

Dry fruit

Endosperm

Epicotyl

Fertilization

Fleshy fruit

Flower

Fruit

Hilum

Hull fruit

Hypocotyl
Imperfect flower
Incomplete flower
Micropyle
Perfect flower
Petals
Pistil
Plumule
Pod fruit
Pollen
Pollination
Radicle
Seed
Seed coat
Seed scar
Sepals
Silk scar
Stamens
Stigma

Interest Approach. Use an interest approach that will prepare students for the lesson. Teachers often develop approaches for their unique class and student situations. An example of an approach is included here.

Ask students to name their favorite ornamental flower. Develop a list on the writing surface. Encourage students to tell why their choice is a favorite with them. After several have been listed, ask students to help classify the flowers by whether or not people grow them in their yards at home or if they are only available from a flower shop. Also, have students help classify the flowers by when and where they are used, such as a Valentine's Day gift, holiday season decoration, prom date corsage, memorials at funerals, or other important times. Summarize the interest approach by asking, "why are flowers important to people?" and "what is the purpose of flowers to a plant?" (Follow the interest approach by having students read appropriate sections in the textbook they are using. Illustrations in the books will also provide good visual information about flowers and fruit. Have students keep notes on information covered in class.)

Summary of Content and Teaching Strategies

Objective I: Identify the major parts of flowers and explain the functions of the parts.

Anticipated Problems: What are the major parts of flowers? What are the functions of the parts?

- I. A *flower* is the reproductive part of flowering plants.

- A. Flowers are in many shapes and colors.
 1. Some flowers are attractive and have appealing fragrances.
 2. Some flowers are important as a step in producing fruit and seed.
- B. The major parts of flowers are to support the production of fruit and seed.
 1. Sepals—The **sepals** are the outer parts of a flower. They cover the bud before it opens and typically have a green color. Sepals offer protection to the developing bud. They are in an outer ring known as a calyx.
 2. Petals—The **petals** are located just inside the sepals and are usually brightly colored to attract insects and promote pollination. Petals protect the stamens and pistil and help collect pollen from the air. Petals are in an inner ring known as a corolla.
 3. Stamens—The **stamens** produce pollen and are the male parts of a flower. A stamen consists of a filament and anther, which is a knob-like structure at the end of a filament.
 4. Pistil—The **pistil** contains the ovary, which has ovules that are fertilized by the pollen, and, on some species, develops into a large fleshy fruit structure. The pistil also contains the stigma and style. The stigma is the opening at the end of the pistil for the entry of pollen. The style leads from the stigma to the ovary. Pollen grains grow a long tube through the style toward the ovules and form two sperm. One sperm unites with the ovule in the ovary to form an embryo. The other sperm forms tissue in the developing seed known as endosperm.

Refer students to a drawing that labels the parts of a flower in the textbook. Make a drawing on the writing surface, and/or use TM: C4–3A to illustrate the parts of a flower. Bring several examples of different flowers for comparison. Have students draw and properly label a flower in their notes or activity manual. Form students into small groups and have them dissect flowers to identify the different parts. Caution: Instruct students in safe methods with the flower dissection activity. Sharp knives or scissors can be dangerous. Appropriate eye safety is recommended.

Objective 2: Describe the types of flowers.

Anticipated Problem: What are the types of flowers?

- II. Type of flower is based on the parts found in the flower of a particular species.
 - A. Parts of a flower determine if it is a complete or incomplete flower.
 1. A **complete flower** has four principal parts: sepals, petals, stamens, and pistil.
 2. An **incomplete flower** does not have all four principal parts. Examples are wheat and oats, which do not have sepals and petals.
 - B. Parts of a flower determine if it is perfect or imperfect.
 1. A **perfect flower** has the stamen and pistil in the same flower.
 2. An **imperfect flower** lacks either stamens or pistils. A flower that has stamens and not a pistil is often referred to as a male flower. A flower that has a pistil but no stamens is a female flower. Plant species that have both male and female flowers on the

same plant are known as monoecious plants. An example is corn. Plant species with the male flowers and female flowers on separate plants are known as dioecious plants. An example is the muscadine grape.

Use TM C4–3B or the writing surface to summarize the types of flowers. Using the flowers dissected in the previous lesson, have students determine if they are complete or incomplete and perfect or imperfect. Identify the kinds of flowers so that students can determine if the plants are monoecious or dioecious.

Objective 3: Explain the processes of pollination and fertilization.

Anticipated Problem: What is pollination? What is fertilization?

- III. **Pollination** is the transfer of pollen from an anther to a stigma of a flower of the same species. (It is an important process with crop growers to assure fruit and seed production.)
- A. **Pollen** is the male sex cell in plants.
1. Pollen is released by the anther which is a part of the stamen.
 2. It matures as a powdery substance that may be moved by wind, insects, or other animals.
- B. The **stigma** is a part of the female reproductive system of a plant.
1. The stigma secretes a sticky substance that traps pollen.
 2. After being trapped on the stigma, the pollen grain grows a tube through the style toward the ovule (egg cell).
- C. **Fertilization** is the union of the pollen cell with the ovule.
1. A pollen grain forms two sperm as it reaches the ovule.
 2. One sperm unites with the ovule to form an embryo; the other sperm forms tissue known as endosperm in the seed. (Some scientists refer to this as double fertilization—a process that occurs only in flowering plants.)

Have students read appropriate sections in the textbook. Use student input to present the information. Use TM: C4–3C or the writing surface to summarize key terms associated with this objective. Have students observe flowers for the presence of pollen. One flower to observe is the tassel of corn, which may produce as many as 15 million pollen grains. Use a developing corn ear with silks to explain how a pollen grain must contact each silk for a kernel of corn to develop. It may be appropriate for students to artificially pollinate plants in a greenhouse or field.

Objective 4: Describe the purposes and kinds of fruit.

Anticipated Problems: What are the purposes of fruit? What are the kinds of fruit?

- IV. Fruit varies with the species of plant. (Some is large, such as watermelon or pumpkin. Other fruit is smaller, such as a bean pod or cherry.)
- A. **Fruit** is the fertilized ovary of a plant that grows to produce and protect seed.
1. Once fertilization occurs, the flower is no longer needed and dries up.

2. Seed are formed within fruit.
 3. Fruit must be sufficiently mature for the seed to be viable.
 4. Good fruit formation is essential in many crops because it is the fruit that is often the most valuable product of a plant.
- B. Fruit may be fleshy or dry.
1. **Fleshy fruit** is large fibrous structures that surround seed. A berry is a kind of fleshy fruit that is typically small, with strawberries and tomatoes being examples. A pome is a fleshy fruit with several seeds such as an apple or a pear. A drupe is a single-seeded fleshy fruit such as plum or cherry.
 2. **Dry fruit** is formed as a pod or in a hull. Caryopsis are kinds of dry fruits with thin walls such as wheat and barley. Samara are kinds of dry fruits with wings attached to aid dispersion, with elm, ash, and maple being examples.
 3. **Pod fruit** has a definite line or seam in the fruit, such as beans, peas, peanuts, and cotton.
 4. **Hull fruit** do not have definite lines or seams in the shell of the fruit, such as pecans and corn.

Have students read appropriate sections in the textbook. Follow this with questions and discussion to develop a summary of key information on the writing surface. Use TM: C4–3D to present key terms. Use examples of different kinds of fruit. Have students classify the examples as fleshy or dry. If dry, have them classify as to pod or hull fruit. Ask students to name examples of each grown in the local area. They may also relate the kinds of fruit to the foods they consume and the way the foods are prepared for eating. Have students name fruits in which the pods are eaten, such as snow peas.

Objective 5: Explain the structure and kinds of seed.

Anticipated Problems: What is the structure of seed? What are the kinds of seed?

- V. A **seed** is a container of new plant life.
- A. Seed are formed in the ovaries of flowers.
 1. Good pollination is essential to assure an abundance of seed.
 2. Seed are used to reproduce plants.
 3. A seed must protect the embryo and provide food for it to grow.
 - B. Seed have many important uses to humans, such as food production.
 1. With some plants, such as soybeans and corn, growers want large yields of seed. (The seed of these plants are valuable and not the fruit.)
 2. With some plants, growers want fruit with few or no seed such as seedless grapes or oranges. (The fruit of these plants are valuable rather than the seed.)
 - C. Seed structure includes external parts and internal parts.
 1. External parts are designed to nourish and protect the internal parts of the seed.
 2. Internal parts include an embryo and needed food supply.

D. Seed structure varies with the kind of plant: dicot and monocot. (Structure is similar but sufficiently different to merit study.)

1. Dicot seed, such as beans, have the following parts:

a. External:

- Seed coat—The **seed coat** is the outer covering of the seed that protects the embryo from injury and holds the seed together.
- Hilum—The **hilum** is the point at which the seed was attached in the fruit. (The hilum is also known as the seed scar.)
- Micropyle—The **micropyle** is the tiny opening near the hilum through which the pollen entered the ovule to form the seed.

b. Internal:

- Cotyledons—The **cotyledons** are fleshy-like structures that contain food for the embryo.
- Radicle—The **radicle** is the part of the seed that forms the root system of the plant.
- Hypocotyl—The **hypocotyl** connects the cotyledons and radicle.
- Epicotyl—The **epicotyl** forms the stem of the plant.
- Plumule—The **plumule** forms the above ground part of the plant.

2. Monocot seed, such as corn, have the following parts:

a. External:

- Seed coat—The seed coat protects and shapes the seed.
- Seed scar—The **seed scar** is the place where the seed was attached, such as a corn kernel to the corn cob.
- Silk scar—The **silk scar** is at the end opposite the seed scar and is the place where the silk was attached to the ovule.

b. Internal:

- Endosperm—The **endosperm** is the stored food in a monocot seed.
- Radicle—The radicle, as with dicots, forms the root system.
- Hypocotyl—As with dicots, the hypocotyl connects the radicle with the food source.
- Epicotyl—The epicotyl forms the stems of monocots in a manner similar to dicots.
- Cotyledon—The cotyledon in a monocot absorbs food from the endosperm and moves it to the embryo.
- Plumule—The plumule develops into the leaves and stems of the plant.

Refer students to drawings of monocot and dicot seed structure in their textbook. Both kinds may be taught together because the differences are relatively small. Have them read the appropriate sections. Use TM: C4–3E to summarize the major parts of seed. Have students examine different kinds of seed and carefully dissect them to identify the different structural parts. Germinate samples of monocot and dicot seed so that growth differences will be obvious. Identify examples of each type grown locally and how they

are used. Have students name common foods of each type. Caution: Instruct students in safe methods of dissecting seed. Eye protection is recommended.

Application. Application can involve one or more of the following student activities:

Have students dissect a flower and label the parts.

Have students compare external features of monocot and dicot seed and prepare a report that describes the differences.

Have students dissect seed and compare the internal seed structure of monocot and dicot seed.

Evaluation. Evaluation should focus on student achievement of the objectives for the lesson. Various techniques can be used, such as student performance on the application activities and written tests. A sample written test is attached.

Answers to Sample Test:

Part One: Matching

1=i, 2=e, 3=c, 4=a, 5=h, 6=b, 7=d, 8=f, 9=j, 10=g

Part Two: Completion

1=Stamen

2=petals

3=pollen

4=dry (or pod)

5=Hull

6=Fleshy

Part Three: Drawing

The drawing should be titled as a monocot or dicot and properly labeled to show the major parts.

Test

Lesson C4–3: Examining Flowers and Fruits

Part One: Matching

Instructions. Match the term with the correct response.

- | | |
|---------------------|----------------------|
| a. complete flower | f. perfect flower |
| b. imperfect flower | g. incomplete flower |
| c. pollination | h. fertilization |
| d. fruit | i. dry fruit |
| e. seed coat | j. endosperm |

- _____ 1. Fruit formed as a pod or hull.
- _____ 2. The outer covering of a seed.
- _____ 3. Transfer of pollen from an anther to a stigma.
- _____ 4. A flower with four principal parts: sepals, petals, stamens, and pistil.
- _____ 5. Union of pollen cell with an ovule.
- _____ 6. A flower that lacks either stamens or pistils.
- _____ 7. The fertilized ovary of a plant that grows to produce and protect seed.
- _____ 8. A flower with stamens and pistils in the same flower.
- _____ 9. Stored food in a monocot seed.
- _____ 10. A flower that does not have the four principal parts.

Part Two: Completion

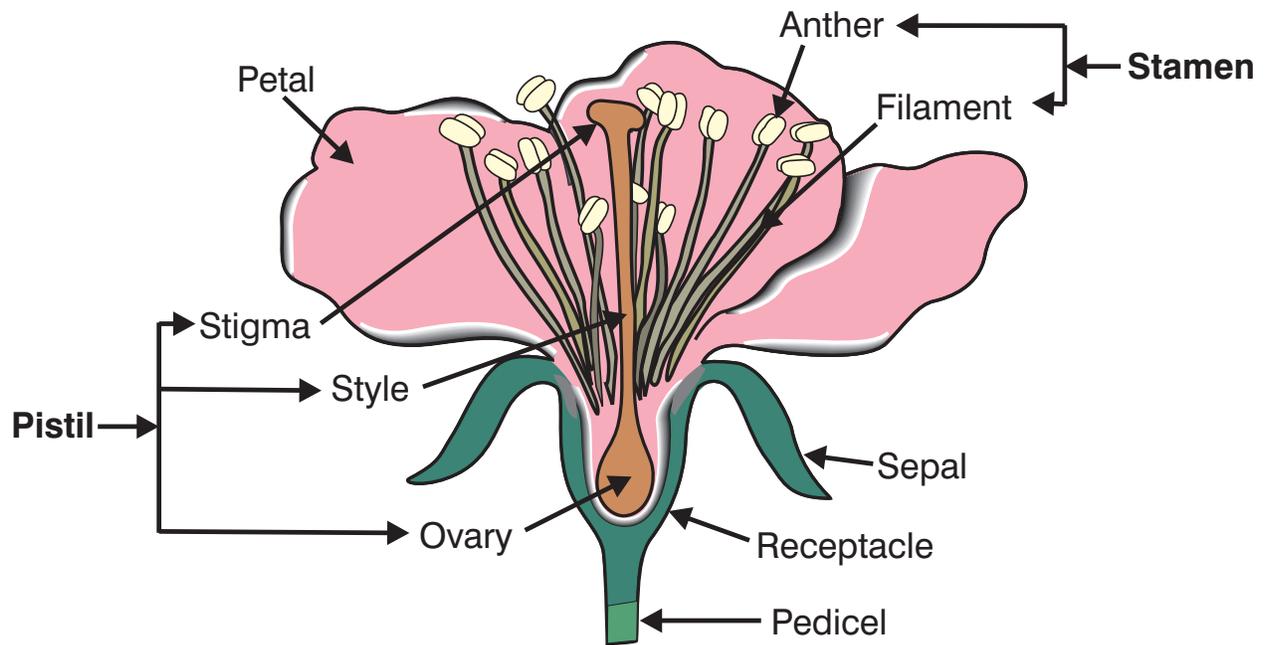
Instructions. Provide the word or words to complete the following statements.

1. _____ is the part of a flower that produces the pollen.
2. The brightly colored parts of a flower are known as _____.
3. The stigma of a flower secretes a sticky substance that traps _____.
4. The bean is an example of a _____ fruit.
5. _____ fruit do not have definite lines or seams.
6. _____ fruit has large fibrous-type structures surrounding the seed.

Part Three: Drawing

In the space below, draw and label the major parts of a seed. You may draw either a monocot or dicot. Indicate if your drawing is a monocot or dicot.

Parts of a Perfect Flower



Types of Flowers

Parts of a flower indicate its type.

Complete flower—has four principal parts: sepals, petals, stamens, and pistil

Incomplete flower—does not have all four parts

Perfect flower—stamen and pistil in same flower

Imperfect flower—lacks either stamen or pistil

Pollination and Fertilization

Pollination—transfer of pollen from anther to stigma

Pollen—male sex cell of plants

Stigma—female reproductive part of flower

Fertilization—union of pollen cell with ovule

Kinds of Fruit

Fruit—fertilized ovary of a plant

Kinds:

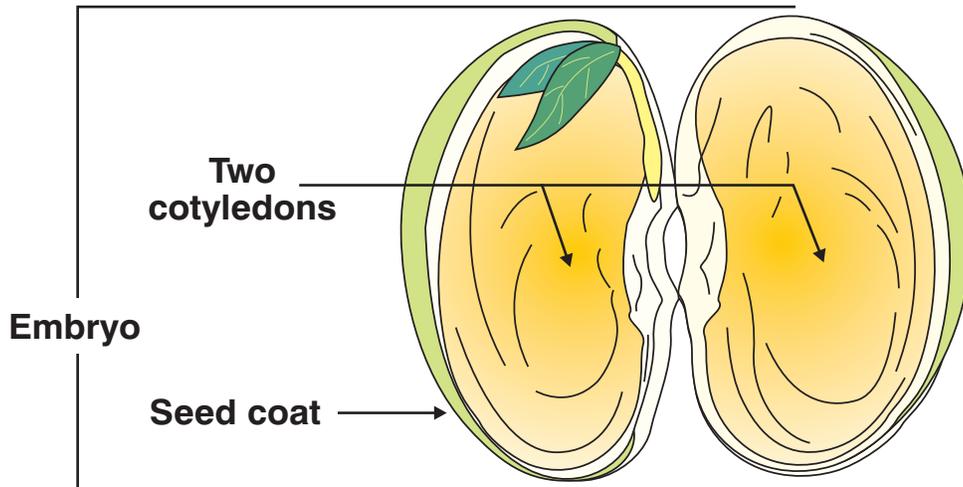
**Fleshy—large fibrous structure
(example: apple)**

Dry:

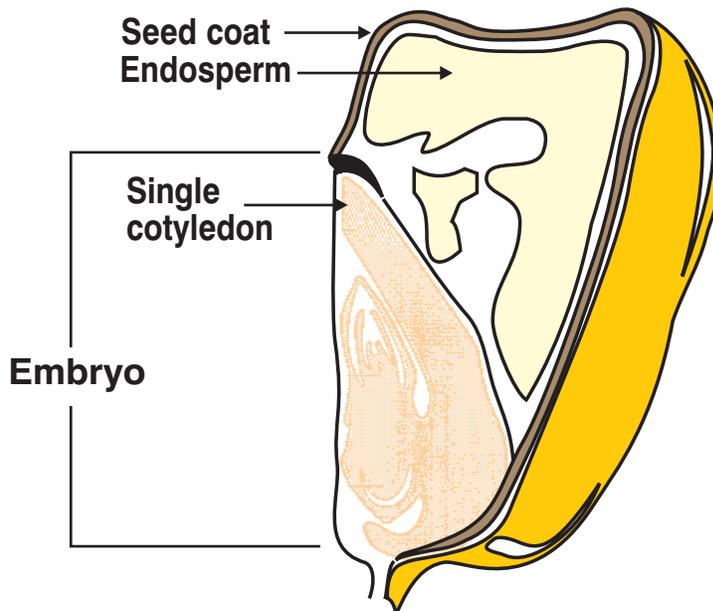
**Pod—dry fruit with definite
line or seam (example: bean)**

**Hull—dry fruit without
definite line or seam
(example: corn)**

Parts of Seed



BEAN SEED



CORN SEED