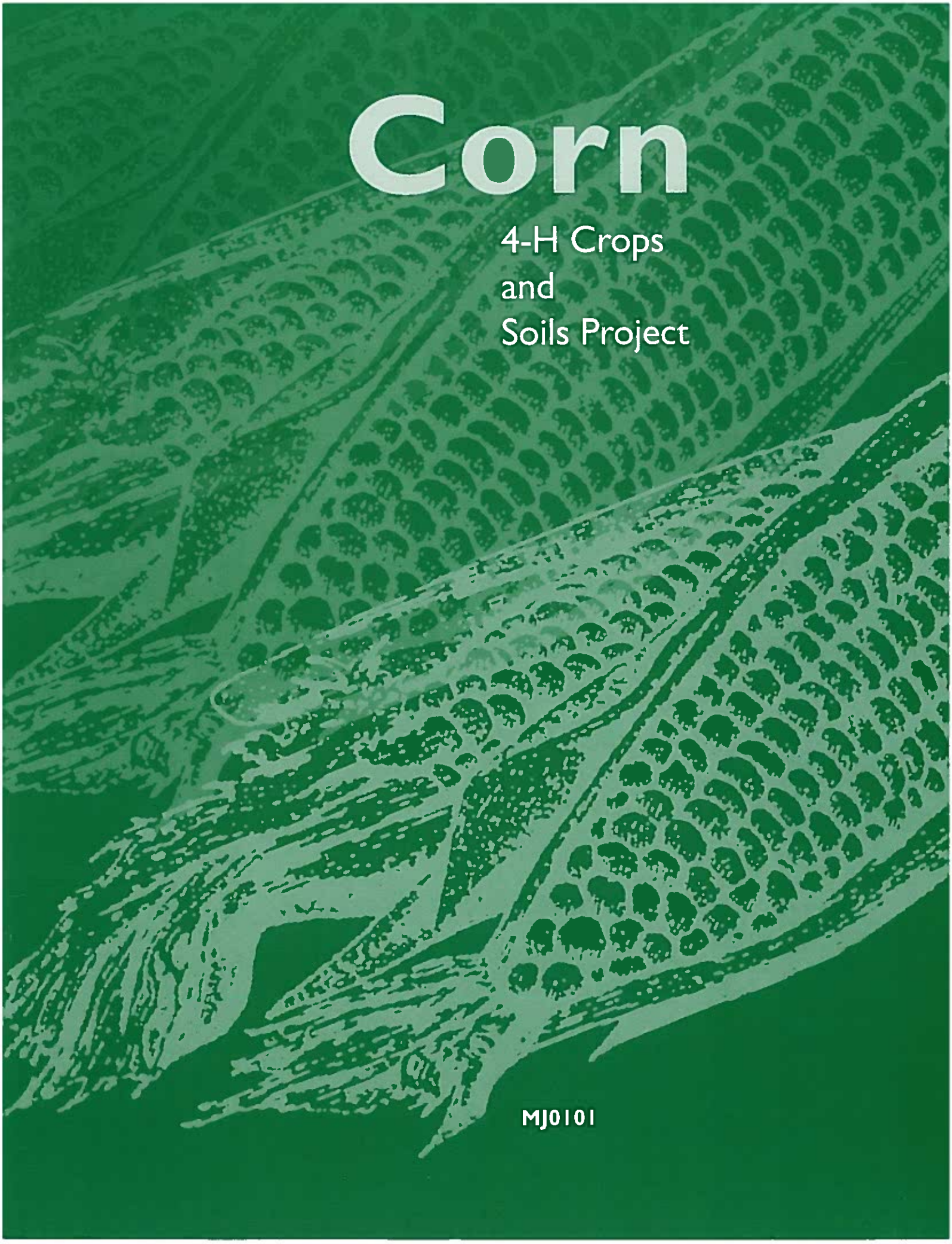
Corn
4-H Crops
and
Soils Project
MJ0101

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The Importance of Corn

Corn is truly the great American crop. The American continent was the first place in the world where corn grew. Corn was very important in the diets and cultures of several American Indian civilizations: the Incan, the Mayan, and the Aztec. When Europeans discovered America, they shared their new knowledge about corn (or maize, as the Indians called it) with other civilizations and the growing of corn spread to other continents. Corn is now grown in more parts of the world than any other food plant. There are more acres of corn grown in the world than any other food crop except wheat.

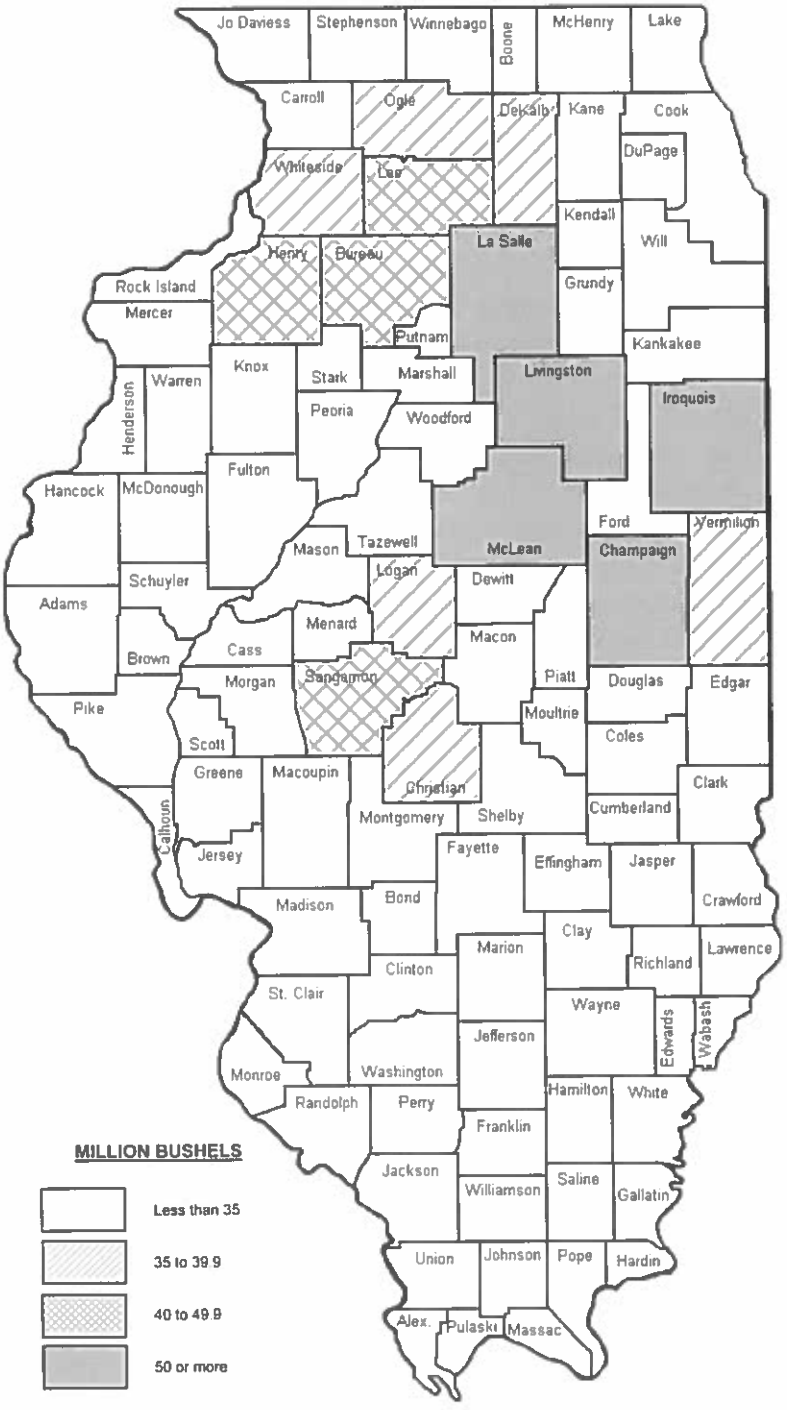
Corn played a leading role in the development of the United States, too. Of our major crops, it is the one that most efficiently converts the sun's energy into food for livestock and people.

We also use corn for many things other than food. Hundreds of products, ranging from soap to wallpaper, are made from corn and its by-products.

The United States produces over one-half of the corn grown in the world. Much of it is grown in the fertile, well-drained area of the north central United States, an area often called the Corn Belt.

Illinois farmers produced 2.09 billion bushels of corn for grain in 2004, 15 percent more than in 2003, and the highest total ever in Illinois. The corn yield averaged a record high of 180 bushels per acre, 16 bushels per acre more than 2003. Although Iowa leads the nation in the amount of corn produced, Illinois is a close second. Illinois usually produces the highest *yields*—the most bushels of corn from each acre.

The Corn Belt



Millions of bushels of corn produced in Illinois counties

The Corn Plant

Corn is a tall member of the grass family of plants. Other common plants in the grass family are wheat, oats, sorghum, foxtail, and bluegrass. Unlike many types of grasses, corn is an *annual* plant, meaning that it cannot survive the winter and must be planted each year. It has a strong, solid stem and long, narrow leaves that are attached alternately on opposite sides of the stem. Its scientific name is *Zea mays.* Plants in the grass family have several common characteristics:

•Their leaves are usually long and narrow and the base of the leaf encircles the stem.

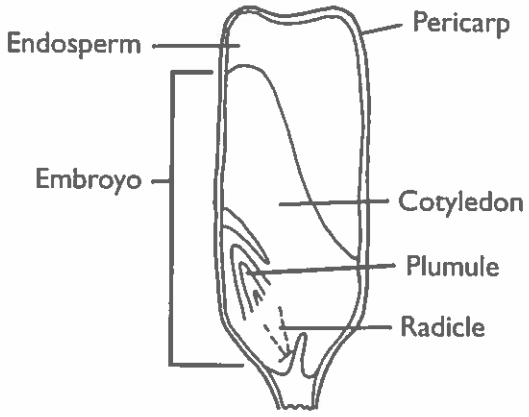
•They usually have an intense root system.

•Their flowers are small and grow in dense spikes or open, branching clusters called *panicles.*

The Corn Seed

Corn is one of nature's most amazing energy-storing devices. A corn seed weighs about one hundredth of an ounce. Yet, this tiny seed can produce a corn plant that will grow from 7 to 10 feet tall and will produce between 600 and 1,000 seeds like the one from which the plant started.

The seeds of a corn plant are the kernels that you find on an ear of corn. The kernels are arranged in rows along the ear. An ear of corn may have as few as 8 or as many as 36 rows, but the number of rows is always even.



The corn seed

The corn seed is composed of three main parts: the *seed coat* or *pericarp,* the *endosperm,* and the *embryo.* Each of these three parts has a role to play in producing a new corn plant.

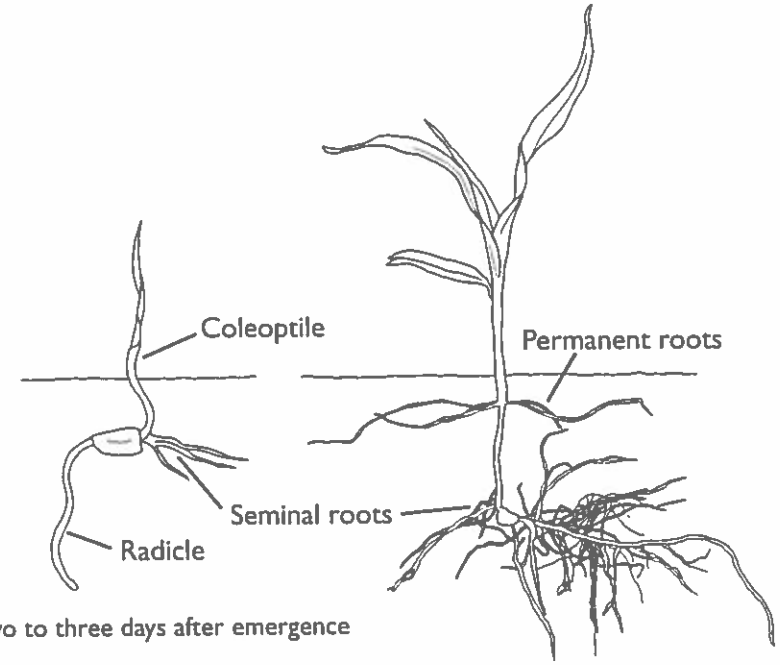
The pericarp is a hard, outer coat that protects the seed both before and after planting. It prevents bacteria and fungi from entering and destroying the kernel.

The endosperm makes up about four-fifths of the kernel's weight. Its chief function is to provide food energy for the young plant until the plant's roots have grown enough and its leaves become big enough to make food energy on their own.

The embryo of the corn kernel has two main parts: the tiny plant itself and the *cotyledon.* The new corn plant has 5 to 6 miniature leaves, the *plumule,* and a root, or *radicle.* When the seed is placed in the right surroundings and germinates (starts to grow), the cotyledon provides the food for the tiny new plant. The endosperm continues to supply food after germination.

Most corn seeds are yellow. Seeds that you purchase from a seed dealer may be stained red or pink. This colored coating means that the seeds have been treated with a chemical to protect them from disease.

Some corn kernels do not produce strong seedlings (young plants) when they germinate. Weak seedlings are very likely to die. If there are too many weak seedlings in a field of corn, there may be large gaps between the plants in a row. With fewer plants to produce corn, the yield is less. When seed analysts test seed corn to see how well it germinates, they do not count the weak seedlings.



Corn seedlings

The Seedling

When the corn kernel is placed in warm, moist soil, germination begins quickly. Moisture from the soil is absorbed through the pericarp and the kernel starts to swell. Chemical changes take place in the embryo and activate the growth of the radicle (root) and plumule (leaves). They push through the seed coat about two or three days after germination begins. The emerging leaves are enclosed in the *coleoptile,* which protects them from damage as they push through the soil.

Additional or *seminal* roots soon join the radicle. This early root system helps to anchor the plant and supply it with nourishment until the main root system is fully developed.

The seedling usually forces its way to the surface of the soil within 6 to 10 days after the seed was planted. The new plant develops very rapidly. About one week after it appears above the soil, the new corn seedling should be well established with two fully expanded leaves and a primary root system to feed and support it.

The Roots

The radicle and seminal roots that support the seedling are soon replaced by the main root system. By the time the corn plant is about 18 inches high, the roots have reached the middle of the corn rows and have extended to a depth of about 18 inches. As the plant continues to develop, the entire plow layer — the region from the surface of the soil to a depth of about 8 to 10 inches — becomes a mass of roots. After the plant has grown a tassel, additional *brace roots* grow out from the stem and enter the soil. These roots provide the extra support and nutrients that the plant needs while it is forming ears and filling them with kernels of corn.

The Mature Plant

The fully developed corn plant is from 7 to 10 feet tall and has 20 to 23 leaves. Different varieties of corn grow to different heights.

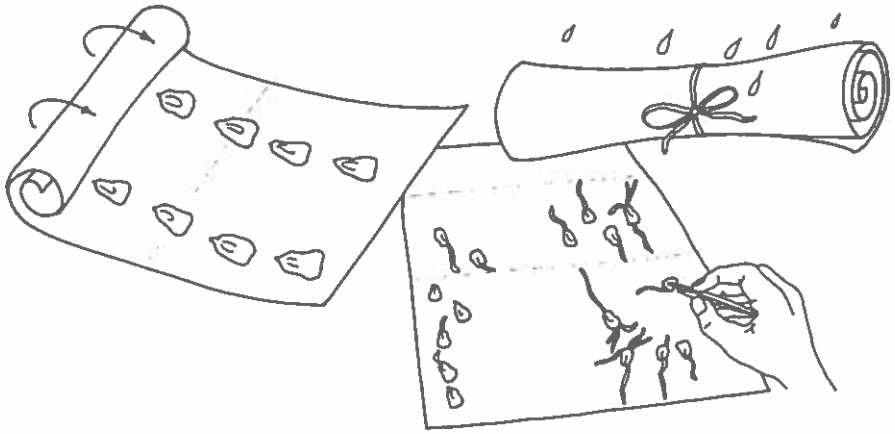
The flowers or *tassels* usually appear during the hottest part of the growing season in the central Corn Belt — mid-July to early August. Once the tassel is fully spread, it sheds pollen for 5 to 8 days.

The mature corn plant

Exercise 1 Test Corn Germination

Follow these steps:

1. The corn plant's life begins when the seed *germinates* (starts to grow). Examine a corn kernel. Break it open carefully and look at the small embryo plant inside waiting to develop when the seed is placed in warm, damp surroundings.
2. Place two paper towels together and sprinkle water on them lightly. The towels should be damp but not soaking wet.
3. Get a sample of seeds to test. What color are the seeds? Have the seeds been stained with a colored material to show that they have been treated with a fungicide?
4. Put 25 kernels on the moist towels. Do not let the seeds touch each other.
5. Moisten two more towels and place them on top of the seeds.
6. Roll the towels and seeds loosely and put a rubber band around each end of the roll. Place the roll on end in a small container.
7. Sprinkle the towels each day with enough water to keep the roll damp.
8. Store the roll in a warm place for five days. Then, unroll the towels and count the number of seeds that have germinated. Germinated seeds will have roots that are at least one inch long. _____
9. Throw away the seeds that have germinated and roll the remaining seeds in the paper towels again. Keep the roll moist at all times and store it in a warm place for seven more days.



10. Unroll the towels. How many seeds have germinated? _____

11. Add the number of seeds that germinated after the first five days to the number that germinated after another seven days.

    Total: _____
    Divide this total by 25. Then multiply the result by 100 to get the total percentage of seeds that germinated.

12. Here is an example:

    In step 8, 12 seeds germinated

    In step 10, 8 more seeds germinated

    Altogether, 20 seeds germinated

    Dividing 20 by 25, we get 0.80

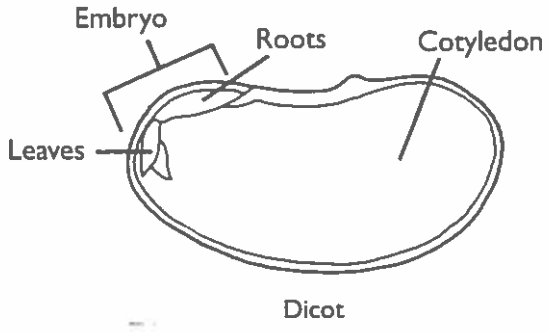
    Multiplying 0.80 by 100 gives a result of 80

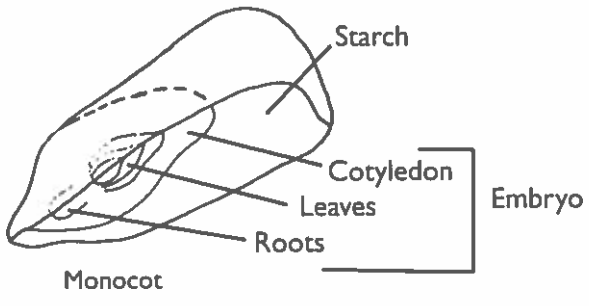
    Answer: 80 percent of the seeds in this example germinated.

Note: For corn seed to perform well in the field, at least 90 percent should germinate.

Exercise 2 Find Out What's Inside a Seed

1. Obtain three or four large seeds of beans, peas, or peanuts and three or four seeds of corn, wheat, or oats.
2. Soak the seeds overnight.
3. Remove the seed coats from the beans, peas, or peanuts and split the halves apart. These are examples of *dicotyledonous* seeds *(dicots,* for short, are plants that have two seed leaves).
4. Cut the corn, wheat, or oat seeds midway through the embryo as shown in the picture. These are examples of *monocotyledonous* seeds. A monocot is a plant with one seed leaf.
5. Note the seed coat, the undeveloped plant (root and leaves), and the stored food. Explain the function of each part.





Selecting a Variety

Just as there are different breeds of dogs, there are different varieties of corn. Each inbred variety (plants resulting from self-pollination) has certain genetic characteristics that make it different from all others.

Hybrid corn is produced by crossbreeding two or more inbred varieties. It has some characteristics of both parent plants. Farmers use hybrid corn to produce a crop that has the best qualities for their particular farms.

All seed corn looks pretty much alike, so you can't judge the performance of a hybrid corn variety by looking at the seed. You need to get information about how well the variety grows and produces on different kinds of land and with different growing methods. No single variety is best for every field on a farm. You must look for hybrids that fit your special needs.

Maturity Rating

The length of time that it takes for corn to grow from the day it is planted until the ears have filled out is called its *maturity time.* Different varieties of corn take different lengths of time to mature. Selecting a variety with the right maturity for your fields is important. Hybrids that mature later usually out-yield earlier hybrids because they make use of more of the growing season. If the hybrid you plant matures too late, you may lose part of the yield if there is an early frost, or you may have to harvest the corn before it has had a chance to dry. You will then be faced with the problem and expense of handling wet corn.

For corn to produce properly filled ears, it is important that the silks receive pollen at the proper time. Pollination occurs when the tassels have formed and release their pollen. If that should happen during bad weather, the pollen from the tassels may never reach the ears. To reduce the risk of that happening, you can plant several different varieties of corn with different maturity times. These varieties will produce pollen at different times, so that if one fails to pollinate because of bad weather, the other varieties can produce the needed pollen after the weather has improved.

Each seed company has its own rating system. The companies' salespeople can help you choose the right varieties for your farm. Because seed companies do not all use the same method of rating their varieties, it is hard to compare the corn from different companies.

Yield

It is hard to predict the yield from factors such as the number of ears on a plant, the ear size, the number of kernel rows, the length of the ear, or the kernel size. Also, each growing season is different and the various varieties of corn will produce different yields when they are grown under different conditions. One variety might do better with more rainfall and lower temperatures, whereas another one might produce more in hotter, drier weather.

Standability

The ability of a corn plant to stand up on its own until harvest is very important. Plants that *lodge* (fall over) before harvest reduce the yield because the combine used to harvest the crop cannot pick up corn from stalks that have lodged. Plant breeders consider stalk strength a very important factor when they develop new hybrid varieties.

The three major causes of lodging are close plant spacings, diseases, and insect damage. To get the most yield from each acre of corn, the plants are usually grown close together. Modern hybrids must be able to stand well even when grown close together.

Diseases often cause lodging. A disease can weaken the plant so that it can fall over or be pushed over easily by wind. Plant breeders work to develop varieties that are resistant to diseases. Insects can also cause corn plants to lodge. The corn rootworm, found in many parts of Illinois, can seriously damage the plant's root system and cause lodging. The European corn borer feeds on the inside of the stalk, weakening the stalk enough that it may break.

Other Qualities to Look For

In selecting a corn variety, you will probably also want to consider its germination rate and vigor, which are measured by hot and cold germination tests. You may also want to think about how well the corn fits into your grain or livestock program, the reliability of the dealer from whom you will purchase the seed, and the guarantee that comes with the seed.

Exercise 3 Study the Information on a Seed Corn Tag and Bag

1. Find a seed corn bag with a tag attached and write down this information from the tag:

   Origin of seed (where it came from) _____

   Lot number _____

   Pure seed percentage _____

   Percentage of other crop seeds _____

   Percentage of inert matter _____

   Percentage of weed seeds _____

   Germination percentage _____

   Date of germination test _____

2. Look at what is printed on the seed corn bag itself and copy down this information:

   Net weight _____

   Number of kernels _____

   Size of kernels _____

   Maturity (in days or heat units) _____

   Seed treatment applied _____

   Precautions for using treated seed _____

   Is the seed genetically modified? _____ If so, how: _____

   _____

   _____

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Urbana-Champaign, Illinois MJ0101 Reprinted 2016

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