Unit D: Production of Field Crops

Lesson 1: Cereal Crops: Growing Wheat

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

1. Identify wheat and its uses.
2. Identify areas where wheat is grown.
3. Describe the different types of wheat.
4. Explain the cultural practices of wheat production.

Recommended Teaching Time: 2 hours

Recommended Resources: The following resources may be useful in teaching this lesson:

- A PowerPoint has also been developed with use of this lesson plan

List of Equipment, Tools, Supplies, and Facilities:

Writing surface
PowerPoint Projector
PowerPoint Slides
Transparency Masters
Examples of wheat plants, a variety of wheat heads, and wheat seeds
Variety of products made from wheat
Materials needed for LS: D1-1

Terms: The following terms are presented in this lesson (shown in bold italics and on PowerPoint Slide 2):

- Durum wheat
- Kernel hardness
- Semolina
- Shattering
- Spring wheat
- Winter wheat

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

Bring a bag of flour, pasta, and a loaf of bread to class. Ask the students what these items have in common. Each product contains wheat. Now show the students a wheat head (or a picture of one). Ask them if it looks tasty. Probably not. Prompt students to discuss the processing of wheat from field to the final product. Follow up the discussion with a preview of the objectives for this lesson.

Summary of Content and Teaching Strategies

Objective 1: Identify wheat and its uses.

(PowerPoint Slides 3 and 4)

I. Wheat is the most important cereal grain crop. The origins of modern wheat, according to genetics, are found in the Karacadag mountain region of southeastern Turkey, some 10,000 years ago. It is grown in all areas of Afghanistan and is considered the staple crop and national food. Wheat is predominantly used for human consumption. Wheat makes up 80 percent of Afghanistan's grain production.

(PowerPoint Slide 5)

A. The mature wheat plant is made up of the roots, stem, leaves, and head. The head contains the kernels and the beard. A kernel is a wheat seed. There are about 50 kernels in a head of wheat and 6804 to 7711 kernels in a kilogram.

(PowerPoint Slide 6)

There are three common kinds of wheat heads: common, which has a longer, bearded head; club, which has a short head and no beard; and the durum, which is bearded and has hard kernels.

(PowerPoint Slide 7)

The parts of the wheat kernel are the husk, endosperm, bran, and germ.

(PowerPoint Slide 8)

B. Wheat is primarily grown for human consumption. The vast majority of wheat grown is made into flour.

(PowerPoint Slide 9)

This flour can then be processed into bread, crackers, pasta, pastries, and cakes. Wheat can also be processed into ready-to-eat foods, alcohol, and dextrose.

(PowerPoint Slide 10)

D. Wheat can also be used as a source of green forage. However once the grain is harvested the remaining straw can also be used as fodder. In other countries straw is used as bedding for livestock.

****Examples of wheat plants, a variety of wheat heads, and wheat seeds would be beneficial for this lesson if they are available. Use PowerPoint Slide 11 or TM: D1-1 to review the parts of a wheat plant, TM: D1-2 to review the kinds of wheat heads, and TM: D1-3 to review the parts of a wheat kernel.**

Objective 2: Identify areas where wheat is grown.

(PowerPoint Slides 12 and 13)

II. Winter wheat is typically grown in the coldest zones, although some Spring wheat is also grown in these zones. There are two main classes of wheat, spring and winter. These classes are based on time of planting; this also determines where they can be grown.

(PowerPoint Slide 14)

A. ***Spring wheat*** is planted in the spring, grows during the summer, and matures in early fall. ***Winter wheat*** is planted in the fall, establishes itself over the winter, and grows rapidly in the spring.

B. Reportedly, 90% of wheat in Afghanistan is winter wheat and 10% is spring wheat

****If available, bring in a variety of wheat seed samples. Review these samples with your students, differentiating between the winter and spring varieties. Ask the students what type of wheat they plant. Have them talk about their experiences.**

Objective 3: Describe the different types of wheat.

(PowerPoint Slide 15 and 16)

III. Wheat can be classified according to time of planting, color, and kernel hardness. Time of planting, or season classifications include spring wheat and winter wheat.

(PowerPoint Slide 17)

Classification by color includes red-kernel wheat and white-kernel wheat. Wheat is also classified as soft-kernel or hard-kernel. Kernel hardness, color, and season can be crossed to develop a wide range of wheat types.

(PowerPoint Slide 18)

A. The color of the seed coat determines classification as red or white.

B. ***Kernel hardness*** is the method used to determine wheat type based on the hardness of the endosperm. Wheat is classified as either soft or hard.

(PowerPoint Slide 19)

C. Soft wheat is commonly used in cakes and cookies because it produces finer textured flour.

(PowerPoint Slide 20)

D. Hard wheat produces the coarse flour used in breads. ***Durum wheat*** is the hard wheat primarily used for making semolina. ***Semolina*** is the granular flour used to make a variety of pasta products.

****Use TM: D1-4 to review the classifications of wheat. PowerPoint Slide 21 can also be used to review this information.**

Objective 4: Explain the cultural practices of wheat production.

(PowerPoint Slide 22 and 23)

V. Cultural practices are the procedures used in producing a crop. Cultural practices for red/white, soft/hard, and spring/winter wheat are similar but vary with the climate of the area.

(PowerPoint Slide 24)

A. A variety is a plant cultivar that is cultivated and retains its features when reproduced. When planting wheat, the variety selection should be based on climate adaptation, yield, disease resistance, pest resistance, plant height, and winter hardiness.

(PowerPoint Slide 25)

B. Successful wheat production is a direct result of proper planting. There are three important factors related to planting: planting date, seedbed preparation, and seeding rate and depth.

(PowerPoint Slide 26)

C. Planting dates are determined by the wheat's season, winter or spring.

(PowerPoint Slide 27)

D. Wheat should be planted in a prepared seedbed. A seedbed can be prepared by turning over the soil and finely raking it. In some parts of the world plowing with a chisel or moldboard plow followed by a disk harrow or do-all is used to cover larger scale operations. Both methods reduce soil clods and prepare a fine seedbed. Turning over the soil before planting also helps reduce weed growth.

(PowerPoint Slide 28)

E. Wheat should be planted in moist soil and should be scatter evenly before raking over them. When dealing on a larger scale, drills also provide a uniform plant population.

(PowerPoint Slide 29)

Drills are about 15.24 centimeters apart and can plant from 9.1 to 45.4 kilograms of seed for every 0.4 Hectares. One-half a kilogram of wheat seeds may include 12,000 to 20,000 seeds. (There is a picture of a modern drill on this slide that other parts of the world use.)

(PowerPoint Slide 30)

F. A healthy wheat plant requires a good fertilizer and proper pH level. Soil tests are used to determine pH and nutrient level. Wheat grows best in slightly acidic soils. Nutrient application timing is as important as the

nutrients applied. Nitrogen should be applied before planting and prior to grain development.

(PowerPoint Slide 31)

G. Wheat plants are subject to a number of pests. Common wheat diseases include snow mold, root rot, rust, powdery mildew, and scab. Common wheat pests include the "Sunn pest" (Eurygaster integriceps), Locust pests, and Russian wheat aphids. Cultural practices, proper seeding, and pesticides can be used to manage pests in wheat plants.

(PowerPoint Slide 32)

H. Wheat should be harvested after the heads of the wheat are mature. Wheat should be harvested before shattering. ***Shattering*** is the point at which mature kernels fall from the wheat head. Wheat should be harvested at 12.5 percent moisture; wheat harvested at higher moisture levels can be artificially dried.

(PowerPoint Slide 33)

You could follow the ancient test and bite down on a grain to see if it's ready to harvest. If it's hard, it's ready. If it's squishy, it's not.

(PowerPoint Slide 34)

1. Use a sickle or scythe to harvest the wheat, leaving at least two or three inches of stubble. Bundle the wheat into large stacks or shocks, and tie each stack with a length of heavy string. Stack the bundles upright in an area where they are protected from moisture. Allow the wheat to cure thoroughly before attempting to thresh and winnow, (to separate the grain or seeds) Traditionally thresh and winnow is done by throwing the wheat up into a breeze. The heavy grain would fall back to the floor, while the wind blew the chaff and dirt away.

(PowerPoint Slide 35)

This slide is shows shocks of wheat drying in the field.

(PowerPoint Slide 36)

2. On large scale operations, wheat is harvested using large combines that cut the stalks and separate the kernels. A picture has been provided on this slide.

****Showing pictures of wheat insects and diseases would be useful in identifying wheat pests from your area. Ask the students if they have had any pest problems dealing with their wheat crop. Ask students how they plant and harvest their wheat.**

****Have students complete LS: D1-1, you will need to provide a wheat head for each group. There will also need to be scales available for access.**

Review/Summary: Summarize the lesson by asking students to explain the content of each objective. Reinforce the key terms and concepts.

Application: Students will be able to apply what they learned about wheat and be able to teach others as well as be able to grow wheat.

Evaluation: Student comprehension of these objectives can be measured with the attached sample test.

Answers to Sample Test:

Part One: Matching

1 = d, 2 = b, 3 = c, 4 = a

Part Two: Completion

1. roots, stem, leaves, head
2. Shattering
3. Common, club, durum

Part Three: Short Answer

1. Time of planting, color, kernel hardness.
2. Diseases: snow mold, root rot, rust, powdery mildew, and scab.
Insects: Sunn pest" (Eurygaster integriceps), Locust pests,and Russian wheat aphids.

Sample Test Name_____

Test

Unit D Lesson 1: Growing Wheat

Part One: Matching

Instructions. Match the term with the correct response. Write the letter of the term by the definition.

a. Spring wheat
b. Winter wheat
c. Durum wheat
d. Semolina

_____ 1. The granular flour used to make a variety of pasta products.
_____ 2. Wheat planted in the fall that establishes itself over the winter and grows rapidly in the spring.
_____ 3. The hard wheat primarily used for making semolina.
_____ 4. Wheat planted in the spring that grows during the summer and matures in early fall.

Part Two: Completion

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

1. The mature wheat plant is made up of the _____, _____, _____, and _____.
2. _____ is the point at which mature kernels fall from the wheat head.
3. The three common kinds of wheat heads are _____, _____, and _____.

Part Three: Short Answer

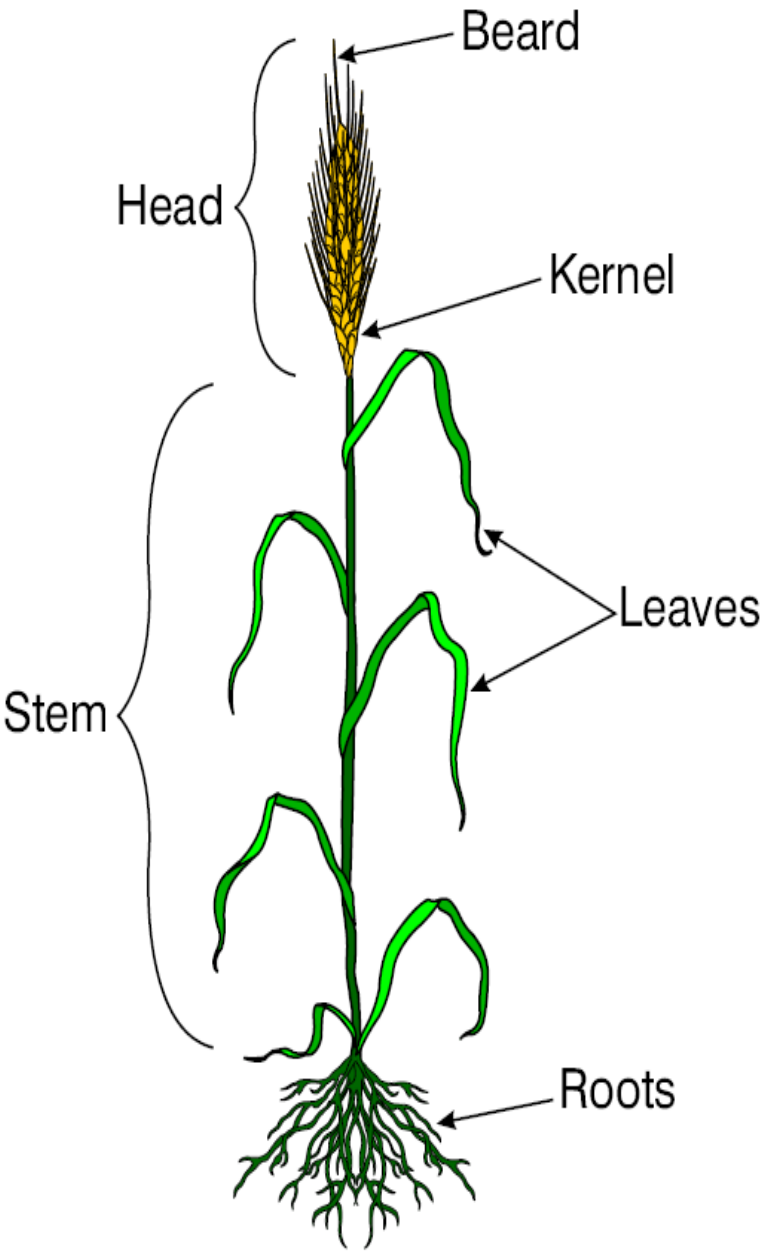
Instructions. Provide information to answer the following questions.

1. How can wheat be classified?

2. List two common wheat diseases and insect pests.

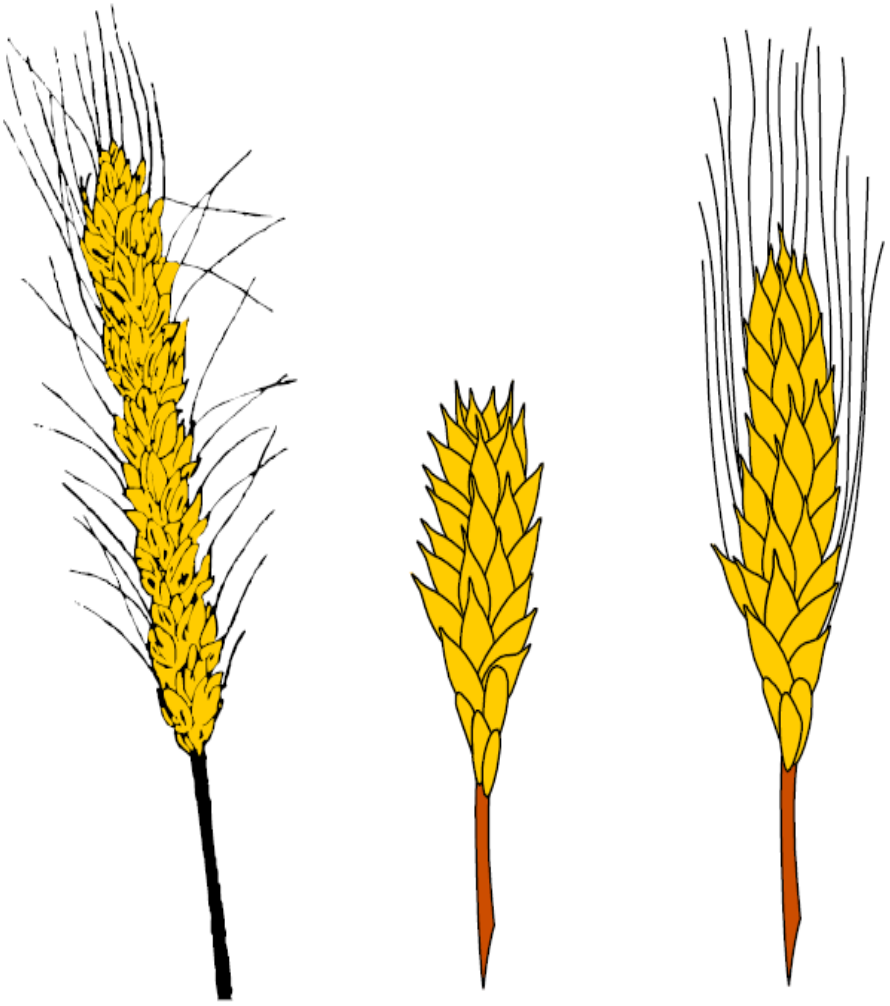
TM: D1-1

MATURE WHEAT PLANT



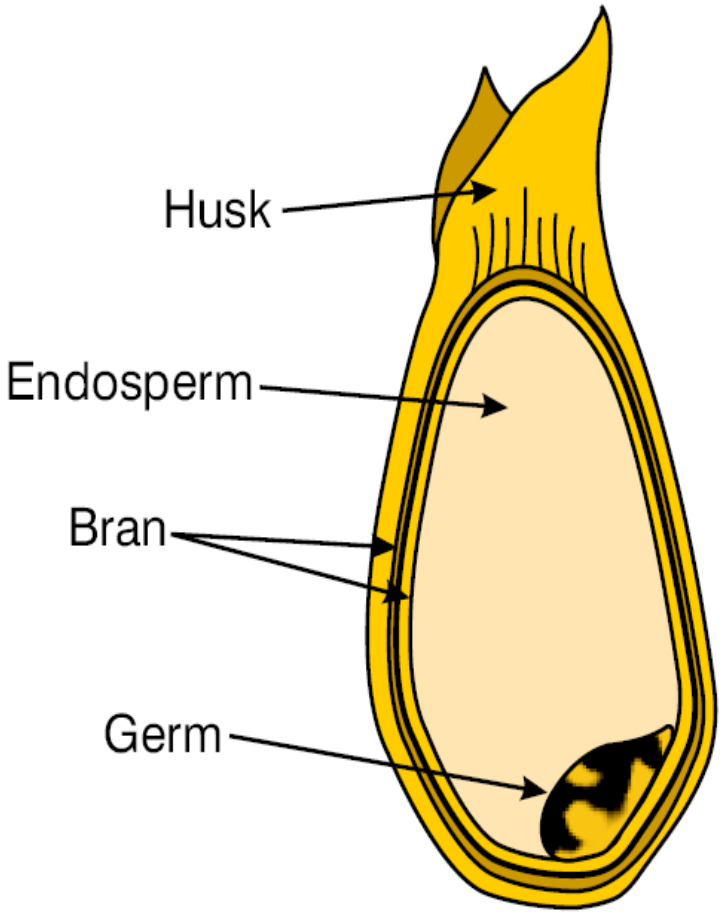
TM: D1-2

WHEAT HEADS



TM: D1-3

PARTS OF A WHEAT KERNEL



TM: D1-4

CLASSIFICATION OF WHEAT

Time of planting/season

- Spring
- Winter

Color

- Red
- White

Kernel hardness

- Soft
- Hard

LS: D1-1 Name_____

Lab Sheet

If you remember from your notes, a kernel is a wheat seed. In this lab you will need to find out how many kernels it takes to plant a half hectare of wheat.

The teacher will give your group a head of wheat. Each group will count the number of kernels of wheat found in their wheat head. Each group will report the number of kernels found to get an estimate of the number of kernels of wheat found in the average wheat head. Using a metric scale they will then weigh the wheat kernels taken from their wheat head and calculate the number of wheat kernels they will need to plant a half hectare of wheat.

Materials:

- Wheat heads
- Scale

Procedure:

1. Place students into groups of 2 or 3
2. Instruct the students to open a head of wheat.
3. Count the kernels.
4. Have each group report the number of wheat kernels found in the wheat head. (Total the numbers on a writing surface and calculate the average number of wheat seeds found in a head of wheat.
5. Weigh the wheat kernels from each head.
6. Then calculate how many kernels it would take to plant a half hectare of wheat. Show your work below.

_____ number of kernels = _____grams

Note: If we do not have heads of wheat available then consider that there are about 50 wheat kernels in a head of wheat and approximately 6804 to 7711 kernels of wheat in a kilogram. Using this information have students complete procedure 6.

Another exercise the students could complete would be to determine the number of wheat heads it would take to plant a half hectare of wheat.