

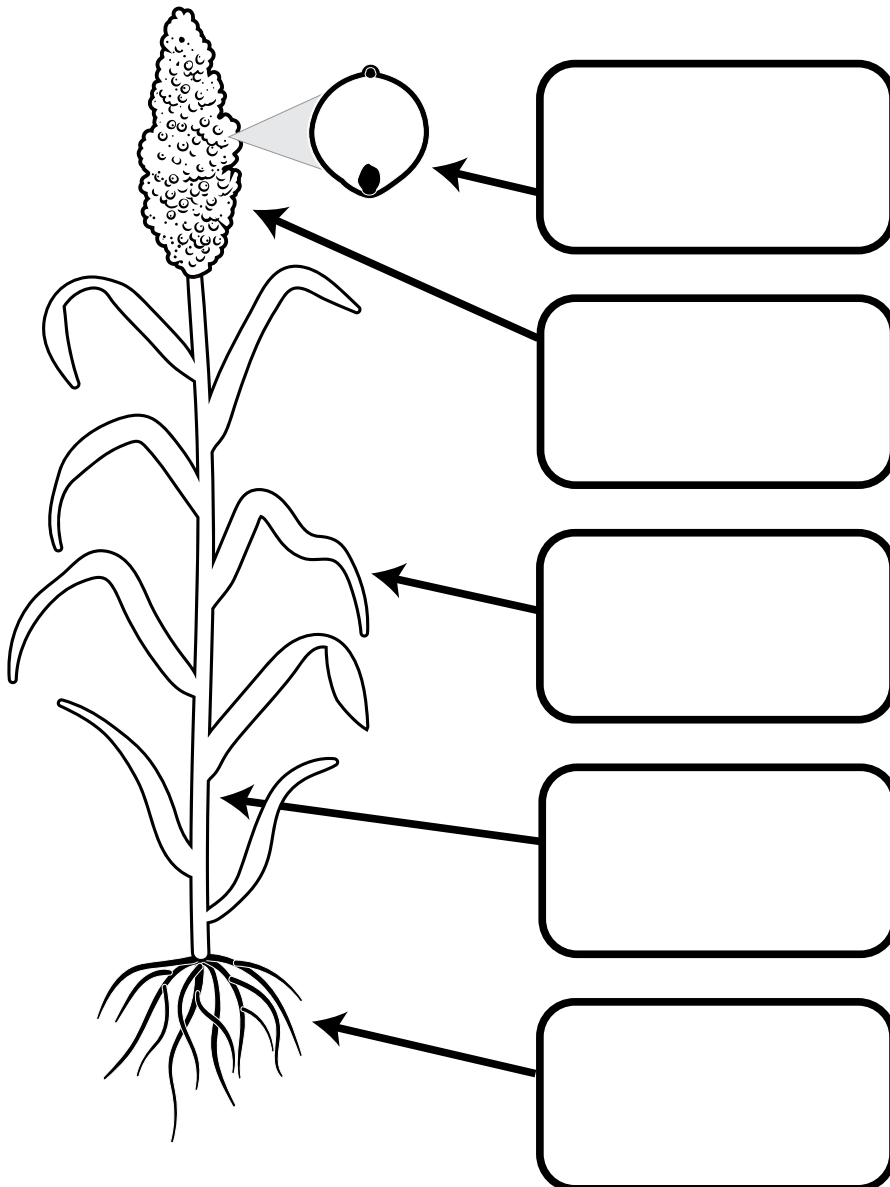


# Learning About **SORGHUM**

Name \_\_\_\_\_ Date \_\_\_\_\_

## 1. The growth of a sorghum plant

Use the Super Star Sorghum! poster to label the parts of the sorghum plant.



### **FUN FACT:**

At maturity, the panicle contains between 750 and 1,250 sorghum grains/seeds!

**SORGHUM**  
Nature's Super Grain



Working in small groups, use the Sorghum Growth and Development poster to answer the following questions using a separate sheet of paper:

- a) Describe the stage of growth pictured on the labeled diagram pictured on page 1.
  - b) The first six stages of growth of a sorghum plant are known as “vegetative.” What is the term for the next four stages of growth?
  - c) What does stage 0 refer to on this poster?
  - d) About how many days does it take for the plant to reach the boot stage?
  - e) How does the information listed beneath each plant stage help the farmers who grow sorghum?
- a) How can you tell when sorghum reaches stage 9 (maturity)?  
*Hint: Look closely at the sorghum grains that your teacher shared with the class.*



**Sorghum Growth and Development**

**Vegetative**

**Stage 0 - Emergence**  
 The first break through the soil surface, early plant growth is slow. The low cover and distribution, soil moisture, planting depth, and seed vigor.  
**Management**  
 Avoid planting later so emergence occurs in warm soil with good moisture conditions. Early planting delays emergence. Test seed before planting. Prepare or pre-emerge herbicide is critical. Scout for proper emergence.

**Stage 1 - Three-Leaf**  
 Three leaves are fully expanded with a visible collar leaf tissue at the junction of the leaf base and sheath. This stage occurs 10 to 20 days after emergence. Because the growing point is under the soil surface, much of the leaf area can be removed (e.g., leaf damage without killing the plant).  
**Management**  
 Scout for insects, diseases, weeds, and other production issues. Poor seed control can significantly reduce yields.

**Stage 2 - Five-Leaf**  
 Five leaves are fully expanded with a visible collar leaf tissue at the junction of the leaf base and sheath. This stage occurs 20 to 25 days after emergence. The growing point is now above the soil surface. Production issues are more apparent. Growth is more rapid. Scout for insects, diseases, weeds, and other production issues. Preventing weed competition from planting through this growth stage is critical.

**Stage 3 - Growing Point Differentiation**  
 Potential leaf number is set. 20 to 40 days after emergence. The growing point is above the soil surface and division into panicle branches is underway. Following growing point differentiation, rapid stem elongation and leaf development occur.  
**Management**  
 Scout for insects, diseases, weeds, and other production issues. Adequate nitrogen and water are critical to maximize growth.

**Stage 4 - Flag Leaf Visible**  
 The flag leaf, the "big leaf" is visible in the whorl. The head is developing. Rapid stem elongation and increase in soil grain occur. All except the flag leaf are fully expanded. Light interception is close to maximum, and growth and nutrient uptake continues at a rapid rate.  
**Management**  
 Adequate application of nutrients and water are key to provide maximum growth. While only about 20% of the total growth has occurred, the flag leaf is the greatest with the most open stomata, and the flag leaf is the most important to protect the leaf to ensure light interception throughout taken up by the plant.

**Stage 5 - Boot**  
 The head has developed to nearly full size and is enclosed in the flag leaf sheath. The growing point is now above the soil surface. Panicle branches are fully expanded. The flag leaf is fully expanded. Light interception is close to maximum, and growth and nutrient uptake continues at a rapid rate.  
**Management**  
 Adequate application of nutrients and water are key to provide maximum growth. While only about 20% of the total growth has occurred, the flag leaf is the greatest with the most open stomata, and the flag leaf is the most important to protect the leaf to ensure light interception throughout taken up by the plant.

**Reproductive**

**Stage 6 - Half Bloom**  
 Full exertion of the head occurs at this stage with 50% of the plants in a field flowering. Soil growth is 20% complete. Compared to final mature sorghum, and more than 50% for proso millet, 70% for proso millet.  
**Management**  
 Sorghum can no longer be controlled because of its reproductive growth. Sorghum can no longer be controlled because of its reproductive growth. Sorghum can no longer be controlled because of its reproductive growth.

**Stage 7 - Soft Dough**  
 Grain formation begins irreversibly after flowering and the grain fills rapidly. 20% dry weight. The stem loses weight due to senescence. Without a good balance between tiller (source) and grain (sink), the duration of grain filling can be shortened.  
**Management**  
 Sorghum at this stage can result in "shading" and poor head filling. Light and soil water are key to maximize grain production. Most leaves must green late green until the end of the season, or yield reducing leaf loss is unacceptable.

**Stage 8 - Hard Dough**  
 Grain reaches 70% of its final dry weight and nutrient uptake is almost complete. Lower leaves lose flexibility due to senescence of dry matter accumulation and duration, with longer duration usually resulting in greater yields.  
**Management**  
 A severe stress at this growth stage can still reduce grain weight, but not to the extent of the soft dough stage. Freese low rainfall and impact if the crop does not reach maturity before the event occurs.

**Stage 9 - Physiological Maturity**  
 Grains achieve maximum dry weight and are physiologically mature. Mature grains are identified by looking for the dark spot, the black layer on the embryo of the grain. Grain moisture ranges from 20% to 25%.  
**Management**  
 Harvest time depends on the environmental conditions. Drying can be achieved using desiccants without affecting yield when applied after maturity.

**Maturity Differences within the Head**  
 Because the sorghum panicle does not undergo growth stages evenly, in the top of the panicle. The lower grains are the last to mature.  
**Management**  
 When cutting in the bottom of the panicle, the upper grains have already been through that stage.

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 Based on information from: Sorghum Research, U.S. State Research and Extension Network, Richard, Loomis and Associates

**K-STATE**  
 Research and Extension

**SORGHUM**  
 Nature's Super Grain

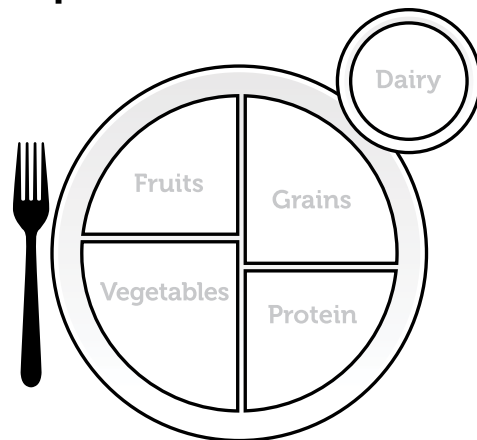
**SORGHUM CHECKOFF**



Use the word bank and the Super Star Sorghum! poster to help you with the remaining sections and puzzle.

## 2. Sorghum Nutrition

- a) Where does sorghum belong on the MyPlate food guide?
- b) **TRUE** or **FALSE** - Whole grain sorghum and whole grain sorghum flour contribute many nutrients that are important for good health.
- c) Use the Super Star Sorghum! Poster to list at least three important nutrients that sorghum provides?



- 1. \_\_\_\_\_
- 2. \_\_\_\_\_
- 3. \_\_\_\_\_

### WORD BANK:

Archaeology  
Environment  
Gluten-free  
Habitat  
Nutrition  
Sorghum  
Water  
Whole grain

- d) Sorghum is \_\_\_\_\_-free, which means it is a safe food for people with celiac disease.
- e) Sorghum can be enjoyed many ways, including in cooked dishes, breakfast bowls, and even popped as a snack! Can you plan a meal or snack menu that includes sorghum? Try to include as many MyPlate groups as you can in your menu.

**Write or draw your suggested menu inside the box for breakfast, lunch, dinner or snack.**

f) Set a goal for how you will try sorghum, either at home or at school:

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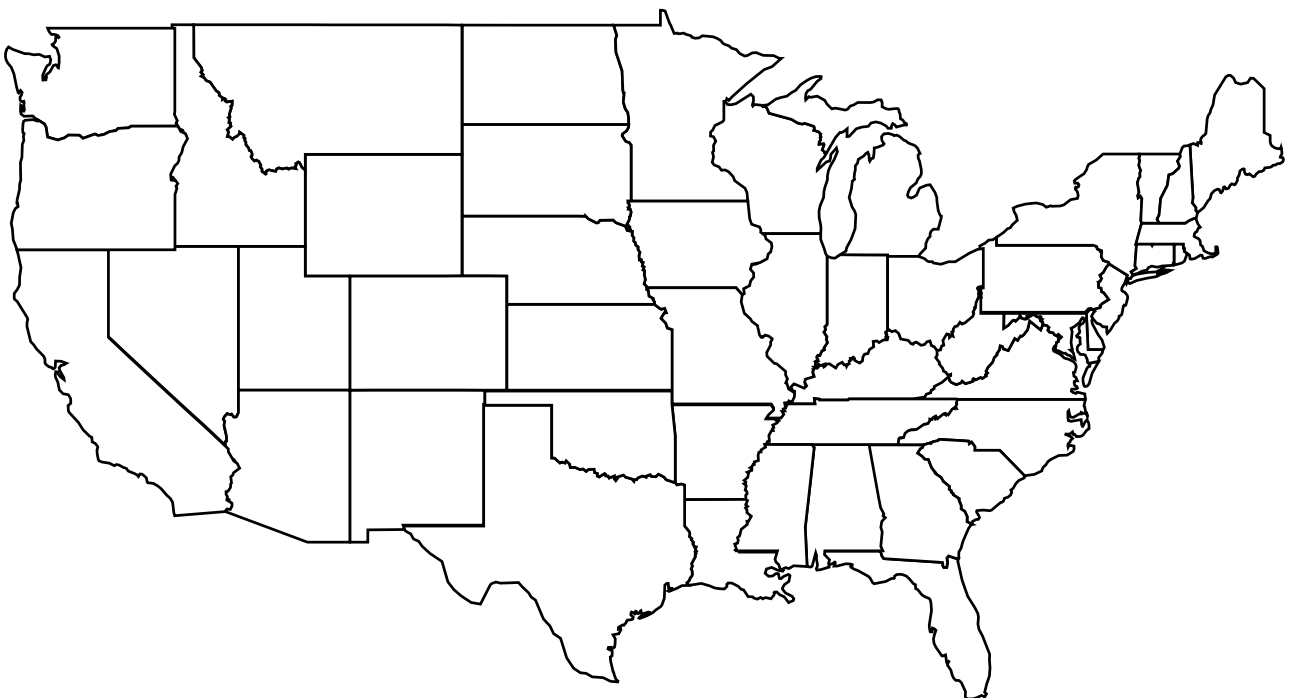
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### 3. Sorghum and the Environment

- a) Sorghum is considered drought tolerant, which means it uses less \_\_\_\_\_ than other crops.
- b) **TRUE** or **FALSE**: Sorghum helps to improve the soil, adding back nutrients that are important for growing plants.
- c) Sorghum provides a \_\_\_\_\_ for deer, quail, pheasants and many other birds. The leaves and stalks left after harvest also provide protection from heat and cold.

### 4. Sorghum around the world

- a) Using a classroom world map, locate the areas where sorghum is most widely eaten today. (China, India, Nigeria, Sudan and Ethiopia)
- b) \_\_\_\_\_ is the study of human history that looks at artifacts and other physical remains. A dig near the Egyptian-Sudanese border known as the ancient Nabta Playa astronomical site found that sorghum was used 8,000 years ago! Can you find Nabta Playa on the world map?
- c) The United States is the world's leading producer of \_\_\_\_\_. On the map below, label and color the 6 states that produce the most sorghum. (Colorado, Kansas, Nebraska, Oklahoma, South Dakota and Texas)



# 5. Scrambled Sorghum

1. Unscramble each word from the word bank.
2. Use the marked letters to solve the second puzzle.
3. BONUS: On a separate sheet of paper, use at least five words from the word bank to write a paragraph or story that shows what you have learned about sorghum.

**AOECYORAHLG**

46			10							16

**HORUMSG**

1	19	23	22	15	6	7

**TEMNEVNIORN**

	41		8			37				47

**AATBIH**

5	9		25	29	12	38

**RWETA**

17	24	43	21	3

**OIRNNTUIT**

	45		30	14	42	33	

**NGUFLEREET**

4	13	40	27	44	26	32	39	11	

**NOEWIRGLAH**

34	18	2	20	48	31	28	36	35	

1	2	3	4	5	6	7

8	1

9

10	11	12	13	14	15	16	

17	18	19	20	21

22	23	24	25	26

27	15	28	29

30	1

31	32	33	34	35

36	37

38	15	39

					<b>D</b>
40	41	42	43	44	

1	45	46	47	48	1

**WORD BANK:**  
 Archaeology  
 Environment  
 Gluten-free  
 Habitat  
 Nutrition  
 Sorghum  
 Water  
 Whole grain

