

HARVEST OF THE MONTH - JULY / WHEAT/GRAINS

Grades 9-12

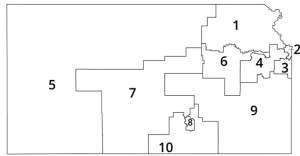


Kansas leads the world in the success of each student.

JULY 17, 2025



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SUCCESS DEFINED

A successful Kansas high school graduate has the

- Academic preparation,
- Cognitive preparation,
- Technical skills,
- Employability skills and
- Civic engagement

to be successful in postsecondary education, in the attainment of an industry recognized certification or in the workforce, without the need for remediation.

OUTCOMES

- Social-emotional growth
- Kindergarten readiness
- Individual Plan of Study
- Civic engagement
- Academically prepared for postsecondary
- High school graduation
- Postsecondary success



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MISSION

To prepare Kansas students for lifelong success through rigorous, quality academic instruction, career training and character development according to each student's gifts and talents.

VISION

Kansans leads the world in the success of each student.

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July 1, 2025

HARVEST OF THE MONTH

July / Wheat/Grains

INTRODUCTION

Over the next few weeks, we will be learning about a kind of food that we grow in Kansas. I'm going to give you some clues to see if you can guess what this food is.

- This food is a member of the grass family.
- it produces a dry one-seeded fruit called a kernel.
- They are high in fiber
- We usually grind them up to make flour.
- Show picture.

Can you guess what food I'm talking about? We will be learning about wheat and grains!



VOCABULARY

Antioxidant - A substance such as vitamin C or E that removes potentially damaging oxidizing agents in a living organism

Autoimmune disease - A condition where the body's immune system, which normally protects against foreign invaders like bacteria and viruses, mistakenly attacks its own healthy tissues and organs

Chlorophyll - A green pigment responsible for the absorption of light to provide energy for photosynthesis

Endosperm - The part of a seed which acts as a food store for the developing plant embryo

Enzymes - A substance produced by a living organism that starts or speeds up a about a specific biochemical reaction

Essential amino acids - Amino acids that the human body cannot synthesize (produce) in sufficient quantities to meet its physiological needs

Germination - The process where a seed starts to grow and develop into a plant

Perennialization - Returning year after year

Starch - A complex carbohydrate made up of many glucose molecules linked together

Storage proteins - A protein that accumulates and stores reserves of amino acids or metal ions within an organism, found in plant seeds

GENERAL RESOURCES

ENGAGE

Begin by having students analyze the texts and images below. This introduction could include the use of notice/wonder routines, jigsaw or rotation through stations. Once students have had sufficient time to generate their analyses, the teacher should engage students in discussion. Suggested discussion questions include:

- What nutritional benefits are provided by wheatgrass?
- What nutritional benefits are provided by wheat grains (flour)?
- What similarities and differences did you notice between wheatgrass and wheat grain?
- What potential harms occur when people with celiac disease consume gluten?
- Explain why wheatgrass labels often contain the phrase "gluten-free".
- Lesson Driving Question: How can we introduce the dietary benefits of wheat to people with celiac disease

Artifact 1: Wheatgrass Nutrition Facts

Supplement Facts

Serving Size 8g (About 1 Scoop)
 Servings Per Container Varies

	Amount per serving	% Daily Value
Calories	30	
Total Carbohydrate	4 g	1%**
Dietary Fiber	2 g	7%**
Total Sugars	0 g	†
Includes 0g Added Sugars		0%**
Protein	2 g	
Vitamin A	80 mcg	9%
Vitamin C	4 mg	4%
Vitamin K	80 mcg	67%
Calcium	30 mg	2%
Iron	1.3 mg	7%
Sodium	5 mg	< 1%
Potassium	240 mg	5%

**Percent Daily Values are based on a 2,000 calorie diet.
 †Daily Value not established.

INGREDIENTS: Organic Whole Leaf Wheat Grass Powder



Artifact 2: Unenriched Wheat Flour Nutrition Facts

Recipe 1236855

Nutrition Facts

About 76 servings per container
Serving size 1/4 cup (30g)

Amount Per Serving

Calories 110

% Daily Value*

Total Fat 0g	0%
Saturated Fat 0g	0%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 0mg	0%
Total Carbohydrate 23g	8%
Dietary Fiber <1g	3%
Total Sugars 0g	
Includes 0g Added Sugars	0%
Protein 3g	
Vitamin D 0mcg	0%
Calcium 0mg	0%
Iron 0.4mg	2%
Potassium 30mg	0%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

INGREDIENTS: UNENRICHED FLOUR
 (WHEAT FLOUR, MALTED BARLEY FLOUR)

COUNTRY LIFE NATURAL FOODS
 PO BOX 489
 PULLMAN, MI 49450



Artifact 3: Nutritional Composition of Wheatgrass (excerpt from “Wheatgrass (*Triticum aestivum*): a miraculous microgreen: an overview)

In addition to minerals including iron, calcium, magnesium, copper, zinc, and sodium, wheatgrass provides a rich source of vitamins A, C and E. The B-complex vitamins, including thiamine, riboflavin, niacin, and folic acid, are also abundant in it. Necessary amino acids, which are the building blocks of proteins, are present in wheatgrass. These amino acids are essential for the development and maintenance of bodily tissues. Several antioxidant compounds, including flavonoids, phenolic acids, chlorophyll and alkaloids are found in wheatgrass. These bioactive substances aid in defending the body against the oxidative damage caused by free radicals, which can result in chronic illnesses. Chlorophyll, a plant-based green pigment, is abundant in wheatgrass. Strong antioxidant properties of chlorophyll have been demonstrated to have an impact on cancer prevention, control of oxidative stress, enzyme activity, gene transcription, scavenge free radicals, chelate metals, and aid in the absorption of iron and other minerals and trace elements has also been demonstrated. Wheatgrass contains a number of enzymes that help with digestion and nutritional absorption, including oxidase, transhydrogenase, protease, amylase, and lipase. Wheatgrass’s alkalizing properties aid to maintain a healthy pH level and lessen acidity in the body.

Artifact 4: Wheat in Nutrition and Health

Wheat is widely consumed by humans, in the countries of primary production (which number over 100 in the FAO production statistics for 2004) and in other countries where wheat cannot be grown. For example, imported wheat is used to meet consumer demands for bread and other food products in the humid tropics, particularly those with a culinary tradition dating back to colonial occupation. Statistics are not available for the total volume of wheat which is consumed directly by humans as opposed to feeding livestock, although figures for the UK indicate about one-third of the total production (approximately 5.7 m tonnes per annum are milled with home production being 15–16 m tonnes). Globally there is no doubt that the number of people who rely on wheat for a substantial part of their diet amounts to several billions.

The high content of starch, about 60–70% of the whole grain and 65–75% of white flour, means that wheat is often considered to be little more than a source of calories, and this is certainly true for animal feed production, with high-yielding, low-protein feed varieties being supplemented by other protein-rich crops (notably soybeans and oilseed residues). However, despite its relatively low protein content (usually 8–15%) wheat still provides as much protein for human and livestock nutrition as the total soybean crop, estimated at about 60 m tonnes per annum (calculated by Shewry, 2000). Therefore, the nutritional importance of wheat proteins should not be underestimated, particularly in less developed countries where bread, noodles and other products (eg bulgar, couscous) may provide a substantial proportion of the diet.

Artifact 5: Excerpt from “What do we really understand about wheat gluten structure and functionality?”¹

Gluten proteins are the major group of storage proteins which are deposited in the cells of the starchy endosperm during grain development. They are mobilised (hydrolysed) during germination and their biological role is to support the growth and development of the seedling. This role clearly imposes some constraints on their structures, to ensure that they are efficiently deposited, stored and mobilised. However, their structures may be less constrained than those of structural and metabolic proteins such as enzymes and transporters.

1 <https://www.sciencedirect.com/science/article/pii/S0733521024000535#:~:text=Gluten%20proteins%20are%20the%20major,and%20development%20of%20the%20seedling.>

Artifact 6: Excerpt from Celiac Disease²

Celiac disease is an autoimmune disorder triggered by an immune-mediated response of the small intestine to dietary gluten, which is a protein found in wheat, barley, and rye. Although traditionally viewed as a gastrointestinal condition primarily associated with malabsorption, it is now more accurately classified as an autoimmune disorder with systemic manifestations. Celiac disease occurs in genetically predisposed individuals and results in a lifelong condition characterized by immune-mediated damage to the lining of the small intestine due to the immune response to gluten. This damage is evidenced by villous atrophy, crypt hyperplasia, and infiltration of the lamina propria by immune cells, which in turn leads to malabsorption of essential nutrients, including micronutrients, fat-soluble vitamins, iron, vitamin B12, and folate. Typical gastrointestinal symptoms include diarrhea, abdominal discomfort, bloating, and constipation. However, celiac disease can also present with extraintestinal manifestations such as fatigue, weight loss, skin rashes, anemia, and osteoporosis. Growth failure is a frequent additional symptom in children with celiac disease.

EXPLORE

Students will design and carry out an investigation on environmental factors that influence germination of wheat grains to produce wheatgrass for consumption. Consider using the Planning an Investigation Tool³ from “The Wonder of Science⁴”. Use this rubric⁵ for assessing student work.

The graphic below (from “Wheatgrass: miraculous microgreen⁶”) illustrates the general protocol for sprouting wheat seeds. Wheatgrass is normally cultivated indoors on trays for medicinal purposes, though it can be grown outdoors. For indoor cultivation of wheatgrass, good quality of wheat seeds are procured and cleaned properly, after that wheat grains are soaked in cold water for 12 h, after the water has been strained, they are tied in wet woven cotton cloth and hung for the next 12 h. Water is sprinkled over the cotton cloth at least 3 times during the germination period. Wheat sprouts contain 4 times as much folic acid and 6 times as much vitamin C than unsprouted wheat. Sprouted wheat is sown in a shaded area, although wheat can grow in any environment, it is best to plant it in a shady place to avoid excessive nutrient loss from exposure to direct sunlight. According to the literature, when the seeds are sowed, the grass develops slowly for the first 7 days before growing quickly during the next twelve to 15 days, reaching a length of 18–22 cm and being ready for harvest. Studies indicate that wheatgrass has peak nutritional value at 12-15 days.



2 <https://pubmed.ncbi.nlm.nih.gov/28722929/>

3 <https://drive.google.com/file/d/1wYMg5ru3-9ZXGBc443aWCTjH67ywjwlv/view>

4 <https://thewonderofscience.com/graphics>

5 https://docs.google.com/document/d/13nbe3cCVMXnU76rNYhv71xVHyAK1am8j8i7_HthnBkk/template/preview

6 <https://www.sciencedirect.com/science/article/pii/S2772566924000375>

GRADES 9-12**Teacher preparation:**

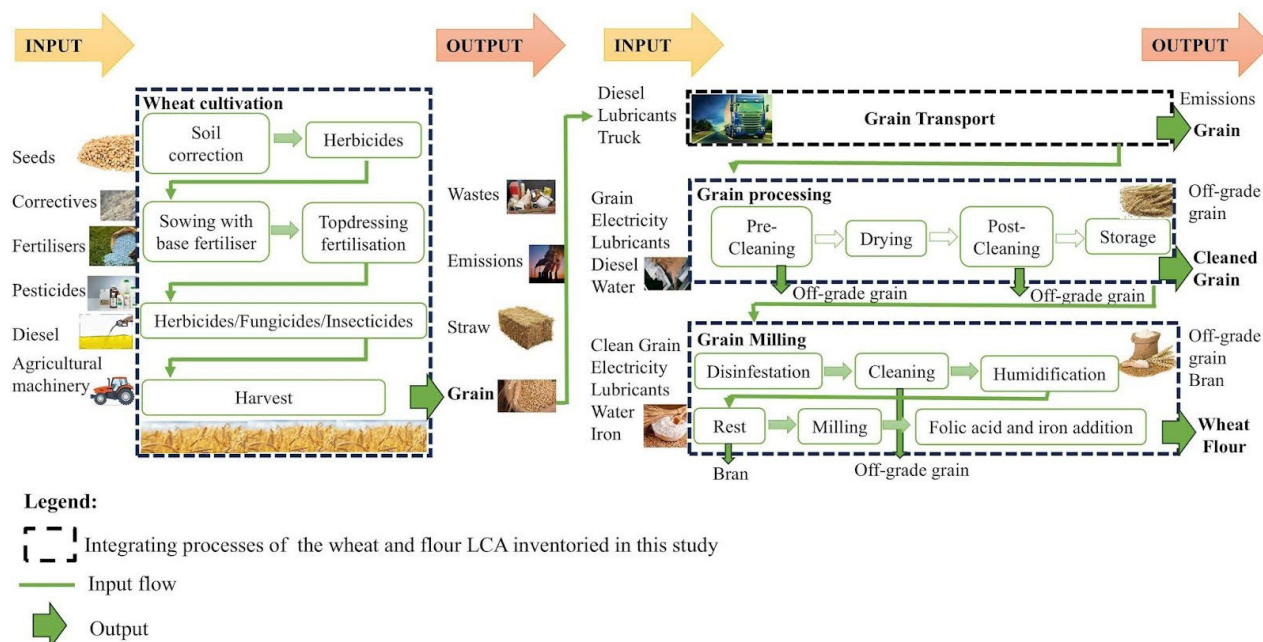
Student teams will need a set of wheatgrass sprouting seeds (can be purchased for about \$13.00/pound), access to de-chlorinated water, paper toweling or cheesecloth, plastic wrap and/or baggies; plastic trays

Once student investigations are complete, they will analyze and share their findings using the Analyzing and Interpreting Data⁷ tool from “The Wonder of Science⁸”. Use this rubric⁹ to analyze student work.

They may then use their wheatgrass as an ingredient for wheatgrass shots or smoothie add-ins.

ELABORATE

The graphic below illustrates the environmental inputs and outputs associated with wheat production. (Image from “How can the environmental impacts of wheat cultivation and wheat flour production be reduced? A life cycle assessment of Brazilian wheat¹⁰”). Show students this graphic and ask them to identify inputs and outputs that might cause environmental harm.



The Land Institute¹¹ is a science-based research organization in Salina, KS. They focus on developing alternatives to destructive agricultural practices. One of their most recent projects is the development of perennial grains.

Have students explore the work of perennial grain development¹².

After students have researched the development of perennial grains, they should complete the Engaging in Argument from Evidence¹³ graphic organizer. Consider suggesting an investigative question such as “How could perennial wheat reduce the environmental impact of traditional wheat production?”

7 https://drive.google.com/file/d/1_JPpQ9VtWKbrFTAHTsIQABaQefuBNX/view

8 <https://thewonderofscience.com/graphics>

9 https://docs.google.com/document/d/11dpWkm1cHw20eqK5c4Lzlxq_LPzvjqANGZQylALDdaQ/template/preview

10 <https://www.sciencedirect.com/science/article/pii/S095965262404099X>

11 <https://landinstitute.org/about-us/>

12 <https://landinstitute.org/our-work/perennial-crops/>

13 https://drive.google.com/file/d/1vn_TCsdAm0dD7UmKKFHISyOP99P1qPyn/view

Other Sources:

- Wheatgrass Nutrition Facts image¹⁴
- Wheatgrass image¹⁵
- Unenriched Wheat Flour Nutrition Facts image¹⁶
- Hard Red Winter Wheat Grains image¹⁷

14 <https://amazinggrass.com/cdn/shop/products/WheatGrass-NutritionFacts.jpg?v=1647449396&width=480>

15 <https://upload.wikimedia.org/wikipedia/commons/6/67/Wheatgrass.jpg>

16 <https://countryslifefoods.com/cdn/shop/products/country-life-natural-foods-flour-organic-white-flour-w-germ-gold-n-white-34001437687992.jpg?v=1661212272>

17 <https://usflour.com/wp-content/uploads/2023/08/1.jpg>

KANSAS SCIENCE STANDARDS ADDRESSED

HS-LS2-7 Ecosystems: Interactions, Energy, and Dynamics

Students who demonstrate understanding can:

HS-LS2-7

Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.*

Clarification Statement:

Examples of human activities can include urbanization, building dams, and dissemination of invasive species.

The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education.

Science and Engineering Practices

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- Design, evaluate, and refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.

Disciplinary Core Ideas

LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- Moreover, anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species.

LS4.D: Biodiversity and Humans

- Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). (secondary)
- Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. (secondary) (Note: This Disciplinary Core Idea is also addressed by HS-LS4-6.)

ETS1.B: Developing Possible Solutions

- When evaluating solutions it is important to take into account a range of constraints including cost, safety, reliability and aesthetics and to consider social, cultural and environmental impacts. (secondary)

Crosscutting Concepts

Stability and Change

- Much of science deals with constructing explanations of how things change and how they remain stable.

SEP-3: Planning and Carrying Out Investigations

SEP-4: Analyzing and Interpreting Data

SEP-7: Engaging in Argument From Evidence

SEP-8: Obtaining, Evaluating, and Communicating Information

Companion Texts for this study:

Kansas Land Institute¹⁸ "Perennial Grain Crops: New Hardware for Agriculture"

Wheatgrass (*Triticum aestivum*): a miraculous microgreen: an overview¹⁹ article

Wheat ²⁰ article

What do we really understand about wheat gluten structure and functionality?²¹ article

Celiac Disease article²²

How can the environmental impacts of wheat cultivation and wheat flour production be reduced? A life cycle assessment of Brazilian wheat²³ article

18 <https://landinstitute.org/our-work/perennial-crops/>

19 <https://www.sciencedirect.com/science/article/pii/S2772566924000375>

20 https://watermark.silverchair.com/erp058.pdf?token=AQECAHi208BE49Oan9kKhW_

21 <https://www.sciencedirect.com/science/article/pii/S0733521024000535#:~:text=Gluten%20proteins%20are%20the%20major.and%20development%20of%20the%20seedling>

22 <https://pubmed.ncbi.nlm.nih.gov/28722929/>

23 <https://www.sciencedirect.com/science/article/pii/S095965262404099X>

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