

UNIT II - FOOD PROCESSING

Lesson 9: Products from Grain Crops

Objective

The student will be able to identify the products of grain crops.

I. Study Questions

- A. What primary grains are used for food products?
- B. What are the primary food products of grain crops?
- C. What by-products are produced from grain crops?
- D. What non-food products are produced from grain crops?

II. References

- A. Martin, Phillip R. *Food Science and Technology* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1994. Unit II.
- B. Activity Sheets
 1. AS 9.1: Soybean Processing
 2. AS 9.2: Corn Sweeteners

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TEACHING PROCEDURES

A. Review

Meat carcasses are individually inspected and graded before they can be processed and/or sold commercially. Grain, on the other hand, is graded in very large quantities, or batches, before processing.

B. Motivation

Bring several snack foods made from different grain crops. Have students identify which grain was used to make the food product. (e.g., crackers, cookies, breakfast cereals)

C. Assignment

D. Supervised study

D. Discussion

1. Discuss the primary grains used for food products.

What primary grains are used for food products?

- a. Cereal grains
 1. Wheat
 2. Corn
 3. Oats
 4. Barley
 5. Rice
 6. Rye
 7. Grain sorghum
 8. Buckwheat
- b. Oil-bearing grains
 1. Soybean
 2. Peanut
 3. Sunflower
 4. Cottonseed
 5. Canola (rapeseed)
- c. Dry legumes

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1. Dry peas
 2. Beans - navy, pinto, black, etc.
 3. Lentils
2. Discuss with students what primary food products come from grain crops. Have students complete AS 9.1.

What are the primary food products of grain crops?

- a. Cereal grains
 1. Wheat
 - a. Hard - Durum - pasta, breadmaking
 - b. Soft - cake and cookie flour
 2. Corn
 - a. Whole - popcorn
 - b. Milled - meal, flour, starch, oil, syrup (sweeteners)
 3. Oats - flour or rolled, bran
 4. Barley - malt, flour, whole
 5. Rice - most important human food
Flour, whole
 6. Rye - flour
 - b. Oil-bearing
 1. Soybean - 20 percent oil, 44-48 percent protein
Soy flour, soy milk, tofu (soy cheese), soy sauce, lecithin
 2. Sunflowers - whole (dried) or 50 percent oil
 3. Peanut - roasted whole, peanut butter
 4. Canola - (rapeseed) - oil
 - c. Dry legumes
Dried peas and beans - protein rich, low in oil
3. Discuss with students what by-products are produced from grain crops. These by-products are used in livestock feeds and pet food. Have students complete AS 9.2.

What by-products are produced from grain crops?

- a. Wheat bran
- b. Corn gluten
- c. Rice hulls
- d. Germ
- e. Distiller's grain
- f. Peanut hulls
- g. Midlings

4. Discuss with students what non-food products are produced from grain crops.

What non-food products are produced from grain crops?

- a. Corn - corn starch/biodegradable plastic, diapers, packing nuts, ethanol, paper production, encapsulated herbicides, etc.
- b. Soybean - soy diesel, soy ink, new stone, paints, magnetic media, leather softener, rust inhibitors, lubricants, paper coating, dust inhibitor, etc.
- c. Peanut - hulls used as "cinders" on slick roads, etc.

F. Other activities

Soak wheat or corn until soft and dissect the seeds to examine the bran, endosperm, and germ.

G. Conclusion

Grains that are processed into food are classified as cereal grains, oil-bearing grains, and dry legumes. A variety of food products ranging from pasta, flour, and bran to soy milk and peanut butter are derived from grains. As food grains are processed, a variety of by-products result that often become livestock feed. In addition to by-products, several non-food products are produced from these food grains.

H. Competency

Identify the products of grain crops.

Related Core Competencies and Key Skills: none

I. Answers to Evaluation

- 1. c
- 2. a
- 3. a
- 4. a
- 5. b
- 6. b
- 7. c
- 8. a
- 9. a
- 10. b
- 11. a
- 12. b

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13. d
14. a
15. protein, oil
16. Hard wheat - bread and pasta making, soft wheat - cake and cookie flour
17. Popcorn, rice, rolled oats, roasted soybeans, and others as appropriate
18. Wheat bran, corn gluten, rice hulls, germ, distiller's grain, and others as appropriate
19. Teacher's discretion

J. Answers to Activity Sheets

AS 9.1 - Instructor's discretion

AS 9.2 - Instructor's discretion

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EVALUATION

Match the grain on the left with its proper category on the right.

- | | |
|----------------------|----------------------|
| 1. _____ Pinto beans | a. Cereal grain |
| 2. _____ Wheat | b. Oil-bearing grain |
| 3. _____ Corn | c. Dry legume |
| 4. _____ Rye | |
| 5. _____ Peanuts | |
| 6. _____ Sunflowers | |
| 7. _____ Dried peas | |
| 8. _____ Rice | |
| 9. _____ Barley | |
| 10. _____ Soybeans | |
| 11. _____ Oats | |
| 12. _____ Canola | |

Circle the letter that corresponds to the best answer.

13. What grain is eaten more than any other?
- a. Soybeans
 - b. Corn
 - c. Barley
 - d. Rice

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14. Soybeans are _____ percent oil and _____ percent protein.
- a. 20, 44-48
 - b. 40, 8-12
 - c. 40, 16-20
 - d. 44-48, 20
15. Dried beans are high in _____ and low in _____.
- a. Starch, protein
 - b. Oil, protein
 - c. Protein, starch
 - d. Protein, oil
16. Explain the primary way hard wheat is used versus soft wheat.
17. Give two examples of whole grain products used for food.
18. List three examples of by-products from processing food grains.
19. Write a short essay on non-food products made from corn and soybeans. Include plastics, ink, ethanol, and soy diesel in your discussion.

Soybean Processing

Objective: Process the soybean into an edible food product.

Activity Length: Overnight soak, 1 hour dry time, 1 lab period

Materials and Equipment:

Soybeans, dry (must be cleaned)

Water

Quart oil for frying

Salt

Deep fat fryer

Paper towels

Procedure:

1. Clean soybean sample by removing all foreign material and washing thoroughly.
2. Soak soybeans in water overnight.
3. Drain beans thoroughly. The skins may be removed if desired. Place beans on absorbent paper and allow to air-dry about one hour. (Your instructor may have done this step for you.)
4. Place oil in a deep fat fryer or a heavy, deep saucepan. Heat oil to 350°F.

CAUTION: Oil is very hot. Be careful when working around the heated oil.

5. Put about 1 cup beans in a fryer basket. Lower basket slowly into the hot fat. Moisture in beans may cause excessive splattering if beans are lowered rapidly into the fat.
6. Fry beans about 6 to 8 minutes or until crisp and lightly browned.
7. Remove from oil.
8. Drain beans on absorbent paper.

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9. Sprinkle with salt.
10. When cool, sample. The remaining beans should be stored in a tightly covered container.

Credit: The Missouri Soybean Association and the Missouri Soybean Merchandising Council, P.O. Box 104778, Jefferson City, MO 65110-4778.

Corn Sweeteners

Objective: Identify corn sweeteners used in snack foods.

Background Information: Wet-milling of corn yields several corn sweeteners. Corn syrup, fructose, dextrose, and dextrin are the most common. As you investigate food products and the corn sweeteners used in them, you will gain a greater appreciation of how important grains are to American tastes and eating habits.

Procedure: Examine ten packages, bottles, or boxes of snack foods. List the product by brand name and the sweetener or sweeteners used.

	Product	Sweetener(s)
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____
5.	_____	_____
6.	_____	_____
7.	_____	_____
8.	_____	_____
9.	_____	_____
10.	_____	_____

