

# Whole Grain Lab

A Consumer Taste Test Comparing White and Red Whole Wheat Bread



## Lab Goals

1. To provide a resource to assist consumers in learning about whole wheat and whole grain breads.
2. To provide a hands-on experience that will assist consumers in adding whole wheat bread to the list of foods they enjoy.
3. To gain consumer response to white whole wheat bread as compared to traditional whole (red) wheat bread's taste and color-- the two major barriers consumers have to eating whole wheat bread.

## Introduction

Fewer than 8% of Americans eat enough whole grain foods. Whole wheat bread is one very convenient way to enjoy one or two servings daily. More than 40% of teens and kids never eat whole wheat bread. Of those who say they do, they do so only three or four times per week.

Whole wheat flour milled from Hard Red Winter wheat has been the standard for whole wheat bread for decades in the United States. U.S. wheat farmers are now producing "Hard White" wheat that is excellent for making bread. The whole wheat flour milled from Hard White wheat is less bitter and lighter in color than whole wheat flour made from Hard Red Winter wheat — two of the major reasons why people may not eat whole wheat bread.

## Objectives

Students will:

- Identify and define "whole grain" and "whole wheat" flour and bread.
- Learn the number of servings of grain foods recommended daily for their age group and how many of the servings should be whole grain foods.
- Be familiar with three reasons whole grain foods are important to health.
- Recognize the top reasons why Americans should eat more whole wheat bread.
- Distinguish between whole wheat flours made from Hard Red Winter and Hard White wheats.
- Organize student consumer test for white whole wheat bread.
- Employ baking equipment and methods used at home, in retail or food service baking.
- Demonstrate the ability to produce whole wheat bread for a test market.
- Analyze the results of the white whole wheat bread consumer test.

## Lesson Supplies

- Whole wheat flours — made from both Hard Red Winter and Hard White wheat. (Whole wheat flour at the supermarket is made from Hard Red Winter wheat unless it states otherwise.) Whole wheat pastry flour may be available and is made from soft white wheat. Pastry flour will not perform well in yeast breads.
- Bread packages (labels) — for white bread, wheat bread, whole grain bread and whole wheat bread.
- Equipment — instant read thermometers, dry and liquid measuring tools, 9x5" bread pans, and bread machine(s) that will produce whole wheat bread OR 4 or 5-qt. mixer(s) with dough hook(s).
- Ingredients — (Need those listed with chosen recipe.)
- Uniform bread samples — made from the same recipe and method to maintain product consistency.
- Consumer test group — examples include an athletic team, school band or another class at school.
- Plastic gloves and napkins — used to distribute samples to consumer test group.
- Approved site(s) and time — for product sampling (example: school cafeteria).
- Forms and pencils for test group to record responses.

## Tech Assignment

### Find and Write:

1. Define "whole grain." Visit [www.flour.com](http://www.flour.com) (Reference section, Wheat Berry Anatomy) and list the three whole wheat parts and their percentages.
2. Write the whole grain health claim as it may appear on the food label. What food may use it?
3. How many servings of whole grain foods should **you** have every day? How many grams of fiber?
4. Complete: Wholegrain is \_\_\_\_\_  
\_\_\_\_\_. (7 words)

### Sources to explore:

The Bell Institute [www.bellinstitute.com/wholegrain/fact\\_sheet.pdf](http://www.bellinstitute.com/wholegrain/fact_sheet.pdf)  
Healthy Whole Grains, KSU Extension [www.oznet.ksu.edu/humannutrition/wholegrains.htm](http://www.oznet.ksu.edu/humannutrition/wholegrains.htm)  
Food and Drug Administration [www.cfsan.fda.gov](http://www.cfsan.fda.gov)  
Wheat Foods Council [www.wheatfood.org](http://www.wheatfood.org)  
Whole Grains Council [www.wholegrains.org](http://www.wholegrains.org)

## Lab Question to Explore

*Would consumers eat more whole wheat bread if it were made from white whole wheat flour?*

### Lesson Outline

**Pre-assignment** — whole grain awareness. Have student keep a “grain food” diary for one school week. What grain foods did they eat each day? How many total servings did they eat daily? How many were whole grains?

**Introduce terms** — whole grain, whole wheat bread and whole wheat flour. Use bread packages to identify whole grain and whole wheat breads. Show the whole wheat flours side by side to illustrate color differences between Hard Red Winter wheat flour and Hard White wheat flour. Can they also taste a difference?

**The whole wheat challenge** — (Read background on page 1.) American children, teens and adults need more whole grain foods. Sliced whole wheat bread is very convenient, but many do not choose it. Why? Barriers include color, price, softness, texture, moistness/dryness and taste. **White whole wheat flour could make a difference, especially with color and taste.**

### Assign baking lab partners.

- Write a hypothesis for the outcome you expect.
  - Read thoroughly through the selected recipe.
- Review Bread Baking Guide sidebar. If students are inexperienced, demonstrate and practice measuring or weighing accurately. (Use Ingredient Power Point or available videos--Kansas Wheat or Home Baking Association)
- Review food safety steps found at [www.fightbac.org](http://www.fightbac.org).
  - Wash hands. Practice taking temperatures with an instant read thermometer, inserting it into flour, water and bread.
- Weigh dough for uniform products; bake.
  - Food service staff may wish to demonstrate this OR view the Quantity Bread preparation video from the Kansas Wheat Commission.

### Assign consumer research division tasks.

- List the information to be gathered during consumer testing (see sample evaluation form, page 4).
- Choose a consumer test group and an appropriate time to conduct consumer testing.
- Explore working with the school food service staff to conduct sampling in the school cafeteria.
- Prepare a written request and/or meet with the appropriate person(s) to gain permission to conduct a consumer test with a selected group at school.
- Once the time for sampling and group size are set, meet with baking lab teams to outline the timeline.
- Conduct the consumer test. Tabulate the evaluation forms and report conclusions. Evaluate results, referring to the Lab Question to Explore (above).

#### A food product is “whole grain” if it contains...

All portions of the grain kernel (bran, germ, endosperm)  
51% whole grain by weight;  
AND meets fat, saturated fat and cholesterol restrictions as a “low fat” food.

**Whole wheat bread.** Made with flour containing all three parts of the whole wheat kernel.

**Whole wheat flour.** Flour produced from the whole kernel of wheat. Wheat class used may be either Hard Red Winter or Hard White wheat.

#### Daily recommendations for grain food servings.

1600 calories daily: 5 servings, 3 of which are whole grain  
2200 calories daily: 7 servings; 3-4 of which are wholegrain  
2800-3200 calories (Teenage boys and active men): 10 servings; 3-5 of which are wholegrain

*Source: [www.nutrition.gov](http://www.nutrition.gov)*

**Why eat whole grain foods?** Whole grains are an excellent source of fiber, they help individuals maintain a healthy weight, and they contain:

1. **Macronutrients** — carbohydrates and protein.
2. **Micronutrients** — vitamins and minerals.
3. **Phytonutrients** — health protecting substances found in plant foods that enhance the body’s resistance to chronic diseases (heart disease, cancer diabetes).

*Sources: [www.health.gov/healthypeople](http://www.health.gov/healthypeople)*

#### Bread Baking Guide

- Room temperature (68-72°F) ingredients.
- Check liquid temperatures with a thermometer.
- Mix (knead) dough until it is elastic and smooth. It will “clean” the mixing bowl or counter if well developed.
- Dough temperature after mixing should be 78°F - 84°F (not too warm).
- Dough rising (fermentation) temperature: 80°F - 85°F.
- Divide dough equally into loaves; weigh each portion.
- If using school oven, dough should rise (proof) at 110°F with 80% humidity OR lightly cover dough with large plastic food bag or wrap with plastic bag, sprayed with cooking spray.
- Bread loaves are done when interior is 205°F - 210°F. Sides and top should be a uniform golden brown color.
- Remove from pan; cool on wire racks til center is 90°F.
- Serve or store in food storage bags at room temperature (70°F - 95°F) up to 1 day OR freeze.
- Thaw bread wrapped, at room temperature.

## 100% Whole Wheat Bread

Note: 2-day method in text box below

### Mixer Method

#### Ingredients\*

	<u>Weights</u>
2 packages active dry yeast	½ oz (14g)
1 cup warm water (105 - 115°F)	8 oz (225ml)
1 cup warm 1% milk (105 -115°F)	8 oz (225 ml)
¼ cup honey or granulated sugar	3 oz (85 ml)
5 ¼ - 5 ½ cups whole wheat flour, divided	20 oz (560g)
2 large eggs	3 1/3 oz (95g)
3 teaspoons salt	½ oz (14g)
¼ cup butter or margarine or veg. oil	2 oz. (55g)
Optional: 2 tablespoons vital wheat gluten**	

#### Directions

1. In a large mixing bowl, dissolve yeast in warm water for 5 minutes. Meanwhile, scald milk and cool to 115 ° F. Beat in warm milk, honey, 3 cups flour and eggs. Beat 3 minutes on medium speed. Cover bowl and let mixture rest 20 minutes.
2. Mix in salt, fat and enough remaining flour to make a soft dough. Knead 10 – 12 minutes, on medium low speed with dough hooks or by hand, until dough is smooth and elastic. (It should clean the mixing bowl if you're using a dough hook attachment).
3. Place dough in a lightly greased bowl, turning to grease the top. Let rise until doubled.
4. Punch dough down; divide in half. Let dough rest 10 minutes while greasing two 9 x 5 inch pans. Shape loaves by rolling each half into a 14 x 7 inch rectangle. Starting with the short side, roll up tightly, pinching edges and ends to seal. Place in pans, cover with a damp cloth, and let rise until doubled.
5. Bake in a preheated 375°F oven for 25 – 30 minutes or until done (200°F in center of loaf); loosely cover bread with foil the last 5 minutes to prevent over-browning. Remove from pans; cool on wire racks.

Makes 2 loaves, 16 slices each

\* Have flour, eggs, sugar, fat room temperature (68°F)

\*\***Vital wheat gluten**, A flour-like product which is gluten derived and dried from wheat flour. It is available in the supermarket baking aisle. It combines with flour in the mixing process. Add an additional 2 Tablespoons water.

**Nutrition Facts:** One (1 oz.) slice (one of 22 per loaf) provides 70 calories, 3 g protein, 1.5 g total fat, 0 mg sat. fat, 10 mg cholesterol, 13 g total carbohydrate, 2g dietary fiber, 2% calcium and vitamin A, 6% iron, 81 mg potassium, 125 mg sodium.

### Bread Machine Method

<u>Ingredients</u>	<u>1# Loaf</u>	<u>1 ½# Loaf</u>	<u>2# Loaf</u>
Water, 80°F	1 cup	1 ½ cups	1 ¾ cups
Nonfat dry milk	1 Tbsp.	1 ½ Tbsp.	2 Tbsp.
Butter or margarine	1 Tbsp.	1 ½ Tbsp.	2 Tbsp.
Honey	1 Tbsp.	1 ½ Tbsp.	2 Tbsp.
Salt	1 tsp.	1 ½ tsp.	1 ¾ tsp.
Whole wheat flour	2 ¼ cups	3 ¼ cups	4 ¼ cups
Wheat gluten*	1 Tbsp.	1 ½ Tbsp.	2 Tbsp.
Active dry yeast	1 ¼ tsp.	1 ½ tsp.	2 ¼ tsp.

#### Directions

1. Bring all ingredients to room temperature before using. Measure ingredients accurately; with flour, stir it, spoon into a dry measuring cup and level off.
2. Place ingredients in the pan in the order specified in the instruction manual. Select the Whole Wheat/Wheat Cycle and Medium crust. If the machine does not have a Whole Wheat Cycle, compensate by using the Basic White Cycle, letting the machine operate through the first kneading cycle, then restarting it.
3. Check the consistency of the dough after 5 minutes into the kneading cycle. It should be in a moist soft ball. If the dough is too dry, add 1 tablespoon of liquid at a time. If it is too wet, add 1 tablespoon of flour at a time.
4. If the machine does not have a cooling cycle, remove bread from the pan and cool on a wire rack. The Delay Timer may be used.

**Nutrition Facts:** One (1 oz.) serving provides 71 calories, 3 g protein, 14 g carbohydrates, 1 g fat, 2 mg cholesterol, 2 g fiber and 143 mg sodium.

#### **To prepare mixer method over two class periods:**

**Day 1:** Prepare the dough. Place in large covered plastic bowls or bags sprayed with non-stick cooking spray. Place in the refrigerator. Punch the dough down after one hour. Keep refrigerated overnight.

**Day 2:** Take dough out of the refrigerator one hour prior to class. Divide dough in half to warm faster. Keep covered. Proceed with steps 4 – 5.

#### **Need baking help?**

Visit [www.homebaking.org](http://www.homebaking.org) or [www.kswheat.com](http://www.kswheat.com) (2005 videos and lessons available)

## Sample Product Evaluation Form

Product Name: \_\_\_\_\_

Consumer Test Group Name: \_\_\_\_\_

Date: \_\_\_\_\_

Please rank the product in each category.

5 = Excellent    4 = Good    3 = Acceptable    2 = Fair    1 = Poor

\_\_\_\_\_ Color                      \_\_\_\_\_ Aroma                      \_\_\_\_\_ Taste

\_\_\_\_\_ Moistness                      \_\_\_\_\_ Softness                      \_\_\_\_\_ Texture

I eat whole wheat bread (check one):

\_\_\_\_\_ Never                      \_\_\_\_\_ Less than once per week                      \_\_\_\_\_ Often

I would (check all that apply):

\_\_\_\_\_ Like to have this bread served in the school cafeteria.

\_\_\_\_\_ Buy it at the grocery store to use at home.

\_\_\_\_\_ Not care to eat this bread again. Why? \_\_\_\_\_

Other Comments: \_\_\_\_\_



KANSAS WHEAT COMMISSION

2630 Claflin Road  
Manhattan, KS 66502-2743  
1-800-75WHEAT / 785-539-0255  
Fax: 785-539-8946 / www.kswheat.com



1203 Niccum Ave.  
Effingham, IL 62401  
800-347-0105 / Fax: 217-347-0198  
www.hodgsonmill.com



HOME BAKING  
ASSOCIATION

2931 S.W. Gainsboro Road  
Topeka, KS 66614-4413  
www.homebaking.org



**Farmer Direct Foods**  
P.O. Box 326, 511 Commercial  
Atchison, KS 66002  
800-372-4422 / 913-367-4422  
Fax: 913-367-4443  
www.farmerdirectfood.com

### Additional Resources and Sites to Cite:

Bell Institute, [www.bellinstitute.com](http://www.bellinstitute.com) (General Mills)  
International Food Information Council, [www.ific.org](http://www.ific.org)  
Fleischmann's Yeast, [www.breadworld.com](http://www.breadworld.com)  
King Arthur Flour, [www.kingarthurfLOUR.com](http://www.kingarthurfLOUR.com)

LeSaffre Yeast Corporation, [www.redstaryeast.com](http://www.redstaryeast.com)  
Stafford County Flour Mill, [www.hudsoncream.com](http://www.hudsoncream.com)  
USDA/HHS, [www.nutrition.gov](http://www.nutrition.gov)  
Wheat Foods Council, [www.wheatfoods.org](http://www.wheatfoods.org)  
Whole Grains Council, [www.wholegrains.org](http://www.wholegrains.org)