

Making “Eat” a Part of Wheat

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The purpose of this booklet is to encourage regular usage and rotation of home wheat storage.
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Making “Eat” a Part of Wheat

- I. There are many advantages of using whole grain wheat.
 - A. Wheat is an excellent food storage item for times of emergency. As with other food storage items, we should store what we eat and eat what we store.
 - B. More nutrients are added to our diets when eating whole grain wheat, especially fiber, trace minerals and phytochemicals.
 - C. Food costs can be reduced when using food storage wheat.
 - D. Whole grain wheat adds flavor and variety to our diet.

- II. Whole wheat kernels (berries) store well.
 - A. If stored in a cool (below 70 degrees F), dry, dark place, wheat kernels can be kept for about 25 years and still retain their quality. Quality includes taste, texture, color, odor, nutritional value and cooking attributes.
 - B. Use food safe containers to store wheat. The following are acceptable storage containers:
 - 1. #10 cans
 - 2. Food grade plastic buckets
 - 3. Metal cans
 - 4. Original paper or plastic sacks

- III. All wheat is not the same. Purchase wheat according to family needs and tastes.
 - A. There are many varieties of wheat. They are divided into 6 major classes. (See Appendix A, *Classes and uses of Wheat.*)
 - 1. Hard Red Winter Wheat (most common; 10-14% protein)
 - 2. Hard Red Spring Wheat (higher protein; 13-17% protein)
 - 3. Hard White wheat (mild flavor, popular new variety; 7-17% protein)
 - 4. Soft White Wheat (pastry flour; 8-10% protein)
 - 5. Soft Red Wheat (pastry flour; 8-10% protein)
 - 6. Durum Wheat (pasta flour – very hard; 12-16% protein)
 - B. Hard wheat has a higher protein amount than soft wheat.
 - 1. Usually high protein wheat also has a high amount of gluten which makes lighter, better textured bread.
 - 2. Soft wheat is lower in protein and is used for cookies, pastries, cakes, crackers, pancakes, and other non-bread applications.

3. In general, wheat that contains a large amount of protein makes the best bread. Wheat with a protein value of 15% or more is known for making consistently high, finely texture loaves of bread.
4. Although Durum wheat is a high protein wheat, it rarely makes good bread by itself because it is not high in gluten. The most common application for Durum wheat is pasta.
5. Around the Utah County area, if a store is selling Hard Red Wheat it is probably winter wheat.

C. It is a good idea to purchase a small amount of the wheat you plan to purchase in bulk to see how it reacts in bread making before purchasing large amounts.

D. It has been estimated that for one year of food storage, 400 pounds of grains are needed per family member. This includes wheat and all other grains.

IV. If you plan to eat your stored wheat, a wheat grinder is an essential purchase. There are many types of home wheat grinders. Consider your family's needs and wants when choosing which grinder to buy.

A. Compare cost, ease of use, size, fineness of the ground flour and the ability to adjust the settings from fine flour to cracked wheat when choosing a grinder that will fit your needs.

B. Electric impact grinders:

1. They are fast, efficient, and neat.
2. They are small and relatively easy to clean.
3. They are the first choice for many looking for a quick, easy way to mill flour.
4. They produce a very fine flour.
5. They produce more heat than hand grinding, especially if doing many batches.
6. They do not crack wheat.

C. Electric stone or metal burr grinders:

1. Some use stones and others use metal burrs.
2. Stone grinders have a slightly finer grind than metal burr grinders.
3. Most have adjustable settings from fine flour to cracked wheat.
4. Many models are made to last a long time.
5. Some models have hand grinding capacity.

D. Hand grinders:

1. They are not dependent upon electric power to use.
2. Like electric grinders, some use stones and others use metal burrs.
3. It takes a lot of work and time to grind enough flour to make bread.
4. They have a cool grind.
5. Most have adjustable settings from fine flour to cracked wheat.
6. Some models can be converted to electricity or bicycle use.

- V. Nutritional aspect of a diet using whole wheat.
- A. Parts of a kernel. (See Appendix E, *The Wheat Kernel*.)
 - 1. Endosperm (the part that makes white flour)
 - 2. Embryo – Wheat Germ
 - 3. Bran – Fiber
 - B. The Food Pyramid suggests eating 6-11 servings of grain a day. (At least one or two of those servings should be whole grain.)
 - C. Whole grains have been shown to reduce many effects of chronic illnesses that plague the American population, including heart disease, cancer, and diabetes. (See Appendix B, *Grains of Science*.)
 - D. Nutritionally all varieties of whole grain wheat are about the same. (See Appendix C, *Comparing the Nutritional Value of the 6 Types of Wheat*.)
 - E. White flour has many of the nutrients stripped away during the milling process. (See Appendix D, *Comparing the Nutritional Value of 4 Kinds of Wheat Flours*.)
 - F. *Nutritional thought concerning wheat and flour since World War II:*
 - 1. To prevent beriberi, white flour was enriched with niacin, riboflavin, and thiamin.
 - 2. In the 1970s the importance of fiber in our diet was introduced. During the milling process, most of the fiber is stripped away from white flour.
 - 3. In 1998, the FDA mandated enriching white flour with folic acid.
 - 4. Today it is known that whole grains have micronutrients and phytochemicals that are essential for a healthy diet. Many of these essential nutrients are found in the bran and germ of the wheat kernel.
 - G. The bottom line – for better nutrition include whole grains in your diet.
- VI. Many of your favorite recipes using all-purpose flour can be adapted to use whole grain flour.
- A. Start by using half white flour and half whole wheat flour.
 - B. Recipes that are bread-like, pancakes, biscuits, muffins, tortillas, etc., are the easiest to change to 100% whole grain.

- C. Cakes and sweet breads can be trickier to adjust.
 - 1. The fat may need to be reduced slightly to compensate for the oil in the germ.
 - 2. When replacing one cup of white flour (pure endosperm) with one cup of whole grain flour (83% endosperm), liquids may need to be reduced or the quantity of whole grain slightly increased.
 - 3. Very fine ground whole grain flours are needed for successful texture in cakes.
 - 4. For some cakes and pastries, the heaviness of the bran makes the texture unacceptable

VII. There is a substantial cost savings using food storage wheat.

- A. Cracked wheat cereal costs pennies per serving and a fraction of the cost of prepared whole wheat cereal (such as Wheaties).
- B. Homemade bread is also a fraction of the cost of store bought bread.

VIII. How to put into practice regular cooking with whole wheat.

- A. Make it as convenient as possible
 - 1. Our society currently values convenience so if you don't have your whole wheat flour ground and ready to use, it probably won't get used.
 - 2. It might be a good idea to make wheat grinding one of your family chores so that wheat flour is always available for you to use.
- B. Set goals to increase your use of whole wheat.
- C. Find new recipes to make cooking with wheat fun and enjoyable.

IX. Resources available for more information on whole wheat: (See Appendix F, *References.*)

- A. Extension publications
- B. Published Books
- C. Web sites.

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Breads

The bread recipes in this section are adapted for use with instant yeast. Instant yeast is quick rising and does not need two risings to make excellent textured bread. Yeast will keep active longer if refrigerated or put in the freezer. The amount of yeast used in a recipe will vary depending on its freshness. Start with the lesser amount of yeast and add more yeast if the bread does not rise well. Some adjustments will need to be made if using active dry yeast. If using active dry yeast, consult a traditional bread recipe.

These recipes were also developed for an altitude of 5000 feet in a dry climate. At sea level more yeast is necessary because there is more air pressure. At an altitude higher than 5000 feet, even less yeast might be needed.

Quick Rise Whole Wheat Bread

Bake at 350°F

Makes approximately two 2-pound loaves

3 cups hot water (about 120° F)	1 ½ teaspoons lemon juice
¼ cup vegetable oil	7 to 8 cups whole wheat flour
¼ cup honey	1/3 cup vital wheat gluten
1 tablespoon salt	1-2 tablespoons instant yeast

Preheat oven to 400° F. Add ingredients in the order listed to bread mixing bowl. Using a dough hook, mix well and add more flour if needed so that the dough cleans the sides of the bowl. Knead for 10 minutes. Shape into 2 or 3 loaves depending on the size of your pans. Cover with a tented plastic sack or cloth and let rise for about 1 hour. It is ready to go into the oven when the dough has doubled in bulk. Turn oven down to 350° F and bake for 25-30 minutes.

Bread Machine Whole Wheat Bread

Makes one 2-pound loaf

1 ¾ cups water	1 teaspoon lemon juice
2 tablespoons vegetable oil	3 ¾ to 4 cups whole wheat flour
2 tablespoons honey	2 tablespoons vital wheat gluten
1 ½ teaspoons salt	1-2 teaspoons instant yeast

Follow directions from your bread machine. If you don't have directions add the ingredients in the order listed. The water should be lukewarm (about 100° F). You might need to adjust the amount of flour and yeast depending on the dryness of the flour and the strength of the yeast. For a 1 pound loaf, half this recipe except keep the lemon juice and yeast the same.

Additional Ingredients

The following additional ingredients may be added to the basic bread recipes found on the preceding page.

Eggs: Decrease water by $\frac{1}{4}$ cup and add two beaten eggs. Eggs add flavor, liquid, color, structure, nutrients and tenderness to breads.

Raisins: Mix in $\frac{3}{4}$ cup for each 4 cups of flour.

Cracked Wheat: Add $\frac{1}{2}$ cup uncooked cracked wheat for each 4 cups of flour. If using uncooked cracked wheat it will be somewhat crunchy. Cooking the cracked wheat first will add a variety of texture without the crunch feel. Many people like to put in oatmeal or other cooked cereals to their bread. As a guideline, use $\frac{1}{2}$ cup or less per 4 cups of flour.

Potatoes: They add a sweet, rich flavor to breads. Add $\frac{1}{2}$ cup to 4 cups of flour and reduce water by $\frac{1}{4}$ cup.

Non-Gluten Flours: There are many grains that add a good flavor and texture to bread, but do not have enough gluten to use in breadmaking entirely by themselves. Some of these flours include amaranth, quinoa, millet, corn, buckwheat, rye, oat, barley, and rice. As a general rule, add approximately $\frac{1}{2}$ cup per 4 cups of flour.

Buttermilk Whole Wheat Biscuits

Bake 425°F

2 cups whole wheat flour	$\frac{1}{2}$ teaspoon salt
2 teaspoons baking powder	$\frac{1}{4}$ cup butter
$\frac{1}{2}$ teaspoon baking soda	1 cup buttermilk, low-fat

Preheat oven to 425° F. Sift together whole wheat flour, baking powder, baking soda and salt. Cut in butter with pastry blender or 2 knives until mixture resembles coarse crumbs. Stir in buttermilk. Add just enough to make the mixture moist. Depending on the dryness of your flour you will need plus or minus one cup of buttermilk. Good biscuit dough will be slightly sticky to touch.

Turn dough out onto a floured surface. Use fingers to pat dough to 1-inch thickness. Cut with round cookie cutter. Bake at 425° F for 12-15 minutes or until light golden brown.

Whole Wheat Pizza Dough

Bake at 450° F

1 2/3 cups water	1 teaspoon lemon juice
2 tablespoons olive oil	4 cups whole wheat flour
2 tablespoons sugar	2 teaspoons instant yeast
1 teaspoon salt	

Preheat oven to 450° F. Place the ingredients in the order listed into a bowl. Using a mixer with a dough hook knead the dough for 10 minutes. You may also use the dough setting on an automatic bread machine.

Roll into two 14-inch circles. Transfer to two 14-inch pizza pans. Use a fork to poke holes so the crust doesn't bubble. Bake for 10 minutes. Remove from oven and add toppings of your choice. Return to oven and bake for 5 to 10 more minutes, or until the cheese is melted and the crust is lightly browned.

Note: My family likes using a combination of ½ whole wheat flour and ½ all-purpose flour for this recipe.

Whole Wheat Tortillas

4 cups whole wheat flour	½ cup shortening
1 tablespoon salt	1 ½ cups water
1 ½ teaspoons baking powder	

Mix together all ingredients using a dough hook. Machine knead for about 3 to 5 minutes. (If you don't have a mixer that will knead dough, you can knead by hand. First cut the shortening into the dry ingredients, then add water. Knead by hand for about 5 minutes.) Let dough sit for about 5 minutes. Form into balls and cook using a tortilla maker. (If you don't have a tortilla maker you can roll the dough very thin and bake on an ungreased fry pan or griddle.)

Note: The amount of water you need to add varies with the dryness of your wheat. The dough should feel similar to bread dough.

My family likes using a combination of ½ whole wheat flour and ½ all-purpose flour for this recipe.

Rolls

It is recommended when baking bread or rolls to use high protein wheat. High protein wheat comes from the hard white or hard red varieties. All of the rolls demonstrated in class use hard white wheat flour.

The roll recipes in this section are adapted for use with instant yeast. Instant yeast is quick rising and does not need two risings to make excellent textured bread or rolls. Yeast will keep active longer if refrigerated or put in the freezer. Some adjustments will need to be made if using active dry yeast. If using active dry yeast, consult a traditional roll recipe.

These recipes were also developed for an altitude of 5000 feet in a dry climate. At sea level more yeast is necessary because there is more air pressure. At an altitude higher than 5000 feet, less yeast might be needed.

Classic Dinner Rolls

Bake at 350° F

2 cups water	2 eggs
¼ cup oil	5 cups flour (white flour, whole wheat flour or combination of the two)
1 teaspoon lemon juice	1 tablespoon instant yeast
1 ½ teaspoon salt	
¼ cup sugar	

Combine water, oil, lemon juice, salt, sugar and eggs. Add 2 cups of flour and yeast. Beat until smooth. Mix in enough remaining flour to make dough easy to handle.

Turn dough onto lightly floured board; knead until smooth and elastic, about 5 minutes. Place in greased bowl; turn greased side up. Cover; let rise in warm place until double.

Punch down dough; shape as desired. Let rise 20-40 minutes before baking.
Bake 350° F for 15-20 minutes until golden brown.

Notes:

This dough can be refrigerated if desired.
To make light, fluffy rolls, dough should be on the sticky side.
Lightly grease your hands to handle the sticky dough.
Use a pizza knife to cut dough easily.
Use dental floss to cut cinnamon rolls.

Shaping the rolls:

Pan Rolls: The most common shape. Shape ½ of the roll dough into 2-inch balls. Place in greased 9x13-inch baking pan. Allow a little space between balls to allow for rolls to rise.
Cloverleaf Rolls: Shape ½ of the roll dough into 1-inch balls. Place 3 balls in each greased muffin cup.

Crescents: Roll ½ of the roll dough into 14-inch circle, about ¼ inch. Spread with soft butter or margarine. Cut into 12 wedges. Roll up, beginning at rounded edge. Place rolls with point underneath on greased baking sheet.

Four-leaf Clovers: Shape ½ of the roll dough into 2-inch balls. Place each ball in greased medium muffin cup. With scissors, snip each ball in half, then into quarters.

Rosettes: Roll piece of 2-inch dough into a 12-inch rope. Tie loose knot in center of each rope. Bring bottom end up and tuck into center of roll; wrap top end around and tuck under roll.

Figure Eight Rolls: Roll 2-inch piece of dough to 12-inch rope. Form each rope into ring, and pinch ends to seal. Twist once at center to make an “8”.

Fan tans: Divide the dough into two parts. Roll ½ the dough into rectangle about 9x13-inches. Spread with soft butter or margarine. Cut crosswise into 6 strips, 1 ½ inches wide. Stack strips evenly. Cut into 1-inch wide pieces. Place cut side down in greased muffin cup.

Parker House Rolls: Roll ½ roll dough into a rectangle ¼ inch thick. Cut into 3-inch circles. Brush with butter. Make crease across each circle. Fold so top half overlaps slightly. Press edges together. Place close together in greased 9-inch pan.

Cinnamon Rolls: Divide dough into 2 parts. Roll one part into rectangle 9x13 inches. Spread with softened butter or margarine. Mix ¼ cup sugar and 2 teaspoons cinnamon. Sprinkle with cinnamon mixture. Add raisins, if desired. Roll up jelly roll style beginning at the long end. Pinch edge of dough into roll to seal well. Cut into 1-inch pieces using dental floss or sharp knife. Place into greased baking pan.

When cinnamon rolls are cool, drizzle with Powdered Sugar Glaze, if desired.

(Powdered Sugar Glaze: Combine 1 cup powdered sugar and 1-3 tablespoons milk. Stir until smooth.)

Additional Roll Recipes

Buttermilk Sweet Roll Dough

Bake at 350°F

1 cup warm water	½ cup sugar
1 cup buttermilk	1 ½ teaspoons salt
2 eggs	5 cups whole wheat flour
½ cup butter, softened	1 tablespoon instant yeast

Add the ingredients in the order listed to a bread mixing bowl. Using a dough hook, machine knead the dough for 8-10 minutes. Turn dough onto floured surface. Divide dough in half. Shape as desired. Let rise in warm place until doubled. Bake at 350° F for 15-18 minutes.

Pumpkin Rolls

Bake at 350°F

1 cup warm water (110° to 115°)	2 eggs
2 tablespoons non-fat dry milk powder	1 ½ teaspoons salt
½ cup butter, softened	5 cups whole wheat flour
½ cup sugar	1 tablespoon instant yeast
1 cup canned pumpkin	

Add the ingredients in the order listed to a bread mixing bowl. Using a dough hook, machine knead the dough for 8-10 minutes. Turn dough onto floured surface. Divide dough in half. Shape as desired. Let rise in warm place until doubled. Bake at 350° F for 15-18 minutes.

Pastry Flour Recipes

All of the recipes in this section are made with whole wheat pastry flour. Whole wheat pastry flour is made from grinding Soft white wheat. Soft White Wheat is a lower protein wheat that is best suited for making cakes, cookies, muffins, pastries, crackers, pancakes, sauces, and other non-bread applications. Hard wheat may be substituted for the soft wheat, but you might have differences in flavor and texture.

When making cakes, cookies and sweet breads with whole wheat flour sometimes the texture is course or it may fall in the middle. To prevent this you may substitute some of the whole wheat flour with all-purpose flour (for example, use ½ whole wheat flour and ½ all-purpose flour). It also might help to reduce the fat in the recipe by 1 or 2 tablespoons.

Many of the recipes in this section call for buttermilk. As a substitute for 1 cup buttermilk, you may use 1 tablespoon lemon juice or vinegar plus enough milk to make 1 cup.

Buttermilk Pancakes

1 ¾ to 2 cups whole wheat pastry flour	1 teaspoon salt
1 tablespoon sugar	2 cups buttermilk
1 teaspoon baking powder	1 tablespoon vegetable oil
½ teaspoon baking soda	1 large egg, lightly beaten

Sift together the wheat flour, cornmeal, baking soda, baking powder and salt. Combine in another bowl the buttermilk, vegetable oil, and beaten egg. Add the liquid ingredients to the dry ingredients and stir until moistened. Do not over stir. Spoon ¼ cup pancake batter onto a hot griddle. Turn pancakes when bubbles appear and edges look cooked.

Yield: 12 (5-inch) pancakes.

Cornmeal and Whole Wheat Pancakes

1 ¾ to 2 cups whole wheat pastry flour	1 ½ teaspoons salt
2/3 cup cornmeal	2 ¼ cups buttermilk
2 teaspoons baking powder	¼ cup vegetable oil
1 ½ teaspoons baking soda	2 large eggs, beaten

Sift together the wheat flour, cornmeal, baking soda, baking powder and salt. Beat the egg, then add buttermilk and oil. Add liquid ingredients to the dry ingredients and stir only to moisten.

Cook on a griddle.

Buttermilk Waffles

Makes about eight 7-inch waffles

2 eggs	2 teaspoons baking powder
2 cups buttermilk	1 teaspoon baking soda
1/3 cup vegetable oil	1/2 teaspoon salt
1 3/4 to 2 cups whole wheat pastry flour	

Preheat waffle iron. Beat eggs. Add remaining liquid ingredients. Sift together flour, baking powder, baking soda, and salt. Add liquid ingredients to the dry ingredients and stir until just blended. Pour batter onto center of hot waffle iron. Bake about 5 minutes or according to waffle iron directions.

Apple Cake

Bake at 350°F

1/2 cup butter	1/2 teaspoon salt
1 cup sugar	1 teaspoon cinnamon
2 eggs	1/2 teaspoon nutmeg
2 cups whole wheat pastry flour	6 med apples, peeled and chopped fine
2 teaspoons baking soda	

Preheat oven to 350°F. Cream butter and sugar. Add eggs. Sift together whole wheat pastry flour, baking soda, cinnamon, nutmeg and salt. Add dry ingredients to creamed mixture. Stir in apples. Pour into 9x13-inch greased pan. Bake for about 40 minutes. The cake may be frosted or served with lemon sauce.

Lemon Sauce:

1/2 cup sugar	1/4 cup lemon juice
2 tablespoons cornstarch	2 tablespoons butter
1 cup water	

Mix sugar and cornstarch in small saucepan. Slowly add water so no lumps form. Bring mixture to boil. Remove from heat and add lemon juice and butter. Cool slightly before serving.

Applesauce Cake

Bake at 350°F

¼ cup shortening	½ teaspoon cinnamon
1 cup sugar	½ teaspoon cloves
1 teaspoon vanilla extract	¼ teaspoon nutmeg
1 egg	1 cup applesauce
1 cup whole wheat pastry flour	¼ cup buttermilk
1 cup flour	1 cup raisins
1 ½ teaspoons baking soda	1 cup chopped nuts
½ teaspoon salt	

Preheat oven to 350° F. Cream together shortening and sugar; add egg and vanilla. Sift together flours, baking soda, salt, cinnamon, cloves and nutmeg. Combine applesauce and buttermilk. Add applesauce mixture alternately with the sifted mixture to the creamed mixture. Add raisins and nuts. Pour into greased and floured 8x8-inch pan. Bake at 350° F for 30 to 40 minutes.

Carrot Cake

Bake at 350°F

2 cups brown sugar, packed	1 teaspoon salt
1 cup vegetable oil	1 teaspoon baking soda
3 eggs	1 teaspoon cinnamon
2 cups (1/2 lb.) carrots, finely grated	2 teaspoons vanilla extract
1 cup crushed pineapple, drained	1 cup raisins
3 cups whole wheat pastry flour	1 cup nuts, chopped

Preheat oven to 350° F. Grease and flour 9x13-inch baking pan. Beat together brown sugar, oil and eggs. Stir in carrots and pineapple. Sift together dry ingredients; stir into batter. Add vanilla, raisins and nuts. Pour into prepared pan. Bake for 30-40 minutes.

Carrot Cake #2

Bake at 325°F

Contributed by Trish Cutler, USU Extension Receptionist

1 cup whole wheat pastry flour	1 cup sugar
2 teaspoons baking powder	2 beaten eggs
1 teaspoon cinnamon	½ cup chopped nuts
½ teaspoon salt	1 ½ cups grated carrots
2/3 cup vegetable oil	1/3 cup crushed pineapple

Preheat oven to 325° F. Sift together flour, baking powder, cinnamon and salt. Mix together oil, sugar and eggs. Add flour to the egg mixture. Add nuts, carrots and pineapple. Pour batter into a 8x8-inch pan. Bake at 325° F for 30 minutes.

Chocolate Zucchini Cake

Bake at 350°F

¼ cup vegetable oil	2 ½ cups whole wheat pastry flour
1 cup sugar	1 teaspoon baking powder
2 eggs	1 teaspoon baking soda
1 teaspoon vanilla extract	1 teaspoon salt
½ cup non-fat yogurt	2 cups shredded zucchini
½ cup buttermilk	½ cup milk chocolate chips
¼ cup baking cocoa	

Preheat oven to 350° F. Beat oil and sugar. Add eggs and vanilla and continue to beat. Stir in yogurt, buttermilk and cocoa. Sift together whole wheat pastry flour, baking powder, baking soda and salt. Add dry ingredients alternately with zucchini to the liquid ingredients. Pour into a greased and floured 9x13-inch baking pan. Sprinkle the top with chocolate chips. Bake at 350°F for 35 - 40 minutes.

Rhubarb Cake

Bake at 350°F

2 ½ cups whole wheat pastry flour	1 cup plain yogurt
1 ½ teaspoons baking powder	2 tablespoons milk
½ teaspoon baking soda	2 ½ cups chopped rhubarb
½ teaspoon salt	
1 teaspoon cinnamon	Topping:
1 cup brown sugar	2 tablespoons butter, melted
½ cup butter	½ cup brown sugar
2 eggs	½ cup chopped pecans
1 teaspoon vanilla extract	¼ cup whole wheat pastry flour

Preheat oven to 350° F. Sift together flour, baking powder, soda, salt and cinnamon. In a large mixing bowl, beat together 1 cup sugar and ½ cup butter. Add eggs and vanilla; beat until fluffy. Mix together yogurt and milk. Add sifted ingredients and yogurt mixture to egg mixture. Beat until well-blended. Add chopped rhubarb (either fresh or frozen rhubarb, thawed). Pour batter into greased and floured 9x13-inch pan. Sprinkle topping over batter. Bake at 350° F for 45 – 50 minutes.

Topping: Combine 2 tablespoons melted butter, ½ cup brown sugar, pecans and ¼ cup flour. Mix well.

Orange Sponge Cake

Bake at 375° F

8 eggs, separated	1 teaspoon baking powder
¾ teaspoon cream of tartar	½ teaspoon salt
¾ cup sugar	1 tablespoon grated orange rind
½ cup orange juice	1 teaspoon lemon extract
1 ½ cups whole wheat pastry flour	1 teaspoon vanilla extract
½ cup sugar	

Preheat oven to 375° F. Separate eggs. Beat egg whites until foamy. Add cream of tartar. Continue beating. Gradually add sugar until stiff peaks form. In another bowl combine egg yolks and orange juice. Add the remaining ingredients to the egg yolks and orange juice. Blend until moistened. Fold this mixture carefully into egg whites until blended. Do not stir. Pour batter into ungreased 10-inch tube pan. Bake for 35 - 40 minutes. Turn cake pan upside down to cool.

Apple Crisp

Bake at 350° F

6 apples, peeled and sliced	Topping:
½ cup water	1 cup whole wheat pastry flour
1 tablespoon lemon juice	2/3 cup packed brown sugar
	½ cup oats
	¼ cup chopped nuts
	½ cup butter, melted

Preheat oven to 350° F. Add peeled and sliced apples to a 2-quart baking dish. Add water and lemon juice.

Topping: To a mixing bowl add whole wheat pastry flour, brown sugar, oats and nuts. Mix thoroughly. Add melted butter and blend. Sprinkle topping over apples. Bake for 50 minutes.

Pear Crisp

Bake at 375° F

6 cups pears, peeled, cored and cut in cubes	Topping:
1 tablespoon lemon juice	1 cup whole wheat pastry flour
1/3 cup sugar	2/3 cup brown sugar
1 tablespoon cornstarch	½ cup oats
1 teaspoon cinnamon	¼ teaspoon salt
	½ cup butter

Preheat oven to 375° F. Combine pears and lemon juice in a 2-quart baking dish. In a small bowl mix well 1/3 cup sugar, cornstarch and cinnamon. Add the cornstarch mixture to the pears and toss well to coat.

Topping: Combine whole wheat pastry flour, brown sugar, oats and salt. Melt butter and add to the flour mixture until crumbly. Sprinkle over fruit. Bake for 40 minutes.

Peach Cobbler

Bake at 400° F

1/2 cup sugar	1 cup whole wheat pastry flour
1 tablespoon cornstarch	1 1/2 teaspoons baking powder
1/4 teaspoon cinnamon	1/2 teaspoon salt
4 cups sliced peaches	1/2 cup milk
1 teaspoon lemon juice	3 tablespoons vegetable oil

Preheat oven to 400° F. Mix sugar, cornstarch and cinnamon together in a saucepan. Add sliced peaches and lemon juice. Cook until mixture thickens and boils. Boil and stir 1 minute. Stir into casserole dish. (Note: It is a good idea to have the sides high enough so the peach mixture doesn't boil over while baking.)

Sift together dry ingredients together. Add milk and oil. Drop biscuit mixture by spoonfuls onto hot peach mixture.

Bake at 400° F for 25–30 minutes or until the topping is golden brown.

Applesauce Brownies

Bake at 350° F

3/4 cup vegetable oil	1/4 cup all-purpose flour
2 cups sugar	1 teaspoon baking powder
4 eggs	1/2 teaspoon baking soda
1 cup applesauce	1/2 teaspoon salt
2 teaspoons vanilla extract	1/2 cup baking cocoa
2 cups whole wheat pastry flour	1/2 cup chopped nuts (optional)

Preheat oven to 350° F. Cream together the vegetable oil and sugar. Add eggs and beat. Add applesauce and vanilla. Sift together flours, baking powder, baking soda and salt. Add sifted ingredients to the creamed mixture. Add cocoa and nuts if desired. Bake in greased 9x13-inch pan at 350° F for 30-40 minutes.

Banana Nut Bread

Bake at 350° F

2/3 cup brown sugar	1/2 teaspoon baking soda
1/2 cup vegetable oil	1/2 teaspoon salt
2 eggs	1 cup mashed bananas
2 1/4 cups whole wheat pastry	2 tablespoons yogurt
1 1/2 teaspoons baking powder	1/2 cup chopped nuts

Preheat oven to 350° F. Beat brown sugar and oil together. Add eggs and continue to beat together until thoroughly combined. Sift together flour, baking powder, baking soda and salt. Add yogurt to the mashed bananas. Add the dry ingredients, banana mixture and nuts to the egg mixture stirring just to combine. Pour into 1 large or 2 small loaf pans. Bake at 350° F for 45-60 minutes depending on size of bread pan.

Chocolate Marbled Banana Bread

Bake at 350° F

½ cup semisweet chocolate chips	1 cup sugar
2 ½ cups whole wheat pastry flour	1 ½ cups mashed bananas
1 teaspoon baking soda	½ cup egg whites
½ teaspoon salt	1/3 cup plain yogurt
¼ cup butter	

Preheat oven to 350° F. Melt the chocolate chips in a microwave for about 1 minute. Stir and set aside. Soft together the whole wheat pastry flour, baking soda and salt. Cream together the butter and sugar; add bananas, egg whites and yogurt. Add the dry ingredients and stir just until blended. Divide the mixture in half. To one half add the melted chocolate chips. Add about ½ of the plain mixture into 1 large or 2 small loaf pans. Add about 6 spoonfuls of the chocolate mixture to the pans and swirl with a knife. Add the remaining plain mixture; then the chocolate mixture and swirl together.

Bake for 50-75 minutes depending on the size of pan used. To test for doneness insert a toothpick in the center. If the toothpick comes out clean then it is done.

Pumpkin Bread

Bake at 350° F

3 cups sugar	2 teaspoons baking soda
4 eggs	1 teaspoon baking powder
½ cup vegetable oil	1 ½ teaspoon salt
1 (15-ounce) can pumpkin	1 teaspoon cinnamon
3 ½ cups whole wheat pastry flour	1 teaspoon nutmeg
	1 teaspoon ginger

Preheat oven to 350° F. Cream eggs and sugar. Add vegetable oil and pumpkin. Sift the dry ingredients together in another bowl. Add dry ingredients to pumpkin mixture. Pour into greased loaf pans. Bake at 350° F for 45-60 minutes depending on the size of the bread pan.

Zucchini Bread

Bake at 350° F.

2 cups sugar	½ teaspoon nutmeg
1 cup vegetable oil	¼ teaspoon baking powder
3 eggs	1 teaspoon baking soda
2 teaspoons vanilla extract	1 teaspoon salt
3 ½ cups whole wheat pastry flour	2 cups shredded zucchini
1 teaspoon cinnamon	¾ cup chopped nuts

Preheat oven to 350° F. Cream oil, sugar and eggs. Sift the dry ingredients together in another bowl. Add dry ingredients to egg mixture. Add grated zucchini and nuts. Pour into greased and floured loaf pans. Bake at 350° F for 45-60 minutes depending on the size of the bread pan.

Chocolate Chip Cookies

Bake at 375° F

½ cup sugar	1 ¾ cups whole wheat pastry flour
½ cup packed brown sugar	½ teaspoon baking soda
½ cup butter	½ teaspoon salt
1 egg	½ package (abt 6 oz.) milk chocolate chips
1 teaspoon vanilla extract	½ cup chopped nuts (optional)

Preheat oven to 375° F. Cream sugars and butter. Blend in egg and vanilla. Mix in whole wheat pastry flour, baking soda and salt. Carefully mix in chips and nuts, if desired. Drop by rounded teaspoonful about 2 inches apart onto an ungreased cookie sheet. Bake at 375° F for 10-12 minutes or until lightly browned.

Tips: When making cookies it is always a good idea to make a test cookie. Bake one cookie. If it spreads too much add 1-2 tablespoons all-purpose flour to the dough. If it's too dry, add 1-2 tablespoons of milk to the dough. Liquid proportions are affected by egg size and dryness of the flour.

Ginger Snaps

Bake at 375° F

½ cup shortening	½ teaspoon salt
¾ cup brown sugar	1 teaspoon cinnamon
¼ cup molasses	1 teaspoon cloves
1 egg	1 teaspoon ginger
2 cups whole wheat pastry flour	½ cup sugar
2 teaspoons baking soda	

Preheat oven to 375° F. Cream together shortening, sugar, molasses and egg. Sift together whole wheat pastry flour, baking soda, salt, cinnamon, cloves and ginger. Gradually add dry ingredients to the creamed mixture. Shape the dough into small balls. Roll the balls in sugar then place on baking sheet 2-inches apart. Bake for 9-10 minutes.

Hazelnut Cookies

Bake at 375° F

¾ cup sugar	1 ¾ cups whole wheat pastry flour
¾ cup hazelnut spread (Nutella)	1 teaspoon baking soda
½ cup butter, softened	½ teaspoon salt
1 teaspoon vanilla extract	¼ cup sugar
1 large egg	

Preheat oven to 375° F. Beat together ¾ cup sugar, hazelnut spread, butter, vanilla and egg. Sift whole wheat pastry flour, baking soda and salt. Add dry ingredients to creamed mixture. Shape dough into round balls and roll in ¼ cup sugar. Place on ungreased cookie sheet and bake for 9-10 minutes.

Oatmeal Cranberry Cookies

Bake at 350° F

1 cup butter	2 cups oats
1 cup brown sugar	2 cups whole wheat pastry flour
½ cup sugar	1 teaspoon baking soda
2 large eggs	1 teaspoon salt
2 teaspoons vanilla extract	2 cups dried cranberries

Cream butter and sugars. Beat in eggs and vanilla. In a separate bowl, combine oats, whole wheat pastry flour, baking soda, cinnamon and salt. Add dry ingredients to creamed mixture and stir until combined. Stir in cranberries. Divide dough in half, roll into log about 1 ½ inches in diameter. Refrigerate until firm.

Preheat oven to 350° F. Slice logs into cookies, bake on parchment lined cookie sheets. Bake for 12 to 14 minutes or until golden brown.

(Option: add 1 cup of white chocolate chips and 1 cup of chopped macadamia nuts!)

Pumpkin Chip Cookies

Bake at 350° F

1 ½ cups canned pumpkin	1 ½ teaspoons baking soda
1 ½ cups sugar	1 teaspoon salt
2 eggs	1 teaspoon cinnamon
1 teaspoon vanilla extract	1 teaspoon nutmeg
½ cup vegetable oil	½ teaspoon cloves
3 ¼ cups whole wheat pastry flour	1 cup chocolate chips
1 tablespoon baking powder	

Preheat oven to 350° F. Beat together the pumpkin, sugar, eggs, vanilla and vegetable oil. Sift the whole wheat pastry flour, baking powder, baking soda, salt, cinnamon, nutmeg and cloves. Add dry ingredients to pumpkin mixture. Stir in chocolate chips. Spray cookie sheet with nonstick spray. Drop dough onto cookie sheet by spoonfuls. Bake for 10-12 minutes.

Snickerdoodles

Bake at 400° F

1 cup shortening	1 teaspoon baking soda
1 ½ cups sugar	½ teaspoon salt
2 eggs	2 tablespoons sugar
2 ¾ cups whole wheat pastry flour	1 teaspoons cinnamon
2 teaspoons cream of tartar	

Preheat oven to 400° F. Cream together 1 ½ cups sugar and shortening. Add eggs and beat well. Sift together whole wheat pastry flour, cream of tartar, baking soda and salt. Add to sugar mixture and mix well. Roll into approximately 1-inch balls. Combine 2 tablespoons sugar and cinnamon. Roll dough balls in cinnamon sugar. Place on ungreased cookie sheet about 3-inches apart. Bake 400° F for 8-10 minutes. Remove from cookie sheet and cool on rack. Makes about 4 dozen cookies.

Sugar Cookies

Bake at 375° F

1 cup butter	1 teaspoon baking powder
1 cup sugar	½ teaspoon baking soda
2 eggs	½ teaspoon salt
½ teaspoon vanilla extract	½ cup sour cream
3 cups whole wheat pastry flour	

Cream butter and sugar. Add eggs and vanilla. Sift together whole wheat pastry flour, baking powder, baking soda and salt. Add dry ingredients alternately with sour cream to creamed mixture. Blend well. Chill well for at least 1-2 hours.

Preheat oven to 375° F. Roll out to ¼-inch thick. Cut into desired shapes. Bake for 8-10 minutes.

Chocolate Chip Bars

Bake at 350° F

Contributed by Linda Steiner, 4-H Secretary

2 eggs	1 ¾ cups whole wheat pastry flour
1 ½ cups brown sugar	1 ½ teaspoons baking powder
2/3 cup vegetable oil	1 teaspoon salt
1 teaspoon vanilla extract	½ cup chopped pecans
	1 cup chocolate chips

Beat eggs until thick and foamy. Gradually add the sugar and beat well. Add the oil and vanilla; mix well. Add the flour, baking powder and salt. Stir in pecans and chocolate chips. Spread in a greased 9x12-inch pan. Bake at 350° F for 25-30 minutes. Cool and cut into squares.

Cranberry Crumbles

Bake 350° F

1 cup brown sugar	2 cups dried cranberries
2 cups oats	1 cup non-fat sour cream
1 ½ cups whole wheat pastry flour	2 tablespoons whole wheat pastry flour
1 teaspoon baking soda	1 teaspoon vanilla extract
1 cup butter, softened	1 egg

Preheat oven to 350° F. Mix well the brown sugar, oats, whole wheat pastry flour and baking soda. Add butter and stir until all of the dry mixture has been coated and is crumbly. Divide mixture in half. Press half of the mixture into a 9x13-inch pan. Bake 25 to 30 minutes.

White Sauce

2 tablespoons margarine or other fat	Dash pepper
2 tablespoons whole wheat pastry flour	1 cup milk
1 ¼ teaspoons salt	

Melt margarine in saucepan over low heat until melted. Add flour, salt and pepper. Stir until smooth. Remove from heat and stir in milk. Heat to boiling, stirring constantly until mixture thickens. Boil thickened mixture for 2 minutes.

Tips: For a thinner white sauce-use 1 tablespoon fat and 1 tablespoon flour; for a thicker white sauce-use 3 tablespoons fat and 3 tablespoons flour.

The fat can be margarine, butter, meat drippings or oil.
Instead of milk you may substitute powdered milk, canned milk, meat stock or vegetable stock.

Cheese sauce:	Add ½ to ¾ cup shredded cheese to hot sauce.
Curry sauce:	Add 1 to 2 teaspoons curry powder.
Mustard sauce:	Add 2 tablespoons prepared mustard and a dash of Worcestershire sauce.

Cauliflower Carrot Soup

1 head cauliflower, chopped into small pieces	1/3 cup whole wheat pastry flour
¾ teaspoon salt	1 cup carrots, thinly sliced
1/8 teaspoon pepper	½ cup onions, chopped
2 cups water	2 cups milk
6 ounces pork sausage	8 ounces American cheese, cubed

In a saucepan, cook cauliflower and carrots in water until tender; set aside (do not drain). In a skillet over medium heat, brown the sausage and onion; drain. Add whole wheat flour, salt and pepper. Gradually add the milk; bring to a boil. Cook and stir for 2 minutes. Add to cauliflower and carrots. Heat through. Remove from heat and add cheese until melted.

Note: 8 ounces of other types of grated cheese may be added instead of American cheese.

Cracked Wheat Recipes

Cracked wheat is made by coarsely grinding whole wheat berries in a wheat grinder (impact grinders do not crack wheat), coffee grinder or blender. If desired, sift out any flour that might be mixed in with the cracked wheat. Some grinders are better than others about leaving flour along with the cracked wheat.

Bulgur is parboiled whole grain wheat that has been dried then cracked or crushed. It comes in coarse, medium or fine grinds. Bulgur can be used interchangeably with cracked wheat in these recipes. Since bulgur has been cooked first before being cracked, it cooks faster than cracked wheat.

Cracked wheat and bulgur can be used as meat extenders, added to breads for variety in flavor and texture, or in place of many of your favorite recipes that call for pasta, rice or barley.

One cup dry cracked wheat = approximately 2 cups cooked cracked wheat.

Cracked Wheat Cereal

4 cups water
½ teaspoon salt
1 1/3 cups cracked wheat

Add water and salt to saucepan. Heat to boiling. Slowly add cracked wheat. Simmer for about 20 minutes.

Serve with milk and sugar, honey, or raisins.

Yield: About three 1-cup servings.

Note: I have also found that white wheat cooks faster than red wheat. This recipe is made for hard red wheat. If using white wheat I would suggest using 1 part wheat to 2 parts water.

Wheat Berries

Wheat Berries are whole wheat kernels that have been cooked in one of several methods described below.

1 cup wheat berries (whole kernels)
3 cups water
½ teaspoon sat (optional)

Method #1 – Place water, wheat and salt in crock-pot and allow to cook overnight, about 8 – 10 hours, on low temperature. All of the water should be absorbed.

Method #2 – Place water, wheat and salt in a saucepan. Cover and let sit overnight. Do not drain. Heat ingredients in saucepan to boiling. Simmer for 45-50 minutes.

Method #3 – Place water (reduce to 2 cups water), wheat and salt in a pressure saucepan. Pressure at 15 lbs. pressure for 15 minutes.

Method #4 – There is a method described in many cookbooks called Thermos Wheat. They suggest placing 1 cup wheat in a thermos and adding 2 cups of boiling water, then let it stand overnight. There is a danger with this method. If the wheat gets below 140° F, bacterial growth can occur. If using this method, make sure you do not let it soak more than 3-4 hours.

Wheat berries can be used alone as a cereal or in casseroles, soups or salads.

1 cup dry wheat = approximately 2 cups cooked wheat berries

Cracked Wheat Chili

2 cups pinto beans or kidney beans	1 quart tomatoes
6 cups water	1 tablespoon chili powder
1 large onion, chopped	¼ cup salsa
¼ pound lean ground beef	2 cubes beef bouillon
2 cups cooked cracked wheat	

Soak beans overnight. Rinse the beans and add 6 to 8 cups of water (until beans are covered by 1-inch) and heat to simmering. Simmer for 1 – 2 hours. (Or you can speed the cooking time by cooking the beans in a pressure saucepan at 15 lbs. pressure for 20 minutes.) While the beans are cooking, mix the lean ground beef and cooked cracked wheat together. Fry beef/wheat mixture with onion. Add to the beans along with tomatoes, chili powder, salsa, and bouillon cubes. Simmer about 1 hour.

Note: For instructions on how to cook cracked wheat see *Cracked Wheat Cereal*.

Cracked Wheat Meat Loaf

Bake at 325° F

2 ½ cups cooked cracked wheat	1 egg
2 pounds lean ground beef	1 tablespoon Worcestershire sauce
1 ¼ cups milk	1 teaspoon dry mustard
¼ teaspoon pepper	½ cup sautéed onions
2 teaspoons salt	1 tablespoon vegetable oil
¼ cup ketchup	

Sauté onions in 1 tablespoon vegetable oil until transparent. Mix the cracked wheat and ground beef together. Add all of the other ingredients and mix well. Turn into loaf pan or shallow baking dish. If desired, spread surface with thin layer of ketchup. Bake at 325° F for about 1 hours.

Note: For instructions on how to cook cracked wheat see *Cracked Wheat Cereal*.

Sloppy Joes

1 pound lean ground beef	2 tablespoons brown sugar
2 cups cooked cracked wheat	1 tablespoon Worcestershire sauce
1 onion, chopped	1 ½ teaspoons chili powder
1 (10 ¾-ounce) can tomato soup	1 ½ teaspoons dry mustard
1 soup can water	1 teaspoon salt
½ cup ketchup	½ teaspoon curry powder

Brown lean ground beef, cooked cracked wheat and onions in large skillet. When onions are soft and transparent, add remaining ingredients. Simmer 30 minutes. Serve about ¼ cup mixture on hamburger bun. Top with cheese slices, if desired.

Cracked Wheat Pilaf

2 tablespoons finely chopped green onions	2 cups water
2 tablespoons chopped green peppers	2 cubes chicken bouillon
¼ cup finely sliced mushrooms	1 cup uncooked cracked wheat
2 tablespoons olive oil	

In a 10-inch skillet, sauté green onions, peppers and mushrooms in olive oil until onions are translucent. Stir in remaining ingredients. Heat to boiling and simmer for about 15 minutes until the liquid is absorbed.

Cracked Wheat Tuna Salad

2 cups water	1/8 teaspoon pepper
1 cup cracked wheat	2 tablespoons sliced green onions
3 tablespoons lemon juice	2 tablespoons red or green peppers
2 tablespoons olive oil	1/4 cup thinly sliced celery
1 tablespoon salsa	1 (6-ounce) can tuna
1/2 teaspoon salt	

Heat water in saucepan. When boiling add cracked wheat. Cook for 10-15 minutes until the water is absorbed. Cool. Mix the lemon juice, olive oil, salsa, salt and pepper together. Add to cracked wheat. Add onions peppers, celery and tuna and mix thoroughly. Chill at least 1 hour before serving. This salad is good if allowed to chill overnight. Serve as a dip with crackers or on a lettuce leaf. It can also be used as a sandwich spread or packed into a pita pocket.

Note: You might like to add other ingredients to this salad such as mint, pickles, olives, cheese, tomatoes, cucumbers, zucchini, pine nuts, chickpeas or poultry.

This recipe is very similar to a Middle Eastern cracked wheat salad called Tabbouleh. There are many different versions of Tabbouleh, but most have bulgur (or cracked wheat), lemon/olive oil dressing, tomatoes and mint as principle ingredients.

Southwestern Cracked Wheat Salad

1 cup cooked cracked wheat	1 1/2 tablespoons olive oil
1 (4-ounce) cans diced green chilies	1/2 teaspoon salt
1 diced red bell pepper	2 cloves garlic, crushed
3/4 cup minced red onions	1 (15-ounce) can black beans, rinsed and drained
1/3 cup chopped fresh cilantro	1/2 cup diced, peeled jicama (optional)
3 tablespoons fresh lime juice	

Combine all ingredients in a large bowl. Chill well.

Note: For instructions on how to cook cracked wheat see *Cracked Wheat Cereal*.

Wheat Berry Salad

Dressing:

2 tablespoons chopped fresh cilantro
2 tablespoons vegetable broth
1 ½ tablespoons olive oil
1 tablespoons lemon juice
1 tablespoon cider vinegar
1 tablespoon mustard
½ teaspoon salt
¼ teaspoon black pepper
1 clove garlic, crushed

Salad:

1 cup wheat berries
1 ½ cups vegetable broth
1 cup water
1 cup cut green beans
¾ cup sliced carrots
½ cup frozen peas, thawed
½ cup frozen corn, thawed
½ cup sliced olives
2 tablespoons chopped green peppers

Dressing: Combine all of the ingredients in the dressing. Shake or whisk until well blended.

Salad: Cook wheat berries in vegetable broth and water. Simmer for about 50 minutes or until all of the water is absorbed. While the wheat berries are cooking, cook green beans and carrots in a small amount of water. Cook for 5-10 minutes and vegetables are still a little crisp. Drain and rinse in cold water.

Combine cooled wheat berries, beans, carrots, peas, corn, olives and peppers. Add dressing and toss.

Cracked Wheat Pudding

2 cups water

1 lemon rind, finely grated

1 cup cracked wheat

2 cups milk

1 ½ cups sugar

6 egg yolks

Cinnamon

In a saucepan, bring the water and lemon rind to a boil. Add cracked wheat (white wheat works best); cook until water is absorbed. Add the milk and sugar; bring to a boil. Lower the heat and cook, stirring constantly, for about 5 minutes. In a bowl, beat egg yolks; add a little of the hot milk mixture. Stirring constantly, slowly add egg mixture to saucepan; cook over low heat for 5 more minutes. Remove from heat and cool. Pour into serving dishes. Sprinkle with cinnamon. Chill before serving.

Note: This recipe is a modification of a dessert I had in Portugal called Aletría. Aletría is made from with pasta by the same name. I substituted cracked wheat for the pasta. Although it has a different texture, it has the same great taste as Portuguese Aletría.

Classes and Uses of Wheat

Dr. Jim Beuerlein

Professor, Horticulture and Crop Science

The primary use of wheat is to produce food for humans. Grain that is not good enough for human food is used for animal feed. Many different food products are made from the different classes of wheat. Durum wheat is used to make pastas. Hard red wheat is used to make loaf bread and other products. The soft red winter wheat grown in Ohio is used to make cookies, cakes, donuts, and other fine pastries. Often, flour from different classes of wheat is blended to make special flours for unique food products. The various classes of wheat are described here.

Durum Wheat, the hardest of all U.S. wheats, is seeded in the spring and contains a high amount of protein (12–16%), which is good for pasta products — macaroni, spaghetti, and other noodles. Durum wheat is grown mainly in North Dakota and has subclasses such as Hard Amber Durum, Amber Durum, and Durum wheats. Total acreage is about 3.2 million acres.

Hard Red Spring Wheat contains the highest protein content (13–16.5%) making it an excellent bread wheat with superior milling and baking characteristics. Hard red spring wheat is grown mostly in Montana, the Dakotas, and Minnesota. This wheat is seeded in the spring and may have either a hard or a soft endosperm. Subclasses are Dark Northern Spring, Northern Spring, and Red Spring wheats. Total acreage is about 13.8 million acres.

Hard Red Winter Wheat is the class of wheat used mostly for bread and all-purpose flour. This wheat is fall-seeded, has medium to high protein content (10–13.5%), and can have either hard or soft endosperm. Hard red winter wheat accounts for more than 40% of the U.S. wheat crop and half of U.S. wheat exports. This wheat is produced in the Great Plains, between the Mississippi River and the Rocky Mountains, and from Texas to the Dakotas and Montana. It has a wide range of protein and good milling and baking qualities. The flour is used to produce bread, rolls, some sweet goods, and all-purpose flour. Total acreage is about 23 million acres.

Hard White Wheat is the newest class of wheat to be grown in the United States. Hard white wheat is closely related to red wheats except for the color genes and has a milder, sweeter flavor, equal fiber, and similar milling and baking qualities. Hard white wheat is used in yeast breads, hard rolls, bulgur, tortillas, and oriental noodles. This wheat is used in domestic markets and is exported in limited amounts. There are no subclasses. Total acreage is about 0.3 million acres.

Soft Red Winter Wheat is seeded in the fall, has a low to medium protein content with soft endosperm, and is used to make cakes, pastries, flat breads, and crackers. It is grown east of the Mississippi and has no subclasses. Ohio is the leading producer of soft red winter wheat followed by Arkansas, Illinois, and Missouri. Ohio wheat is known for making higher-quality flour than that coming from any other soft red winter wheat-producing state. Total acreage is about 13.0 million acres.

Soft White Wheat is used much the same way as soft red wheat (for bakery products other than bread) and is grown mostly in the Pacific Northwest and to a lesser extent in California, Wisconsin, Michigan, and New York. Soft white wheat has low protein and high yields. Subclasses are Soft White, White Club, and Western White wheats. Total acreage is about 8.3 million acres.

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Grains of Science

Research demonstrates importance of harvesting the energy of grain foods

Besides providing natural energy for keeping up to speed to tackle all of life's daily tasks, consuming a variety of grain foods is a great way to help achieve good overall health. Grain foods help prevent a variety of health problems and can help with weight management. The following are summaries of recent studies that have found positive correlations between grain foods and good health. Key findings are noted in bold.

Alzheimer's

Folic acid may help prevent Alzheimer's. A research project at the University of Kentucky Sanders-brown Center on Aging found folic acid – a B vitamin found in foods such as enriched breads and pastas – may slow the destruction of brain cells in Alzheimer's disease. The Nim Study's lead investigator explained folate is important in the development of the human nervous system during pregnancy and may play a role in the maintenance of the integrity of the brain later in life.

(Source: *Harvard Women's Health Watch*, April 2001)

Birth Defects

Neural tube defects (NTDs): Researchers at the Centers for Disease Control and Prevention (CDC) report neural tube defects (NTDs) decreased by 19 percent following folic acid fortification in the U.S. food supply. For almost 10 years, the CDC and the U.S. Public Health Service have recommended all women of childbearing age consume 400 micrograms of the B vitamin folic acid each day to decrease the risk of NTDs, such as spina bifida and anencephaly. CDC researchers reported a 19 percent decrease in NTDs since the government mandated folic acid fortification of enriched breads, cereals, pastas, and other grain foods.

(Source: *Journal of the American Medical Association*, June 20, 2001)

Cancer

Breast cancer: Folic acid intake may reduce breast cancer risk associated with alcohol. Mayo Clinic researchers evaluated health questionnaires filled out by more than 41,000 women. They found those who had the lowest intake of folic acid, either from diet or supplement and drank more than four ounces of alcohol a day, had a 59 percent increased risk of developing breast cancer, compared with women whose folic acid intake was above average and who never drank alcohol.

(Source: *Mayo Clinic Women's Health Source*, September 2001)

Stomach Cancer: Researchers determine cereal fiber helps prevent at least one form of stomach cancer. A study conducted by the Mayo Clinic found those who ate the highest amount of cereal fiber, which can be found in whole grain bread, oatmeal, and certain breakfast cereals, were less likely than those who ate little or not cereal fiber to develop cancer at the juncture between the esophagus and the stomach.

(Source: *Health News*, April 2001)

Diabetes

Researchers find eating a serving of whole grain cereal every day may reduce the risk of diabetes as much as 34 percent. A study conducted by Harvard researchers showed one serving of whole grain cereal a day had a statistically significant impact, measuring a 34 percent decrease in the incidences of Type 2 diabetes. Other whole grain foods effective in lowering risk include whole grain bread, bran cereals, oatmeal, whole wheat pasta, and brown rice.

(Source: *Harvard Heart Letter*, September 2000)

Heart Health

Heart disease: Researchers determine whole grains lower the risk of heart disease. A study conducted by researchers at Brigham Women's Hospital and Harvard Medical School in Boston found women who consume two to three servings of whole grains per day by eating foods, such as whole wheat bread and multi-grain bagels reduced their risk of heart disease by almost 30 percent.

(Source: *Reuters Health*, 2001)

Overall Health

Reduced health risks: A study conducted by researchers at the University of Minnesota finds those who eat a variety of grains daily, especially whole grains, have a reduced risk of death from heart disease and cancer. In a study of nearly 34,000 Norwegian adults, those who ate the highest amounts of whole grains – found in foods such as whole grain bread, cereals, muffins, and pastas – had a 23 percent reduced risk of death from heart disease and a 21 percent reduced risk of death from cancer, compared with people who ate little or no whole grains. These study findings and other similar research are the basis for the United States Department of Agriculture's (USDA) recommendation that Americans “eat a variety of grains daily, especially whole grains.”

(Source: *European Journal of Clinical Nutrition*, February 2001)

Reduced health risks: Researchers determine Okinawans' exceptionally good health could be linked to their high grains/vegetables diet. Okinawa boasts the highest percentage of centenarians anywhere – heart disease rates are low, breast and prostate cancer are practically unheard of, and obesity is rare. The Okinawan diet could be the key. Grains, vegetables, and fruit make up 72 percent of their diet. The average Okinawan consumes at least seven servings of vegetables daily and an equal number of grains in the form of noodles, bread, and rice.

(Source: *University of California, Berkeley Wellness Letter*, September 2001)

Weight Management

Weight control: Researchers report diets high in carbohydrates and low in fat can help in weight control. Ian Caterson, professor of human nutrition at Sydney University and a world expert on obesity, and Janet Franklin, an accredited, practicing dietitian who works with the Metabolism and Obesity Services at Royal Prince Alfred Hospital in Sydney, found scientific evidence supporting the claim that a high-carbohydrate, low-fat diet can help people lose weight and keep it off. Carbohydrates, found in breads, pastas, and cereals, satisfy your appetite, plus offer the added benefits of fiber and other nutrients. Contrary to popular belief, high-protein, low-carbohydrate diets (which are generally high in fat) do not lead to long-term weight loss – and may actually be dangerous.

(Source: *Australian Journal of Nutrition and Dietetics*, June 2001)

Weight reduction: The USDA finds while many diets help people lose weight, only moderate-fat, high-carbohydrate regimens seem to keep the pounds off long term. The USDA released a white paper examining existing scientific literature on weight reduction. At the heart of the USDA findings was the simple observation: diets that reduce caloric intake result in weight loss. But keeping the pounds off requires a long-term commitment to managing consumption. Low-calorie grain foods, such as breads, cereals, crackers, and pastas, are low-fat foods that provide many of the nutrients necessary for good health.

(Source: *American Heart Association*, September 2001)

Comparing the Nutritional Value of the 6 Types of Wheat

value per 100 grams of edible portion

Nutrient	Units	Wheat, hard red winter	Wheat, hard red winter	Wheat, hard white	Wheat, soft white	Wheat, soft red	Wheat, Durum
Proximates							
Water	g	13.1	12.76	9.57	10.42	12.17	10.94
Energy	g	327	329	342	340	331	339
Energy	ki	1368	1377	1431	1423	1385	1418
Protein	g	12.61	15.4	11.31	10.69	10.35	13.68
Total lipid (fat)	g	1.54	1.92	1.71	1.99	1.56	2.47
Ash	g	1.57	1.89	1.52	1.54	1.68	1.78
Carbohydrate, by difference	g	71.18	68.03	75.9	75.36	74.24	71.13
Fiber, total dietary	g	12.2	12.2	*	12.7	12.5	*
Minerals							
Calcium, Ca	mg	29	25	32	34	27	34
Iron, Fe	mg	3.19	3.6	4.56	5.37	3.21	3.52
Magnesium, Mg	mg	126	124	93	90	126	144
Phosphorus, P	mg	288	332	355	402	493	508
Potassium, K	mg	363	340	432	435	397	431
Sodium, Na	mg	2	2	2	2	2	2
Zinc, Zn	mg	2.65	2.78	3.33	3.46	2.63	4.16
Copper, Cu	mg	0.434	0.41	0.363	0.426	0.45	0.553
Manganese, Mn	mg	3.985	4.055	3.821	3.406	4.391	3.012
Selenium, Se	mcg	70.7	70.7	*	*	*	89.4
Vitamins							
Vitamin C, total ascorbic acid	mg	0	0	0	0	0	0
Thiamin	mg	0.383	0.504	0.387	0.41	0.394	0.419
Riboflavin	mg	0.115	0.11	0.108	0.107	0.096	0.121
Niacin	mg	5.464	5.71	4.381	4.766	4.8	6.738
Pantothenic acid	mg	0.954	0.935	0.954	0.85	0.85	0.935
Vitamin B-6	mg	0.3	0.336	0.368	0.378	0.272	0.419
Folate, total	mcg	38	43	38	41	41	43
Folic acid	mcg	0	0	0	0	0	0
Folate, food	mcg	38	43	38	41	41	43
	mcg_DF						
Folate, DFE	E	38	43	38	41	41	43
Vitamin B-12	mcg	0	0	0	0	0	0
Vitamin A, IU	0	0	0	0	0	0	0
Retinol	mcg	0	0	0	0	0	0
	mcg_RA						
Vitamin A, RAE	E	0	0	0	0	0	0
Vitamin E	mg_ATE	1.44	1.44	*	1.44	1.44	*
Lipids							
Fatty acids, total saturated	g	0.269	0.314	0.277	0.368	0.289	0.454
Fatty acids, total monounsaturated	g	0.2	0.303	0.203	0.227	0.178	0.344
Fatty acids, total polyunsaturated	g	0.627	0.765	0.75	0.837	0.656	0.978
Cholesterol	mg	0	0	0	0	0	0

*The value of this nutrient was not included by the USDA. Most likely its value would be similar to the other types of wheat.

Nutrient	Units	Wheat, hard red winter	Wheat, hard red winter	Wheat, hard white	Wheat, soft white	Wheat, soft red	Wheat, Durum
Amino Acids							
Tryptophan	g	0.16	0.195	*	*	*	0.176
Threonine	g	0.365	0.433	*	*	0.342	0.366
Isoleucine	g	0.458	0.541	*	*	0.396	0.533
Leucin	g	0.854	1.038	*	*	0.763	0.934
Lysine	G	0.335	0.404	*	*	0.315	0.303
Methionine	G	0.201	0.23	*	*	0.174	0.221
Cystine	G	0.322	0.404	*	*	0.3	0.286
Phenylalanine	G	0.592	0.724	*	*	0.508	0.681
Tyrosine	G	0.387	0.441	*	*	0.327	0.357
Valine	G	0.556	0.679	*	*	0.498	0.594
Arginine	G	0.595	0.702	*	*	0.522	0.483
Histidine	G	0.285	0.33	*	*	0.256	0.322
Alanine	G	0.45	0.555	*	*	0.412	0.427
Aspartic acid	G	0.64	0.808	*	*	0.557	0.617
Glutamic acid	G	3.998	4.946	*	*	3.663	4.743
Clycine	G	0.528	0.621	*	*	0.455	0.495
Proline	G	1.289	1.68	*	*	1.166	1.459
Serine	G	0.586	0.663	*	*	0.54	0.667

*The value of this nutrient was not included by the USDA. Most likely its value would be similar to the other types of wheat.

Source: USDA National Nutrient Database for Standard Reference, Release 20 August 2007
<http://www.nal.usda.gov/fnic/foodcomp/search/>

Comparing the Nutritional Value of the 6 Types of Wheat Flours

value per 100 grams of edible portion

Nutrient	Units	Wheat flour, whole-grain	Wheat flour, all-purpose, unenriched	Wheat flour, white, all-purpose, enriched, bleached	Wheat flour, white, all-purpose, enriched, unbleached
Water	g	10.27	11.92	11.92	11.92
Energy	kcal	339	364	364	364
Energy	kJ	1418	1523	1523	1523
Protein	g	13.7	10.33	10.33	10.33
Total lipid (fat)	g	1.87	0.98	0.98	0.98
Ash	g	1.6	0.47	0.47	0.47
Carbohydrate, by difference	g	72.57	76.31	76.31	76.31
Fiber, total dietary	g	12.2	2.7	2.7	2.7
Minerals					
Calcium, Ca	mg	34	15	15	15
Iron, Fe	mg	3.88	1.17	4.64	4.64
Magnesium, Mg	mg	1.38	22	22	22
Phosphorus, P	mg	346	108	108	108
Potassium, K	mg	405	107	107	107
Sodium, NA	mg	5	2	2	2
Zinc, Zn	mg	2.93	0.7	0.7	0.7
Copper, Cu	mg	0.382	0.144	0.144	0.144
Manganese, Mn	mg	3.799	0.682	0.682	0.682
Selenium, Se	mcg	70.7	33.9	33.9	33.9
Vitamins					
Vitamin C, total ascorbic acid	mg	0	0	0	0
Thiamin	mg	0.447	0.12	0.785	0.785
Riboflavin	mg	0.215	0.04	0.494	0.494
Niacin	mg	6.365	1.25	5.904	5.904
Pantothenic acid	mg	1.008	0.438	0.438	0.438
Vitamin B-6	mg	0.341	0.044	0.044	0.044
Folate, total	mcg	44	26	194	162
Folic acid	mcg	0	0	165	132
Folate, food	mcg	44	26	29	30
Folate, DFE	mcg_DFE	44	26	309	255
Vitamin B-12	mcg	0	0	0	0
Vitamin, IU	IU	0	0	0	0
Retinol	mg	0	0	0	0
Vitamin A, RAE	mcg_RAE	0	0	0	0
Vitamin E	mg_ATE	1.23	.006	0.132	0.476

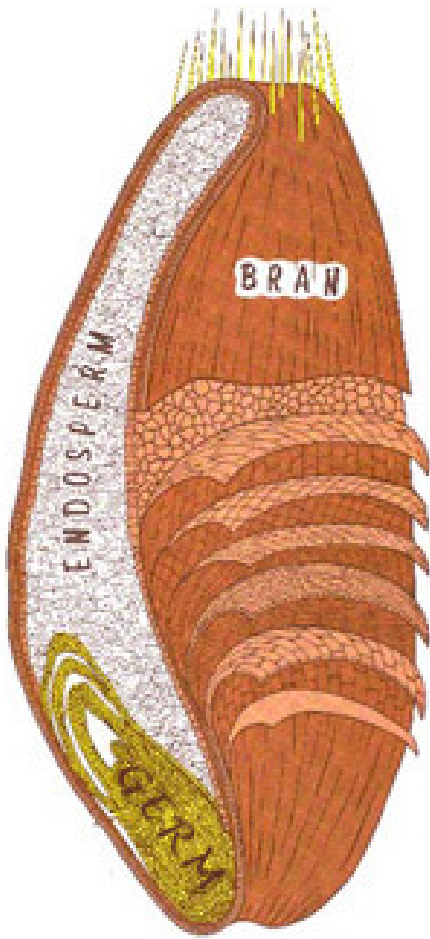
Comparing the Nutritional Value of the 6 Types of Wheat Flours

value per 100 grams of edible portion

Nutrient	Units	Wheat flour, whole-grain	Wheat flour, all-purpose, unenriched	Wheat flour, white, all-purpose, enriched, bleached	Wheat flour, white, all-purpose, enriched, unbleached
Lipids					
Fatty acids, total saturated	g	0.322	0.155	0.155	0.155
Fatty acids, total monounsaturated	g	0.232	0.087	0.087	0.087
Fatty acids, total polyunsaturated	g	0.779	0.413	0.413	0.413
Cholesterol	mg	0	0	0	0
Amino Acids					
Tryptophan	g	0.212	0.127	0.127	0.127
Threonine	g	0.395	0.281	0.281	0.281
Isoleucine	g	0.508	0.357	0.357	0.357
Leucine	g	0.926	0.71	0.71	0.71
Lysine	g	0.378	0.228	0.228	0.228
Methionine	g	0.212	0.183	0.183	0.183
Cystine	g	0.317	0.219	0.219	0.219
Phenylalanine	g	0.646	0.52	0.52	0.52
Tyrosine	g	0.4	0.312	0.312	0.312
Valine	g	0.618	0.415	0.415	0.415
Arginine	g	0.642	0.417	0.417	0.417
Histidine	g	0.317	0.23	0.23	0.23
Alanine	g	0.487	0.332	0.435	0.435
Aspartic acid	g	0.703	0.435	0.435	0.435
Glutamic acid	g	4.325	3.479	3.7479	3.479
Glycine	g	0.552	0.371	0.371	0.371
Proline	g	1.422	1.198	1.198	1.198
Serine	g	0.646	0.516	0.516	0.516

Source: USDA National Nutrient Database for Standard Reference, Release 20 (August 2007)
<http://www.nal.usda.gov/fnic/foodcomp/search/>

The Wheat Kernel



The wheat kernel is the seed of the wheat plant. It is also an important source of people food. More foods are made with wheat than any other cereal grain.

One bushel of wheat contains approximately 1 million individual wheat kernels. Each tiny seed has 3 parts: the endosperm, the bran, and the germ.

The endosperm is about 83% of the wheat kernel. It is used to make white flour. To make whole wheat flour, the endosperm is combined with the bran and the germ.

Bran is made up of the outer layers of the wheat kernel. Bran is used in whole wheat flour. It is also used in breakfast cereals.

The germ is tiny - about 2 1/2% of the whole wheat kernel. The germ is the part that will sprout and grow into a new wheat plant if the kernel is planted. Wheat germ is sold in grocery stores and food markets. Whole wheat flour also contains wheat germ.

Drawing courtesy of the Kansas Wheat Commission

U.S. dietary guidelines recommend 6 to 11 servings of the bread, cereal, rice and pasta group each day. Grain-based foods provide complex carbohydrates, the best source of time-released energy for our bodies. These foods are usually low-fat and provide fiber. Grain foods provide vitamins—especially the three key B vitamins (thiamine, riboflavin and niacin) and iron.

Source: <http://www.kswheat.com/general.asp?id=519> (accessed 17 September 2008)

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