Dear Educator:

Thank you for requesting material from the California Wheat Commission. Wheat is a vital component in our diet. The wheat produced in California is used for both human and animal consumption; up to 25% is exported. The per capita consumption of flour for the United States in 2014 was 135 pounds/year.

The California Wheat Commission was established in 1983 to develop and maintain international and domestic markets for California-grown wheat and support research which will improve California wheat quality and marketability.

The Commission has a state of the art laboratory that tests the quality of wheat and determines how millers can effectively use California wheat in their operations. Once a wheat sample reaches the lab, it goes through five analytical phases: Wheat Analysis, Test Milling, Flour Analysis, Physical Dough Testing and the Baking Test. The laboratory also provides technical services and training to overseas buyers.

Wheat is an excellent plant to use in the classroom to teach plant science, agricultural concepts, and even United States History. Enclosed you will find an abundance of information including background information on wheat, ways to incorporate wheat resources into your classroom curriculum, directions on how to grow wheat in your classroom and sample lesson plans. I hope you find the information enjoyable and useful. Please let me know if I can be of further assistance.

Sincerely,

Cymantha Fredrickson

Cymantha Fredrickson
Assistant Director

1240 Commerce Ave., Woodland CA 95776 (530) 661-1292* FAX: (530) 661-1332* E-Mail: info@californiawheat.org* www.californiawheat.org*

Wheat growers voted to establish the California Wheat Commission in 1983, expressly to develop and maintain domestic and international markets for California wheat and support research that improves California wheat quality and marketability. The Commission, operating under the California Food and Agriculture Code, is funded entirely by wheat growers and is guided by a board which includes thirteen wheat producers, two handlers, two at-large members, and one public member – each with alternates. California wheat production covered over 500,000 acres with a farm value of approximately 128 million dollars for grain produced in 2014.

California Wheat Laboratory

In 1990, the California Wheat Commission opened its analytical laboratory. The laboratory analyzes California wheat quality and the resulting data is published in an annual Wheat Crop Quality Report printed in three languages and distributed to potential buyers in both domestic and international markets. The lab performs milling quality testing, chemical analysis of wheat and flour, physical dough testing and baking and noodle production tests. The Commission also provides analysis for advanced experimental wheat varieties being developed at the University of California as well as cooperates with private wheat breeders in evaluating promising new lines.

California Wheat Commission Staff

Janice Cooper – Executive Director
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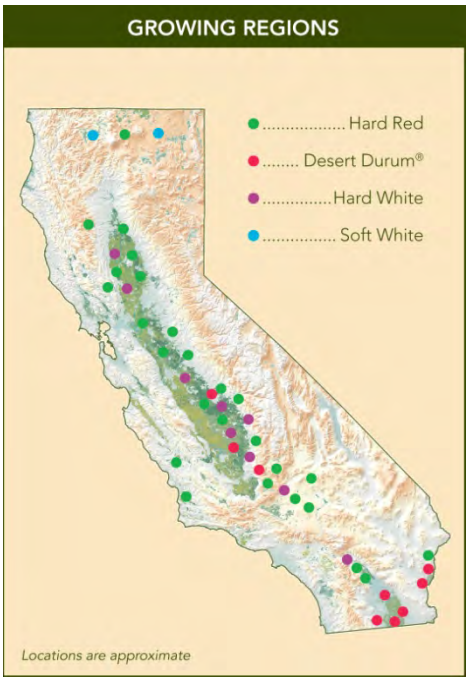
U.S. and California Wheat Classes

There are hundreds of varieties of wheat produced in the United States, all of which fall into one of six recognized classes: Hard Red Winter, Hard Red Spring, Hard White, Soft White, Durum, and Soft Red Winter. California grows all of the U.S. wheat classes except Soft Red Winter.



Wheat has two distinct growing seasons. Winter wheat is sown in the fall or winter and harvested in the spring or summer; spring wheat is planted in the spring and harvested in late summer or early fall. Most varieties grown in California are genetically spring wheat varieties, i.e. do not require vernalization, however because the majority of California wheat-growing regions have very mild winter temperatures, spring wheat can be sown in the fall or early winter. Since market classifications typically refer to the season of production, not growth habit, California's red wheat production is referred to as Hard Red Winter wheat.

Wheat classes are determined not only by the time of year they are planted and harvested, but also by their hardness, color and the shape of their kernels. Where each class of wheat is grown depends largely upon rainfall, temperature, soil conditions and tradition. Each class of wheat has similar family characteristics, especially as related to milling and baking or other food use.

Hard Red Winter - Hard red winter wheat is an important, versatile bread wheat with excellent milling and baking characteristics. It has medium to high protein (10.0 to 14.0 percent), hard endosperm, red bran, and strong and mellow gluten content. It is used in Artisan and pan breads, Asian noodles, hard rolls, flat breads, and general purpose flour.

Hard Red Spring - Hard red spring wheat is an important bread wheat with excellent milling and baking characteristics. It has high protein (12.0 to 15.0 percent), hard endosperm, red bran, strong gluten, and high water absorption. It is used in pan breads, hearth breads, rolls, croissants, bagels, hamburger buns, pizza crust, and for blending.

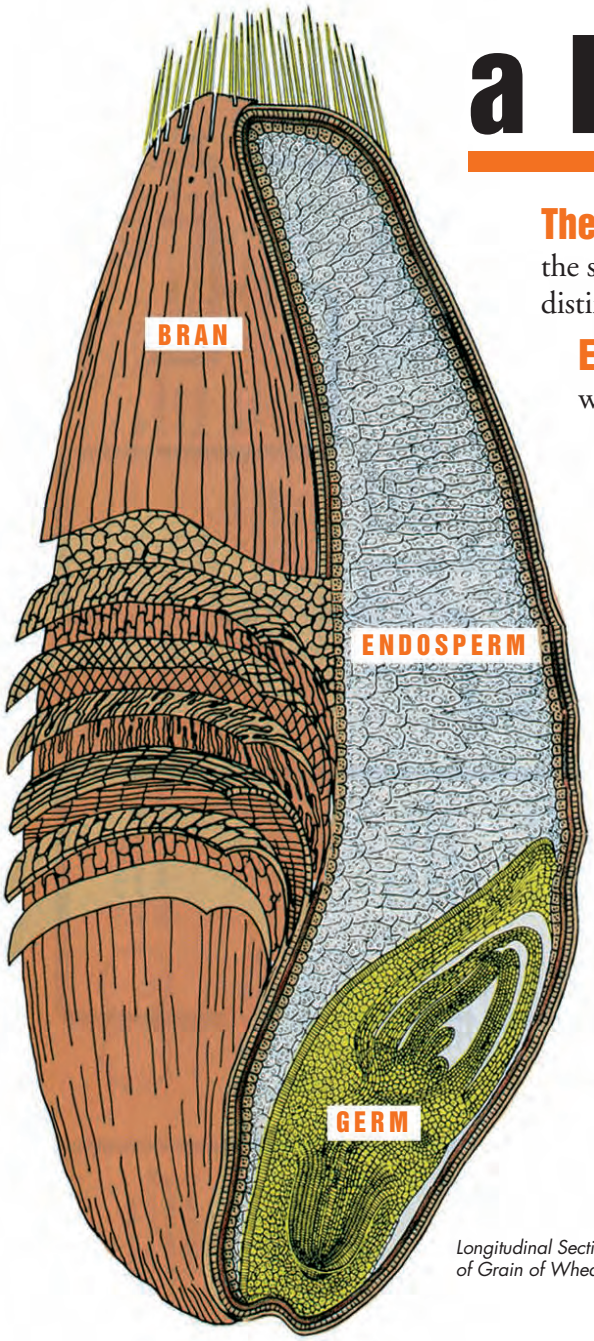
Soft White - Soft white wheat has low protein (8.5 to 10.5 percent) and low moisture, and provides excellent milling results. It is used in flat breads, cakes, biscuits, pastries, crackers, Udon-style noodles, and snack foods.

Hard White - Hard white wheat has a hard endosperm, white bran, and a medium to high protein content (10.0 to 14.0 percent). It is used in instant/ramen noodles, whole wheat or high extraction flour applications, Artisan and pan breads, and flat breads.

Durum - Durum wheat is the hardest of all wheat classes with a high protein content (12.0 to 15.0 percent), yellow endosperm, and white bran. It is used in pasta, couscous, and some Mediterranean breads.

Soft Red Winter - Soft red winter wheat is a high-yielding wheat with low protein (8.5 - 10.5%), soft endosperm, red bran, and weak gluten. It is used in pastries, cakes, cookies, crackers, pretzels, flat breads, and for blending flours. This class of wheat is grown primarily in the eastern third of the United States.

a Kernel of Wheat



Longitudinal Section of Grain of Wheat

The Kernel of Wheat...sometimes called the wheat berry, the kernel is the seed from which the wheat plant grows. Each tiny seed contains three distinct parts that are separated during the milling process to produce flour.

Endosperm...about 83 percent of the kernel weight and the source of white flour.

Bran...about 14 1/2 percent of the kernel weight. Bran is included in whole wheat flour and can also be bought separately.

Germ...about 2 1/2 percent of the kernel weight. The germ is the embryo or sprouting section of the seed, often separated from flour in milling because the fat content limits flour's shelf-life.

Whole Grains...whole grain products are made with the whole kernel of grain. The bran (outer layer) contains the largest amount of fiber (insoluble), B vitamins, trace minerals and a small amount of protein; the endosperm (middle layer) contains mostly protein and carbohydrates along with small amounts of B vitamins, iron and soluble fiber; and the germ (inner part) is a rich source of trace minerals, unsaturated fats, B vitamins, antioxidants, phytochemicals and a minimal amount of high quality protein.

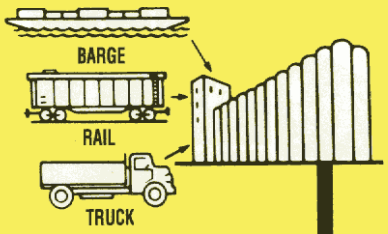
Enriched Grains...enriched white flour is the finely ground endosperm of the kernel. Some of the nutrients that are milled out are replaced through enrichment. Slice for slice, enriched white bread as well as other enriched grain products, are a good source of iron and or B vitamins (thiamin, riboflavin, niacin and folic acid) as well as complex carbohydrates. Enriched grain products have over twice the amount of folic acid as whole wheat. Compare a slice of enriched white bread with 37mcg to a slice of whole grain bread at 17.5mcg.

Grain-based Foods...provide complex carbohydrates – the best fuel for our bodies. These foods are often low in fat and contain fiber. Grain foods provide vitamins – especially the four key B vitamins (thiamin, riboflavin, niacin and folic acid) and iron. During the milling process, white flour is produced by removing the bran and germ portions of the wheat. Most (95%) products made from white flour are enriched. Whole grain foods are made with flour that contains all three parts of the kernel. Nutrition experts recommend that at least half of our daily grains come from whole grain products. The total number needed each day depends on age, gender and activity level. MyPyramid.gov can help individuals determine the appropriate amount of foods needed.

HOW FLOUR IS MILLED

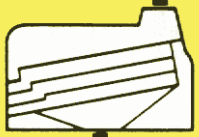
(A SIMPLIFIED DIAGRAM)

IT STARTS HERE . . .

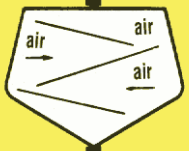


ELEVATOR–storage and care of wheat.

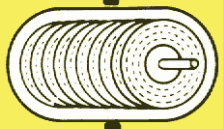
PRODUCT CONTROL–chemists inspect and classify wheat, blending is often done at this point.



SEPARATOR–reciprocating screens remove stones, sticks and other coarse and fine materials.

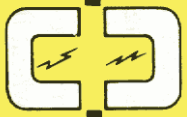


ASPIRATOR–air currents remove lighter impurities.



DISC SEPARATOR–barley, oats, cockle and other foreign materials are removed.

SCOURER–beaters in screen cylinder scour off impurities and roughage.



MAGNETIC SEPARATOR–iron or steel articles stay here.

WASHER-STONER–high speed rotors circulate wheat and water–stones are removed.

TEMPERING–water toughens outer bran coats for easier separation–softens or mellows endosperm.

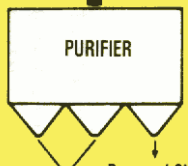
BLENDING–types of wheat are blended to make specific flours.

ENTOLETER–impact machine breaks and removes unsound wheat.

FIRST BREAK–corrugated rolls break wheat into coarse particles.

broken wheat is sifted through successive screens of increasing fineness.

← to a series of purifiers, reducing rolls and sifters.



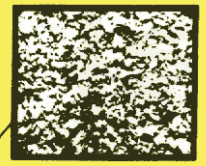
air currents and sieves separate bran and classify particles (or middlings).

Bran and Shorts

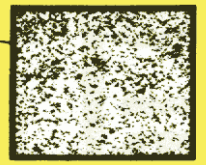
REDUCING ROLLS–smooth rolls reduce middlings into flour.

A series of purifiers, reducing rolls and sifters repeat the process.

BLEACHING–flour is matured and color neutralized.

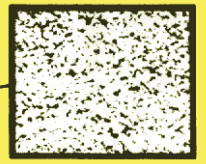


BRAN

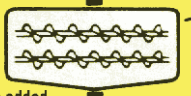


SHORTS

CLEAR FLOUR



GERM



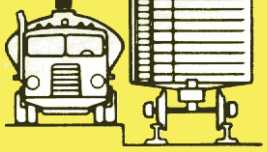
ENRICHING–thiamine, niacin, riboflavin and iron are added.

PATENT FLOUR

SACKED–for home and bakery use.

BULK DELIVERY to bakeries . . .

by truck



by rail

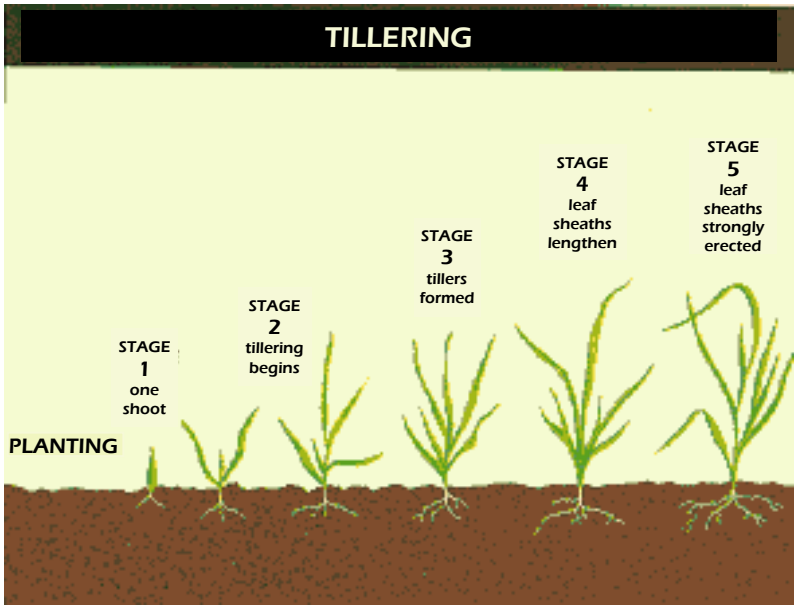
NOTE: This chart is greatly simplified. The sequence, number and complexity of different operations vary in different mills.

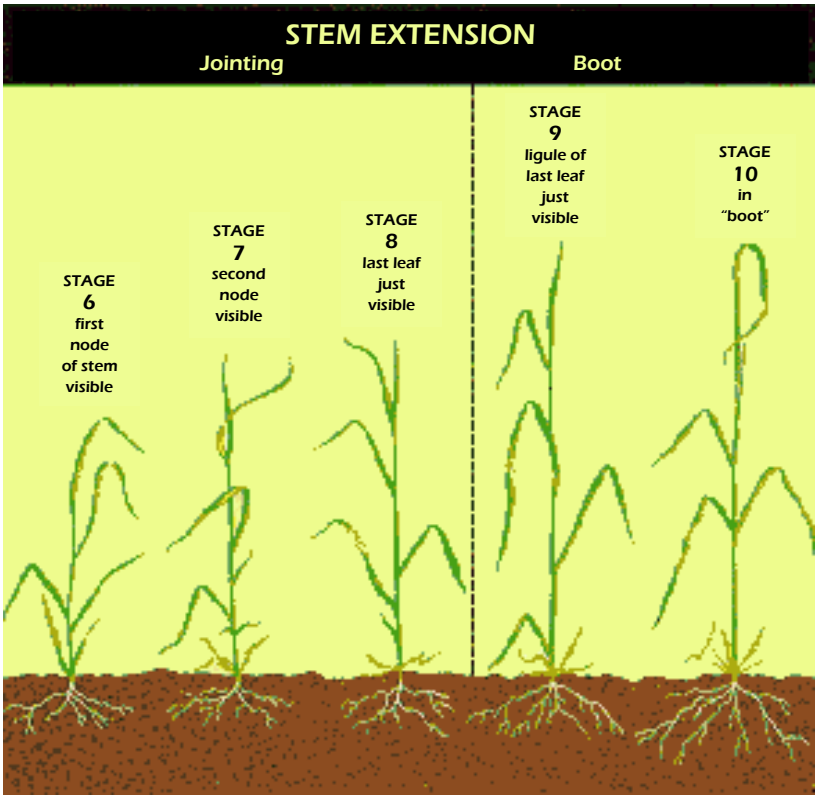
FEEKES' SCALE OF WHEAT DEVELOPMENT

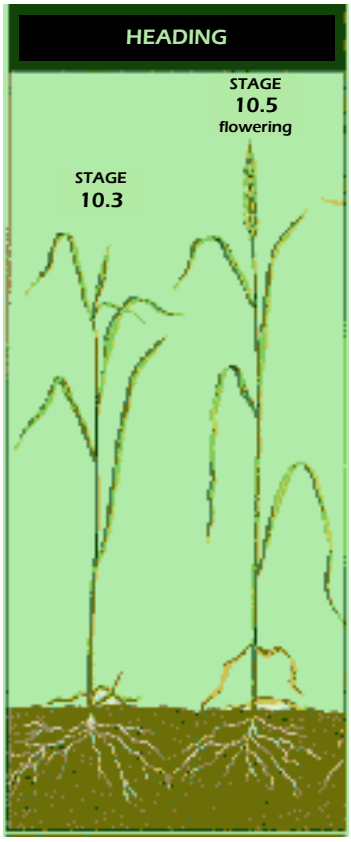
Knowing the various stages of growth and development of a wheat crop enables growers to exercise better management of inputs by allowing these inputs to be used at the proper growth stage and not according to a calendar date.

Agronomists have developed the Feekes' Scale, an objective measure of the growth and development of wheat plants, to help growers identify the optimum time to apply inputs.

This measuring system ranges from 1.0 (to designate emergence of the first seedling leaf) to 11.4 (to designate mature plants with hard grain).







Growing Wheat in the Classroom

INTRODUCTION

Wheat is an excellent seed for student experiments. It grows rapidly and quickly responds to experimental variables such as changes in light, water and nutrient availability. Wheat typically has a 6 to 8 month growing cycle with heads appearing, in an optimum environment, 3 months after planting. Wheat in California is planted in the fall (October through December) and harvested in late spring/early summer (June through July). The wheat kernels are checked periodically for moisture content and when the moisture level is between 7% and 11%, the wheat is harvested. The time of harvest can depend on the weather and climate of the growing region. In the classroom, if maintained at room temperature, the cycle can be significantly reduced. In the greenhouse in the spring/summer, the mature plants can be produced in 3 months, depending on the variety and temperature maintained.

MATERIALS NEEDED

- Soil – any type but for best results, it must include some nitrogen
- Wheat seeds – obtain wheat berries from health food stores or contact the California Wheat Commission for samples
- Paper cups, 4”- 6” planting pots or an outdoor growing plot
- Fertilizer high in nitrogen (if planning to grow wheat to full maturity)
- Water

PROCEDURE

1) Punch small drainage holes in the cups.
2) Fill cups about $^{2}/_{3}$ full of moist soil leaving at least ½” of space below the lip of the cup.
3) Plant 2-3 wheat seeds in a paper cup at a depth of 1 ½”. If you are using 4”-6” pots, plant six to eight seeds in each pot. Place the cups or pots in a pan that will catch drainage water.
4) Water as needed to keep the soil moist, but not overly wet. Grow the wheat in a well-lit area (sunlight or artificial grow lights) and keep the wheat at room temperature.
5) In approximately 3 months, the properly cared for wheat plants should produce a head (spike). After the head is fully developed, stop watering the wheat and harvest it when the plant becomes dry and the wheat kernels are hard throughout.

SPECIAL NOTES

- For quicker results, you may wish to germinate seeds in a wet paper towel before planting. Germination usually takes six to eight days.
- You may choose to plant wheat in larger containers if you are growing the wheat to maturity. Paper cups have a tendency to tip when the wheat grows tall.
- You may choose to add fertilizer high in nitrogen, twice during the growing season, especially if the plants have minimal soil available to them.
- If growing wheat outdoors, plan to plant it in October through December for harvest in June – July.

(Growing instructions were obtained from Dr. Lee Jackson; Small Grains Extension Specialist at the University of California at Davis (now retired).

WHEAT TRIVIA

Wheat is a member of the grass family that produces a dry, one-seeded fruit commonly called a kernel.

More than 17,000 years ago, humans gathered the seeds of plants and ate them. After rubbing off the husks, early people simply chewed the kernels raw, parched or simmered.

Wheat originated in the "cradle of civilization" in the Tigris and Euphrates river valley, near what is now Iraq.

The Roman goddess, Ceres, who was deemed protector of the grain, gave grains their common name today – "cereal."

Wheat was first planted in the United States in 1777 as a hobby crop.

Today, wheat is the primary grain used in U.S. grain products — approximately three-quarters of all U.S. grain products are made from wheat flour.

Wheat is grown in 42 states in the United States.

Six classes bring order to the thousands of varieties of wheat. They are: hard red winter (HRW), hard red spring (HRS), soft red winter (SRW), hard white (HW), soft white (SW) and durum.

In 2008/2009, U.S. farmers grew nearly 2.4 billion bushels of wheat on 63 million acres of land.

In the United States, one acre of wheat yields an average of around 40 bushels of wheat.

About half of the wheat grown in the United States is used domestically.

One bushel of wheat contains approximately one million individual kernels.

One bushel of wheat weighs approximately 60 pounds.

One bushel of wheat yields approximately 42 pounds of white flour OR 60 pounds of whole-wheat flour.

A bushel of wheat yields 42 one-and-a-half pound commercial loaves of white bread OR about 90 one-pound loaves of whole wheat bread.

There is approximately 16 ounces of flour in a one-and-a-half pound loaf of bread.

Based on the "Grains of Truth about Wheat" fact sheet produced by the Wheat Foods Council.

Wheat Lesson Ideas

Mathematics

1. Introduce the concepts of acre, bushel, pound, etc., using the “Wheat Trivia” information page and other information found in the packet.
2. Create a logic problem that teaches students the sequence of events that occur in a combine during harvest. Study the history and components of a modern combine.
3. Learn how the price of wheat is determined. What do farmers do to maximize their profit?
4. Create math word problems or logic problems related to wheat.

Science

1. Analyze the parts of a wheat plant and learn their names.
2. Grow wheat and study its life cycle.
3. Research and study how local climate and soil types determine what types of wheat are grown in certain areas.
4. Use wheat for a variety of plant science experiments.
5. Study the machinery used to plant, cultivate and harvest wheat. What machinery is used in the process of making wheat flour from wheat grain?
6. Study the science of silo designs. Why do grain operators need to be concerned about spontaneous combustion? What is done to prevent it?
7. Plant wheat seeds at different depths. How does seed depth affect plant growth?
8. Germinate wheat seeds on wet sponges or petri dishes with moist paper towels. Examine the sprouts and tiny root hairs.
9. Perform various chemical analyses of wheat flour such as starch and protein content. Compare whole wheat flour to white bleached flour or ground wheat germ.
10. Study the science of making bread rise. What is the importance of gluten and yeast in the bread-making process?
11. Build molecular models of simple and complex carbohydrates. Relate this information to wheat.

Nutrition

1. Create a unit with the theme “Healthful Eating.” Include the growing of wheat and production of wheat products in your unit.
2. Have students make a creative menu that includes the proper amounts of each type of food in the food pyramid. Have students think of creative ways to include wheat products in their diet.

3. Study the composition of wheat. How many grams of carbohydrates, protein, fat, etc. does a slice of white bread contribute to one's diet? How about a slice of whole-wheat bread?
4. Have students bring in empty food containers whose labels list the primary ingredient as wheat. Discuss the other ingredients in the products.
5. Discuss how wheat can be a major source of fiber in one's diet. What is the importance of a high-fiber diet?
6. Have a wheat tasting party. Have students try a variety of ethnic foods whose primary ingredients are wheat.
7. Have students create a new wheat product. It can be a new type of a common product such as cereal or bread or a brand new product such as "frozen wheatcicles."
8. Schedule a day where your students will eat lunch in your classroom. Before they eat, have them determine which parts of their lunches are made from wheat. Have them discuss what it would be like to have a lunch without wheat.

History/Social Science/Geography

1. Using a map of the United States, have students learn where different types of wheat are grown and where wheat shipping ports are located.
2. Study the history of wheat and how it became a commercial product in the United States.
3. Study the history of wheat in California.
4. Determine whether or not wheat is grown in your county. Find out why this is so.
5. Study the import/export operations of California wheat.
6. Examine how wheat production affects political decisions made in the United States.
7. Examine the federal regulation put on wheat and wheat flour production.
8. Analyze how important wheat is to the economy of the United States.

Language Arts

1. Read the story of the "Little Red Hen." Discuss the process of growing wheat to produce bread. Discuss how everyone should contribute to keeping a healthy environment so enough food can be produced for all people.
2. Write a poem about people's dependence on wheat and/or the history of wheat.
3. Collect books that highlight wheat or a wheat product. Read them aloud to students while they grow wheat in the classroom.
4. Create a bingo game using wheat vocabulary words. Have students make their own bingo cards using wheat vocabulary you provide. Read a definition and ask the students to cover up the appropriate word. Students who get "bingo" can win a healthy snack made from wheat.

Art

1. Make a collage of wheat products.
2. Have students draw and label the parts of a wheat kernel.
3. Using stalks of wheat have students weave bookmarks or wall hangings.
4. Dip heads of wheat or entire wheat plants into paint and make wheat prints on paper lunch bags. Have students use these bags for school lunches.
5. Create a mural that shows the sequence of wheat from the field to final product—cakes, tortillas and pasta.
6. Have students use photographs of wheat fields to create realistic charcoal or pastel drawings.

Other Ideas

1. Research the different types of wheat and their uses.
2. Create a cooperative research lesson using the material provided in this packet.
3. Create a classroom or family scavenger hunt revolving around wheat.
4. Thresh wheat by hand and grind it into flour.
5. Bring in different types of wheat flour and wheat products such as wheat germ, couscous, whole-wheat flour, gluten, etc. Have students participate in a guessing game as to each item's name and function. Reveal the true identities and discuss the uses for each item.
6. Have a student cooking session where each group of students creates a different wheat product—bread, pasta, tortillas, pancakes, dumplings, doughnuts, etc. Have students create a name and advertisement for their product.
7. Create a trivia game associated with wheat. See trivia sheet (enclosed)
8. Visit a local wheat farm or mill. Observe the wheat being frown or processed.
9. Visit a local grocery store. Explore the variety of products made from wheat.
10. Invite a wheat farmer to your class to discuss his/her operation.

WHEAT RESOURCES

California Foundation for Agriculture in the Classroom
2300 River Plaza Drive
Sacramento, CA 95833
(800) 700-AITC Fax (916) 561-5697
www.cfaitc.org

California Wheat Commission
1240 Commerce Ave., Ste. A
Woodland, CA 95776
(530) 661-1292 Fax (530) 661-1332
www.californiawheat.org

Fleischmann's Yeast
AB Mauri Fleischmann's
1350 Timberlake Manor Parkway, Suite 550
Chesterfield, MO 63017
(314) 392-0800 Fax (314) 392-0825
Home Baking Questions?
(800) 777-4959
www.breadworld.com

National Pasta Association
750 National Press Building
529 14th Street, NW
Washington, DC 20045
(202) 637-5888 Fax (202) 223-9741
www.ilovepasta.org

Tortilla Industry Association
1600 Wilson Blvd, Suite 650
Arlington, VA 22209
(800) 944-6099 Fax (800) 944-6177
www.tortilla-info.com

U.S. Department of Agriculture
Food & Nutrition Information Center
National Agricultural Library
10301 Baltimore Avenue, Room 105
Beltsville, MD 20705
(301) 504-5414 Fax (301) 504-6409
http://fnic.nal.usda.gov

Wheat Foods Council
51 D Red Fox Lane
Ridgway, CO 81432
(970) 626-9828 Fax (970) 626-3686
www.wheatfoods.org

California Straw Artists Guild
Nan Rohan
Vice President
nanrook@hotmail.com
(510) 525-0835

The Culinary Institute Of America at Greystone
2555 Main Street
St. Helena, CA 94574
Admissions: 1.800.CULINARY
Restaurant: 707.967.1010
Continuing Education: 1.800.888.7850
www.ciachef.edu/California

USDA – MyPlate.gov
USA Center for Nutrition Policy and Promotion
3101 Park Center Drive Room 1034
Alexandria, VA 22302-1594
www.choosemyplate.gov/contact-us.html
www.MyPlate.gov

Grain Foods Foundation
490 Bear Cub Drive
Ridgway, CO 81432
Phone: 617.226.9927
ashley.reynolds@mullen.com
www.gowiththegrain.org

Whole Grains Council
Oldways
266 Beacon Street
Boston, MA 02116
Phone: 617.421.5500 Fax: 617.421.5511
www.wholegrainscouncil.org

Grains of truth about COOKIES

Definitions

Originally called "little cakes," cookies are made with sweet dough or batter, baked in single-sized servings and eaten out-of-hand. Perfect for snacking or as dessert, cookies are consumed in 95.2 percent of U.S. households. Americans alone consume over 2 billion cookies a year, or 300 cookies for each person annually.

Cookies are most often classified by method of preparation—drop, molded, pressed, refrigerated, bar and rolled. Their dominant ingredient, such as nut cookies, fruit cookies or chocolate cookies, can also classify them. Whether gourmet, soft or bite-sized cookies, new categories are always cropping up as the American appetite for cookies continues to grow.

History

The word cookie originally came from the Dutch *keokje,* meaning "little cake." In addition, the Dutch first popularized cookies in the United States. The British took a liking to them in the 19th century, incorporating them into their daily tea service and calling them biscuits or sweet buns, as they do in Scotland.

Sometime in the 1930's, so the story goes a Massachusetts innkeeper ran out of nuts while making cookies. Therefore, she substituted a bar of baking chocolate, breaking it into pieces and adding the chunks of chocolate to the flour, butter and brown sugar dough. The Toll House Cookie, so named after the inn in which it was served, was a hit.

Historians credit the innkeeper, Ruth Wakefield, with inventing what has since become an American classic—the chocolate chip cookie.

Ingredients

Following are the basic ingredients used in cookie making. In addition to these, fruits, nuts, chocolates, candies and flavors are used to make the hundreds of cookie varieties that keep Americans asking for more.

Flours: Different types of flours may be used in cookie making, depending on the mix. For butter-rich cookies, all-purpose flour or a blend of cake and bread flour will maintain the desired shape and texture of the cookie. All-purpose flour also holds up better when egg yolks are used. A low gluten cake flour blends easily with whipped egg whites, and results in puffier, softer cookies.

Sugar: A finely granulated sugar is preferred for most cookie mixes unless the recipe calls for something different. Coarsely ground sugar is sometimes used for sprinkling on top of cookies but should not be used in the mix because it will result in poor baking performance. Molasses is ideal for soft cookies because it sweetens and increases moisture retention during baking. In some recipes, brown sugar, honey or corn syrup may be used as a sweetener.

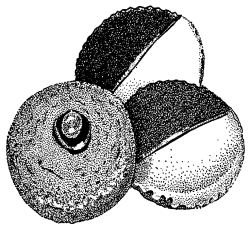
Fat: Butter, margarine and vegetable shortening are the fats used in cookies in relatively high ratios to flour, sugar and other ingredients. Largely responsible for the rich taste associated with cookies, these fats also contribute tenderness and keeping qualities to the finished product. Cookies made with vegetable shortening will spread less in the oven than those made with butter because shortening will hold its shape over a wider temperature range.

Eggs: Eggs add flavor and keeping qualities to cookies, and help maintain the final shape and structure of the cookie. The whole egg, the yolks only or the whites only may be used.

Preparation

Mixing affects the overall quality and tenderness of the cookie, so recipes should be followed carefully. Thorough creaming or blending of ingredients before flour is added is important. Improper mixing can result in a tough cookie. Whip egg whites to wet peaks, rather than dry. In most cases, flour should be folded in gently to maintain tenderness of the final product.

If pans are to be greased, avoid over-greasing, which will c ause cookies to spread excessively; or uneven greasing, which will cause some cookies to stick and not spread enough. Watch baking time and temperature closely. Unless directions state otherwise, remove from the oven as soon as the cookies are done and place on wire racks to cool.



High altitude baking

Directions vary among altitudes from 5,000 to 8,000 feet above sea level. Ideally, the recipe will give High-altitude directions, but if not, call your nearest county extension office for assistance.

Storage

Cookies usually do not stale as quickly as other baked goods bec ause of their high fat content. In general, store cookies in an airtight container at room temperature, or freez e in a sealed container for longer periods.

Nutritional value

One of the rewards of eating plenty of low-fat grain products, fruits and v egetables is that one can occasionally enjoy treats that are higher in fat, such as cookies. There is also increasing availability of sugar-free, low-fat and fat-free cookies.

To compare how some of the traditional favorites measure up nutri tionally, see the table below:

Nutritional value (cookies listed according to ingredients used.)

ONE PIECE	WEIGHT (ounces)	CALORIES	CARBOHYDRATES (gm)	PROTEIN (gm)	FAT (gm)
Oatmeal Raisin	.5	61.0	9.0	.75	2.5
Shortbread	1.0	40.0	5.0	.5	2.0
Peanut Butter	.5	61.0	7.0	1.0	3.5
Chocolate Chip	.4	49.0	7.0	.6	2.0
Sugar Cookie	.4	60.0	8.0	.5	3.0
Brownie w/Nuts	.7	95.0	11.0	1.3	6.3

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Revised 2007

Grains of truth about PASTA

Definitions

"Pasta," an Italian word meaning paste, describes the various s hapes and sizes of products made with flour and water. Pasta products may be divided into two types; dried or commercial and fresh. Fresh pasta is often made at home or in restaurants. Pasta may also be categorized by shape:

- Long goods such as spaghetti, fettuccine or linguine.
- Short goods, including elbows, rotini, penne and ziti.
- Specialty products, such as shells, bow ties and lasagna.

Noodles, which have ri bbon-like shapes and are generally made with eggs. By law, pasta labeled "egg noodle" must contain 5.5 percent egg solids by weight. Commercial pasta may be made with 100 percent durum semolina or durum flour; or a combination of durum and other hard wheat flours (farina).

Durum, from the Latin word meaning "hard," is the hardest wheat known to man. The durum grown in the United States is used primarily for pasta and couscous. Semolina is the coarsely ground endosperm of durum. Granular in texture, semolina is used in spaghetti, macaroni and specialty products.

Durum flour is a finer granulation (similar to all-purpose flour) that is used in noodl e products. It is produced as a by-product when grinding semolina or is ground directly from durum wheat.

- Farina is the coarsely ground endosperm of other high quality hard wheats. (Cream of Wheat cereal is an example of farina.)

History

By 3,000 B.C., the Chinese were eating noodles: long and flat, wide or thin, made with wheat, corn, rice or peas. Italians swear, however, that pasta was in Italy long before Marco Polo's first trip to China (the first in 1255).

Thomas Jefferson is cr edited with introducing pasta to the United States. As the U.S. minister to France from 1785 to 1789, he first tasted pasta while visiting Italy.

When he returned to the United States, he brought four cases of "maccaroni" and a pasta machine with him. However, pasta did not appear commercially in the United States until 1848. The first pasta factory was built in Brooklyn, New York by a Frenchman who spread his spaghetti strands on the roof to dry in the sunshine. Pasta production increased during World War I when all Italian imports were cut off.

Pasta's popularity in t he United States has been steadily increasing since. Per capita consumption was 11.3 pounds in 1975 and currently has increased to an average of 19.52 pounds per person in 2005 according to the 2006 U.S. Pasta Market Outlook Report. In comparison, Italians eat about 62 pounds per year.

Choosing your pasta

Although Italy and pasta are practically synonymous, you do not have to buy Italian pasta to obtain a quality product. P ublications such as *U.S. Consumer Report* have judged U.S. pasta equal to or better than Italian pasta. In addition, U.S. manufacturers have to follo w regulations concerning ingredients and manufacturing inspections. Laws prohibit the use of artificial coloring and most U.S. pasta is enriched with iron and four B-vitamins: thiamin, riboflavin, niacin and folic acid.

There are approximately 600 shapes worldwide. Pasta shapes can be used interchangeably in recipes. A general guideline to selecting shapes:

- Thin delicate pasta should be served with light, thin sauces.
- Thicker shapes work well with heavier sauces.
- Pasta shapes with holes or ridges are best for chunkier sauces. Some shapes have ridges in which to hold sauces better.

Pasta can be purchased plain or in a variety of colors and flavors—tomato, spinach, herb and whole wheat, to name a few. Good quality pasta is a golden color, with a fine even grain. Pasta that is too white or too gray indicates poor quality flour; the pasta will not cook properly and will be limp and sticky and the water will be cloudy after cooking.

Allow 2 ounces of dry pasta for a side dish serving and 4 ounces for a main dish serving. Although it will vary with the shape, 1 pound of pasta will yield about 8 cups of cooked pasta.

Cooking & Storage

Dry pasta can be stored up to two years if kept in a tightly sealed package or a covered container in a cool, dry place.

To cook pasta, boil 4 to 6 quarts of water for 1 pound of dry pasta. Add salt if desired.

Follow package directions for cooking time. If the pasta is to be used as part of a dish that requires further cooking, undercook the pasta by 1/3 of the cooking time specified on the package. Pasta should be cooked "al dente" meaning "to the tooth," or tender, yet firm. It should be slightly resistant to the bite, yet cooked through. Drain pasta to stop the cooking action. Do not rinse unless the recipe specifically says to do so. For salads, drain and rinse pasta with cold water.

If cooked pasta is not to be used immediately, drain and rinse thoroughly with cold water. Allowing the pasta to sit in water will cause it to absorb water and become mushy. When the pasta has cooled, toss lightly with salad oil to prevent it from sticking and drying out. Cover tightly and refrigerate or freeze. Refrigerate the pasta and sauce separately or the pasta will become soggy.

To reheat, put pasta in a colander and immerse in rapidly boiling water just long enough to heat through. Pasta may also be reheated in a microwave.

Nutritional value

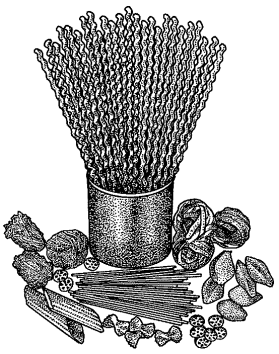
The 2005 Dietary Guidelines for Americans recommends five to ten ounce-equivalents of bread, cereal, rice and pasta daily (depending on age, gender and activity level), with half of them coming from whole-grains. One ounce-equivalents equals ½ cup of cooked pasta. Pasta is a complex carbohydrate and very low in fat, calories, sodium and cholesterol. Following is the nutrient profile for a ½ cup cooked, enriched pasta: 99 Calories, 3 g protein, 20 g carbohydrates, 1 g fiber, 0 g fat, 0 mg cholesterol, 49 mcg folate, 1 mg iron, 5 mg calcium, 22 mg potassium, 15 mcg selenium and 1 mg sodium. Egg noodles are a little higher in calories, but nutritionally, approximately the same.

Revised 2008

The protein in pasta contains six of the eight essential amino acids. When combined with meat, poultry, cheese, dairy products, beans or tofu all of the essential amino acids are present.

FOR MORE INFORMATION: For nutrition details and recipes, visit these sites on the World Wide Web of the Internet:

- www.ilovepasta.org
- www.ndwheat.com
- www.wheatfoods.org



Recipes

ZESTY PASTA SALAD

10	ounces rotini pasta
1 ½	cups broccoli, cut into florets
1	can (15 oz.) kidney beans, drained & rinsed
1	large red or green sweet pepper, chopped
⅓	cup chopped onion
4	ounces part skim Mozzarella cheese, cubed or grated
1	can (2 oz) chopped ripe olives
1	large carrot, diced
8	ounces lean, deli roast beef, cut in julienne strips
⅔	cup low-calorie Italian dressing

Cook pasta according to package directions. Drain and rinse with cold water. Pour boiling water over broccoli, drain and immediately rinse with cold water. Combine additional ingredients and chill before serving. Makes 6 servings.

Nutrient Analysis: One serving provides approximately: 379 calories, 23 g protein, 53 g carbohydrates, 7 g fiber, 8 g fat (3 g saturated), 25 mg cholesterol, 106 mcg folate, 4 mg iron, 205 mg calcium, 218 mg potassium and 873 mg sodium.

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Grains of truth about TORTILLAS

Definitions

A tortilla is an unleavened flatbread or pancake made either of corn or wheat flour, water, vegetable shortening and a little salt. They are the plate, envelope or folder surrounding an array of delicious fillings. The tortilla can be wrapped around your choice of fillings, used as a food scoop or served plain, hot or cold. You can place anything you desire into a tortilla and have a quick meal or snack; scrambled eggs for a breakfast burrito, hot dogs and cheese for a quick wrap or maybe just some peanut butter and jelly. Even certain leftovers—you can wrap them in a tortilla, heat in the microwave and enjoy!

History

The word "tortilla" comes from the Spanish word "torta" which means "round cake." According to Mayan legend, tortillas were invented by a peasant for his hungry king in ancient times. Corn tortillas date back around 10,000 years before Christ and were made of native corn with dried kernel. When the Spanish brought wheat to the New World, flour tortillas were created.

A tortilla, once thought of as an ethnic food, has moved into the mainstream. Americans today are eating meatball tacos, corned beef on tortillas, tuna melt wraps, to name a few. Tortillas are not just for Mexican food anymore.

Availability

Tortillas can be found in supermarkets and a variety of food stores. Thanks to the widespread popularity of Mexican and Southwestern cuisine, Americans love tortillas.

The wheat flour tortilla is the fastest growing product line not only in the tortilla industry, but in the entire grain products industry. In 2000, the overall tortilla market in the United States was an estimated $4 billion, representing a 57 percent growth rate over the past four years.

Storage

Tortillas are normally packed in polyethylene bags in counts varying from one-half dozen to three dozen. Shelf life can vary from as little as four days (for those sold and stored fresh) to as long as two months (for refrigerated products), depending on ingredient and preservative formulations.

Nutrition

Flour tortillas are a low-fat nutritious food and an easy, tasteful way to help reach the USDA's recommendation for five to ten ounces of grain foods a day. However, the USDA is recommending that half of those five to ten ounces be whole-grain, and one 7-inch corn tortilla is equal to one ounce.

Nutritional Chart

Nutrient	Corn	Flour
Calories	58	159
Protein	1 g	4 g
Carbohydrate	12 g	27 g
Fat	1 g	3 g
Calcium	46 mg	61 mg

- Based on serving size—1, 6-inch corn tortilla and 1, 7-inch flour tortilla.

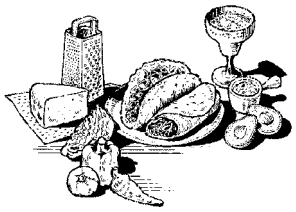
Preparation

TO HEAT:

♦ Microwave: Place tortilla between paper towels and heat on medium high for 20–30 seconds.

♦ Oven: 400°F; Place tortilla on the rack and heat for 3-4 minutes or wrap in foil and warm in oven for 10 minutes.

Recipes



CARAMELIZED ONION QUESADILLAS

1 tablespoon	**olive oil**
1 medium	**red onion, thinly sliced**
4	**green onions, sliced**
2 cloves	**garlic, chopped**
1 teaspoon	**ground cumin**
¼ teaspoon	**dried oregano leaves**
1 tablespoon	**lime juice**
4 large (10-inch)	**wheat tortillas**
2 cups	**reduced fat shredded cheese: a combination of cheddar, jalapeno, Monterey jack or other spicy cheese**
Optional:	**Salsa, guacamole and sour cream**

Preheat oven to 400° F.

Heat oil in skillet over medium heat and sauté onion and garlic until softened, stirring occasionally—usually about 10 minutes.

Stir in cumin and oregano. Remove from heat and stir in lime juice.

Place 2 tortillas on a baking sheet and spread the onion mixture equally on the two. Sprinkle with equal amounts of cheese. Top with remaining tortillas and bake for about 8 minutes until the edges are golden. Let stand 5 minutes and cut each into sixths with a pizza cutter. Garnish with salsa, guacamole and sour cream if desired.

Nutritional Analysis: Three wedges provides approximately: 382 calories, 21 g protein, 46 g carbohydrates, 4 g fiber, 13 g fat (4 g saturated), 12 mg cholesterol, 110 mcg folate, 3 mg iron, 350 mg calcium, 227 mg potassium and 695 mg sodium.

Revised 2009

CHICKEN ENCHILADAS

10	**corn tortillas**
8 ounces	**light cream cheese, softened**
¼ cup	**skim milk**
2 cups	**cubed, cooked skinless chicken breasts**
½ cup	**sliced green onions**
1 cup	**shredded, low-fat Monterey Jack cheese**
10 ounces	**enchilada sauce * (use mild, medium or hot)**
6 ounce	**container frozen avocado dip, thawed**
½ cup	**non-fat sour cream**

Pre-heat oven to 375°F.

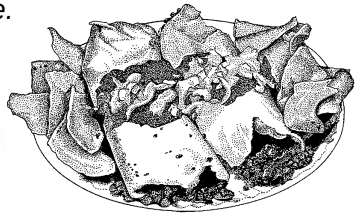
In a large bowl, combine cream cheese and milk. Stir in chicken, onions and one-half cup of cheese.

Heat tortillas on griddle. Spoon one-quarter cup filling down center of each warm tortilla; roll up. Place seam side down in un-greased 13 x 9-inch (3-quart) baking dish. Pour enchilada sauce evenly over tortillas; sprinkle with remaining cheese.

Bake in preheated oven 10 to 15 minutes or until bubbly. In a small bowl, combine guacamole and sour cream; spoon over warm enchiladas. Serves 10.

Nutritional Analysis: Each serving provides approximately: 234 calories; 16 g protein; 20 g carbohydrates; 2 g dietary fiber; 10 g fat (5 g saturated); 38 mg cholesterol; 34 mcg folate; 1 mg iron; 191 mg calcium, 203 mg potassium and 453 mg sodium.

- Enchilada sauce used was low in calories and fat.
- *Adapted recipe from the Tortilla Industry Association's web site.*



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Grains of truth about CARBOHYDRATES

Definitions

There are two kinds of carbohydrates: simple and complex.

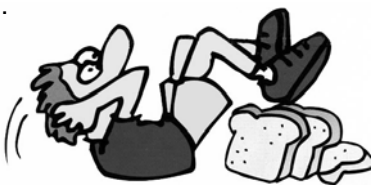
Simple carbohydrates require little digestion and thus are a quick energy source. Fruits, fruit juices and milk contain simple s ugars (carbohydrates) that provide valuable nutrients in addition to an energy boost. Candies, table sugar , alcoholic beverages and sweetened soft drinks are simple sugar sources that provide calories, but usually no nutrients.

Complex carbohydrates are found in grains, some vegetables and legumes. They are starches and require more digestion than simple carbohydrates. Rich in B-vitamins, fiber and iron, complex carbohydrates from grains are the body's best source of energy because they are burned in a constant, time-released manner. They provide sustained energy for athletic events and can help manage blood sugar irregularities. The fiber found in complex carbohydrates, fruits and vegetables can help lower blood cholesterol in some people when eaten as part of a low-fat diet.

Daily consumption

Although there is no Recommended Dietary Allowance (RDA) for carbohydrates, most nutrition authorities recommend that carbohydrates comprise at least 45 percent—and up to 70 percent—of a person's daily calories. In contrast, most Americans average only 50 percent of their daily calories from carbohydrates.

Americans can meet their carbohydrate goals by eating five to ten ounces of bread, cereal, rice or pasta (depending on age, gender and activity level), with half of them coming from whole grains, daily as recommended by the sixth edition of the "Dietary Guidelines for Americans."



Sports performance

Athletes should eat 60 to 70 percent of their total calories in the form of carbohydrates, which are stored as glycogen in the muscles and then used as a source of energy. High gl ycogen stores are essential for endurance sports. Regular inclusion of complex carbohydrates foods such as bread, cereals, pasta, corn and potatoes will supply sustained energy for most athletic events.

Weight control

Why are Americans getting fatter on a low-fat, high carbohydrate diet? We're not. Because we are not eating less fat; we are eating the same number of grams of fat as we did 20 years ago, and about 300 to 500 extra calories per day. Therefore, the *percentage* of fat calories has gone down but only because total calories have gone up.

	% Calories from fat	Total calories	Calories from fat
1978	36	1969	709
2001	35	2000	748

Source: USDA, NHANES III

Complex carbohydrates foods play an important role in weight control because they are usually low in calories and fat and high in dietary fiber which creates a full fee ling, and may help discourage over-consumption of higher caloric foods.

Contrary to the rec ent resurgence of high-protein-diet claims, bot h controlled, peer-reviewed studies & epidemiologica l data show that high carbohydrate diets are best fo r weight control. High protein diets promise that "magic bullet" that dieters are always looking for. Unfortunately, these diets have not been shown to be either safe or effective long term.

Diabetes

Carbohydrates are crucial to managing diabetes and high blood sugar. Under medical supervision, persons with diabetes who follow a diet high in complex carbohydrates and fiber often have better blood sugar control. Many are able to reduce or eliminate their need for drugs or insulin for non-insulin dependent diabetes.

Heart disease

A diet high in fiber and complex carbohydrates may be beneficial in lowering blood cholesterol. The soluble fiber in oats, l egumes, fruits, vegetables and some grains is effective in lowering blood cholesterol, which reduces the risk of heart disease.

A high-carbohydrate, low-fat diet

The following meal pattern contains about 2,100 calories, 59 percent of them from carbohydrates and only 17 percent from fats. This meal plan also provides 29 grams of dietary fiber (20 to 38 grams are recommended daily).

Breakfast

1 orange
1 ½ ounces wheat flakes cereal with ½ cup skim milk and 1 teaspoon sugar
1 cup skim milk
Coffee (optional)

Lunch

1 ham sandwich made with 2 ounces lean ham, 2 slices whole wheat bread
1 cup vegetable soup
1cup skim milk

Snack

1 bagel with 1 teaspoon jelly
1 ounce low-fat mozzarella cheese, melted on 1 wheat tortilla
1 cup skim milk

Dinner

3 ounces lean beef
1 cup pasta and vegetable salad
1 cup broccoli, seasoned with spices
1 whole wheat dinner roll with 1 teaspoon butter
1 slice angel food cake with 1 cup fresh strawberries

Revised 2008

High-carbohydrate foods

FOOD	% of Calories from Carbohydrates
GRAINS	
All-bran cereal	80
Angel food cake	89
Bagel	79
Banana nut bread	55
Biscuit	61
Bulgur	84
Cheese pizza	53
Cheerios cereal	70
Corn flakes	91
Cream of Wheat	85
English muffin	79
French bread	78
Graham cracker	72
Pancake	58
Pasta	82
Pita bread	80
Raisin bread pudding	56
Rice, white	89
Saltine cracker	67
Shredded wheat cereal	83
Wheaties cereal	86
Wheat tortilla	69
White bread	76
Whole wheat bread	73
FRUITS	
Apple – 1 medium	94
Banana – 1 small	92
Bing Cherries – ½ cup	83
Cantaloupe – ½ of medium size	92
Orange – 1 medium	91
Peach – 1 medium	92
Strawberries – sliced ½ cup	83
VEGETABLES	
Broccoli – ½ cup	57
Carrots – ½ cup sliced	87
Green Beans – ½ cup	78
New Potatoes – ½ cup	93
Squash – ½ cup	73
Sweet Peas – ½ cup	75
Sweet Potatoes – ½ cup mashed	91

Menu/food analysis from ESHA Corp., "Food Processor," nutrient analysis, 2000.

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GRAINS of TRUTH

Fiber

Definitions

It has been called bulk or roughage, but today we call it fiber. Fiber is a general term for the indigestible part of plant foods. It provides almost no energy or calories, yet is an important part of a healthful diet. Whole grain products, fruits, legumes and vegetables are significant sources of fiber. In contrast, virtually no fiber is present in dairy products, meat, poultry, fish, fats and sweeteners. Cooking, freezing, canning and other preservation methods have little effect on fiber content.

There are two types of dietary fiber: soluble and insoluble.

What is the difference?

Insoluble fiber passes through your digestive tract largely intact. Soluble fiber forms a gel when mixed with liquid, while insoluble fiber does not. Both types of fiber are important in the diet and provide benefits to the digestive system by helping to maintain regularity.

INSOLUBLE FIBER: Insoluble fiber is found in foods such as wheat bran, other whole grains, vegetables and seeds. Foods containing insoluble fiber:

- May aid in weight control if high-fiber foods are substituted for high -fat, high calorie foods. High-fiber foods take longer to chew and provide a feeling of fullness that lingers longer, so you feel full a greater amount of time. Additionally, high fiber diets tend to be less “energy dense,” which means they have fewer calories for the same volume of food, therefore aiding in weight control.
- Prevent constipation, relieve hemorrhoids and prevent diverticular disease by absorbing water and moving intestinal contents more quickly. Generally, the less processed the fiber source, the greater the laxative effect.
- Prevent diarrhea by normalizing the stools.

SOLUBLE FIBER: Soluble fiber is found in legumes, various brans (oat, rice, barley and corn), white flour products (white bread, bagels, pasta, etc.) and some fruits and vegetables. Foods containing soluble fiber:

- Help lower blood cholesterol in some people when eaten as a part of a low-fat diet, thus decreasing the risk for heart disease.
- May aid in control of blood sugar in people with diabetes and help reduce their insulin requirement. However, diabetics should follow a high fiber diet only under medical supervision.

Daily consumption

Selecting good tasting foods that provide fiber is not difficult. Selecting these high fiber diets are the key to regular bowel movements and are believed to help reduce health risks, including obesity and possibly high blood cholesterol. In fact, the Food and Drug Administration has authorized food companies to use the health claim for soluble fiber from both psyllium and oats. For example, the new claim for psyllium states, “Soluble fiber from foods with psyllium husk, as part of a diet low in saturated fat and cholesterol, may reduce the risk of heart disease.”

The National Academy of Sciences recommends a daily dose of 25 grams for women and 38 grams for men under age 50. As for adults 50 and over, 21 grams for women and 30 grams for men is a day’s supply. According to the American Dietetic Association, dietary fiber intake continues to be less than recommended levels in the United States with intakes averaging only 14 to 15 grams/day.[1]

An adequate amount for a healthy individual can be obtained by following the seventh edition of the “Dietary Guidelines for Americans.” To help achieve the recommended amount of fiber, the dietary guidelines recommend (based on a reference of 2,000 calorie intake/day) 2 1/2 cups of vegetables and fruits per day; 6 ounces from the grains group, with at least half of them coming from whole grains.

Although rare on a mixed diet, too much fiber can be a problem. Calcium, iron, zinc and magnesium are poorly absorbed with excessive fiber consumption.

Adding fiber

- Eat 6 ounces each day of bread, cereal, rice and pasta, making sure at least half of them are whole grains.
- Choose a variety of fiber-rich foods such as fruits, vegetables and whole grains instead of fiber supplements.
- Add bran to muffins, pancake or waffle batters, casseroles, breakfast cereals, and 1% or fat-free yogurt.
- Boost the fiber in cereals by adding fresh fruit.
- Choose whole grain baked goods with seeds, raisins or othe dried fruit.

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GRAINS of TRUTH

Fiber

Foods differ in the amount and type of dietary fiber. Many foods contain a combination of insoluble and soluble fiber. The fiber content of fruits and vegetables varies depending upon the season, growing conditions, ripeness and storage.

References:
1) Journal of The American Dietetic Association; (2008) Position of the American Dietetic Association: Health implications of dietary fiber; 108(10): 1716-1731

Fiber finder

FOOD	ONE SERVING	TOTAL FIBER PER SERVING
CEREALS		
All-Bran®,	1 oz. ⅓ cup	8.5 grams
Corn Bran,	1 oz. ⅔ cup	5.4 grams
Bulgur, cooked	½ cup	4.1 grams
40% Bran Flakes,	1 oz. ¾ cup	4.0 grams
Shredded Wheat,	1 oz. ⅔ cup	3.1 grams
Wheaties®, 1 oz.	1 cup	3.0 grams
Oatmeal, cooked	½ cup	2.0 grams
Green beans, cooked	½ cup	1.0 grams
FRUITS		
Prunes, stewed	½ cup	4.5 grams
Apple, with skin	1	3.1 grams
Orange, average	1	3.1 grams
Peach, w/skin, avg.	1	2.3 grams
Strawberries	½ cup	2.0 grams
LEGUMES		
Kidney Beans, cooked	½ cup	8.2 grams
Pork & Beans in sauce	½ cup	7.0 grams
Lentils, cooked	½ cup	5.0 grams
Split peas	½ cup	4.4 grams

FOOD	ONE SERVING	TOTAL FIBER PER SERVING
VEGETABLES		
Potatoes, w/skin	1 medium	4.7 grams
Peas, cooked	½ cup	4.0 grams
Carrots, raw	1 medium	2.3 grams
Broccoli, cooked	½ cup	2.3 grams
Tomato, fresh	1 medium	1.5 grams
Corn, canned	½ cup	1.1 grams
Celery, diced	½ cup	1.1 grams
Lettuce, chopped	1 cup	0.8 grams
GRAINS		
Bran Muffin	1 average	2.5 grams
Whole Wheat Bread*	1 slice	2.1 grams
Wheat Berries, cooked	½ cup	1.7 grams
Rice, brown, cooked	½ cup	1.7 grams
Spaghetti	½ cup	1.1 grams
White Bread	1 slice	0.5 grams
Rice, polished, cooked	½ cup	0.4 grams

Fiber values from ESHA Corp., "Food Processor," Nutritional analysis software,
*Note: Some brands of whole wheat bread are fortified with fiber. Check the nutrition label for more information.

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GRAINS of TRUTH

Wheat Flour

Definitions

Flour is the product obtained by grinding wheat kernels or "berries." The kernel consists of three distinct parts: bran, the outer covering of the grain; germ, the embryo contained inside the kernel; and endosperm, the part of the kernel that makes white flour. During milling, the three parts are separated and recombined accordingly to achieve different types of flours. This has no effect on nutrient and or vitamin value. The only loss is a minute amount of vitamin E.

There are six different classes of wheat: Hard Red Winter, Hard Red Spring, Soft Red Winter, Hard White, Soft White and Durum. The end products are determined by the wheat's characteristics, especially protein and gluten content. The harder the wheat, the higher the protein content in the flour. Soft, low protein wheats are used in cakes, pastries, cookies, crackers and Oriental noodles. Hard, high protein wheats are used in breads and quick breads. Durum is used in pasta and egg noodles.

History

Ground grain was one of civilized man's first foods. Ancient methods of grinding can be traced to the Far East, Egypt and Rome. As early as 6,700 B.C., man ground grains with rocks. Water mills did not appear until 85 B.C. in Asia Minor. Windmills appeared between 1180 and 1190 A.D. in Syria, France and England.

Storage

Flour should be stored in airtight containers in a cool, dry place (less than 60 percent humidity). All purpose, bread and cake flour will keep for 6 months to a year at 70°F and 2 years at 40°F; store away from foods with strong odors. Whole-wheat flour should be refrigerated or frozen, if possible. Before using refrigerated or frozen flour, allow it to warm to room temperature and inspect for rancidity and taste.

Nutritional Value

Wheat flour is an excellent source of complex carbohydrates. Other than gluten flour, all types of wheat flour derive at least 80 percent of their calories from carbohydrates. Depending on the flour type, the percent of calories from protein ranges from 9 to 15 percent, except from gluten flour, which has 45 percent protein content. Calories from fat are never more than 5 percent.

In addition, wheat flour provides from 3 g (cake flour) to 15 g (whole -wheat flour) of dietary fiber per 1 cup serving. Wheat flour contains four B-vitamins, (thiamin, riboflavin, niacin and folacin), calcium, iron, magnesium, phosphorus, potassium, zinc, minimum amounts of sodium and other trace elements.

Types of Flour

- White flour is the finely ground endosperm of the wheat kernel.
- All-purpose flour is white flour milled from hard wheats or a blend of hard and soft wheats. It gives the best results for many kinds of products, including some yeast breads, quick breads, cakes, cookies, pastries and noodles. All-purpose flour is usually enriched and may be bleached or unbleached. Bleaching will affect nutrient value. Different brands will vary in performance. Protein varies from 8 to 11 percent.
- Bread flour is white flour that is a blend of hard, high-protein wheats and has greater gluten strength and protein content than all and in some cases conditioned with ascorbic acid, bread flour is milled primarily for commercial bakers, but is available at most grocery stores. Protein varies from 12 to 14 percent.
- Cake flour is fine soft wheats with low protein content. It is used to make cakes, cookies, crackers, quick breads and some types of pastry. Cake flour has a greater percentage of starch and less protein, which keeps cakes and pastries tender and delicate. Protein varies from 7 to 9 percent.
- Self-rising flour, also referred to as phosphated flour, is a convenience product made by adding salt and leavening to all-purpose flour. It is commonly used in biscuits and quick breads, but is not recommended for yeast breads. One cup of self-rising flour contains 1½ teaspoons baking powder and ½ teaspoon salt. Self-rising can be substituted for all-purpose flour by reducing salt and baking powder according to these proportions.
- Pastry flour has properties intermediate between those of all-purpose and cake flours. It is usually milled from soft wheat for pastry-making, but can be used for cookies, cakes, crackers and similar products. It differs from hard wheat flour in that it has a finer texture and lighter consistency. Protein varies from 8 to 9 percent.

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GRAINS of TRUTH

Types of Flour (con't)

- Semolina is the coarsely ground endosperm of durum, a hard spring wheat with a high-gluten content and golden color. It is hard, granular and resembles sugar. Semolina is usually enriched and is used to make couscous and pasta products such as spaghetti, vermicelli, macaroni and lasagna noodles. Except for some specialty products, breads are seldom made with semolina.
- Durum flour is finely ground semolina. It is usually enriched and used to make noodles.
- Whole wheat, stone-ground and graham flour can be used interchangeably; nutrient values differ minimally. Either grinding the whole-wheat kernel or recombining the white flour, germ and bran that have been separated during milling produces them. Their only differences may be in coarseness and protein content. Insoluble fiber content is higher than in white flours.
- Gluten flour is usually milled from spring wheat and has a high protein (40-45 percent), low starch content It is used primarily for diabetic breads, or mixed with other non-wheat or low-protein wheat flours to produce a stronger dough structure. Gluten flour improves baking quality and produces high-protein gluten bread.

Substituting

- Any recipe calling for all-purpose flour may use ½ whole-wheat flour and ½ all-purpose flour.
- To obtain a 100% whole wheat product substitute 1-cup whole-wheat flour minus 1-tablespoon for every cup of all-purpose or bread flour the recipe calls for.
- To create a lighter whole-wheat loaf, add 1 tablespoon gluten flour and 1-tablespoon liquid for each cup of whole-wheat flour.

Wheat Flour Terms

The Food and Drug Administration inspects and approves the use of flour treatments and additives that are used to improve the storage, appearance and baking performance of flour. The treatment additives are in no way harmful.

- **"Enriched"** flour is supplemented with iron and four B-vitamins (thiamin, niacin, riboflavin and folic acid). These nutrients are added back to the processed flour in amounts equal to or greater than amounts found in the unprocessed flour.
- **"Fortified"** implies that something has been added to a product that makes its nutritional status higher than the product made from "unprocessed" raw materials. i.e. Cereals. Calcium and folic acid are examples of nutrients added to fortified flour.
- **"Pre-sifted"** flour is sifted at the mill, making it unnecessary to sift before measuring.
- **"Bromated"** flour is largely discontinued in the United States. Ascorbic acid is now being added to strengthen the flour for bread doughs.
- **"Bleached"** refers to flour that has been bleached chemically to whiten or improve the baking qualities. It is a process which speeds up the natural lightening and maturing of flour. No change occurs in the nutritional value of the flour and no harmful chemical residues remain.
- **"Unbleached"** flour is aged and bleached naturally by oxygen in the air. It is more golden in color, generally more expensive and may not have the consistency in baking qualities that bleached flour does. Unbleached is preferred for yeast breads because bleaching affects gluten strength
- **"Patent"** flour, bleached or unbleached, is the highest grade of flour. It is lower in ash and protein with good color. Market-wise, it is considered the highest in value and mostly used by bakers.
- **"Organic"** or chemical-free flour is not standardized, so its definition varies from state to state. It may be grown and stored without the use of synthetic herbicides or insecticides. It may also mean no fumigants were used to kill pests in the grain and no preservatives were added to the flour, packaging, or food product.
- **"Gluten"** is a protein found in wheat, barley and rye. Gluten gives bread dough elasticity, strength and gas-retaining properties. Wheat is the only grain with sufficient gluten content to make raised or leavened loaves of bread.

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Grains of truth about WHEAT KERNELS

Definition

Wheat, a member of the grass family (Gramineae), produces a dry one-seeded fruit, “caryopsis,” commonly called a kernel, grain or berry. Wheat kernels or berries vary widely in hardness and color. The color of the bran is usually white or red and sometimes may be purple. Wheat kernels may be cooked and eaten whole and are the simplest form of wheat.

History

Neither the geographical, historical, nor the biological origin of wheat is known, although like all grains, it began as a wild grass. Existing evidence points to Mesopotamia as the original home, but the theory that the plant once grew wild in the Euphrates and Tigris river valleys has a wider acceptance than any other. Most ancient languages mention wheat and the fact that it has been found in the prehistoric habitations of man as early as 6700 B.C., notably in the earliest Swiss lake dwellings, is proof of its antiquity. Wheat was also cultivated in China in 3000 B.C. and was the chief crop in ancient Egypt and Palestine.

Availability

Whole-kernel wheat is available in its raw, dry form, or in a precooked, frozen “ready-to-eat” form. It may be found in the supermarkets, bulk bin commodity stores, health food stores, elevators, mills and through mail-order. In the store, it may be found in the produce section, the dry foods section or the specialty food aisle. The ready-to-eat form is available mainly to commercial institutions or on salad bars.

Storage

Because whole-wheat kernels contain the oil-rich germ, they will become rancid if stored too long at room temperature or warmer. To reduce rancidity and prevent insect problems, store the kernels in an airtight container in a cool (60°F or less), dry place.

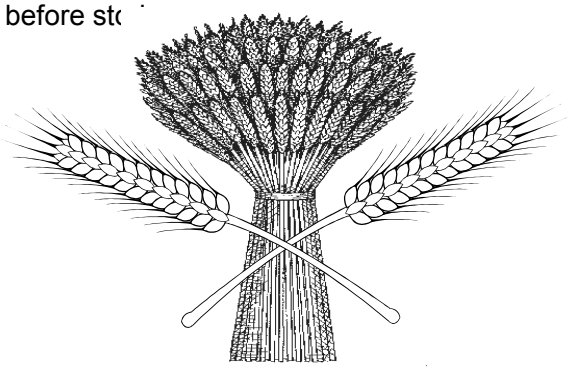
For best results, refrigerate for up to six months or freeze indefinitely. Before using refrigerated or frozen kernels in cooking, be sure to allow them to come to room temperature.

If storing large quantities of wheat for grinding, metal containers are the most effective. A clean garbage can with a secure lid will work. Store the garbage can on 2 x 4-inch slats so air can circulate around it, and it will last up to 2 years. Do not set the storage container directly on cement because this may cause the container to sweat. A metal container may absorb the moisture and rust, ruining the container.

Infestation

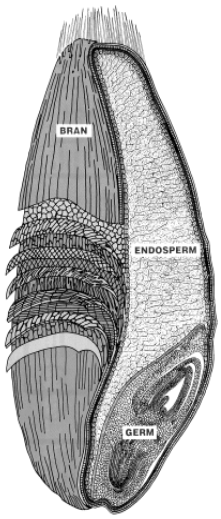
There are two ways to rid wheat of infestation: dry ice and freezing. Both are effective in killing any infestation inside and outside the kernel. The dry ice method uses a 3-ounce piece of dry ice in the bottom of the container. Pour the wheat on top of the dry ice and let the ice evaporate up through the wheat. This drives out the oxygen necessary for insects to survive. Allow sufficient time for the dry ice before sealing the container. Feel the bottom to see if it is still cool or has become warm. If it is warm, the dry ice has evaporated. Each 100 pounds of wheat will require 8 ounces of dry ice. The use of dry ice could hinder the sprouting process.

The next best alternative is freezing. If the kernels are frozen thoroughly, infestation will be eliminated. To achieve a sanitary point, freezing should be done in small amounts. The suggested amount is one gallon of wheat kernels frozen for five to six days. This guarantees the penetration of cold air throughout the kernel. Be sure to check for moisture buildup before st



Nutritional value

One serving of fully cooked wheat kernels equals ½ cup, about 2.5 ounces (or 1 ounce dry), and provides:



	Calories	42	
	Carbohydrates	10	g
	Cholesterol	0	mg
	Dietary Fiber	2	g
	Fat (Total)	0	g
	Potassium	50	mg
	Protein	2	g
	Sodium	0	mg
	Selenium	8	mcg
	Iron	0	mg
	Niacin	1	mg
	Thiamin	0	mg
	Riboflavin	0	mg
	Folate	6	mcg
Calories from:	Carbohydrates		81%
	Fat		4%
	Protein		15%

Preparation

♦ Use only untreated wheat from the combine or commercially sold wheat berries.

♦ Rinse whole-wheat kernels before cooking, but do not wash before grinding or milling.

♦ Presoaking wheat kernels overnight in the water it is to be cook in will cut cooking time in half. Proportions should be 3 cups hot water to every 1 cup of kernels. Salt may be used if desired, ¼ to ½ teaspoon salt per each cup of wheat.

♦ Cook kernels 20 minutes if presoaked; 45 minutes if not. One cup of wheat kernels equals 2 ½ cups cooked, plump kernels.

♦ A slow cooker or crock-pot will work well to cook whole-wheat kernels. Just set on low and cook overnight (about 8 hours), stirring once during the first hour of cooking. Use 2 cups of wheat per 4 cups of water.

♦ To cook whole-wheat kernels in the oven, preheat oven to 300°F. Boil 1 cup of wheat and 2 cups of water in a heavy saucepan for 5 minutes. Remove from heat, cover and place in the oven. Turn oven off and leave undisturbed for about 6 hours. It will yield about 3 cups cooked whole-wheat kernels.

Revised 2009

♦ To microwave wheat kernels, combine, cover and cook ½ cup wheat and 1 cup cold water 3 to 4 minutes on high, or until tender. Cover with waxed paper during cooking. Simmer 4 to 6 minutes longer, add 1 to 1 ½ cups of water and cook longer if needed for more tenderness.

♦ Par-cooked or presoaked wheat kernels may be refrigerated for three to four days. Fully cooked wheat can be refrigerated for one week. Both may be frozen for up to six months.

♦ Cook a large amount of wheat and freeze the kernels in small portions to save time and energy. After cooking, just drain the cooked kernels well and place ½- to 1-cup portions in freezer containers. Thaw kernels by running hot tap water over them in a colander.

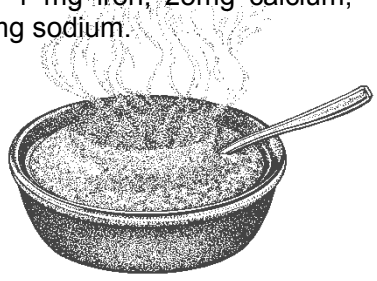
Recipe

SALEETAH

1 cup water
2 cups precooked wheat kernels
¼ teaspoon ground cinnamon
1-tablespoon whole anise seed
2 tablespoons sugar
½ cup raisins (golden or dark)
½ cup chopped pecans

Combine water, wheat and spices in a pan. Simmer 5 to 10 minutes; remove from heat. Add sugar, raisins and pecans. Chill or serve warm. Makes six servings.

Nutrient Analysis: Each serving provides approximately: 153 calories, 3 g protein, 22 g carbohydrates, 3 g fiber, 8 g fat (1 g saturated), 0 mg cholesterol, 7 mcg folate, 1 mg iron, 25mg calcium, 180 mg potassium and 3 mg sodium.



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Grains of truth about WHEAT PRODUCTION AND CONSUMPTION

Definitions

Wheat is one of eight cereal grains known to man. It is a grass variety producing edible seeds and is the most widely cultivated grain grown in the world. Its botanical name is *Triticum aestivum.*

History

The development of civilization may be directly connected to the cultivation of wheat. Villages developed when primitive man discovered he no longer needed to follow game and forage for his food. He could grow wheat during the summer, store it for food in the winter and use the remaining seed to plant in the spring. Actual cultivation may have started in the Fertile Crescent of western Asia around 6,000 to 8,000 B.C. or earlier.

Anthropologists speculate that primitive man first chewed the raw wheat kernel before he learned to pound it into flour and mix it with water to make porridge. About 10,000 years before Christ, man first started eating a crude form of flat bread—a baked combination of flour and water.

Ancient Egyptians are believed to be the first bakers of the white, leavened bread that we know today. Around 3,000 B.C., they started to ferment their flour and water mixture using wild yeast present in the air. Eventually they added sugar, salt and flavorings such as poppy and sesame seeds. Even though the Egyptians and Romans made leavened bread, they did not understand that airborne yeast caused the bread to rise. Not until the 1800's was yeast identified as the organism that converts carbohydrates into alcohol and produces a leavening gas (carbon dioxide) in the process.

Wheat was introduced into the United States through two separate avenues: first, by the French and Spanish into the Southwest; and second, by Northern Europeans into the eastern United States.

Spanish wheat was introduced into what is now the Big Bend area of Texas in 1582. Hard red winter wheat, the largest commercially grown wheat in the United States, was not introduced until 1874, when Mennonite immigrants from the Crimea brought this winter-hardy wheat to the Kansas plains.

Classes of wheat

Six classes of wheat are grown in the United States: hard red winter, soft red winter, hard red spring, hard white, soft white and durum. Wheat is classified by hardness of the grain, the color of the kernel and the time of planting.

Growing wheat requires soil, water and sunlight. Farmers use special equipment to prepare the soil, plant the seeds, water the crop and harvest the wheat.

Winter wheats are planted in the fall. After the grasslike seedlings emerge, they lie dormant during the winter months. They emerge again in the spring, ripen and are harvested in early summer. Spring wheats are planted in the spring and harvested in late summer. Spring wheats grow best in the northern areas of the United States where the summers are not too hot for the young plants. Conversely, winter wheats grow best in those areas where the winters are not too cold.

Among the classes of wheat, the only difference in nutrients is the protein content. This difference is nutritionally insignificant, but the protein content and quality does make a difference in terms of baking. Durum, the hardest wheat, averages 14 to 16 percent protein and is primarily used for pasta. Hard spring wheats range from 12 to 18 percent protein and are used for yeast breads. Hard winter wheats range from 10 to 15 percent and are used for breads and all-purpose flour. Soft wheats range from 8 to 11 percent protein and are used in cakes, cookies, pastries, crackers and cereals.

Availability

Wheat is grown in nearly every state in the United States and in many other countries. The top wheat-producing countries are China, India, the United States, former Soviet Republics, France, Canada and Australia.

The United States exports as much as 50 percent of its own production and is considered a primary supplier of wheat to the world. This wheat helps improve the nutritional status of many people. The top 5 wheat customers of the United States in 2003/04 were: 1) Egypt, 2) Japan, 3) Mexico, 4) Nigeria and 5) South Korea.

Wheat consumption

A nation of 1 billion people, China is traditionally thought of as a rice-eating nation. The Chinese, however, consume 180 pounds of wheat flour per person every year, mostly in the form of noodles. Some nations have much higher annual per capita wheat flour consumption, such as Israel, at 294 pounds; France, at 241 pounds; Egypt, at 384 pounds; and Algeria, at 441 pounds.

Revised 2005

The average American consumed 133 pounds of wheat flour in 2004. There is room for increased wheat consumption in the United States. At the turn of the century, Americans consumed about 210 pounds of wheat flour per person each year. In 1971, that figure hit an all-time low of 110 pounds per person because of inaccurate information that portrayed bread, starches and carbohydrates as fattening.

Today, health professionals recommend that more than 45-65 percent of daily caloric intake should be from grain based foods. The 2005 Dietary Guidelines suggest that we consume 5 to 10 ounces of grain foods daily (depending on age, gender and activity level), with half of them coming from whole grains. Consumption has had its up and downs through the years due to various fad-diets. Hopefully consumption will be on the rise again and may someday approach the 210-pound level.

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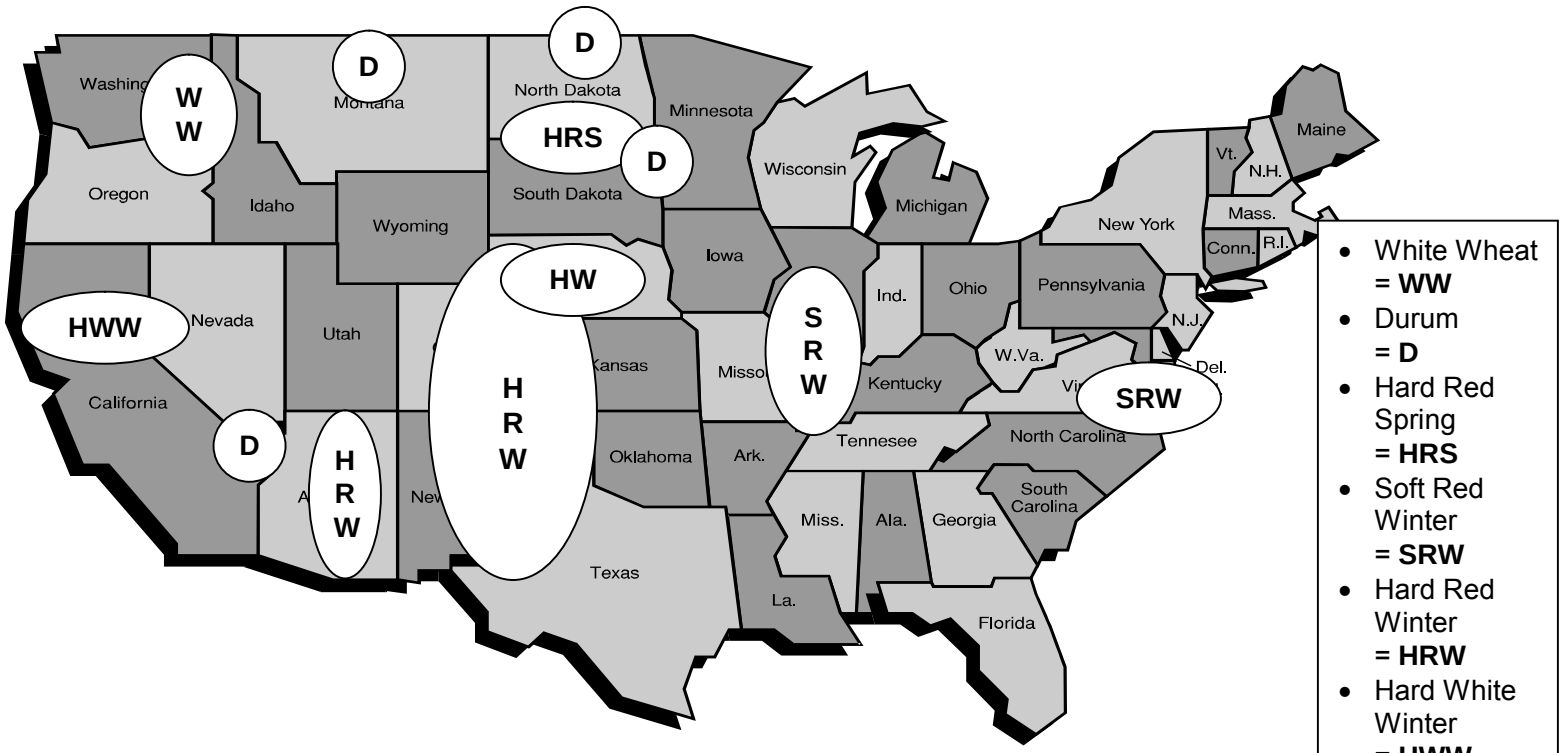

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GRAINS of TRUTH

Whole Grain & Enriched Products

Definitions: Whole Grains

Whole grain products are made with the whole kernel of grain. It consists of three components: bran, endosperm and germ. The bran (outer layer) contains the largest amount of fiber, the endosperm (middle layer) contains mostly protein and carbohydrates along with small amounts of B vitamins, and the germ (inner part) is a rich source of trace minerals, unsaturated fats, B vitamins, antioxidants and phytonutrients.

In 1999, the Food and Drug Administration (FDA) approved a health claim for whole grain products, for use on product labels of foods that contain 51 percent or more whole grains by weight. The claim was approved by FDA because over 50 scientific studies have shown the benefits of whole grains in the diet and their relationship with the reduction of risk of certain diseases. The claim reads as follows: "Diets rich in whole grain foods and other plant foods, and low in total fat, saturated fat, and cholesterol, may reduce the risk of heart disease and certain cancers."

Research continues to show the importance of including whole grain foods in a healthful diet. The 2010 Dietary Guidelines for Americans recommend that everyone eat at least three ounce equivalents of whole-grains (i.e. whole-wheat bread, whole grain cereal, whole wheat crackers, brown rice or whole wheat pasta) everyday. Continual research increases our knowledge about which nutrients, in what amounts, are needed to maintain and prevent disease for a healthy body.

- FACT: The number one cause of death or disability of both men and women in the United States is heart disease. A number of studies support the connection between consumption of whole grain foods and a reduced risk of CHD (coronary heart disease) and its risk factors.[1]

There are several feasible theories as to how whole grains may help reduce the risk of cardiovascular disease, however, the specific beneficial mechanism is still unclear. It is likely that whole grain components work together to achieve improved health. The sum is greater than its parts.

- FACT: Cancer claims an estimated 569,000 lives each year, second only to heart disease as an American killer. Dietary factors, such as fiber, vitamin B6 and phytoestrogen intake and positive lifestyle factors such as exercise, or negative factors such as smoking and alcohol use, do not explain the apparent protective effect of whole grains against cancer. It is suggesting that once again it is all of the whole grain components that are effective.[2,3,4]

Whole grains are a rich source of a wide range of phytonutrients with anti-carcinogenic properties. Some of these phytonutrients may block DNA damage and suppress cancer-cell growth. Many of the phytonutrients concentrated in grains have shown promising results against cancer in lab and animal studies.[5]

Other components of whole grains may bind carcinogens and thereby limit their absorption or limit their exposure time in the stomach. Components such as selenium, dietary fiber and vitamin E are also believed to be cancer inhibitors by preventing the formation of carcinogens.

- FACT: Whole grains may help protect against diabetes, which is the nation's fifth leading cause of death by disease in the United States. Several studies have shown that cereal fiber (wheat, oats, barley, corn, millet, sorghum, rye and rice) intake is associated with a reduced risk of type 2 diabetes. The intake of fiber from whole grain cereals has also been found to be inversely related to type 2 diabetes. In a long-term study of almost 90,000 women and in a similar study of 45,000 men, researchers found that those with higher intakes of cereal fiber had about a 21% to 36% lower risk of developing type 2 diabetes, compared to those with the lowest intakes. 6, 7

Definitions: Enriched Grains

Enriched white flour is the finely ground endosperm of the kernel. The assumption that everything good has been "stripped" away is a fallacy. Many of the nutrients that have been milled out are replaced through enrichment or fortification. Slice for slice, enriched white bread, as well as other enriched grain products, are a good source of iron and four B vitamins; thiamin, niacin, riboflavin and folic acid, as well as complex carbohydrates.

- FACT: Refined grains have been enriched since 1941 with iron and three B vitamins; riboflavin, niacin and thiamin. In fact, riboflavin and thiamin are added back at twice the original amounts. With this enrichment, pellegra and beriberi have been eradicated from the United States.

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- FACT: In 1998, a 4th B vitamin, folic acid, was added to the enrichment formula. Since that time, neural tube birth defects have decreased by 1/3. A study showed that neural tube defects (NTD) have decreased by 26 percent following the folic acid fortification in enriched grains in the U.S.[8] In Nova Scotia, NTD has decreased by 54 percent.[9] FACT: Enriched grain products have over twice the amount of folic acid as whole grains. A slice of enriched white bread has 37 mcg versus whole-wheat at 17.5 mcg.

- FACT: Recent studies demonstrated folic acid's value to help prevent some cancers and birth defects, and may help to prevent strokes and Alzheimer's.[10]

- FACT: Folic acid also helps lower blood levels of an amino acid called homocysteine, which has been linked with an increased risk for heart disease.[11]

- FACT: Studies from Tufts and Boston Universities have linked high homocysteine levels with increased risk for Alzheimer's disease.[12]

- FACT: A 1999 study found that 77 percent of low-income women could consume adequate amounts of folic acid through enriched grain products. The cost of supplements can be expensive, and therefore often not taken by low-income women.[13] Even those who can afford a folic acid supplement often forget to take them.

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