

FN-SSB.920



Essential Ingredients

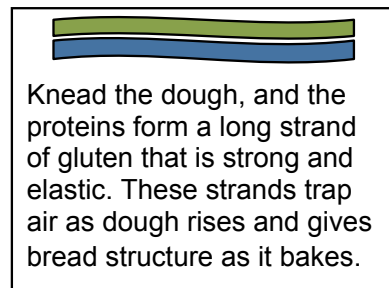
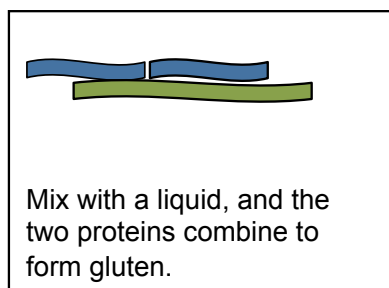
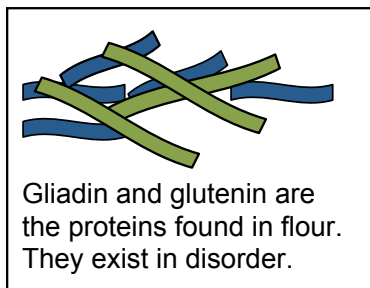
It seems that bread has been a staple food for many ancient people groups. Loaves of bread can be found in the British Museum in London and the Museum of Fine Arts in Boston, presumably taken from Egyptian tombs, where they were left to nourish the spirit into the afterlife. The Bible tells how the Israelites carried dough on their backs that they baked as they escaped into the desert. In western Asia, people hung rings of dried bread from the rafters in the winter. Whenever fresh bread was needed, the ring of bread was moistened with water and then was ready to eat. It is not surprising that bread has evolved just like our diverse cultures have evolved.

The ingredients that go into a loaf of bread are simple — flour, yeast or other leavening agent, liquid, and salt. These simple ingredients combined however are wonderfully complex. The nature of the ingredients, the proportion used in a recipe, and the way they are combined or baked, make for a thousand different combinations.

FLOUR

Most flours are named according to the percent of protein present. The percent of protein determines the amount of gluten that can be developed. Pastry flour has less gluten potential than cake flour, which has less than all-purpose flour, which has less than bread flour. So, each type of flour has an impact on the end results of the baked product. The more gluten developed, the tougher the product will be. As seen in the illustrations below, there are two proteins in wheat flour, gliadin and glutenin. When these proteins and a liquid are mixed together, gluten is formed. Once developed through mixing or kneading, gluten has the capability to stretch, trap air, and expand. As the flour in the batter or dough heats, it sets the structure of the baked good. Some flour packaging mentions spring or winter wheat, indicating when the seed was planted. Winter wheat (hard) results in a higher protein content that is more suitable for making bread and pasta. Spring wheat (soft) is used for products such as tender pastries and cakes.

For added flavor, textures, and fiber in the diet, add whole-grain breads, such as wheat berries, whole oats, wheat bran or germ, bulgur, barley, or kasha. Add as little as one tablespoon or as much as ¼ cup of whole grains per cup of flour in breads. The more you add, the heavier and more crumbly the bread will be. Seeds, raisins, nuts, chili peppers, potatoes, dairy products (sour cream, cheese, and yogurt),



flavorings, and fruit add nutrients and flavor when added to breads but may change the texture of the product if not called for in the recipe.

The parts of the wheat kernel can be seen in the illustration below. Mechanical rollers crack the wheat kernel, allowing the germ and bran to be removed from the endosperm. For whole-grain flours, the germ and bran are then added back. Wheat flour is slightly yellow after milling. If allowed to age for one to two

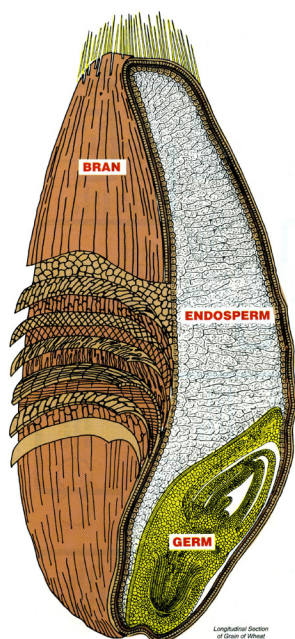


Illustration Courtesy of the Wheat Foods Council used with permission

months, it turns white naturally through oxidation. But most wheat flour is quickly bleached using a maturing or bleaching agent. Aging improves the baking qualities, but because aging takes so much time and space, flours are usually chemically aged. Bromated flour or those that contain ascorbic acid create higher-rising loaves.

Dough enhancers are supplements that can increase gluten strength, aid yeast fermentation, convert starch into sugar, or aid in emulsifying oils. Their optional use will often result in taller, lighter loaves that stay fresh longer. Some common dough enhancers are gluten, diastatic malt powder (malted barley flour), lecithin, ascorbic acid (vitamin C), and potassium bromate. Commercial dough enhancers may be a blend of these enhancers.

To accurately measure flour, dip the measuring cup into the flour, fill it, and level the top with a straight edge. Most commercial flours are pre-sifted, but if the recipe calls for sifted flour, it should be sifted before measuring. The percentages of protein in the flour, as well as the humidity in the air, affect the absorbency of the flour. Use only enough flour to produce the type of dough described in your recipe.

Most flour should be stored in an airtight container in a cool, dry location. If properly stored, the shelf life of commercial flour is 15 months from the coded date on the back of the package. If weevils are a problem, place a newly bought bag of flour in the freezer for several days. Whole wheat and other whole-grain flours should be stored in the refrigerator for up to three months. Colder temperatures slow the natural oils in flour from turning rancid.

LEAVENING AGENTS

Baking Powder

Baking powder contains baking soda, an acid (such as cream of tartar), and a moisture absorber (such as cornstarch). Baking powder releases carbon dioxide bubbles when mixed with a liquid, which causes bread or cake to rise. Single-acting baking powder releases the gas bubbles as soon as it is moistened. Double-acting baking powder releases some gas bubbles when it becomes moistened and enlarges the gas bubbles when exposed to heat in the oven. Too much baking powder will result in a bitter taste. The batter may also rise rapidly and then fall, causing a coarse, fragile crumb with a fallen center. Too little baking powder will result in a tough product with a compact crumb.

Baking Soda

Baking soda must be combined with an acid ingredient such as buttermilk, sour cream, molasses, or brown sugar to develop gas bubbles. Baking soda reacts immediately when moistened, so it must be mixed with dry ingredients, the liquid is added and then immediately placed in the oven. Baking soda is about four times more powerful than baking powder. Too much will result in a soapy taste with a coarse, open crumb. The reddening of cocoa powder in Devil's Food Cake is caused by the baking soda in the recipe.

YEAST

Yeast is a living cell that multiplies rapidly when given the correct amount of food, moisture, and warmth. Yeast grows with a small amount of sugar, but too much slows the rate. As yeast grows, it converts the

sugar into alcohol and carbon dioxide. This process allows the bread to rise and gives it a distinctive flavor. The most commonly used yeasts are active dry and quick rise. Yeast is heat sensitive: too little and it will not multiply; too much and it will die. Dissolve active dry yeast in $\frac{1}{4}$ cup of warm water (100-115°F). Then the yeast is added to the other ingredients and kneaded. It must proof until it is doubled in size, be shaped, and then allowed to double in size again before baking. Quick-rise yeast can be added to the dry ingredients. The liquid must be heated to a higher temperature (120-130°F). After the dough is mixed and kneaded, it is allowed to rest for several minutes. Then it is shaped and allowed to proof before baking. Since only one proofing is necessary, the quick-rise yeast saves time when baking yeast breads.

SWEETENERS

The most common sweetener in baking is sugar. Sugar gives tenderness to the crumb and color to the crust. There is a wide variety of sugars that can add different flavors to baked goods. Sweeteners should be measured in dry measuring spoons and cups. To measure liquid sugars such as honey or molasses, coat your measuring spoon with a small amount of oil first. The sugar will glide out easily. Although a cup of brown sugar is equal to a cup of granulated sugar, each sugar has a different density, causing it to weigh more or less. Brown sugar must be packed into a measuring container to provide the same sweetness as granulated sugar. Brown sugar contains from 3.5 to 6.5 percent molasses. The darker the brown sugar, the more molasses it contains. Brown sugar will dry out after it is opened. Either add a few drops of moisture or a cut apple to it and reclose the package. The brown sugar will soften after a day or two. Powdered sugar, which is usually used for icings, is granulated sugar that has finer grains. The fineness is describes by the number of Xs on the package, indicated how many times it has been ground. Powdered sugar usually has an anti-caking agent added, such as cornstarch or calcium phosphate so it will not clump. Other sweeteners used in baking include honey, molasses, maple syrup, corn syrup, and non-nutritive sweeteners. Follow the directions on the packaging for non-nutritive sweetener use. Use the following conversions, if desired:

One tablespoon sugar = 2 teaspoons honey = $\frac{1}{4}$ tablespoon maple syrup = 4 teaspoons molasses = 2 tablespoons corn syrup

FATS

Butter, margarine, shortening, and oil are all considered fat. Fats coat the strands of gluten so they won't combine as easily, which allows the product to be more tender. When sugar is creamed with fat, air bubbles form a finer crumb and produce more volume in the finished product. Fat offers flavor and mouth feel to the product. Fat also slows down the moisture loss that causes staling. Butter is usually the fat of choice for baking. Margarine is made from a single oil or blend of oils and contains moisture, so is not suitable for cookies. Shortening creams better, distributing the fat more effectively, and minimizing gluten development, but it does not impart any flavor. Oil, being a liquid, adds to the moisture content of a recipe. Thus, follow the recipe suggestions for best results in baking.

EGGS

Eggs give a rich flavor and color to breads. The protein in eggs also contributes to the structure of the baked bread. Eggs also help bind all the ingredients together. When eggs are beaten, they incorporate air into the batter, which expands in the oven to help the product rise. Egg breads have a tendency to dry out faster than other breads.

SALT

In addition to flavoring bread, salt helps control the rate of fermentation in yeast breads and makes the dough easier to handle.

LIQUID

Liquid helps to distribute the ingredients evenly within the batter or dough. Ingredients such as sugar and salt will also dissolve. Without moisture, gluten cannot develop. Water generally yields crisper breads than dough made with milk. Milk adds richness, makes a finer crumb and softer crust, and can help retard staling. Scalding is no longer required since we drink pasteurized milk. However, since yeast needs a certain temperature to begin to grow, heating on top of the stove or in a microwave-proof container in the microwave are both good methods. If your dough appears dry, add one tablespoon of liquid at a time until the correct consistency is reached. The liquid in a recipe also produces steam during baking to assist in leavening and tenderizing the product.

REFERENCES

- Bastin, S. (2004). Great grains; FN-SSB.0064. University of Kentucky Cooperative Extension Service. Retrieved on February 22, 2010, from <http://www.ca.uky.edu/HES/fcs/factshts/FN-SSB.064.pdf>
- Culinary Institute of America. (2009). Baking and pastry: mastering the art and craft. Hoboken, New Jersey: John Wiley and Sons.
- Sher, G. (2004). From a baker's kitchen: techniques and recipes for professional quality baking in the home. Cambridge, Massachusetts: DaCapo Press.

Sandra Bastin, PhD, RD, LD, CCE
Extension Specialist for Food and Nutrition

December 2010