What's in a Recipe

Flour, liquid, fat, sugar, eggs, leavening, and salt are the basic ingredients used in batters and doughs. The amounts of each and how they are mixed together determine the final product. The cooking time and temperature also make a difference.

The quality of home-baked products depends on the proportions of ingredients, how they are mixed, cooking temperatures, and times. These relationships affect the color, flavor, texture, shape, and volume.

Flour

Flour contains proteins that combine with liquid to form gluten. This sticky, elastic material gets stronger and more elastic as the batter is stirred or the dough is kneaded. These strands of gluten form a network of cells that expand when heated. Baking "sets" this framework.

Flour also contains starch, which absorbs liquid and swells. When heated, this adds body to the framework of baked foods.

Three common types of flour are available:

All-purpose flour is a blend of hard and soft wheat flours, which makes it versatile for many products. It is usually enriched, and may be bleached or unbleached.

Bread flour is made from hard wheat which is rich in protein and forms strong gluten. It is desirable for yeast breads and rolls.

Cake flour is made from soft wheat which is lower in protein, so less gluten is developed; thus, it produces more tender cakes.

When the same amount of liquid is used, both all-purpose flour and bread flour produce a stiffer dough than cake flour.

Liquid

Some type of liquid is needed to develop the gluten, gelatinize the starch, activate the leavening agent, and dissolve the sugar and salt to distribute them through the batter or dough.

The proportion of water and flour helps determine the amount of gluten formed.

Milk is the most commonly used liquid, although fruit juice and water also can be used. Milk is 87 percent water and also contains protein. Milk tends to give baked products a finer texture, better color, and somewhat different flavor than water.

Fat

Shortening, cooking oil, butter, and margarine make baked products tender and rich. They also help retain freshness and serve to blend and distribute flavorings. When butter is used, it gives a special flavor to the final product.

Since fat is insoluble in any of the other ingredients, it separates the particles of dough. During baking, the fat melts while other ingredients are setting up. It is easy for the leavening gas to expand into the tiny areas of melted fat. However, excess fat weakens the gluten structure and can cause the product to decrease in volume or fall.

Vegetable shortening and oils are 100 percent fat. By contrast, butter and margarine are 80 percent fat with 20 percent water and milk solids.

Sugar

Although primarily added for sweetening, sugar has additional functions. Because it caramelizes with heat, sugar helps the product brown during baking. It also increases the tenderness of the product.

Honey, corn syrup, and molasses are sugars and can be substituted for granulated sugar. However, the amount of liquid used also must be adjusted. As a guideline, try reducing the liquid by ¼ cup.

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Noncaloric sweetening agents require special recipes. They contribute a sweet flavor but do not tenderize or increase browning. Sometimes they lose their sweetening power and become bitter with heat.

Eggs

By their emulsifying action, egg yolks bring about even distribution of fat in batters and doughs. They promote tenderness and a fine texture. The egg proteins, along with gluten, form the structure of the product.

Beaten eggs, particularly beaten egg whites, aid in leavening because of the formation of tiny air cells. The air expands on heating and steam is formed from the moisture of the egg. As the egg proteins coagulate with heating, the cell walls become set.

Leavening

Leavening is produced by the release and/or expansion of gas or air within a batter or dough. A variety of substances contribute to lighten the batter or dough.

Air is incorporated in baking mixtures in several ways. The most common is folding whipped egg whites into the batter. Other ways include beating whole eggs, creaming sugar and fat, and beating the batter itself.

Heating the batter or dough causes the air bubbles to expand, making the batter light. Angel food cakes depend on the incorporation of air for one-half to two-thirds of their leavening.

Baking powder releases gas during mixture and/or baking and is used in most cakes and quick breads. Baking powder contains baking soda (sodium bicarbonate) and acid-producing ingredients. In the presence of moisture and heat, these components react to form carbon dioxide gas, which expands and leavens.

Baking powder contains cornstarch to keep the mixture dry by absorbing moisture, and to standardize measuring.

Baking soda is required to neutralize an acid ingredient such as buttermilk, sour cream, sour milk, or molasses. The combination releases carbon dioxide gas, which leavens the batter or dough.

Steam provides the leavening in batters containing large proportions of liquid, such as popovers and cream puffs. When water is heated, it produces more than 1,600 times its volume in steam.

Yeast is a microscopic plant that grows rapidly in a warm, moist medium. It ferments sugar and/or starch to form carbon dioxide gas and alcohol. The gas is the principal leavener, but the alcohol vaporizes during baking and also helps in leavening.

During baking, the heat expands the gas, stops the yeast action in the raised dough, evaporates the alcohol, and sets the gluten.

Salt

The major function of salt in baked products is to add and enhance flavor. In yeast breads, it helps to control the action of the yeast, thus improving texture.

For more information

Ask your Iowa State University Extension county office for copies of these publications.

Altering Recipes, NCR 473
Does Your Recipe Need Changing? N 3320*
Revise a Recipe Guidelines, NCR 473a*
Safe Recipe Checklist, Pm 1523*

*Also available electronically at http://www.exnet.iastate.edu/Pages/pubs/Food.html

Prepared by Patricia Redlinger, extension food science specialist, and Diane Nelson, communication specialist.

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