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Using Flours

When a recipe lists "flour" as an ingredient, we assume it means plain, white all-purpose wheat flour, and usually that's correct. But there are others—flours made from other grains, legumes, and tubers. Experimenting with these can bring a variety of flavors and textures to your baked products.

STORING

All flours should be stored in tight containers at room temperature. Flour should not be stored near heat. Freeze flour for long-term storage. To freeze flour, wrap the bag carefully in moisture proof material or place flour in a heavy plastic bag. Freezing is especially helpful for whole wheat and graham flours which contain the oil-rich germ of the wheat kernel; these flours can turn rancid if improperly stored.

NUTRIENTS AND OTHER ADDITIVES

When nutrients are added to refined flour, the product is called "enriched." This will be stated on the package. To be labeled "enriched," flour must have three B-vitamins and iron added in amounts specified by law. Calcium and vitamin D are sometimes added. Currently, enriched flour has 10 times the thiamin, 7 times the riboflavin, 5½ times the niacin, and over 3 times the iron content of unenriched flour. To get the most nutrients for your money, look on the label for the word "enriched" when buying white flour.

White wheat flours also come bleached or unbleached. Chlorine dioxide, chlorine, benzyl peroxide are agents which accelerate the normal maturing of the

flour to make bleached flour. Unbleached flour matures naturally. It is a creamy color and produces a lower volume and coarser texture in baked goods.

Bromated flours are untreated flours. Since untreated flour forms doughs that tend to be soft and sticky, a small amount of potassium bromate is added to strengthen the protein and improve the flour's baking performance. If potassium bromate is added, it will be stated on the front label.

GLUTEN

Wheat flour contains high quality proteins. When mixed with liquid these proteins form gluten. Gluten is essential for the structure and elasticity of batters and doughs.

For yeast breads, the more gluten proteins in the flour the greater the volume of the loaf; developing the gluten by kneading is important for good volume and fine texture. For baked products like pastry the dough is handled lightly and as little as possible to avoid developing the gluten; this gives a flaky, tender product.

Flours milled from grains other than wheat form little or no gluten; therefore, these flours are usually combined with white wheat flour in baked products to insure good volume and appearance. These flours may be used alone, however, in special diets; see table for substitutions.

The following chart lists kinds of flour and some information about each. Cost comparisons are made using all-purpose enriched flour as a base.

Kind of Flour	Description	How to Use	Cost Compared to All-Purpose Flour
White Wheat Flours			
All-Purpose Flour	Made from blends of wheat. Forms less gluten than bread flour.	Use in yeast breads, quick breads, pastries, cookies, cakes. To substitute all-purpose flour for cake flour, use 2 tablespoons less for each cup of flour in recipe.	Base price.

Kind of Flour	Description	How to Use	Cost Compared to All-Purpose Flour
Bread Flour	Milled from hard wheat blends. High in gluten, slightly granular to touch.	Used chiefly by bakers for yeast breads.	Seldom available.
Cake Flour	Milled from soft wheats with less gluten-forming protein than all-purpose flour. Has a fine, satiny feel. Holds shape when pressed lightly.	Use in tender products like angel food, sponge, and shortened cakes.	Much more than all-purpose.
Instantized Flour (Instant, Instant-blending, or Quick-mixing Flour)	Granular all-purpose flour made by exposing flour to hot water or steam which agglomerates the individual particles. Then the flour blends more easily without clumping when combined with liquid.	Excellent for sauces and gravies. For baked products, use special recipes. Or use 2 tablespoons less of instant flour for each cup of flour in the recipe.	Slightly more than all-purpose.
Pastry Flour	In between the properties of all-purpose and cake flour. Usually made from soft wheat.	Used chiefly by bakers.	Seldom available.
Self-Rising Flour	Leavening ingredients and salt are added.	Use recipes formulated for self-rising flour. Or, adjust regular recipes by omitting the baking powder and salt. May be used for all home baking <i>except</i> angel food cake, popovers, pastries, and cookies with soda.	Slightly more than all-purpose.
Entire Wheat Flours or Whole Grain Flours			
Whole Wheat Flours	Made from milled wheat without altering natural ingredients. Contains bran, germ, and endosperm. Shorter storage life because of fat in germ.	Use recipes calling for whole wheat or graham flour. Or substitute whole wheat flour for $\frac{1}{4}$ of the wheat flour. Stir before measuring. Also stir into other dry ingredients. Do not sift because it is coarser than white flour.	Slightly more than all-purpose.

Kind of Flour	Description	How to Use	Cost Compared to All-Purpose Flour
Graham Flours	Like whole wheat flour except more coarsely ground.	Use and substitute like whole wheat flour. Since graham flour is coarsely ground, it may take longer to absorb liquid. Bread doughs may seem sticky. Allow time for absorption before adding more flour. Breads take longer to rise. Products usually lower in volume.	Slightly more than all-purpose.
Flours from Other Grains, Legumes and Tubers			
Barley Flour	Milled from barley. Contains some gluten-like protein.	Use in special recipes. Or, substitute barley flour for $\frac{1}{4}$ of the wheat flour. Can give a moist texture (like cake) to quick breads.	Much more than all-purpose.
Buckwheat Flour	Buckwheat is a plant seed; flour is obtained by sifting buckwheat meal. Contains some gluten-like protein.	Primarily used in pancakes by substituting buckwheat flour for $\frac{1}{2}$ the wheat flour. Use in bread recipes by substituting buckwheat flour for $\frac{1}{8}$ of the wheat flour.	Much more than all-purpose.
Cornmeal and Corn Flour	Milled from white or yellow corn. Corn flour is finer than cornmeal. Has no gluten-forming properties, so must be combined with other flours in baked goods.	Use in quick breads and pancakes. Substitute cornmeal for $\frac{1}{2}$ of the wheat flour in the recipe.	Much more than all-purpose.
Oat Flour	Milled from oats. Has relatively high protein content but little gluten. Has high fat content, so will not keep as long as white flour.	Use special recipes. Or, substitute oat flour for $\frac{1}{3}$ of the wheat flour. Used alone, products feel sticky in mouth.	Much more than all-purpose.
Potato Flour	Made from cooked potatoes which have been dried and ground. Chiefly starch and contains no gluten.	Used primarily by those allergic to gluten. See substitution chart for wheat-free diets.	Much more than all-purpose.

Kind of Flour	Description	How to Use	Cost Compared to All-Purpose Flour
Rice Flour	Milled from rice. Chiefly starch; contains no gluten.	Used primarily by those allergic to gluten. Gives a grainy texture to baked products.	Much more than all-purpose
Rye Flour	Milled from rye. Light, medium, and dark flours available. Contains gluten-forming protein, but not as much as wheat flour.	Use special recipes or substitute rye flour for $\frac{1}{3}$ to $\frac{1}{2}$ of the wheat flour. Breads made from all rye flour will be more compact.	Slightly more than all-purpose.

Flours from Other Grains, Legumes and Tubers

Soy Flour	Made from soybeans, high in protein. Lacks gluten. Comes as: defatted, low-fat, and full fat. In baked products, reduces staling, reduces fat absorption in doughnuts. Usually increases tenderness and moistness, gives a rich color and finer texture, and increases protein content. Because of high fat content, does not keep as long as white flour. Strong flavor.	Must be used with wheat flour for structure in baked products. Substitute soy flour for $\frac{1}{4}$ wheat flour in recipe.	Much more than all-purpose.
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Use of Flours for Wheat-Free Diets

For those with certain allergies, physicians suggest wheat-free diets. Different flours cannot be easily substituted because each flour functions differently. Experimenting is necessary, and some failures should be expected. This table will help in making substitutions for 1 cup wheat flour in recipes.

To substitute for 1 cup wheat flour, use:

Kind of Flour	Amount
Barley flour	$1\frac{1}{4}$ cups
Corn flour	1 cup
Oat flour	$1\frac{1}{3}$ cups
Potato flour	$\frac{3}{4}$ cup
Rice flour	$\frac{3}{4}$ cup
Rye flour	$1\frac{1}{3}$ cups
Soy flour	$1\frac{1}{3}$ cups

Oat flour produces a somewhat sticky feel to the mouth. Potato and soy flours are best used in combination with other flours. Rice flour gives a distinct graininess to baked products. Rye flour gives a dark color and distinctive flavor. If diets are to be gluten-free, barley, oat, and rye flours would not be suitable.

Adapted from a publication of Iowa State University, Cooperative Extension Service by Sandra Simons, Nutrition and Health Specialist, Purdue University.

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