

Contrary to common belief, gluten is not a carbohydrate but a protein that is naturally present in some grains such as wheat, barley and rye. Gluten allows bread to rise by trapping carbon dioxide inside and it contributes to the thick, airy, elastic texture of the final product. Although gluten free flours may be lacking in these qualities, there are ways to prepare easy and delicious gluten free meals! Since different grains, legumes and starches have different properties, mixing them together can allow for a better finished product as well as significantly improve nutritional quality of the diet.

Alternative flours for the gluten free diet

Rice flour is the most common versatile standby. It is milled from different kinds of rice, such as wild, brown, sweet or white, with the latter being the most popular. *Brown rice* flour is simply ground from unpolished rice and is high in many nutrients, including fiber. In contrast, *white rice* flour has almost no fiber or nutrients and is mostly starch. *Sweet rice* or *glutinous rice* flour is ground from short-grain white rice, is very sticky and often used as gluten-free thickener. Despite its name, *wild rice* is not a rice, but seeds of a grass that grow in shallow freshwater marshes across North America. It is also very nutritious and has high protein content relative to other grains. Because of the different starch contents of each of these rice types, you need to pay attention to the amount of fluid in your recipe.

Flavour: depends on type of grain used, from nutty to sweet and almost flavourless

Corn flour, not to be confused with cornmeal and cornstarch, is also commonly used. Corn flour is the finest-ground form of corn and is usually used in combination with other flours and comes in different colors. *Cornmeal* is less finely ground and contributes noticeable graininess to the final product. Sometimes cornmeal that was coarsely ground is called *polenta*. Corn flour and cornmeal have fiber, protein and other valuable nutrients since both are made from ground dried kernels. *Cornstarch* is highly processed from starchy endosperm and thus has little nutritional value in comparison. *Masa Harina* is a very soft version of corn flour, often referred to as “instant”, because by simply adding water, one can prepare dough for tortillas or other traditional Mexican dishes. Considering these differences, corn flour, cornmeal and cornstarch cannot always be substituted for each other.

Flavour: depends on type of processing, from nutty and slightly bitter to sweet

Buckwheat flour is made of milled buckwheat which is native to central Asia. Despite its name, it is not related to wheat rather it is a member of the rhubarb family. It has a distinctive, nutty taste and is rich in vitamins and minerals. Darker varieties have a stronger taste and coarser texture but are higher in fiber and nutritional value, while lighter varieties with hulls removed have a slightly milder taste but lack certain nutrients. Usually lighter varieties are used for moist, light baking products, whereas darker flour can be advantageous for granola bars and products requiring more distinct texture.

Flavour: distinctive toasty and rich

Soy flour is derived from dried ground soybeans. The taste varies from mild and sweet to strong and “beany”, depending on the type of processing. Soy flour is available in three forms: full-fat (all natural soy oils present), low fat (1/3 the amount of fat in full-fat) and defatted (with most of the oil removed).



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Written by Alena Frankish (BSc)

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Since soy flour browns fast, it is often combined with other flours during baking to add color to the final product. Soy is unique because it has complete protein whereas many other plant products must be used in combinations in order to have protein complete.

Flavour: depends on type of processing, from “beany” flavor to sweet and mild

Millet flour is ground from the yellow round millet seed. Unlike other grains, millet refers to a large number of different seeds that share similar characteristics. Although some popular sources advise against millet consumption because it contains goitrogens (substances that can impair the thyroid gland), the most recent scientific evidence suggests that the risk is only relevant in areas with high rates of iodine deficiency and high intake of millet, which is rare in North America.

Flavour: corn-like, sweet

Potato flour is a powdered form of whole cooked dehydrated potatoes and should not be confused with potato starch which is made of the starch portion of potato (not substitutable for one another). Potato flour can be white or slightly greyish with a definite potato taste. It tends to crisp faster than wheat flour and has a heavy dense texture. Added in small quantities to bread, potato flour helps to retain freshness and leaven the product. Recently sweet potato flour has also become available.

Flavour: depends on type of potato used (mild, sweet, or savory)

Flaxseed flour is made of ground flaxseed. Sometimes it is used interchangeably with flaxseed meal; however, the latter is coarser. Flaxseed lacks starch, so it cannot be used by itself and cannot act as a thickener. Coarser varieties can be used as binders and can successfully replace eggs in some recipes. Flaxseed flour is an excellent addition to a gluten free diet as it is full of nutrients and not only has all essential amino acids, but also fiber and some essential fatty acids, including omega-3.

Flavour: mild, nutty (more coarsely grinded flaxseed meal may taste a bit fishy)

Quinoa flour is milled from quinoa seeds which somewhat resemble sesame seeds in their appearance. As a whole grain flour it is high in fiber and many essential nutrients. It works best for muffins and quick breads, but it is quite versatile and can be used in a variety of recipes.

Flavour: bold and nutty, some brands may be slightly bitter

Sorghum flour is made of a cereal grain that originated in Africa. Sorghum is now currently grown in many countries and can be found as whole grain or pearled (with the outer coating and some germ removed). The pearled version is lower in nutrients and fiber; however, it is lighter in color, has a milder flavour and is faster to cook. Whole grain sorghum is very rich in nutrients, protein, fiber and antioxidants and is a great choice to a gluten-free diet. Although name *sorghum* is most commonly used, it can be sold under variety of other names, such as *durra* (don't confuse with durum!) or *Iowar*.



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Flavour: mild, almost bland, darker varieties may taste more sweet and earthier

Legume Flours are made of fruits or seeds of plants called *fabaceae*. Legumes are generally high in protein, fiber and resistant starch, which is beneficial for human digestion. microbiota. These flours may cause flatulence (gas) in some individuals, so a gradual increase in consumption is recommended. There are about 20 different species of legumes cultivated in various parts of the world and their nutritional value, appearance and texture will vary. Below is the list of some common legume flours, aside from soybean which was already discussed earlier.

Lentil flour – comes in different colors and is versatile. Green and brown varieties are unhulled and keep the shape better. Can be used as a thickening and binding agent. Flavour is mild in comparison to other legume flours.

Pea flour – also called peas meal, usually comes as yellow or green and can be made of whole or split peas. Characteristic flavour comes from a component related to green peppers and is overwhelming in green varieties therefore yellow pea flour is mostly used for baking.

Bean flour – comes in many variations such as pinto, navy, black, chickpea (garbanzo beans), fava, cranberry (Roman) and others. Garbanzo bean flour is a popular, versatile, naturally dense flour with a sticky texture when combined with liquids. Garfava flour is a blend of chickpea, fava beans and sometimes Roman beans. Bean flours have a powerful taste and some people may find certain varieties unpleasant. Some sources suggest to offset the flavour with brown sugar, spices or chocolate.

Peanut flour – made by grinding roasted peanuts and pressing out the oil. It can be sold in both light and dark roast varieties and varies in oil content. It is a good thickener and can be used along with other flours to increase nutritional value and add unique nutty flavour to the end product.

Nut Flours are generally made by grinding raw whole nuts (almonds, pecans, walnuts, etc.) into powder. These can be called nutmeals and they are higher in fiber than nut flours that have been made from blanched ground nuts, which will be finer in texture. Sometimes these two terms are used interchangeably, so reading the product label may help. In contrast to others, nut flours are high in fat and can add moist, rich texture to the final product.

Almond flour – one of the most commonly used sweet, mild nut flours; can be used alone or blended with other flours. If whole raw nuts have been used, it can be called almond meal and it will be coarser in texture. This flour is high in fat so most recipes will reduce or eliminate other fat sources.

Hazelnut flour – popular in Europe and is gaining popularity in North America. It has distinct flavour and gives unique grainy texture to baked goods. Dark in color if skin was preserved.

Coconut flour is made of dried coconut with the fat removed and is a low carbohydrate, high fiber sweet flour. Some sources warn that too much of this flour can create a dense final product and that additional water and egg can be required for rising and lightness.



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Flavour: strong, sweet, coconut

Chia flour is a soft fluffy flour made of finely milled chia seeds. Its close relative is called *salba* and is also available for sale but not as common. Although very similar, chia seeds are black and can be grown wild throughout central and South America, whereas salba seeds are white and are farmed in small quantities. It is versatile and can be used on its own for thick and gummy dough or combined with other flours for more solid mixtures. Can also be used as an egg substitute.

Flavour: nutty

Teff flour is made of a grass seed that is grown primarily in Ethiopia and has a variety of colours from dark red to almost white. Traditionally it has been used to make thin, sour flatbread which can stay soft and chewy for several days, however, it is now used in a variety of ways especially in gluten free cooking. It has one of the highest amounts of calcium of all flours and is full of fiber.

Flavour: Earthy, molasses-tasting, toasted. Pigmented varieties tend to have more flavour

Amaranth flour is protein rich flour ground from tiny seeds and comes in different colours from gold to pink and white. It is versatile and can be used alone for non-rising breads or combined with others to make a variety of baked goods. It is high in lysine, an essential amino acid often lacking in other plant-based products. Amaranth flour tends to brown quickly, so it is more suitable for darker baked goods such as brownies or chocolate muffins.

Flavour: bold, peppery, earthy, nutty, slightly sweet

Cricket flour or powder is made by milling crickets and is currently gaining popularity across the globe. It is very different from other flours as it is not plant-based and is very high in protein (more than in meat) and unsaturated fatty acids, rather than starch. As a result, cricket powder has very different properties than other flours and is mostly valued for its nutrient-rich content as well as sustainable production. It is almost flavourless (with a hint of nuttiness) and can be used in a variety of recipes.

Flavour: neutral with hint of nuttiness

Thickeners and binders

Potato starch should not be confused with potato flour. Potato starch is made of the starch portion of the potato. As sometimes potato starch is incorrectly called potato flour, checking the ingredient list may help. Potato flour will include whole potatoes and potato starch will usually include “vegetable starch” or potato extract. Potato starch is flavourless and looks like a fine white powder. It can be used as a thickener or be added to baked goods for moistness and softness.

Corn starch is another common flavourless thickener. See *Corn flour* section for more details.

Tapioca starch is obtained from the cassava root and bleached. Low in nutritional value, it is a good thickener and can add lightness and chewiness to baked goods. This starch sometimes is labelled as



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tapioca flour or tapioca starch flour. Tapioca starch that has been modified (to change molecular structure and improve texture and moistness of the final product) is called *expandex*.

Arrowroot starch is made from the tubers of a plant native to tropical South America. It has little nutritional value but is excellent in thickening up sauces and gravies.

Xanthan Gum is a sugar-like compound that was discovered in the 1950s and is made by plant microorganisms through the process of fermentation. Some xanthan gums are produced by feeding bacteria with a glucose solution derived from wheat, but only the starchy portion of the wheat is used, and therefore no gluten is present. It helps to stabilize, thicken and emulsify baked goods and add elasticity to prevent crumbling of gluten free flours. Only a small amount is needed in most recipes. Some people can be sensitive to xanthan gum so guar gum can be used instead.

Guar Gum has very similar properties to xanthan gum. Sometimes it is used instead of xanthan gum, or in combination with it for better results. Guar gum is made of guar beans and is used in very small amounts; however, it is not always substituted 1:1 with xanthan gum. For example, for cookies it can be substituted 1:1, whereas muffins may require slightly more guar gum (1 guar: 0.75 xanthan).

Bean flours, rice, sorghum, chia flours as well as gelatin and agar are also popular thickeners.

General tips about gluten free flours

- ◆ Gluten free flours should not be simply substituted for wheat flour, as they have very different properties. Some flour blends can be used cup-for-cup though it is important to read the directions on the packaging (i.e. Bette Hagman's GF flour blend).
- ◆ Gluten free flours cannot be always substituted for each other 1:1 in a recipe. It may take some practice to recognize types of flours and amounts required. Some examples of substitution: potato starch can be substituted for cornstarch; chickpea for sorghum flour; millet for amaranth flour.
- ◆ Many of these flours should be refrigerated in airtight containers so they can remain fresh longer. Some sources advise to freeze flours if they won't be used within a few months. Allow the flour to reach room temperature prior to cooking and mix flour blends well prior to use to ensure even distribution.
- ◆ Most gluten free flours will require additional leavening agents to compensate for the lack of gluten.
- ◆ To offset strong flavours of some gluten free flours ingredients like spices and chocolate can be used.
- ◆ Be careful with commercially prepared flours and flour blends as they can be contaminated with gluten. **Always read labels** and ensure that the product is clearly marked as gluten free.



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- ◆ Let the dough/batter rest for about 15 minutes prior to cooking to ensure optimal quality and airiness.
- ◆ What may taste sweet or bitter for one may not for another! Don't be afraid to experiment with gluten free flours to find what's best for you!
- ◆ Add liquid slowly if you are unfamiliar with the recipe. Different gluten free flours have different water absorption properties with some requiring just a tiny amount. If batter/dough is too thick, you can always add more liquid later.

Follow recipes precisely (in measurements and content) until you get familiar with various flours and how they work. Don't get discouraged and don't be afraid to experiment! There are a variety of recipes and cookbooks that can be found on the Internet as well as in book stores. A few cookbooks are generally available in our office for a small charge.

Examples of simple gluten free (GF) flour mixtures

<p>Fork & Beans GF flour blend:</p> <p>3 cups sorghum flour 3 cups fine brown rice flour 1 ½ cups potato starch 1 ½ cup arrowroot starch (powder)</p>	<p>Bette Hagman's GF flour blend*:</p> <p>6 cups rice flour 2 cups potato starch (not potato flour) 1 cup tapioca starch</p> <p><i>*based on ratios in Bette Hagman's <i>Gluten Free Gourmet</i>. NY: Henry Holt and Company, 1990, 24.</i></p>
<p>Minimalist Baker GF flour blend:</p> <p>1 ½ cups brown rice flour ½ cup potato starch ¼ cup white rice flour ¼ cup tapioca flour 1 tsp xanthan gum (optional)</p> <p>For directions see: https://minimalistbaker.com/diy-gluten-free-flour-blend/</p>	<p>GF flour blend provided by Linda Arnold:</p> <p>4 cups white rice flour 2 cups potato starch 1 cup corn starch 1 cup soy flour (or any other high protein flour such as chickpea)</p>

As time goes on there are more and more gluten free products that become available. Please consult with a Registered Dietitian or call us if you are unsure about a new product.

Used for gluten free cooking classes and Gluten Free Living 101 sessions.

