



**GoBarley**

## Barley Ingredients

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Barley is an ancient cereal grain that offers not only versatility but a high nutritional profile. It is a good source of protein, dietary fibre, vitamins and minerals. Barley is also an excellent source of  $\beta$ -glucan soluble fibre, which helps to reduce cholesterol, a risk factor for heart disease. Both Canada and the U.S. allow manufacturers to make a heart-health claim for foods containing barley. The food must have at least 0.75 grams of  $\beta$ -glucan soluble fibre per serving in the U.S.<sup>1</sup>, and one gram in Canada<sup>2</sup>, to make the claim. Research has also shown that barley  $\beta$ -glucans lower blood glucose levels, which is important in the prevention and management of type 2 diabetes. Eating barley also increases satiety, which aids in weight management.

### Canadian Barley

Canada is one of the world's largest barley producers, and produces both hulled and hullless barley. Hullless barley has a weaker attachment of the hull to the seed kernel than regular or hulled barley, allowing for the hull to be removed during harvesting and eliminating the need for it to be removed prior to processing the grain. This is particularly beneficial in the production of barley flour.

Canada is a leader in the development of hullless barley varieties, some of which have different starch characteristics due to altered levels of amylose content. These varieties are considered more functional than varieties with more normal starch characteristics. This is due to the high swelling power and the colloidal stability associated with the zero- or low-amylose (waxy) starch types and the unique gelling and film-forming properties of the high-amylose types<sup>3</sup>. In addition, barley, having different starch characteristics, tends to be higher in  $\beta$ -glucans and total dietary fibre than varieties with normal starch characteristics<sup>4</sup>.

**Amylose and  $\beta$ -glucan Levels in Hullless Barley Types**

Barley Type	Amylose Level (%)	$\beta$ -glucan (%)
Normal Starch	20-30	4.5-5.0
Zero Amylose	0	8.0-10.0
Low Amylose (Waxy)	1-5	6.0-8.0
High Amylose	>30	6.0-8.0

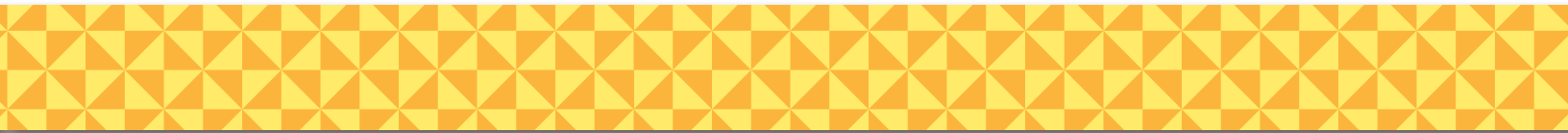


## Pearled Barley

The most common method of processing hulled barley involves the gradual removal of the outer tissues of the kernel by abrasion—a process referred to as pearling. Through this process, the tough, fibrous and largely indigestible hull is removed. The hull represents 10 to 13 per cent of the dry weight of the kernel, but the commercial pearling method involves removing more than the hull in order to produce a white-coloured, quick-cooking product. Pearling allows barley to have a longer shelf life by removing the germ that causes rancidity as well as the phenolic compounds and enzymes that cause barley to darken<sup>5</sup>. Typically, pot or scotch barley has 15 per cent of its outer layers removed, whereas pearl barley has more—commonly as high as 45 per cent<sup>6</sup>. Because the bran layer and germ are removed, pot and pearl barley are not considered whole-grain.

Cooked pearled barley is used in preparing soups, stews, casseroles and pilafs. It is also used to produce miso, barley tea, shochu and rice extender in the Japanese market.





## Barley Grits and Flakes

Barley grits or bits are made from dehulled barley using rotary cutters that are mounted in a revolving drum. Depending on the angle of the knives, the kernels can be cut into varying sizes depending on the size of pieces desired<sup>5</sup>.

The flaking process used to produce barley flakes is similar to that of producing oat flakes or rolled oats. Dehulled barley kernels are first sized, then tempered to increase moisture content by two to four per cent. The tempered kernels are then passed through a kiln where they are heated to 99 to 104° C. The heating process deactivates enzymes, produces a roasted flavour and gelatinizes starch. Flaking is accomplished by passing hot, moist grains through flaking rollers that flatten the kernel, producing flakes of different thicknesses. Instant or quick-cooking barley flakes are about 0.25 to 0.38 millimetres thick, whereas “old-fashioned” barley flakes are 0.5 to 0.76 millimetres thick. Steel-cut barley can also be made by cutting tempered barley using rotary cutters<sup>5</sup>.

Barley grits, flakes and steel-cut barley are considered whole grain and are used to make porridge. Barley grits and flakes can be used as an additive in multigrain bread formulations. Barley flakes are also used for making cookies and other baked products, and can be used as a topping on pan breads.



## Barley Flour

Hulless or dehulled barley can be milled into flour using conventional milling processes including stone, hammer, pin and roller milling. According to research conducted at the Canadian International Grains Institute (unpublished data, 2008), roller milling barley requires adjusting the milling process as follows:

- Eliminating the tempering step
- Reducing the load to the first break
- Changing the mill flow to target the bulk of flour production in the break system
- Using fine wire screens
- Adjusting roll gaps to improve flour yields



The research also showed that the relatively harder kernel texture associated with the hulless barley varieties with normal starch properties allowed for improved handling during the milling process compared with hulless barley varieties with waxy and zero-amylose starch properties. However, it was possible to increase extraction rates of waxy and zero-amylose varieties by directing the shorts to the low-grade stream and by using coarser screens.

Provided the bran and germ are present, barley flour is considered to be whole-grain. Barley flour can replace all or part of the wheat flour in a wide assortment of bakery products including pan breads, flat breads (pitas, tortillas, chapatis), cookies, muffins and cakes. Depending on the product, only partial replacement of the wheat flour is possible to achieve optimum quality. Barley flour can also partially replace wheat flour in the production of pasta and noodles. Extruded snacks and breakfast cereals can be produced using 100 per cent barley flour.



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## Infrared Processing

Partially cooked barley flour, flakes and grits can be produced using infrared processing or micronization. The process involves exposing the product to electromagnetic waves within the infrared spectrum. The heat treatment deactivates enzymes and partially gelatinizes starch, resulting in more shelf-stable products, reduced cooking times and a softer texture.

## Fractionation and $\beta$ -Glucan Extracts

High  $\beta$ -glucan, high protein and starch fractions can be achieved by pin milling and air classifying barley. These fractions can be added to food formulations to boost the  $\beta$ -glucan or protein content of the product. Various extraction procedures can be used to produce high barley  $\beta$ -glucan extracts (70 to 80 per cent  $\beta$ -glucan), which can be used to produce foods with enhanced  $\beta$ -glucan content. Both fractions and extracts are more expensive than more traditional barley ingredients.

## Barley—The Right Choice

Barley ingredients offer versatility along with desirable nutritional and functional properties. Adding barley allows manufacturers to make a heart-health claim. Barley also has a great flavour, making it a good choice for creating healthier-for-you foods.

## References

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