

Scope of Hulless Barley (*Hordeum vulgare* L.) as a Nutritious and Medicinal Food: A Review

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Basically, barley is known as ancient cereal grain with high nutritional value and very specific health benefits and fourth most important crop after maize, wheat and rice. Barley is good source of protein, insoluble fiber, vitamins, minerals and it is an excellent source of the soluble fiber β -Glucan. β -Glucan in barley has been shown to reduce cholesterol, a risk factor for heart disease. Hulless barley has many positive characteristics for feed, food and malt uses. On the basis of hulling barley is classified into two group's hulled barley and hulless barley. The development of hulless barley varieties with normal and enhanced levels of β -glucans provides an opportunity to more easily mill barley into whole grain flour for incorporation into foods that meet barley health claim requirements. Because of presence of more high levels of both soluble and insoluble fibers, barley flours typically have a much greater water absorption capacity than wheat flours. Research showed that barley efficiently can be used in preparation of different food products viz., barley flours in baked goods, pasta, snack food, bread, crackers, and soups.

Keywords: β -Glucan, Hulless Barley; Medicinal; Flour; Food; Human Consumption; Cereal**Introduction**

Barley (*Hordeum vulgare* L.) is one of the world's most ancient grown good crop since the early stages of agricultural innovations 8,000-10,000 years ago [1]. The world production of barley during year 2017-18 was 142 Global demand and consumption of agricultural crops, particularly cereals, for food and feed is increasing at a rapid pace [2]. Barley is considered as most cosmopolitan of the crops, grown in wide environmental range and it has been considered, as poor man's crop because it needs low input and have better adaptability to changing environments viz., drought, salinity, alkalinity and marginal lands [3]. Presently use of barley is primarily for malt and beer production, secondarily used as animal feed and also increases the use as food for human consumption. But before the introduction of semi dwarf high yielding wheat varieties during green revolution (1960's) about 80% barley produced in India was being consumed as food grains [4]. Both hulled and hulless barley varieties are grown, although the vast majority are hulled. Hulless barley refers to a type of barley in which the tough inedible outer hull is loosely adhered to the

kernel. The outer hull is so loose, that when this barley is harvested in the field, the outer hull usually falls off. Processors often refer to this type of barley as 'naked' barley. Hulless barley requires little to no processing to remove the tough inedible outer hull. Because this product requires minimal cleaning as compare to hulled barley [5]. A great interest has recently risen in the development of functional foods and products that may provide a health benefit beyond the traditional nutrients. Foods rich in antioxidants and a low glycemic index (GI) can reduce the risk of increased postprandial oxidative stress, which is one of the constituents of the onset of several chronic diseases [6]. Traditionally barley had been grown and used as a medicinal food and presently research showed that it is a good source of protein, insoluble fiber, vitamins, minerals and it is an excellent source of the soluble fiber β -Glucan, which has been shown to reduce cholesterol, a risk factor for heart disease.

Nutrient composition and health benefits of barley

The health benefits and medical applications of barley foods are referred to in ancient Arabic, Chinese, Egyptian, Ethiopian

and Greek literature and have been reported by more recent civilizations from Asia to Europe [7]. Whole barley grain consists of about 65 - 68% starch, 10 - 17% protein, 2 - 3% free lipids, 4 - 9% β -glucans and 1.5 - 2.5% minerals [8]. Barley contain protein similarly to other cereals, but like oats, contains higher levels of the soluble fiber β -glucan compared with other cereal grains such as wheat and rye. And research showed that the β -glucans found in barley can lower blood cholesterol levels and thereby, reduce the risk of coronary heart disease [9]. Research has also shown that these β -glucans also lower blood sugar, which is important in the prevention and management of type 2 diabetes [10]. Barley have a soluble fiber in the form of β -glucans and also an excellent source of insoluble fiber, which is important in maintaining digestive health and protecting against colon cancer [11]. Barley also has high levels of tocotrienols, phenolic compounds and lignans, which are responsible to reduce the risk of coronary heart disease, diabetes, and certain cancers. Barley is a good source of many essential vitamins and minerals, including thiamin, niacin, folate, riboflavin, iron, phosphorus, magnesium, zinc, and selenium, all of which are important in maintaining good health and weight control. Barley contains levels of fat that are similar to other cereal grains, with the exception of oats, which has higher levels of fat than any other cereal grains [12].

Renewed interest in barley

Barley occupies the fourth position among the cereal crops in the world [13] However, presently, barley remains underutilized as human food, only three percent of the total produce being used the most economically desirable use of barley is for the production of malt, research is going on to produce new barley varieties with favorable production characteristics and high quality for human and animal consumption. US Food and Drug Administration reported in 2006 [14] that it is containing foods which provide at least 0.75 g of soluble fiber/serving can make the claim that they may reduce the risk of heart disease. Barley β -glucans have been shown to lower/reduce blood cholesterol. High cholesterol is a risk factor in the development of coronary heart disease. Because of these medicinal and nutritional value of barley, the interest in increasing day by day.

Use of hulless barley

With the global food problems and environmental changes, the demand on cereals, especially those that are drought tolerant such as barley has increased tremendously [15]. Most barley is used in

the malting industry or as a livestock feed, but there is growing interest in the use of barley ingredients in food products. However, barley remains underutilized as human food, only three percent of the total produce being used [8]. Hulless barley has higher crude protein and lower crude fiber than hulled barley [16]. The presence of β -glucans is undesirable for malt production, but it is highly desirable when barley is grown for food. For this reason, hulless varieties are being developed primarily for use as human food. The development of hulless barley varieties with normal and enhanced levels of β -glucans provides an opportunity to more easily mill barley into whole grain flour for incorporation into foods that meet barley health claim requirements. Barley flours typically have a much greater water absorption capacity than wheat flours, which can affect baking performance. Their greater water absorption capacity is due to their higher levels of soluble fiber, mainly β -glucans [17]. Whole grain hulless barley flour can be used to formulate health-promoting baked products, pastas and direct expanded snack/breakfast cereal products. Partial substitution of wheat flour with whole grain barley flour resulted in the production of high quality products, although modifications to formulation and processing conditions were needed the most.

Conclusion

Because of more nutritional benefit and yield ability of a barley in drought stress condition, it is a very important cereal crop to be used as food purpose. Recent researches have established several health benefits of barley, predominantly because of its β -glucans content. There is need to do more research on use of hulless barley for the preparation of different food products.

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