

**Mini-review****Potential Therapeutic Effect of Barley on Cardiovascular Diseases**

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ABSTRACT

Barley is a fantastic food option for those with various illnesses as well as for those who want to lead a healthy lifestyle. This cereal is a great source of soluble dietary fiber, particularly beta glucans, and it also includes vital vitamins and minerals. For its excellent antioxidant activity and as a source of vitamins and minerals, green barley is advised. Depending on phytonutrients such as -glucan, phenolics, flavonoid, lignans, tocols, sitosterol, and folic, regular consumption of whole wheat grain and its hydroethanolic extracts decreases the risk of chronic ailments (hyperglycemia, malignancy, overweight, cardiac disease. Barley and its products in a recent year had gain an importance due to its counteractive components which play potent role against cardiovascular diseases by lowering down the oxidative stress and improving High density lipoprotein further Lowering down low-density lipoprotein, VLDL ratios further regulating insulin levels and lowering down the spike in blood glucose levels showing potent anti-oxidative and cardiovascular functions. Due to their abundance in these nutrients, barley is effective in promoting healthy bodily function. To enjoy all of the advantages of barley, barley grain is a wonderful option.

INTRODUCTION

Elevated blood pressure, coronary heart disease (CHD), heart failure, and stroke are all examples of cardiovascular disease (CVD), a condition that affects the heart and blood arteries. Elevated blood pressure, coronary heart disease (CHD), heart failure, and stroke are all examples of cardiovascular disease (CVD), a condition that affects the heart and blood arteries. This disease is usually related with fatty deposits which are buildup inside arteries and there is chance of blood clots. Strokes and heart attacks are acute events which are mainly caused by obstruction of blood from going from the heart to brain. Heart muscles, valves are affected by the heart disease this can also result in arrhythmias. Heart and blood vessel disorders that

impact the anatomy and physiology of the circulatory system are referred to as cardiovascular diseases [1]. Hypertension, ischemic heart disease, Peripheral vascular disease, stroke, rheumatic heart disease, heart failure, valvular heart disease, and a congenital cardiac condition are the most prevalent forms of CVD [2]. Cardiovascular diseases (CVDs) are becoming more common over the world and are currently regarded as the main cause of death in both emerging and industrialized nations. The prevalence of these diseases has increased and reached alarming levels in recent decades as a result of the quick economic development and increasingly westernized lifestyle [3]. Symptoms include chest pain, breathlessness,

feeling dizzy, faint, swollen limbs, fatigue, weakness, very fast or slow heartbeat, numbness in legs or arms, stress, and being physically inactive [4] as shown in Figure 1.

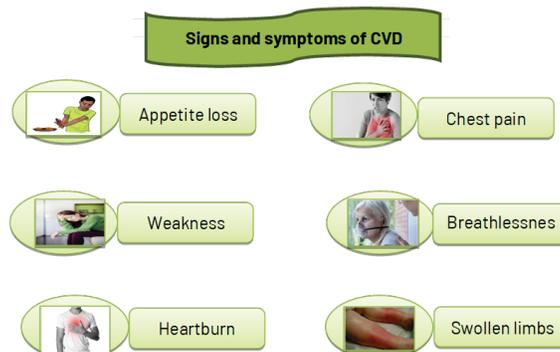


Figure 1: Signs and Symptoms of CVD

Health benefits

Hordeum vulgare, often known as barley, is a plant in the Poaceae family. One of the oldest cereal crops still being cultivated today is barley [5]. It is estimated that barley was cultivated from its native relative roughly 10,000 years ago. Phenolic acid, folate, vitamin E, lignans, phenolic acids, flavonoids, phytosterols are all present in whole grain barley. Barley is not just a significant feeder, malts, and food crops in several countries throughout the world, as well as the greatest cereal resource of functional component among the most widespread variety of multifunctional cereal crops and are incredibly full of beneficial nutrients. Especially fibre, phenol's, flavones, phytosterol, alkylneresorcinols, benzoxenezinoids, lignans, tocols, and folic acid, which have anti-diabetes, anti-cancer, anti-obesity, preventive cardiovascular disease, antioxidant, anti-proliferative, and cholesterol lowering properties [6,7].

Functioning Ingredients in Barley grass and Barley grain against chronic illnesses:

β-Glucans can be used as candidates for the medication in the treatment of human chronic diseases as depicted in Table 1:

Preventative action against Chronic Illnesses	Functioning component in Grass	Functioning components in Grains	References
Anti-Hyperglycemic effect	Saponin; Fibres Calcium; AMPK, polyaminases; Gamma alpha amino butyric acid, Sodium Oxide Dismutase.	beta-glucan; phenols polysaccharidases; tocolic compounds; phytosterolic compounds, resistant starches.	[8]
Lipid lowering effects or anti-obesity	Saponin; α-tocopherols; 2"-O- homovitexin, polysaccharidases	Polysacchridases, starches, tocolic compounds, dietary fibers, polyphenolic compounds, polysaccharidases, phytosterolic compounds.	[9]
Anti-cancerous	Alkaline, flavonoids, chlorophyll; tricin; Sodium Oxide Dismutase	Beta-glucan, phenolic compounds, arabinoxylanes, phytosterolic compounds, lignans, resistant starches	[10,11]
Anti-oxidative effects	Chlorophyll; lutoarin, saponarin; isoorientin, orientin; γ-tocopherol, glutathione; Sodium Oxide Dismutase, flavonoid, (GABA)	Polyphenolics, anthocyanides, tocotrienols, polysaccharidases, (GABA)	[12,13]
Immunomodulatory effects	Arabinoxylan; polysaccharide, Gamma amino butyric acid	Beta-Glucans, Arabinoxylan's	[14,15]
Cardioprotective effects	potassium, Gamma amino butyric acid	Beta-D-Glucan	[16]
Blood pressure regulatory effect	Saponarin; lutoarin, potassium, Calcium; Gamma Amino Butyric Acid	Beta-Glucans	[17]
Bowel health regulatory effect	Soluble and Insoluble fiber	Beta-Glucans, Soluble and insoluble Fiber	[18]
Anti-preventative effect against CVD	Saponin; tryptophan's, vitamins (retinol, Thymine, tocopherol), Sodium Oxide Dismutase; Potassium, Calcium; Gamma Amino Butyric Acid	Beta-Glucans, Arabinoxylan's, polyphenolic compounds, phytosterolic compounds, lignans, tocolic compounds, folic acid	[19-20, 5]

Table 1: Functioning Ingredients in Barley grass and Barley grain against chronic Illnesses

CONCLUSIONS

Barley (*Hordeum vulgare* L.) is the world's fourth most significant cereal grain, with the greatest fibre composition, and can be utilized in a variety of industries for a variety of uses. Regular consumption of whole wheat grain and its hydroethanolic extracts decreases the risk of chronic ailments such as hyperglycemia, malignancy, overweight, cardiac disease, and so on. Barley and its products had gained an importance due to its counteractive components which play potent role against cardiovascular diseases.

Conflicts of Interest

The authors declare no conflict of interest.

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REFERENCES

- [1] Guglielmo M, Lin A, Dey D, Baggiano A, Fusini L, Muscogiuri G, et al. Epicardial fat and coronary artery disease: role of cardiac imaging. *Atherosclerosis*. 2021 Mar; 321: 30-8. doi: [10.1016/j.atherosclerosis.2021.02.008](https://doi.org/10.1016/j.atherosclerosis.2021.02.008).
- [2] Csige I, Ujvárosy D, Szabó Z, Lőrincz I, Paragh G, Harangi M, et al. The impact of obesity on the cardiovascular system. *Journal of diabetes research*. 2018 Nov; 2018: 1-12. doi: [10.1155/2018/3407306](https://doi.org/10.1155/2018/3407306).
- [3] Nangia R, Singh H, Kaur K. Prevalence of cardiovascular disease (CVD) risk factors. *Medical Journal Armed Forces India*. 2016 Oct; 72(4): 315-319. doi: [10.1016/j.mjafi.2014.07.007](https://doi.org/10.1016/j.mjafi.2014.07.007).
- [4] Sidhu GS, Ward C, Ferdinand KC. Racial disparity in atherosclerotic cardiovascular disease in hospitalized patients with diabetes 2005-2015: Potential warning signs for future US public health. *American Journal of Preventive Cardiology*. 2020 Dec; 4: 100095. doi: [10.1016/j.ajpc.2020.100095](https://doi.org/10.1016/j.ajpc.2020.100095).
- [5] Jabeur I, Martins N, Barros L, Calhella RC, Vaz J, Achour L, et al. Contribution of the phenolic composition to the antioxidant, anti-inflammatory and antitumor potential of *Equisetum giganteum* L. and *Tilia platyphyllos* Scop. *Food and Function*. 2017 Jan; 8(3): 975-984. doi: [10.1039/C6F001778A](https://doi.org/10.1039/C6F001778A).
- [6] Woldemichael MD. Importance, biology, epidemiology, and management of Loose Smut (*Ustilago nuda*) of barley (*Hordeum vulgare*): A Review. *East African Journal of Sciences*. 2019 Jan; 13(1): 89-108.
- [7] Wang Y, Ren X, Sun D, Sun G. Origin of worldwide cultivated barley revealed by NAM-1 gene and grain protein content. *Frontiers in Plant Science*. 2015 Sep; 6(3): 1-12. doi: [10.3389/fpls.2015.00803](https://doi.org/10.3389/fpls.2015.00803).
- [8] Punia S, Siroha AK, Sandhu KS, Kaur M. Rheological behavior of wheat starch and barley resistant starch (type IV) blends and their starch noodles making potential. *International journal of Biological Macromolecules*. 2019 Jun; 130(34): 595-604. doi: [10.1016/j.ijbiomac.2019.03.009](https://doi.org/10.1016/j.ijbiomac.2019.03.009).
- [9] Zhang J, Xiao X, Dong Y, Shi L, Xu T, Wu F. The anti-obesity effect of fermented barley extracts with *Lactobacillus plantarum* dy-1 and *Saccharomyces cerevisiae* in diet-induced obese rats. *Food and Function*. 2017 Jan; 8(3): 1132-43. doi: [10.1039/C6F001350C](https://doi.org/10.1039/C6F001350C).
- [10] Guo H, Lin S, Lu M, Gong JD, Wang LU, Zhang Q, et al. Characterization, in vitro binding properties, and inhibitory activity on pancreatic lipase of β -glucans from different Qingke (Tibetan hulless barley) cultivars. *International journal of Biological Macromolecules*. 2018 Dec; 120(33): 2517-2522. doi: [10.1016/j.ijbiomac.2018.09.023](https://doi.org/10.1016/j.ijbiomac.2018.09.023).
- [11] Fritsche S, Wang X, Jung C. Recent advances in our understanding of tocopherol biosynthesis in plants: an overview of key genes, functions, and breeding of vitamin E improved crops. *Antioxidants*. 2017 Dec; 6(4): 99-121. doi: [10.3390/antiox6040099](https://doi.org/10.3390/antiox6040099).
- [12] Liao Z, Cai H, Xu Z, Wang J, Qiu C, Xie J, et al. Protective role of antioxidant huskless barley extracts on TNF- α -induced endothelial dysfunction in human vascular endothelial cells. *Oxidative Medicine and Cellular Longevity*. 2018 May; 15(2): 1-12. doi: [10.1155/2018/3846029](https://doi.org/10.1155/2018/3846029).
- [13] Gangopadhyay N, Rai DK, Brunton NP, Gallagher E, Hossain MB. Antioxidant-guided isolation and mass spectrometric identification of the major polyphenols in barley (*Hordeum vulgare*) grain. *Food Chemistry*. 2016 Nov; 210(33): 212-220. doi: [10.1016/j.foodchem.2016.04.098](https://doi.org/10.1016/j.foodchem.2016.04.098).
- [14] Ma Y, Wang P, Wang M, Sun M, Gu Z, Yang R. GABA mediates phenolic compounds accumulation and the antioxidant system enhancement in germinated huskless barley under NaCl stress. *Food Chemistry*. 2019 Jan; 270(39): 593-601. doi: [10.1021/jf802846x](https://doi.org/10.1021/jf802846x).
- [15] Zhu F. Anthocyanins in cereals: Composition and health effects. *Food Research International*. 2018 Jul; 109(31): 232-249. doi: [10.1016/j.foodres.2018.04.015](https://doi.org/10.1016/j.foodres.2018.04.015).
- [16] Casieri V, Matteucci M, Cavallini C, Torti M, Torelli M, Lionetti V. Long-term intake of pasta containing barley (1-3) beta-D-glucan increases neovascularization-mediated cardioprotection through endothelial upregulation of vascular endothelial growth factor and parkin. *Scientific*

- Reports. 2017 Oct; 7(1): 1-6. [doi: 10.1038/s41598-017-13949-1](https://doi.org/10.1038/s41598-017-13949-1).
- [17] Tong LT, Zhong K, Liu L, Zhou X, Qiu J, Zhou S. Effects of dietary hull-less barley β -glucan on the cholesterol metabolism of hypercholesterolemic hamsters. *Food Chemistry*. 2015 Feb; 169(23): 344-349. [doi: 10.1016/j.foodchem.2014.07.157](https://doi.org/10.1016/j.foodchem.2014.07.157).
- [18] Martínez M, Motilva MJ, de Las Hazas MC, Romero MP, Vaculova K, Ludwig IA. Phytochemical composition and β -glucan content of barley genotypes from two different geographic origins for human health food production. *Food Chemistry*. 2018 Apr; 245: 61-70. [doi: 10.1016/j.foodchem.2017.09.026](https://doi.org/10.1016/j.foodchem.2017.09.026).
- [19] Zhang H, Zhang N, Xiong Z, Wang G, Xia Y, Lai P, et al. Structural characterization and rheological properties of β -D-glucan from hull-less barley (*Hordeum vulgare* L. var. nudum Hook. f.). *Phytochemistry*. 2018 Nov; 155(67): 155-163. [doi: 10.1016/j.phytochem.2018.08.004](https://doi.org/10.1016/j.phytochem.2018.08.004).
- [20] Sima P, Vannucci L, Vetvicka V. β -glucans and cholesterol. *International journal of molecular medicine*. 2018 Apr; 41(4): 1799-808. [doi: 10.3892/ijmm.2018.3411](https://doi.org/10.3892/ijmm.2018.3411).