

## Health Benefits of Hazelnut

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### Abstract

Hazelnuts are nutrient nuts with complex matrices rich in unsaturated fatty and other bioactive compounds such as high-quality vegetable protein, fiber, minerals, tocopherols, phytosterols, and phenolic compounds. By advantage of their exclusive composition, hazelnuts are likely to beneficially health impacts. Epidemiologic studies have associated hazelnut consumption with a reduced incidence of the risk of certain chronic diseases, such as heart disease, type 2 diabetes, hypertension, and cancer and that it may combat some of the negative effects associated with aging. Hazelnut oil decreases the cholesterol level in blood and also controls unfavorable effects of hypertension. Cognitive decline and Alzheimer's disease also appear to be positively influenced by hazelnut consumption. It is clear that  $\beta$ -sitosterol of hazelnut have a beneficial impact to reduce cholesterol levels and defend against different types of cancer such as breast, colon and prostate cancer. Interventional studies consistently show that hazelnut fiber clears the veins and arteries of cholesterol and thus helps the blood to flow more freely, transporting oxygen and nutrients more speedily around the body and avoiding heart difficulties. Further it also clears the digestive and intestinal tract and helps to prevent constipation and to flush the system of toxins. Contrary to expectations, epidemiologic studies and clinical trials suggest that regular hazelnut consumption is unlikely to contribute to obesity and may even help in weight loss. Also, 100 g hazelnut can provide easily, a daily consumption of Mn, Cu and Co levels of human beings and about 50% for Fe, 41% for Mo, 32% for Zn, 21% for Se, 21% for Cr, 5% for B, 1% Ni of the recommended daily amount. Briefly, hazelnuts are nutrient rich foods with wide-ranging cardiovascular and metabolic benefits, which can be readily incorporated into healthy diets.

**Keywords:** Cardiovascular Disease; Cholesterol; Hazelnut; Health; Nut; Nutrient

### Introduction

A hazelnut tree (*Corylus*) belongs to *Corylaceae* family and is classified to the oldest fruit trees to be originated in the regions of north-western Europe and North America. Today, the most popular hazelnut tree (*Corylus avellana* L.) is grown mainly in Europe and in Asia Minor, with Turkey and Italy as the leading producers. Hazelnut tree fruit is a nut connate with its tightly adherent fruit coat. A dry coat provides, average, for 40% of a nut weight and the remaining 60% constitutes a nut itself [1].

Hazelnuts are used as popular snacks. Hazelnut kernels are consumed as natural, blanched and roasted or their products, such as sliced, chopped, flour and hazelnut butter, in the world in order to provide flavor in dairy, bakery, confectionery, candy and chocolate products. Hazelnut oil is produced in a cold pressed version as well as in a refined version in the countries which are its main manufacturers. Eighty percent of the hazelnut kernels are processed in chocolate manufacture, 15% in confectionery, biscuit and pastry manufacture, 5% is consumed without any further processing [2,3].

Although nutritional and chemical composition of hazelnuts are generally referred to variety, ecology and cultural purposes [4], this paper provides a compilation of nutrient content of hazelnut, highlighting the nutritional benefits.

### Nutrient Content of Hazelnut

Hazelnuts play a major role in human nutrition and health due to their very special nutritional value. One hundred grammes of hazelnut provides 600 - 650 kcal [5]. Hazelnut kernel includes carbohydrate at 10 - 22% [6]. It also includes organic acids but in small quantities and the most abundant organic acid in hazelnut kernel is malic acid [6]. Cellulose and pectin in hazelnut are available at a rate of 1 - 3% [2]. The protein content of hazelnut kernel changes between 10% and 24%. It has been reported that 22% of daily protein requirement in the human diet could be supplied by consuming 100 g of hazelnut in a day [2]. Hazelnut kernels are a good source of fat (50 - 73%) and contain unsaturated fatty acids i.e. linoleic, linolenic, oleic acids, palmitic and stearic [7]. Besides their rich mineral content, hazelnut kernels are among important sources of essential vitamins, such as vitamins B<sub>1</sub>, B<sub>6</sub>, niacin and  $\alpha$ -tocopherol [2]. In sterol fraction,  $\beta$ -sitosterol is dominant (up to 90%), apart from this compound there are also campesterol (4%), stigmasterol (2%). Other compounds identified in hazelnut oil include 4-metylosterols, represented by citrostadienol (27%), obtusifoliol (21%) and gramisterol (9%) [8]. hazelnuts also are a good source of dietary fiber (10.4%) [9]. Moreover, hazelnuts are rich in various bioactive substances such as L-arginine [10], selenium, caffeic acid [11], gallic acid, p-hydroxy benzoic acid, epicatechin, sinapic acid and quercetin that could have anti-atherogenic effects by means of biological mechanisms acting on various pathways in cardiovascular disease development [12].

### Effects of microelement profile of hazelnut

Hazelnut is a rich source of major elements and it may turn into an good-looking food for its trace elements for the human diet. Many aware people prefer supplementary foods with rich contents. Therefore, in recent years, there has been an increasing interest in the use of trace elements as micro-nutrient supplements in medical treatment to avoid various diseases such as cancer, cardiovascular diseases, AIDS, Alzheimer's disease, Kashin-Beck disease, Keshan disease, osteoporosis, osteoarthritis, asthma, goiter, cataracts, stroke, arthritis, ageing, anemiaeate, and to complete mineral deficiency [13,14]. It is important to estimate the plant type and growth situation in view of the human healthy standard and so, many papers have been published in recent years on the biological tasks of microelements in humans. According to the daily microelement requirements, 100 g hazelnut provided about 50% for Fe, 41% for Mo, 32% for Zn, 21% for Se, 21% for Cr, 5% for B, 1% Ni of the recommended daily amount. Also, 100 g hazelnut can provide easily, a daily consumption of Mn, Cu and Co levels of human beings [15].

### Effects of hazelnut oil and fatty acids

The ratio of unsaturated/saturated fatty acids of hazelnut oil as mean fatty acid was 13.1. As a result of the high ratio of unsaturated/saturated fatty acids found in hazelnut, its addition to processed food can develop the nutritional excellence of the produced food [16]. Also, the ratio of polyunsaturated/saturated fatty acids was 1.23 - 2.87 in the hazelnut varieties. Dietary advices tend to decrease total quantity of fats and cholesterol and to attain a ratio of polyunsaturated/saturated fatty acids greater than 1 [17]. Hazelnuts may be correlated with cardiovascular disease prevention because of their fatty acid composition, mostly based on monounsaturated fatty acids, that protect low-density lipoproteins against oxidation. Damavandi, *et al.* [18] demonstrated that replacing 10% of total daily calorie intake with raw, unsalted hazelnuts could preserve high density lipoprotein cholesterol in patients with type 2 diabetes but had no effects on fasting blood sugar, total cholesterol, low density lipoprotein cholesterol, and triglyceride levels. Perna, *et al.* [19] performed a systematic review and a meta-analysis to combine the consequences from several trials and to estimate the overall outcome of hazelnuts on blood lipids and body weight outcomes. Results showed that a hazelnut-enriched diet decreases low-density lipoprotein cholesterol in a significant way and shows a tendency toward reduction of total cholesterol, without decreasing high-density lipoprotein cholesterol; while triglycerides and body mass index stay substantially unchanged. These data verified a potentially favorable effect on cardiovascular disease avoidance and propose the need for further research with long-term intervention studies and large study groups in order to confirm and subsequently support the consumption of hazelnuts to advantage the physiological cholesterol serum pattern. Also, Durak, *et al.* [20] showed that hazelnut oil decreases the cholesterol level in blood and also controls unfavorable effects of hypertension.

**Effects of hazelnut tocopherols**

Hazelnut is known to contain lipids including tocopherols. Among tocopherols,  $\alpha$ -tocopherol (382 - 472 mg/kg) occurs in the highest quantities and is also accompanied by  $\gamma$ -tocopherol [8]. There is growing evidence that  $\alpha$ -tocopherol, the active form of vitamin E, helps to lower the risk of certain chronic diseases, such as heart disease [21], type 2 diabetes [22], hypertension [23], and cancer [24] and that it may combat some of the negative effects associated with aging [25].  $\alpha$ -Tocopherol may also be protective against cognitive decline and Alzheimer's disease [26].

**Effects of hazelnut  $\beta$ -Sitosterol**

Hazelnuts contain  $\beta$ -sitosterol, a natural plant sterol recognized to reduce cholesterol levels and defend against different types of cancer such as breast, colon and prostate cancer.  $\beta$ -sitosterol is presently under intense study because it is believed it can capably stop tumor growth and induce programmed cell death in cancer cells [27].

**Effects of hazelnut Proteins**

Hazelnuts similar to many nuts are a great plant source of protein. Human body uses protein in countless important tasks such as building and maintaining the skin and tissue. Essentially the body takes the amino acids used in protein sources and then recombines them to build parts of the body. As well as tissues and other body parts, proteins are also used for the creation of enzymes (the catalysts for chemical reactions around the body), immune function and much more. While meat sources are higher in protein content, and higher in bioavailability, hazelnuts are a popular and important source of high-quality vegetable protein in vegetarian diets, where they rank high on the list of foods most frequently consumed, above meat substitutes. Also, they have a high content of L-arginine. This amino acid is the precursor of the endogenous vasodilator (nitric oxide), and might help improve vascular reactivity [28].

**Effects of hazelnut Fiber**

Hazelnuts are a great source of dietary fiber. Fiber essentially passes through the body without being transformed or dissolved and this means that it acts approximately similar to a 'sweep' going through the system and clearing debris and toxins along the way. This clears the veins and arteries of cholesterol and thus helps the blood to flow more freely, transporting oxygen and nutrients more speedily around the body and avoiding heart difficulties. Further it also clears the digestive and intestinal tract and helps to prevent constipation and to flush the system of toxins [29].

**Conclusion**

Hazelnuts are energy dense foods rich in bioactive macronutrients, micronutrients and phytochemicals. The distinctive composition of hazelnuts is critical for their health effects. In fact, there are consistent evidences from epidemiologic and clinical studies of the beneficial effects of hazelnut consumption on risk of coronary heart disease and emerging cardiovascular risk factors. Hazelnuts in a healthy dietary pattern will enlarge the cardioprotective effects beyond those attributable to the components of any healthy diet exclusive of nuts. Importantly, these effects occur without undue weight gain, or even with reduced adiposity, and target multiple cardiovascular risk factors and mechanisms, which help clarify why hazelnuts so potently diminish the risk for coronary heart disease.

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