



Peanut Health Benefits (HBs) – A Critical Review

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ABSTRACT: Peanuts are a great source of monounsaturated and polyunsaturated fatty acids, like oleic acid, which are beneficial for human health. Their favorable lipid profile is known to improve consumer health by lowering levels of harmful cholesterol. Peanuts naturally contain no cholesterol and are a good source of protein, with a well-rounded amino acid profile. They also contain essential minerals and antioxidants. The peanut's skin is particularly rich in antioxidants and amino acids, providing long-term health advantages. Processed products like roasted peanuts can have more health benefits than raw ones. Roasting, for example, can significantly increase the quantity of antioxidants. Similarly, boiling peanuts boosts the amount of beneficial compounds, such as the antioxidant isoflavin and biochannin. Regular consumption of peanuts and peanut butter is linked to a reduced risk of cardiovascular diseases, benefiting people of all ages and genders. Studies have also shown that a modest intake of peanuts may help reduce the risk of type 2 diabetes, certain cancers, and Alzheimer's disease. However, a significant drawback is that peanuts are a common allergen for many people. Globally, the majority of peanuts are used for oil extraction. China is the world's largest producer, accounting for 44% of global production, followed by India at 20% and Nigeria at 11%.

Keywords: Antioxidants, Biochannin, China, Isoflavin, Riboflavin.

INTRODUCTION

Groundnut, often called the "king of oilseeds", is a legume from the *Fabaceae* family that originated in South America and is now cultivated worldwide. It is a vital crop grown across more than 20 million hectares globally, ranking as the second most planted oilseed crop, after rapeseed. Annual global production is approximately 33 million tons. In India, which has the largest area under groundnut cultivation and ranks second in production, the crop was grown on 5.34 million hectares, yielding 7.46 million tons during the 2020 season. The leading global producers are China (44%), India (20%), and Nigeria (11%), which together account for 75% of the world's production. Groundnuts are nutritionally significant due to their rich content of proteins, fats, carbohydrates, vitamins, minerals, and organic compounds. Thousands of varieties are cultivated worldwide, with the most common being Spanish, Runner, Virginia, and Valencia. The choice of variety depends on factors such as flavor, oil content, size, shape, and disease resistance. For instance, Spanish groundnuts are often used for making groundnut candy, salted nuts, and groundnut butter,

while Runner varieties are typically preferred for producing groundnut butter.

MATERIALS AND METHODS

The foundation of this study is a combination of the author's empirical observations and an extensive survey of existing literature. To gather relevant information and draw meaningful conclusions, data was collected from a range of sources, including textbooks, newspapers, university websites, and peer-reviewed journal articles.

RESULTS AND DISCUSSION

Nutrients of peanut

Fat. Peanut's lipid profile is highly beneficial, consisting of approximately 50% monounsaturated fatty acids (MUFAs), 30% polyunsaturated fatty acids (PUFAs), and 20% saturated fatty acids. This healthy fatty acid composition helps to lower overall cholesterol, particularly LDL (bad) cholesterol, while preserving or even increasing HDL (good) cholesterol (Arya *et al.*, 2016). Additionally, regular consumption of peanuts and peanut butter has been shown to reduce triglyceride levels.

Because they are nutrient-dense and high in calories, peanuts are an excellent food source for providing essential energy and nutrition, especially for malnourished babies, children, and pregnant women (Parilli-Moser *et al.*, 2022).

Proteins. Peanuts are an excellent source of protein. A high intake of peanuts has been associated with a significant decrease in mortality rates, with some studies suggesting a reduction in death of up to 40%. Even after oil extraction, the remaining peanut cake retains about 50% of the original protein, making it a valuable and nutritious feed for livestock, particularly dairy animals. The health benefits of peanut protein are notable, with some studies indicating that its unique amino acid profile and beneficial compounds provide a healthier alternative to certain animal proteins (Cue *et al.*, 2023).

Fiber. Peanuts have a low glycemic index (GI) and glycemic load (GL), primarily due to their high fiber content. The carbohydrates in peanuts, which are mainly composed of sucrose and starch, help to maintain stable blood sugar levels (Balasubramanian *et al.*, 2024).

Vitamins. A 100-gram serving of peanuts provides a significant portion of several daily recommended vitamins, including 75% of niacin, which is important for the digestive system, and 53% of thiamine. It also contains 10% of riboflavin, 35% of pantothenic acid,

27% of pyridoxine, and 55% of vitamin E. As vitamin E is often rare in our diets, its presence in peanuts is particularly valuable. This vitamin is known to help combat diseases such as Alzheimer's and may also help bolster immunity in conditions like AIDS and cancer (Shweta Singh and Neelma Kunwar 2018). Additionally, peanuts are a good source of folate, which is an essential nutrient for children and pregnant women. Overall, a daily intake of peanuts provides a substantial amount of crucial vitamins (Kirti Mishra and Rashmi 2022).

Table 1: Nutritional Profile of Groundnut (Peanut) per 100 g.

Calcium (mg)	93
Carbohydrate (g)	16.13
Copper (mg)	11.44
Fat (g)	49.24
Fiber(g)	8.5
Iron (mg)	4.58
Magnesium (mg)	168
Manganese (mg)	1.934
Phosphorus (mg)	376
Potassium (mg)	7.5
Zinc (mg)	3.27
Protein (g)	25.80
Sodium (mg)	18

Source: (Shweta Singh and Neelma Kunwar 2018)

Table 2: MP-AES and Chemical analysis of groundnut leaf samples.

Composition of elements	GJG-20	GJG-22	GJG-17	GG-21	GG-5	Average
N %	3.29	3.81	3.79	3.59	3.16	3.53
P%	0.07	0.06	0.05	0.05	0.06	0.06
K%	2.19	2.27	2.06	2.04	1.68	2.05
S%	0.04	0.05	0.05	0.05	0.06	0.05
Na %	0.03	0.04	0.02	0.03	0.04	0.03
Ca%	1.57	1.52	1.89	2.02	1.51	1.70
Mg%	0.49	0.58	0.64	0.57	0.54	0.57
Cu ppm	11.29	11.32	10.46	9.80	11.15	10.80
Fe ppm	142.93	535.16	126.15	138.88	378.39	264.30
Mn ppm	71.73	65.22	104.27	81.08	97.54	83.96
Zn ppm	17.83	17.60	19.38	18.09	15.93	17.76
Ti ppm	9.48	11.79	10.73	10.23	11.05	10.65
V ppm	44.48	65.39	29.45	35.80	59.59	46.94
Cr ppm	1.10	2.12	1.31	2.95	3.23	2.14
Mn ppm	73.51	65.61	78.7	73.48	102.40	78.75
Sr ppm	296.80	229.10	285.40	294.52	277.04	276.57
Co ppm	10.85	28.83	18.51	20.37	28.62	21.43

Source: (Parakhia *et al.*, 2017)

Analysis of groundnut leaves using scanning electron microscopy-EDX, MP-AES, and chemical methods revealed they contain a higher amount of nitrogen than potassium and calcium. The leaves also contain other trace elements such as copper, iron, and zinc. A specific particle found on the leaves was identified as calcium by comparing the EDX and MP-AES analysis results. Overall, groundnut leaves are a good source of trace elements and are used as animal fodder to meet micronutrient requirements (Parakhia *et al.*, 2017).

Amino acid profiling of peanut

Arginine. Arginine is an amino acid that plays a key role in several bodily functions. It helps to increase immunity, regulate hormones, maintain blood sugar

levels, and may reduce male infertility. Arginine is also used to treat impotence and reduces the risk of heart diseases. While the body can produce arginine on its own, dietary intake is still recommended. Peanuts are an excellent source of arginine, which acts as a precursor to nitric oxide. This compound helps to relax arteries, thereby improving blood flow and reducing healing time in body tissues (Moncada and Higgs, 1993). In terms of its functional activity, Duggan *et al.* (2002) claimed that arginine acts as a protective nutrient for the gastrointestinal tract.

Resveratrol. Resveratrol (3, 4', 5-trihydroxystilbene) is a member of the stilbenes, a class of polyphenolic compounds. Plants produce resveratrol and other

stilbenes in response to stressors like damage, fungal infection, or ultraviolet (UV) radiation (Jeandet *et al.*, 2012). As a fat-soluble substance, resveratrol can exist in both *trans* and *cis* forms. It is also found as a glucoside, where it is attached to a glucose molecule; this form is called piceid. Scientific interest in resveratrol surged in 1992 after its presence in red wine was documented. Since then, it has been shown to be abundant in peanuts (Geulein, 2010) and has been linked to numerous health benefits. Resveratrol is a powerful antioxidant with protective effects against various conditions, including cancer (Gagliano *et al.*, 2010), heart disease (Juan *et al.*, 2002), degenerative neurological disease, Alzheimer's disease (Chen *et al.*, 2005), tumors (Bishayee *et al.*, 2010), and inflammation (Kang *et al.*, 2010).

According to Fazel Nabavi *et al.* (2014), this bioflavonoid is thought to increase cerebral blood flow by up to 30%, which may lower the risk of stroke. In addition to its antioxidant qualities that protect against cardiovascular conditions like arteriosclerosis, resveratrol acts as a chemopreventive agent by inhibiting the initiation, promotion, and progression of various cancers (Delmas *et al.*, 2006).

Resveratrol also appears to prolong the lifespan of various organisms, including mice, *Drosophila melanogaster*, and *Saccharomyces cerevisiae* (Baur *et al.*, 2006). Resveratrol is found in all parts of the peanut plant, including the roots, epidermis, and shell (Francisco and Resurreccion 2008). Interestingly, peanut butter has almost three times the resveratrol concentration of grape wine (Sobolev and Cole 2003). Research indicates that the resveratrol content in peanuts can be increased by stressing the plants in various ways (Rudolf and Resurreccion 2006).

Phytosterols. Phytosterols, also known as plant sterols and stanol-esters, are naturally occurring compounds found in plant cell membranes. Due to their structural similarity to the body's cholesterol, they compete for absorption in the digestive system. This competition blocks cholesterol absorption, which in turn lowers blood cholesterol levels.

Consuming recommended quantities of phytosterols has been shown to reduce total cholesterol by up to 10% and LDL ("bad") cholesterol by up to 14%. There is growing evidence that reintroducing phytosterol-rich plant foods into the modern diet can improve serum lipid profiles and lower the risk of cardiovascular disease. Peanuts, peanut butter, peanut flour, and peanut oil all contain phytosterols such as beta-sitosterol, campesterol, and stigmasterol, which inhibit dietary cholesterol absorption (Lopes *et al.*, 2011). In addition to the healthy fats, proteins, and fibers in peanuts, phytosterols may contribute to the lower incidence of heart disease observed in populations that consume a small amount of peanuts daily (Awad *et al.*, 2000). Emerging evidence also suggests that phytosterols may decrease inflammation and reduce the growth of various cancers, including lung, stomach, ovarian, prostate, colon, and breast cancer (Woyengo *et al.*, 2009).

Phenolic acids and flavonoids. Research clearly reveals that peanuts and their skin are excellent sources of beneficial phytochemicals, such as phenolic acids (Francisco and Resurreccion 2008). Peanuts contain high concentrations of polyphenolic antioxidants, primarily in the form of p-coumaric acid, which boosts their overall antioxidant content by up to 22% (Duncan *et al.*, 2006). Studies have also shown that roasted peanut skin has a higher antioxidant capacity. Lopes *et al.* (2011) also discussed the role of phenolic acids as powerful antioxidants. Flavonoids, another class of antioxidants, are found in all sections of the peanut plant. A high intake of flavonoids is expected to provide protection against heart disease and cancer through a variety of mechanisms. Emerging research continues to explore how these beneficial compounds promote overall health. Peanuts and peanut butter are considered a major dietary source of flavonoids, containing the same types found in green and black tea, apples, red wine, and soybeans (Francisco and Resurreccion 2008).

Table 3: Profiling of amino acids from peanut variety JL-24.

Amino acids (g/100 g prot.)	<i>Arachis hypogaea</i> (L.) JL -24
Aspartic acid	3.459
Threonine	0.689
Serine	-
Glutamic acid	1.397
Proline	6.412
Glycine	1.232
Alanine	1.792
Cysteine	0.334
Valine	1.134
Methionine	0.243
Isoleucine	1.001
Leucine	1.622
Tyrosine	0.972
Phenylalanine	1.266
Histidine	0.568
Lysine	0.929
Ammonia	0.494
Arginine	2.795
Tryptophan	0.306

Source: Ingale and Shrivastava (2011)

A study by Ingale and Shrivastava (2011) on groundnut seeds found the following composition: moisture (5.53%), crude fiber (1.1%), lipid (46.22%), crude protein (25.2%), carbohydrate (21.2%), and ash (2.5%). The study also noted the presence of minerals, including calcium (0.09%) and phosphorus (0.29%), and an energy content of 601.8 kcal per 100g. The total fatty acid composition was analyzed as 10.4% saturated and 33.51% unsaturated fatty acids. Furthermore, the study investigated protein solubility at different pH levels ranging from 0.5 to 13.5, finding that the maximum amount of protein was extracted at pH 12. The researchers reported that while serine was not detected in the seed protein, it contained a high amount of proline (6.4%).

Health benefits

In anti diabetes. A study by Jiang *et al.* (2002) found that regularly incorporating peanuts into one's diet significantly lowered the risk of diabetes. Inflammatory substances in the blood, such as C-reactive proteins (CRP), have been identified as a risk factor for cardiovascular disease. Dietary factors can help reduce this inflammation (Nettleton *et al.*, 2006). Specifically, certain lipids, antioxidants, dietary fiber, arginine, and magnesium found in foods like peanuts have been shown to help control inflammation (Salas-Salvado, 2008).

In anticancer. Unsaturated fats, specific vitamins, minerals, and various bioactive components all of which are contained within a single peanut kernel—have been shown to have cancer-preventive benefits (Gonzalez and Salvado, 2006). For example, the phytosterols found in peanuts have been extensively researched for their anti-cancer properties (Woyengo *et al.*, 2009). These compounds have been observed to reduce prostate tumor growth by more than 40% and inhibit the metastasis (spreading) of cancer to other parts of the body by over 50% (Awad *et al.*, 2000).

Unsaturated fats, certain vitamins and minerals, and bio active components have been demonstrated to have cancer preventive benefits, which are all packaged inside a peanut kernel (Gonzalez and Salvado, 2006).

In example, the phytosterols in peanuts have been researched in relation to cancer (Woyengo *et al.*, 2009), and they have been observed to lower prostate tumor growth by more than 40% and the occurrence of cancer spreading to other parts of the body by over 50% (Awad *et al.*, 2000).

Similar to phytosterols, resveratrol has been shown to inhibit the proliferation of cancer cells by cutting off their blood supply (Fazel Nabavi *et al.*, 2014). According to Balasubramanian *et al.* (2020), peanuts are a "smart meal" that can help prevent cancer.

Alzheimer's and gallstone issues. Peanuts are rich in niacin and are an excellent source of vitamin E, both of which have been shown to help protect against Alzheimer's disease and age-related cognitive decline. In a study of over 4,000 individuals aged 65 and older, dietary niacin was found to reduce cognitive deterioration (Morris *et al.*, 2004).

Health-promoting compounds. Peanuts and peanut butter are considered a major food source of flavonoids, containing the same types found in green and black tea, *Kalaichelvi et al.*

apples, red wine, and soybeans. Additionally, peanuts, peanut butter, peanut flour, and peanut oil all contain phytosterols (such as beta-sitosterol, campesterol, and stigmasterol), which inhibit dietary cholesterol absorption. In addition to healthy fats, proteins, and fibers, these phytosterols may contribute to a lower incidence of heart disease, as observed in populations that consume a small amount of peanuts daily. Peanuts are also high in niacin and vitamin E, both of which have been shown to protect against Alzheimer's disease and age-related cognitive decline. Due to these and other beneficial compounds, peanuts offer numerous health benefits and are considered a valuable crop for the future of human health.

Fodder. Groundnut leaves contain high amounts of nitrogen, potassium, and calcium, along with other essential trace elements like copper, iron, and zinc. These nutritional properties make groundnut leaves a suitable fodder crop for livestock.

CONCLUSION AND FUTURE DIRECTIONS

Given the significant health benefits of peanuts, awareness campaigns should be created to educate the public on their nutritional value. This information is especially important to disseminate to illiterate populations. Furthermore, the negative effects of the allergic compounds present in groundnuts should be identified and studied.

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