REVIEW ARTICLE Agricultural Reviews, Volume 41 Issue 4: 403-407 (December 2020)

Peanut as a Smart Food and their Nutrients Aspects in Planet: A Review

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10.18805/ag.R-2004

ABSTRACT

Peanut is a legume crop that belongs to the family of Fabaceae, genus *Arachis* and botanically named as *Arachis hypogaea* L. Peanuts are considered as a vital source of nutrients plays an important role in growth and energy gain of living organisms. They are rich in calories and contain many nutrients, minerals, antioxidants and vitamins that are essential for optimum health. All these biomolecules are essential for pumping vital nutrients into the human body for sustaining normal health. This paper presents an overview of the peanut composition in terms of the constituent biomolecules and their biological functions, also discusses about the relationship between consumption of peanuts and their effect on human metabolism and physiology. It highlights the usefulness of considering peanuts as an essential component in human diet considering its nutritional values.

Key words: Bioactive, Health benefits, Nutritional profiles, Peanuts, Plant protein.

Groundnut (*Arachis hypogaea* L.), is a species of legume family (*Fabaceae*) which is believed to have its origin in South America from where it spread to other parts of the world. They are widely cultivated in India, Africa, South America, United States, China and a few other countries. China leads in production of peanuts, having a share of about 45% of overall world production, whereas India is second in production and has (16%) share and the United States of America has 5% share (USDA, 2014). There are thousands of peanut cultivars around the world the most popular cultivars being Spanish, Runner, Virginia and Valencia. Preference by cultivars is based on differences in flavour, oil content, size, shape, and disease resistance. Spanish peanuts are used mostly for peanut candy, salted nuts and peanut butter whereas majority of the runner cultivars are used to make peanut butter (Woodroof, 1983). Apart from oil, peanuts are widely used for preparation of peanut butter, confectionaries such as roasted peanuts, snack products, extenders in meat product formulation, soups and desserts.

The colour of groundnut varies from red to brown and are usually coarse in their appearance. The nutritional importance of peanuts is attributed mainly to the carbohydrates, lipids, proteins, vitamins, minerals, some organic acids and purines which are known as energy and growth supplementing constituents. Peanuts, which are a rich source of protein and essential amino acids, can help in preventing malnutrition (Pelto and Klemesu, 2011). Moreover, energy rich compounds such as lipids and carbohydrates in peanuts are highly capable of complementing the basic energy demands of the human body. This review article describes chemical composition of peanuts and the importance of groundnut as a smart food is discussed.

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How to cite this article: Balasubramanian, P., Mariappan, V.E.N., Lourdusamy, D.K., Chinnamuthu, C.R. and Swetha, S. (2020). Peanut as a Smart Food and their Nutrients Aspects in Planet: A Review. Agricultural Reviews. 41(4): 403-407.

Submitted: 09-04-2020 **Accepted:** 07-09-2020 **Published:** 05-12-2020

Nutritional profile of peanut

Peanuts are grown in the ground, as the seeds of the ovary from the peanut plant. They contain anywhere from 21-36.4% protein, 18% carbohydrates and 36-54% fat (Woodroof, 1973). In their natural state, peanuts contain at least 10% of the recommended daily intake for vitamin E, folate, niacin, magnesium, copper, phosphorus and potassium, their fat content 30-35% is polyunsaturated and 40-45% is oleic, a monosaturated fatty acid (Woodroof, 1973). Peanut contain about 100-120 grams of fiber per kg (Kris-Etherton *et al.*, 2011). Peanuts have been recognized as a valuable protein source since the 1800s. Since the protein in peanuts is plant-based, it carries with its additional components promoting positive health benefits like fibre and unique bioactive, unlike animal protein. Peanuts are high in arginine, an amino acid, which is one of the building blocks of protein. This amino acid is a precursor to nitric oxide, a compound that expands your blood vessels. Adding peanuts to your diet is a great way to add healthy protein bioactive

like arginine that can improve blood pressure, decrease chronic disease risk and promote longevity.

Plant-based proteins such as peanuts contain healthy monounsaturated and polyunsaturated fats and other important nutrients. In addition, the peanut diets reduced triglyceride levels, which were increased in the low-fat diet. Moreover, peanuts contain lipids and carbohydrates which are energy rich compounds, capable of complementing the basic energy demands of the human body.

a) Vitamins

Vitamins are a group of organic compounds that are not synthesized in the body, but have to be supplied to the body to maintain normal health and metabolism. Vitamins are classified as fat soluble and water-soluble vitamins. Vitamins A, D, E and K are fat soluble vitamins and water-soluble vitamins are B-Complex and vitamin C. Fat soluble vitamins exert an important role in the maintenance of certain essential physiological functions. Vitamin A is associated with normal vision and epithelial functions, vitamin D is associated with calcium metabolism, and vitamin K for coagulation of blood. Vitamin E, a powerful antioxidant is also vital for a healthy immune system. Consumption of Vitamin E even in low quantities provides protection against coronary heart disease (Bramley *et al*., 2000).

The nuts are packed with many important water-soluble vitamins comprising B complex groups of vitamins such as riboflavin, niacin, thiamine, pantothenic acid, vitamin B_6, and B_9 folates are associated with certain biochemical reactions by forming coenzymes that assist the enzyme in converting a substrate into a product. Riboflavin (vitamin B_2) in the form of Flavin mono nucleotide (FMN) and Flavin adenine dinucleotide (FAD), participate in electron transfer and hydrogen transfer reactions in the human body. Vitamin B_9, more commonly known as folate or folic acid. Folic acid is the synthetic form of folate and folate occurs naturally in foods. Vitamin B_9 is useful for human growth and helps the mechanism of normal nerve and brain functioning (Fishman *et al*., 2003). Estimation suggests that 100 g of peanuts provide about 85% of RDI of niacin, which contributes to health and blood flow to the brain.

b) Minerals

Groundnut consumption can meet the most part of Recommended Daily Allowance (RDA) of many minerals which are crucial for health and proper functioning of the body as mentioned in the Table 1. It is clear from the data's that 100g of peanut can provide RDA levels of 127% copper, 84% manganese, 57% iron, 54% phosphorus, 42%. magnesium intake is associated with reduced inflammation (King 2005; Song *et al.,* 2005) and a decreased risk of metabolic syndrome (Song *et al*., 2005) and type II diabetes (Larsson and Wolk 2007).

c) Fat

Fatty acids that are present in groundnut belong to the category of lipids. In addition to carbohydrates, they also are considered as energy producing biomolecules. They compose sufficient levels of monounsaturated fatty acids (MUFA), especially oleic acid. MUFA helps lower LDL or "bad cholesterol" and increases HDL or "good cholesterol" level in the blood. Research studies suggest that the Mediterranean diet which is rich in monounsaturated fatty acids help prevent coronary artery disease and stroke risk by favouring healthy serum lipid profile. Groundnut contains about 50% monounsaturated fatty acids (MUFAs), 33% Paraformaldehyde (PFAs) and 14% saturated fatty acids which is a healthy combination of fatty acids. The amount of trans fat in peanut butter with 2% stabilizer is 156 times less than what is needed to reach the 0 g trans-fat cut-off on food labels (Sanders, 2001).

Groundnut products (raw, butter and oil) are more beneficial to heart health when compared to the low-fat diets. The high monounsaturated fat of groundnut diets is believed to lower the total body cholesterol by 11% and bad LDL cholesterol by 14%. The benefits of the groundnut diets on cholesterol were comparable to the olive oil diet. There is a strong association between monounsaturated fat as well as

Table 1: Nutritional value per 100 g.

Principle	Nutrient value	Recommended daily allowance
Energy	567 Kcal	28%
Carbohydrates	16.13 g	12%
Protein	25.80 g	46%
Total fat	49.24 g	165%
Cholesterol	0 mg	0%
Dietary fibre	8.5 g	22%
Vitamins		
Folates	240 µg	60%
Niacin	12.066 mg	75%
Pantothenic acid	1.767 mg	35%
Pyridoxine	0.348 mg	27%
Riboflavin	0.135 mg	10%
Thiamine	0.640 mg	53%
Vitamin A	0	0%
Vitamin C	0	0%
Vitamin E	8.33 mg	55.5%
Electrolytes		
Sodium	18 mg	1%
Potassium	705 mg	15%
Minerals		
Calcium	92 mg	9%
Copper	1.144 mg	127%
Iron	4.58 mg	57%
Magnesium	168 mg	42%
Manganese	1.934 mg	84%
Phosphorus	76 mg	54%
Selenium	7.2 µg	13%
Zinc	3.27 mg	30%

(Source: USDA National Nutrient Data Base, 2014).

overall nut intake and decline in the risk of coronary heart disease (Matilsky *et al*., 2009).

d) Proteins

Groundnuts are actually a legume and have more protein than any other nut with levels comparable to that of beans. After the groundnut oil is extracted, the protein content in the cake can reach upto 50% (Zhao *et al*., 2011). Groundnut contain all the 20 amino acids in variable proportions and is the biggest source of the protein called Barginine (USDA., 2014). According to Protein Digestibility Corrected Amino Acid Score (PDCAAS) groundnut proteins and other legume proteins such as soy proteins have been found to possess equal nutrition to meat and eggs for human growth and health (FAO 2002). The amino acid profile of the groundnut meals shows that it can effectively be used as an ingredient for protein fortification (Yu *et al*., 2006). Since the proteins in groundnuts is plant based, it carries with its additional components that have positive health benefits like fibre and unique bioactive components, unlike animal protein. In addition, groundnut proteins have been found to have good emulsifying activity, emulsifying stability, foaming capacity, excellent water retention and high solubility, and can also provide a new high protein food ingredient product formulation and protein formulation in food industry (Wu *et al*., 2009).

e) Bioactives in peanuts

i) Arginine

Arginine or L-arginine is an amino acid that is essential in maintaining the liver, skin, joints and muscles healthy. Arginine is an amino acid that acts as a precursor to nitric oxide which helps to keep the arteries relaxed, improving blood flow and healing time in tissues in the body with respect to functional activity and that arginine is one of the protective nutrients for the gastro intestinal tract Duggan *et al*. (2002).

ii) Resveratrol

Groundnut is an excellent source of resveratrol, another polyphenolic antioxidant. Resveratrol (3,42 ,5-trihydroxystilbene) belongs to a class of polyphenolic compounds called stilbenes. Groundnut is an excellent source of resveratrol, a polyphenol antioxidant (Geulein, 2010) which have been found to have protective function against cancers (Gagliano *et al*., 2010), heart disease (Juan *et al*., 2002), degenerative nerve disease, Alzheimer's disease (Chen, 2005), tumour (Bishayee *et al*., 2010) and inflammation (Kang *et al*., 2010). Furthermore, research evidence suggest that resveratrol may reduce stroke risk through altering molecular mechanisms in the blood vessels such as reducing susceptibility to vascular damage through decreased activity of angiotensin, a systemic hormone responsible for blood vessel constriction that would elevate blood pressure and by increasing production of vasodilator hormone, nitric oxide.

iii) Phytosterols

Phytosterols also referred to as plant sterol and stanol esters are found in plant cell membranes which belongs to a group of naturally occurring compounds. They compete with cholesterol for absorption in the digestive system because phytosterols are structurally similar to the body's cholesterol, when they are consumed. Groundnut, peanut butter, groundnut flour, and groundnut oil are all filled with phytosterols (betasitosterol, campesterols and stigmasterol) that block the absorption of cholesterol from the diet (Lopes *et al*., 2011).

Phenolic acids and flavonoids

The functional compounds such as phenolic acids and flavonoids are very high in groundnut and their skin. Hence groundnut are exceptional sources of functional compounds, including phenolic acids (Francisco and Resurreccion, 2008). Research studies have revealed that groundnut contains high concentrations of polyphenolic antioxidants, primarily in p-coumaric acid levels, boosting it overall antioxidant content by as much as 22% (Duncan *et al*., 2006). Furthermore, roasted peanut skin has greater antioxidant capacity than the roasted whole groundnut. Lopes *et al*. (2011) have also described the role of phenolic acids as antioxidants. Flavonoids are in all parts of the groundnut plants.

Health benefits of peanuts

Several studies have looked at the health benefits of regular consumption of peanuts. The consumption of either peanuts or processed peanuts has been shown to be beneficial to health, due to their desirable lipid profile, which is higher in unsaturated fatty acids than in saturated fatty acids peanut oil is naturally trans- fat-free, cholesterol-free and low in saturated fats. It shows many positive biological effects, which are mostly connected with its high oleic acid content (Woodroof 1983). Peanut skins contain potent rich antioxidants. Recent research studies suggest that boiling enhances antioxidant concentration in the peanuts. It has been found that boiled peanuts have two and four fold increase in isoflavone antioxidants biochanin A and genistein content, respectively (Craft *et al*. 2010). As much as 40% reduction in mortality due to any factor has been reported when peanuts were included as an integral part of the routine diet (Fraser *et al*. 1992). Reduction in deaths due to cardio vascular diseases in particular was found in population who consume peanut or peanut butter regularly (Fraser *et al*. 1992). Peanuts and peanut butter contain health monounsaturated fatty acids, plant proteins, magnesium, potassium, fiber arginine and many bioactive components, each of which could be contributing to lowering blood pressure.

a) Alzheimer's and gallstone disease

Peanuts have a high content of niacin and are an excellent source of vitamin E, both of which have been shown to protect against Alzheimer's disease and age-related cognitive decline. It has also been found that the consumption of vitamin E from supplements had no effect on the incidence of Alzheimer's, vitamin E intake from food has been was protected (Morris 2002). In those who were

in the top fifth of intake, incidence of Alzheimer's disease was reduced by 70%. Resveratrol has also been recognized as beneficial in Alzheimer's disease and other nerve degeneration disease (Chen 2005). It has been found that those who eat peanuts and peanut butter five times a week or more have a reduced risk of gallbladder disease bias much as 25% (Tsai *et al*. 2004).

b) Peanuts and weight management

Considerable evidences show that incorporating peanut and peanut butter into the diet does not lead to weight gain or higher bodyweight (Mattes *et al*. 2008). In another research exclusively on school children it was found that there was weight loss in peanut fed group whereas the control group gained weight in a span of 2 years (Johnston *et al*. 2007). Similar data has been published in many more epidemiological studies where it was found that peanuts reduced the total and LDL cholesterol (Pelkman 2004).

c) Hunger maintenance

Research data show that peanut and peanut butter consumption improved the feeling of fullness and satisfied the consumers better than the carbohydrates snacks like rice cakes in equal quantities (Kirkmeyer and Mattes 2000). Another study showed that peanut consumption curbed the appetites of the subject due its fullness effect (Alpher and Mattes 2002). Emerging evidence is also showing that the type of healthy monounsaturated fat in peanuts may stimulate a hormone that helps to feel satisfied after consumption (Schwartz *et al*.2008).

d) Malnourishment

Peanut milk although not very popular is used extensively incases of emergencies and malnutrition for rapid recovery and gain of health. In the past, Peanut based product like a RUTF (Ready-to-Use Therapeutic Food) has been formulated to overcome severe malnourishment. It is a lipid-based mix containing ground, roasted peanuts. In addition, vegetable oil, powdered milk, vitamins, minerals, and sugar are added. Peanuts as the basis for RUTF enable better delivery of a full range of balanced lipids, essential amino-acids, minerals and vitamins required by developing children (Patel *et al*. 2005).

CONCLUSION

Peanuts are an excellent and affordable source of nutrition, supplementing vital nutrients to the human body such as proteins, carbohydrates, lipids, vitamins, minerals and fiber. They are often referred as poor man's protein but, when taken in adequate amounts in any form, will supplement rich nutrients to the body that can provide growth and energy, and play a vital role in the prevention of diseases. Metal ions which are cofactors for many enzymes, vitamins that are not synthesized in the body, poly unsaturated and monounsaturated fatty acids, whose consumption can increase the levels of HDL cholesterol which is good for the heart, are present in peanuts. Essential amino acids that are not synthesized in the body, but are essential as building blocks of proteins and carbohydrates, which are the principle source of energy in the body, can be provided by peanuts. It is clear that there is a huge scope for the commercialization of peanut products and the market trends look extremely positive owing to all the above-mentioned factors. A diet including peanuts could provide all these vital nutrients and play a critical role in preventing disease and promoting good health.

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