



Walnut: Nutritional aspects and by Products – A review

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ABSTRACT

Walnuts are one of the most widely consumed tree nuts in the world. Walnut is a good source of many nutrients such as proteins fat, vitamins, amino acids, carbohydrates and many minerals which makes its more beneficial for human consumption as it gives many health benefits. Walnut is a source of many by products as well such as walnut shells and green husk which are also very important for various uses. Walnut shells show good antioxidant activity because of the presence of polyphenols. Walnut shell also contain an ample amount of oil also. Walnut husk is also an important source of various bioactive compounds which have the potential of antioxidant activity and antimicrobial activity. Besides all this, walnut husk is also the rich source of natural dye and can be used in dyeing of textiles. This review focuses on the general nutritional aspects of walnut and the related byproducts.

Key words: Walnut, nutritional aspects, byproducts

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INTRODUCTION

Walnut (*Juglans regia* L.) is an important nut belonging to family Juglandaceae. In India it is normally known as 'Akhrot', all parts of which are utilized in one way or the other. It is one of the essential nut product of India being sent out to in excess of 42 nations with profit of more than Rs. 300 crores every year. The area under walnut in India is about 1,12,000 ha with production and productivity of 2,88000 metric tonnes [1]. It is grown mainly in Jammu & Kashmir, Himachal Pradesh, Uttarakhand and Arunachal Pradesh. However Jammu & Kashmir is the major walnut producing state contributing 80.58% of total area and 91.16% total production of the country. The most important walnut growing districts in Kashmir are Anantnag, Pulwama, Kupwara, Budgam, Baramulla and Srinagar while in Jammu region Doda, Kistwar, Poonch, Udhampur are important with minor quantity in Rajouri and Kathua. In Himachal Pradesh Kullu, Mandi, Shimla, Kinnaur, Sirmour, Chamba are important with a productivity of 2.70t/ha. While in Uttarakhand Nainital, Dehradun, Pauri, Tehri, Chamoali, Almora and Pithoragarh are major growing areas with productivity of 1.10t/ha. The major importing countries of walnut from India are Spain, Egypt Arab Republic, Germany, Netherlands, United Kingdom, France, and Taiwan [2].

Walnuts are harvested starting around mid-September. The harvest season usually continues through November. Walnuts are ready to harvest when the green hulls begin to split and nuts naturally drop from the trees.

COMPOUNDS OF POTENTIAL IMPORTANCE TO HUMAN HEALTH

Walnuts consist of different mixture of nutrients and many phytochemical species of many benefits for human health and also having the highest known levels of phenolic antioxidants (phenolic acids, flavonoids, tannins, etc) when compared with other species of nut [3, 4]. Walnut macronutrients include monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA). Furthermore, concentration of these provide the highest known ratios of oleic acid (OA) and alpha linolenic acid (ALA) to total FA content of all tree nuts [5].

Walnut as vitamin source

Walnut is rich source of vitamin E. Walnut fat has two forms in vitamin E: alpha tocopherol and gamma-tocopherol. 21 mg gamma-tocopherol (Vitamin E) is present in 100 gm of walnut, and this 140% of the amount which is required for daily need. Vitamin E is a strong fat-soluble antioxidant. Vitamin E is needed

to protect the mucus and skin cell membranes against the harmful effects of free radicals and to keep their unity. Important vitamin structures are present in walnut such as: riboflavin, niacin, thiamine, pantothenic acid, vitamin B6, and folate/B₉ [6]. Walnut also have a preventive effects on inflammation, it reduces the risk of high blood pressure; it also prevents arterial illnesses that can result with: heart, and brain stroke, chest diseases, colon and prostate cancer [7, 8].

Walnut As Protein, Fat, And Carbohydrate Source

Walnut contains single and multi-unsaturated fat that affect the heart health. 4/3 of the calories in walnut are coming from fats. Walnuts are rich source of fat, a diet constituted with walnuts had a beneficial effect on blood lipids, it lowers the blood cholesterol and reduces the ratio of serum concentrations of low density lipoprotein and high density lipoprotein by 12% [9]. As we all know, calories are given by three food nutrients : proteins, fats, and carbohydrates. Proteins and carbohydrates provide 4 calories per gram, whereas fats gives 9 calories per gram. For this reason, while eating hard shell fruits, we have to be careful about the amount of portion we should eat and we shouldn't eat too much [10, 11].

Walnut as antioxidants source

The antioxidant substances in walnut have 15 times more effects than pure vitamin E has. Walnut is considered as the number one heart health friendly hard shell fruit. The reason of this is that walnut contains much more antioxidants than the other hard shell nuts. Antioxidants are the substances that protect the cells against the damages caused by harmful molecules known as free radicals. Walnut reduces: cholesterol, oxidative stresses caused by free radicals, and the inflammations that damage the health [12, 13]. Walnut was the number one when he analyzed the antioxidants in walnut and the other hard shell nuts. Antioxidants in walnut is of better quality than the other hard shell nuts [4]. The antioxidants in 30gm walnut is more than the antioxidants that a normal man gets from the fruit and vegetable he eats all day long. But it is just in order to say how sufficient the antioxidant density in walnut is [14-17].

BY PRODUCTS FROM WALNUT

Walnuts are a perfect ingredient in a variety of breads, muffins, cakes and biscuits [20]. Many parts of the walnut tree shows antioxidant potential, including the stem, leaf, shell, husk, kernel, and bark. [18, 19]. However, unlike the kernel and shell, walnut husks are very rarely used commercially and are mostly often discarded.

Walnut shells are rich source of phenolic acids and related polyphenols that, as shown in other studies, the use of antioxidants is dynamically rising in the food industry. Agricultural and food waste is becoming an ideal substance for extraction of phenolic compounds as natural antioxidants [21]. Walnut kernels (*Juglans regia* L.) nearly contain about 60% of oil in them (Prasad, 1994) but this may vary depending on the cultivar, location grown and irrigation rate [22].

Walnut husks contain a different type of phenolic antioxidant compounds [23]. The extracts from walnut husk have demonstrated antimicrobial effects against gram-positive bacteria. [24, 25]. The dye which is extracted from walnut husk gives brown color to the textile substrates [26, 27]. Walnut husk is good source for natural dye.

CONCLUSION

Through this study, we can conclude that walnut is an important and rich source of nutrients and can be used as an effective health supplement. Besides being the rich supplementary source, its byproducts are also useful and effective and can be fixed for various purposes. The need of the hour is to look for the utilization of this product in different food forms and its byproducts as well.

REFERENCES

1. Agriculture Cooperation and Farmer Welfare (2017).
2. APEDA (2012). Export import report of agricultural commodities.2012
3. Espin, J.C., Garcia-Conesa M.T., and Tomas-Barberan F.A. (2007). Nutraceuticals: facts and fiction. *Phytochemistry* 68: 2896–3008. International Nut and Dried Fruit Foundation. 2010.
4. Vinson J.A and Cai Y. (2011). Nuts, especially walnuts, have both antioxidant quantity and efficacy and exhibit significant potential health benefits. *Food Funct.* 3:134-40.
5. Maguire L.S., O'Sullivan S.M., Galvin K., O'Connor T.P., and O'Brien N.M. (2004). Fatty acid profile, tocopherol, squalene and phytosterol content of walnuts, almonds, peanuts, hazelnuts and the macadamia nut. *J Food Sc Nutr* 55: 171–178.
6. Sen S. M. (2011). Walnut, cultivation, nutritional value, folklore (4th Ed.) (in Turkish). ICC Publication, Ankara, Turkey, pp. 220.

7. Marangoni F., Colombo C., Martiello A., Poli A., Paoletti R., Galli C. (2007). Levels of the n-3 fatty acid eicosapentaenoic acid in addition to those of alpha linolenic acid are significantly raised in blood lipids by the intake of four walnuts a day in humans. *Nutr. Metab. Cardiovasc. Dis.*, 17, (6), pp. 457-46.
8. Amaral J. S., Casal S. Pereira J. A., Seabra R. M., Oliveira B. P. P. (2003). Determination of sterol and fatty acid compositions, oxidative stability, and nutritional value of six walnut.
9. Sabaté, J., Fraser, G.E., Burke, K., Knutsen, S.F., Bennett, H. and Linstead, K.D. (1993). Effects of walnuts on serum lipid levels and blood pressure in normal men. *New England Journal of Medicine* 329, 603-60.
10. Tapsell L., Batterham M., Tan S. Y., Warensjö E. (2009). The effect of a calorie controlled diet containing walnuts on substrate oxidation during 8-hours in a room calorimeter. *Journal of the American College of Nutrition*, 28, (5), pp. 611-617.
11. Crews C., Hough P., Godward J., Brereton P., Lees M., Guiet S., Winkelmann W. (2005). Study of the main constituents of some authentic walnut oils. *J. Agric. Food Chem.*, 53, pp. 4853-4860.
12. Anderson K. J., Teuber S. S., Gobeille A., Cremin P., Waterhouse A. L., Steinberg F. M. (2001). Walnut polyphenolics inhibit in vitro human plasma and LDL oxidation. *J. Nutr.*, 131, (11), pp. 2837-2842.
13. Morgan J. M., Horton K., Reese D., Carey C., Walker K., Capuzzi D. M. (2002). Effects of walnut consumption as part of a low-fat, low-cholesterol diet on serum cardiovascular risk factors. *Int. J. Vitam. Nutr. Res.*, 72, (5), pp. 341-347.
14. Reiter RJ, Manchester LC, Tan DX. (2005). Melatonin in walnuts: Influence on levels of melatonin and total antioxidant capacity of blood. *Nutrition* 2005, 21(9), 920-924.
15. Canales A., Benedi J., Nus M., Librelotto J., Sánchez-Montero J. M., Sánchez-Muniz F. J. (2007). Effect of walnut-enriched restructured meat in the antioxidant status of overweight/obese senior subjects with at least one extra CHDrisk factor. *J. Am. Coll. Nutr.*, 26, (3), pp. 225-232.
16. Fukuda T., Ito H., Yoshida T. (2003). Antioxidative polyphenols from walnuts (*Juglans regia* L.). *Phytochemistry*, 63, (7), pp. 795-801.
17. Negi A. S., Luqman S., Srivastava S., Krishna V., Gupta N., Darokar M. (2011). Antiproliferative and antioxidant activities of *Juglansregia* fruit extracts. *Pharm. Biol.*, 49, (6), pp. 669-673.
18. Wang, X., M. M. Zhao, G. W. Su, M. S. Cai, C. M. Zhou, J. Y. Huang, *et al.* (2015). The antioxidant activities and the xanthine oxidase inhibition effects of walnut (*Juglansregia*L.) fruit, stem and leaf. *Int. J. Food Sci. Technol.* 50:233–239.
19. Yaylaci, F., S. Kolayli, M. Kucuk, S. A. Karaoglu, and E. Ulusoy. (2007). Biological activities of trunk bark extracts of five tree species from Anatolia, Turkey. *Asian J. Chem.* 19:2241–2256.
20. Anon., (1991). California walnuts-the versatile nut. *Eur Food Drink Rev* 121:123-125
21. Singh, A., Kuila, A., Yadav, G. and Banerjee, R. (2011) Process Optimization for the Extraction of Polyphenols from Okara. *Food Technology and Biotechnology*, 49,322-328.
22. Greve C., Mcgranahan G., Hasey J., Snyder R., Kelly K., Goldhamer D. and Labavich J., (1992). Variation in polyunsaturated fatty acid composition of Persian walnut. *J. Soc. Hort. Sci.* 117:518-522.
23. Stampar, F., A. Solar, M. Hudina, R. Veberic, and M. Colaric. (2006). Traditional walnut liqueur –cocktail of phenolics. *Food Chem.* 95:627–631.
24. Oliveira, I., A. Sousa, I. Ferreira, A. Bento, L. Estevinho, and J. A. Pereira. (2008). Total phenols, antioxidant potential and antimicrobial activity of walnut (*Juglansregia*L.) green husks. *Food Chem. Toxicol.* 46:2326–2331.
25. Fernandez-Agullo, A., E. Pereira, M. S. Freire, P. Valentao, P. B. Andrade, J. Gonzalez-Alvarez, *et al.* 2013. Influence of solvent on the antioxidant and antimicrobial properties of walnut (*Juglans regia* L.) green husk extracts. *Ind. Crops Prod.* 42:126–132.
26. Mirjalili, M., K. Nazarpour, and L. Karimi. (2011). Extraction and identification of dye from walnut green husks for silk dyeing. *Asian Journal of Chemistry* 23: 1055–1059.
27. Mirjalili, M., and L. Karimi. (2013). Extraction and characterization of natural dye from green walnut shells and its use in dyeing polyamide: Focus on antibacterial properties. *Journal of Chemistry* 2013: 1–9. doi:10.1155/2013/375352

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