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Effects of Different Solvents on Extraction Rate of Gallic Acid in the Inner Woody Shell of Walnuts (Methanol, Ethanol)

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Abstract

In this study we tried to fine the best solvent for extraction of Gallic acid from inner woody shall of walnut. Solvents include Ethanol, Methanol, 70% Ethanol with 30% Water and 70% Methanol with 30% Water. After the extraction, samples were predicated with rotary, and then inject samples to HPLC and Results were analyzed. The highest of dry matter rate was for methanol-water (Respectively 70%, 30%). The best extractions of Gallic acid were related to Methanol with 0.33%. So one of the material that removed from the food industry (inner woody shall of walnut) have favorable content of Gallic acid.

Keywords: Extraction; Gallic acid; Ethanol; Methanol; Water; Inner woody shall of walnut

Introduction

Walnut (*Juglans regia* L.) is the most widespread tree nut in the world. The tree is commonly called as the Persian walnut, white walnut, English walnut or common walnut. It belongs to juglandaceae and has the scientific name *Juglans regia*. The walnut tree species is native to the old world. It is native in a region stretching from the Balkans eastward to the western Himalayan chain [1] and was cultivated in Europe as early as 1000 BC. At present, walnut is cultivated commercially throughout southern Europe, northern Africa, eastern Asia, the USA and western South America. World production of whole walnut was around 1.5 × 106 tons in 2008 [2]. China is the leading world producer, followed by the USA, Iran, Turkey, Ukraine, Romania, France and India, but production in other countries such as Chile and Argentina has increased rapidly in recent years [3]. Walnut has been used globally in human nutrition since ancient times. The high protein and oil contents of the kernels of *Juglans regia* L. (Juglandacea) make this fruit indispensable for human nutrition. Therefore, the walnut is classified as a strategic species for human nutrition and is included in the FAO list of priority plants [4].

Antioxidant activity

Bullo, et al. [5] reported a decrease in the antioxidant burden observed in enzymatic and non-enzymatic antioxidant systems after the consumption of a whole-walnut or a walnut-skin diet in C57BL/6 mice. The same author also reported that consumption of walnuts and walnut skins have no deleterious effect on low-density lipoprotein (LDL) oxidizing capability, despite their higher contents of omega-6 PUFAs. Several phenolic compounds isolated from *J. Regia* such as Pyrogallol, p-hydroxy benzoic acid, Vanillic acid, ethyl gallate, protocatechuic acid, Gallic acid, 3,4,8,9,10-pentahydroxydibenzo pyran-6-one, tannins, glansrins, adenosine, adenine, etc, could provide a chemical basis for some of the health benefits claimed for *J. regia* in foods and folk medicine [6,7].

Anti-diabetic activity

Fukuda et al. [8] demonstrated a strong inhibitory activity of walnut polyphenols and the poly phenolic components like Casuarictin, tellimagradin II and Tellimagradin I on different enzymes like glycosidase, sucrose, maltase and amylase. In addition to the above findings, researchers also noticed that walnut polyphenol-rich fraction has triglyceride lowering effect and urine peroxide lowering effect in genetically inherited Type II diabetes mellitus (*db/db*) mice at the dose of 200mg/kg/day. The consumption of walnut leaf pellets in alloxan induced diabetic rats at the dose of 185 mg/kg reduced fasting blood sugar significantly and the histomorphometric study of pancreas showed a sign of regeneration of β-cells in the treated group [9]. *J. regia* leaves Methanolic extract at dose of 250 mg/kg decreases the postprandinal plasma blood glucose levels in both short and long term models. The plant extract significantly inhibited α-glycosidase activity *in-vitro* for both maltase and sucrose enzymes and showed no changes in the insulin and glut-4 genes expression. The author attributed the inhibitory action of the plant extract to Gallic acid and Caffeoylquinic acid in the leaves [10]. The maximum of Gallic acid content that there are in the shell woody inner of walnuts (*Juglans regia* L.) with different solvent.

Materials and Methods

Materials

In our experiments we had to use 3 solvents including: water, Ethanol, & Methanol 99% purity made by German's Merck co. in order to extract the composed material of the internal wooden shall of

walnuts. These alcohols each mixed 70% with water to solve the wooden divider & achieve the subjected compound we were after.

Methods

Extracting process is as follow; marinating the 2 grams samples of the walnuts wooden dividers with solvents inside the soxhlet machine for six hours. Then place them in rotary machines at 45 degree Celsius. Drain the solution to separate the white pieces of particles, weight the white particles and solved one gram of these particles in one cc methanol in the power sonic device. Then pick 20 microliter of this solution & injected to HPLC machine and the result is reported at the end of this paper.

Results Analysis

Dry matter weight

Through this experiment walnut wooden dividers grinded to powder and marinated in four separated solution in order to extract the composed substances then solution separated, and finally weigh the white stuff have remained. This is the weight of composed substances extracted from walnuts wooden divider which they are varied for different solution expressed at the following (Figure 1).

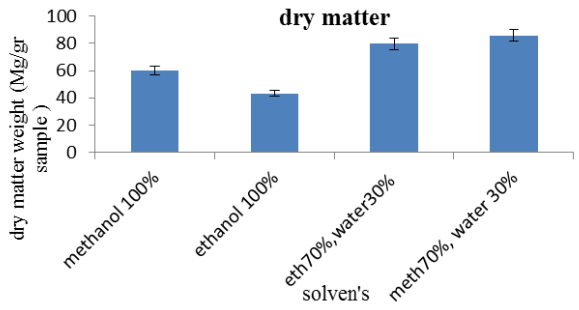

Figure 1: Weight Measurement analysis of dried production gained from four samples.

Gallic Acid percentages extracted from walnut wooden skin inner

In this section of research the analysis of Gallic acid in the wooden divider is studied. According to Figure 2 illustration, the walnuts wooden divider enriched with the Gallic acid. Proper solvent for this process is the Methanol as much as 1/3 portion of HPL display. It also proves that it is the good source of anti-oxidant which could be used for diabetic medicine.

Conclusion

As many other discoveries in our day-to-day life, through this research, we found the natural curing medicine for diabetic patients off of waste material portion of walnut's wooden (the nut's core) dividers. In this research we have found the central core of walnut contains the Gallic Acid the anti-oxidant substance that could prescribe by physicist to typed II diabetic patients.

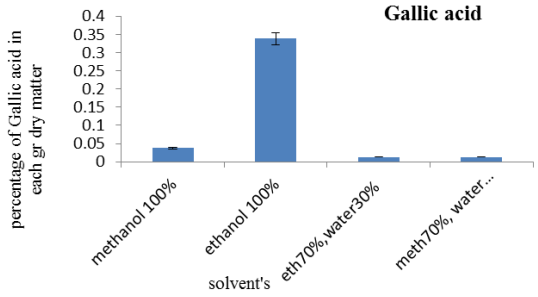

Figure 2: The percentages of acid Gallic gained in samples.

By producing and taking such natural source of medicine, not just saving the public money, but also, keep our environment as clean and safe as we always demand, too.

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