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Short Communication

Assessment of nutritional facts and antioxidant efficacy of clove (*Syzygium aromaticum* L.) collected from Lahore, Pakistan in water and methanol extracts

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Abstract

Clove (Syzygium aromaticum L.) is known for its use as a spice. In the present study its nutritional, antioxidant and reducing power were assessed. Clove is commercially used for the clove oil production that contains active ingredients which have antioxidant and pain reliving properties. It is therefore, necessary to investigate the nutritional status as well as antioxidant activity. The results show that cloves contain 10.20% moisture level, 1.24% total ash content, 1.25% protein content, 0.42% fat content, 0.71% fiber content, 1.20% carbohydrate content and the energy value were 6.70 Kcal/mol. The clove extract exhibited strong radical-scavenging activity ranging from 10.71%-50.65% in water extract and 18.22%-73.78% in methanol extract while the reducing power activity increase as the concentration increased. Thus, the overall finding of the present research indicates that clove possesses high antioxidant potential along with nutritional facts.

Keywords: Clove, antioxidant, nutritional aspects, water extract and methanol extract.

Introduction

Spices obtained from plants have been an important additive to food which play taste forming role and give better smell features. These spices are also added to food for assuring longer shelf-life. Phenolic contents are present in different spices. Clove (Syzygium aromaticum) is also amongst one of the main precious spices that have been used for many medicinal purposes as well as food preservative[1,2]. Clove is a nutrient rich food entity which has useful phytochemicals[3].

Clove in particular among other spices has attracted the consideration due to its antioxidant and antimicrobial properties[4]. In comparison with wolf berries or blueberries, a drop of clove oil is 400 times more potent antioxidant. Various health benefits of clove uses have been well known over the centuries. It is as valuable as a home medication in curing a number of diseases. In addition to its gastronomic uses, the clove buds have loads of recreational and medicinal uses.

Clove consumption is much more in home kitchens. However, the clove oil extracted from cloves contains antioxidant, antifungal, antiviral, anti-inflammatory, antimicrobial, antidiabetic, anesthetic, antithrombotic, pain reliving and pest repugnant properties. The main ingredient which is accountable for the therapeutic properties of the clove bud is Eugenol[5].

Clove and Eugenol both show strong antioxidant activity which may be compared to the activities of other synthetic antioxidants like BHA and pyrogallol[6]. Clove reduces lipid peroxidation as it has the highest capacity to give off hydrogen. The inhibitory action of clove oil can be determined by using a linolenic acid emulsion system which showed a higher antioxidant activity as compared to standard BHT. A noteworthy inhibitory effect of clove is also effective against hydroxyl radicals as it act as an iron chelator. The metal chelating activity and DPPH radical scavenging activity of different spices were calculated in rat liver homogenate. Cloves showed the maximum DPPH radical scavenging activity values[7]. The major aroma components and antioxidant activity of clove buds extract, eugenol acetate and eugenol were comparable to the natural antioxidant named alpha-tocopherol[8]. Eugenol inhibited leukotriene C-4 and 5-lipoxygenase activity in human cells[9].

Natural antioxidants in clove are helpful against chronic diseases. The main objective of this study was to determine the nutritional values and antioxidants activity in both methanol and water extracts of the Cloves (*Syzygium aromaticum).*

Materials and methods

Sample Collection: Different fresh samples of Clove were collected randomly from the local market of Lahore, Pakistan. All the clove samples showed physical consistency in pH, color and density.

The samples were collected in Polyethylene bags and transported to the laboratory for analysis. All samples were stored at-10°C. The study was carried out in Food Additives and Contaminants Laboratory at PCSIR Lahore, Pakistan.

Extract preparation: Fresh spices of clove were collected and 100g of cloves were grinded in grinder/mixer to powdered form. 20g of clove spice was extracted with 100ml methanol for 24 hours. The obtained extracts were filtered through Whatmann filter paper. The residue material was extracted twice by using solvent. The obtained extracts were dried at 80ºC.

Proximate analysis: Association of Official Analytical Chemist standard techniques were used for the proximate composition of clove powder[10]. Moisture content was determined by drying the samples all night at 105°C. The ash contents were measured by ashing the samples all night at 550°C. The Kjeldahl method was used to measure crude protein contents while fat contents were determined by the Soxhlet method. The carbohydrate contents were calculated by measuring difference (total mass of moisture, ash total fat and crude protein subtracted from the total mass of cloves).

Determination of DPPH Antioxidant Activity: Free radical scavenging activity of the clove extract was analyzed by using DPPH (2, 2-Diphenyl-1-picrylhydrazyl)[11]. 0.1 mL of clove extract was taken and 2.9 mL of DPPH solution (0.004%) was added. The reaction mixture was left to stand in the dim for 30 minutes at room temperature. The absorbance was noted at 517 nm. The scavenging effect of DPPH radicals was measured by using the subsequent equation:

Inhibition % (DPPH Scavenging effect) = $A^0 - A1/ A^0 \times 100$

Where: A^0 = absorbance of the control, A1 = absorbance of the sample.

Determination of Reducing Power: Methanol and water extracts (0.5mL) were mixed with 0.1mL of phosphate buffer (0.2M with pH 6.6) and 0.5mL of 10 mg/mL potassium ferricyanide and incubated at 50ºC for 20 mimutes. 0.5mL of 100 mg/mL trichloroacetic acid was added. From this mixture 0.5mL was diluted with 0.2mL of distilled water and 0.1mL of 0.1% ferric chloride. The absorbance was noted at 700nm after 15 minutes[12]. Increase in absorbance of the mixture was in direct proportion to the high reducing ability.

Results and discussion

Antioxidants can save oils and lipids in food commodities against oxidative degradation. When these antioxidants are added to food, these may control development of rancidity, slow down the formation of noxious oxidation products, preserve dietary quality, and lengthen the products shelf-life. The synthetic antioxidants are limited to be used as food preservatives due to food safety issues. Natural antioxidants obtained from safe to eat materials like clove (spices) and herbs are very useful as they provide immunity against diseases[13].

Nutritional Status of Clove: Figure-1 shows the percentage of moisture, ash, protein, fat, fiber, carbohydrate and energy values of clove sample i.e. 10.20%, 1.24%, 1.25%, 0.42%, 0.71%, 1.20%, and 6.70 Kcal/mol respectively.

Antioxidant activity of clove in water extract: Table-1 shows that at different concentration of clove ranging 20µl/ml to120 µl/ml. The absorbance was reduced, ranging from 1.0171 to 0.5621. The corresponding inhibition percentage values were found to be 10.71 to 50.65%. The highest inhibition % 50.65 at concentration of 120µg/ml and lowest inhibition % was 10.71% at 20µg/ml.

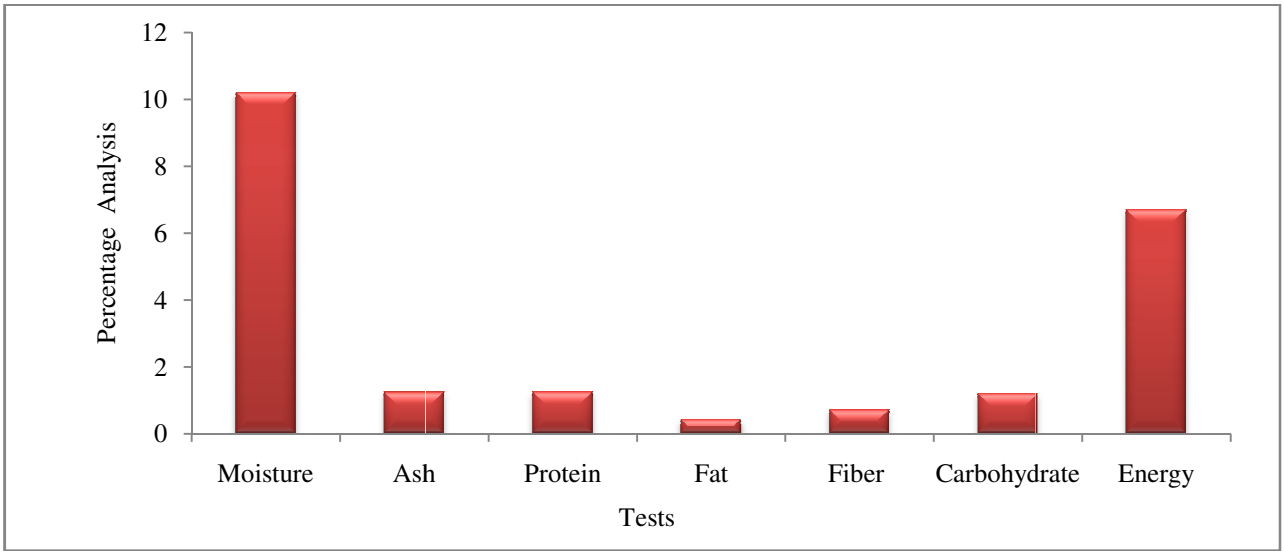

Figure-1: Nutritional status of clove sample.

Table-1: % Inhibition of Clove at different concentration in water extract.

Concentration	Absorbance	%Inhibition
20 µg/ml	1.0171	10.71
40 µg/ml	0.9242	18.86
60 µg/ml	0.8290	27.22
80 µg/ml	0.7445	34.64
100 µg/ml	0.6563	42.38
120 µg/ml	0.5621	50.65

Antioxidant activity of clove in methanol extract: Table-2 shows that at different concentration of clove ranging 10µl/mg to 60µl/mg. The absorbance was reduced, ranging from 0.9315 to 0.2986. The corresponding inhibition % values were found to be 18.22 to 73.78%. The highest inhibition% 73.78 at 60µg/ml and lowest %inhibition was observed at 18.22 at 10µg/ml.

Table-2: % inhibition of Clove at different concentration in methanol extract.

Concentration	Absorbance	%Inhibition
10 µg/ml	0.9315	18.22
20 µg/ml	0.6952	38.96
30 µg/ml	0.5514	51.59
40 µg/ml	0.4804	57.82
50 µg/ml	0.4113	63.89
60 µg/ml	0.2986	73.78

Table-3 shows that at different concentration of clove ranging 100µg/ml to 500µg/ml. The absorbance was increased, ranging from 0.5254 to 0.7721. The highest absorbance rate was observed as 0.7721 respectively.

Table-3: Reducing power of Clove in Water.

Concentration	Absorbance
100 µg/ml	0.5254
200 µg/ml	0.5922
300 µg/ml	0.6440
400 µg/ml	0.7164
500 µg/ml	0.7721

Table-4 shows that at different concentration of clove ranging 100µl/mg. The absorbance was increased, ranging from 0.6683 to 0.9749 respectively.

Table-4: Reducing power of Clove in Methanol.

Concentration	Absorbance
100 µg/ml	0.6683
200 µg/ml	0.7194
300 µg/ml	0.7830
400 µg/ml	0.8867
500 µg/ml	0.9749

Different vegetables, fruits, medicinal herbs and spices like cloves are known to have a variety of useful antioxidants[14]. Clove is looked upon as the winners of all the antioxidants known till date. In the present study clove was evaluated for nutritional status, antioxidant activity and reducing power were also analyzed in water as well as in methanol extracts. Antioxidant activity, antioxidant efficacy or efficiency of spices and herbs can be determined by employing several analytical methods. The most frequently used analytical test is DPPH (2, 2-diphenyl-1-picrylhydrazyl), a stable nitrogen centered free radical, whose color change from violet to yellow when it is reduced by either the process of hydrogen or electron donation[15]. Substances which perform such radical scavenging activity may be considered as potent antioxidants.

Preceding studies have also shown that clove is a very strong antioxidant having high levels of phenols[16]. A strong hydrogen-donating ability, a metal chelating ability and effectiveness as good scavengers of free radicals, hydrogen peroxide and superoxide make clove as strong antioxidant[17]. The results showed that the clove extract exhibited the strongest radical scavenging activity and was the most powerful phenolic antioxidant having best reducing power activity in both water and methanol extracts.

Conclusion

Clove is a powerful therapeutic herb having a solid useful known antioxidant source in history and traditional heritage. It is known to possess medicinal potential as well. The present work was carried out to determine nutritional status, antioxidant activity and reducing power of locally available clove in Lahore, Pakistan. The antioxidant activity and reducing power activity were determined both in water and methanol extracts which showed that antioxidants were found to be higher in methanol extract. The results obtained to calculate the antioxidant activity showed that clove might be considered as excellent sources of natural compounds with noteworthy antioxidant activity. The antioxidant activity depends on the analysis used, the

concentration and the physicochemical characteristics of the studied antioxidant compound. It is generally concluded that clove was a more powerful antioxidant.

References

1. Hinneburg I., Dorman H.D. and Hiltunen R. (2006). Antioxidant activities of extracts from selected culinary herbs and spices. *Food Chem.*, 97(1), 122-129.

2. Suhaj M. (2006). Spice antioxidants isolation and their antiradical activity: a review. *J. Food Comp. Anal.,* 19(6), 531-537.

3. Mashkor I.M.A.A. (2015). Evaluation of Antioxidant Activity of Clove (Syzygium Aromaticum). *Int. J. Chem. Sci.,* 13(1), 23-30.

4. Cortés-Rojas D.F., de Souza C.R.F. and Oliveira W.P. (2014). Clove (Syzygium aromaticum): a precious spice. *Asian Pac. J. Trop. Biomed.,* 4(2), 90-96.

5. Milind P. and Deepa K. (2011). Clove: a champion spice. *Int. J. Res. Ayurveda Pharm.,* 2(1), 47-54.

6. Dorman H.D., Surai P. and Deans S.G. (2000). In vitro antioxidant activity of a number of plant essential oils and phytoconstituents. *J. Essen. Oil Res.,* 12(2), 241-248.

7. Yadav A.S. and Bhatnagar D. (2007). Free radical scavenging activity, metal chelation and antioxidant power of some of the Indian spices. *Biofactors,* 31(3-4), 219-227.

8. Lee K.G. and Shibamoto T. (2001). Antioxidant property of aroma extract isolated from clove buds (Syzygium aromaticum (L.) Merr. et Perry). *Food Chem.,* 74(4), 443-448.

9. Raghavenra H., Diwakr B.T., Lokesh B.R. and Naidu K.A. (2006). Eugenol-the active principle from cloves inhibits 5-lipoxygenase activity and leukotriene-C4 in human PMNL cells. *Prostaglandins, Leukotrienes and Essential Fatty Acids*, 74(1), 23-27.

10. AOAC (2012). Officials Method for the Analysis (19th edition.). Arlington, Washington DC: Association of Official Analytical Chemists.

11. Ivanisová E., Tokár M., Mocko K., Bojnanská T., Marecek J. and Mendelová A. (2013). Antioxidant activity of selected plant products. *The J. Microb. Biotech. Food Sci.,* 2, 1692-1703.

12. Oyaizu M. (1986). Studies on products of browning reaction. *The Jap. J. Nutr. Diet.,* 44(6), 307-315.

13. Yashin A., Yashin Y., Xia X. and Nemzer B. (2017). Antioxidant activity of spices and their impact on human health: A Review. *Antioxidants*, 6(3), 70.

14. Zheng W. and Wang S.Y. (2001). Antioxidant activity and phenolic compounds in selected herbs. *J. Agri. Food Chem.,* 49(11), 5165-5170.

15. Schaich K.M., Tian X. and Xie J. (2015). Hurdles and pitfalls in measuring antioxidant efficacy: a critical evaluation of ABTS, DPPH, and ORAC assays. *J. Functional Foods,* 14, 111-125.

16. Gülçin İ., Şat İ.G., Beydemir Ş., Elmastaş M. and Küfrevioğlu Ö.İ. (2004). Comparison of antioxidant activity of clove (Eugenia caryophylata Thunb) buds and lavender (Lavandula stoechas L.). *Food Chem.,* 87(3), 393-400.

17. Hossain M., Brunton N., Barry-Ryan C., Martin-Diana A.B. and Wilkinson M. (2008). Antioxidant activity of spice extracts and phenolics in comparison to synthetic antioxidants. *Rasayan J. Chem.,* 1(4), 751-756.