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Proximate analysis and mineral composition of *Myristica fragrans* seeds

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Abstract
The curative effects of some plants for curing various human diseases could be as a result of the presence of bioactive constituents in them. The proximate composition and mineral composition of dried *Myristica fragrans* (nutmeg) seeds were studied. The nutrients and minerals were analyzed by using different biochemical methods and by using various titration methods. *Myristica fragrans* seeds showed the presence of high contents of moisture (51.03± 0.25) mg/g and fiber (10.91± 0.3) mg/g. The mineral content estimation indicated the major presence of calcium (30.95 ± 1.25). On dry matter basis, these medicinal plants show high nutritive value with a maximum percentage of important minerals, which can be used for health care during the anemic condition and as food and fodder for livestock. In the present study *Myristica fragrans* was proved to have high nutritive and mineral composition.

Keywords: *Myristica fragrans,* ash, moisture, fiber, minerals.

1. Introduction
In the present pharmaceutical field, plants from the major sources for medicines, as the large numbers of drugs in use are obtained from plants. The medicinal plants are rich in secondary metabolites, which are potential sources of drugs and essential oils of therapeutic importance. Medicinal plants are widely used in various ailments, because of their safety besides being economical, effective and their easy availability [1]. According to a survey (1993) of the World Health Organization (WHO), the practitioners of traditional system of medicine treat about 80% of patients in India, 85% in Burma and 90% in Bangladesh [1, 2].
Globally, the early part of the 20th century brought an evolution of the pharmaceutical industry. With the progress of chemical techniques, crude drugs came to be replaced by pure chemical drugs and the developed countries witnessed a decline in popularity of medicinal plant therapy. However, during the recent part the interest has swung again and there is a resurgence of interest in the study and use of medicinal plants.
Mixtures of medicinal plants are prescribed by the traditional healers for diseases ranging from common colds to malaria, arthritis, ulcers, etc. [3]. Minor elements have very important functions and it is believed a key component of proteins such as haem protein and hemoglobin, which play a role in biochemical functions and essential enzyme system even in low doses. Başgel & Erdemoğlu [4] reported the daily mineral intakes by consuming herbal tea for a 70 kg person and the reported amounts of minerals per day are 500 mg Ca, 300 mg Mg, 15 mg Fe, 5 mg .Studies originally showed that optimal intakes of elements such as sodium, potassium, magnesium, calcium, manganese, copper, zinc and iodine could reduce individual risk factors, including those related to cardiovascular disease for both human beings and animals [5-7].
Minerals are obtained from the earth's crust. Through the effects of the weather, rocks that contain minerals are ground into smaller particles, which then become part of the soil. The mineral content in the soil is absorbed by growing plants. The plants are consumed by both animals and human beings as food. This mineral becomes part of the food chain. The plants absorb much of the essential elements from the soil in which they grow and serve as indicators of the materialization [8].
Calcium is the main component of bones and teeth. Their elementary function in cell membranes and on muscles is by regulating endo- exoenzymes and blood pressure [8]. Throughout the world, there is increasing interest in the importance of dietary minerals in the prevention of several diseases. Minerals are of critical importance in the diet, even though they comprise only 4–6% of the human body. Major minerals are those required in amounts greater than 100 mg per day and they represent 1% or less of bodyweight. These include calcium, phosphorus, magnesium, sulphur, potassium, chloride and sodium. Trace minerals are more

essential in much smaller amounts, less than 100 mg per day, and make up less than 0.01% of bodyweight. Essential trace elements are zinc, iron, silicon, manganese, copper, fluoride, iodine and chromium [9].

The major minerals serve as structural components of tissues and function in cellular and basal metabolism and water and acid-base balance [10-12]. Trace metals constitute significant health hazards for man and have become an area of particular concern and high priority in environmental research [13]. Trace elements can be directly taken up by the leaves of plants or they are accumulated in the soil and reach the plants through their roots [14]. Several studies have been carried out on edible wild plants [15-21] but, limited studies on mineral contents of condiments were made [22-23].

Proximate analysis in plants gives valuable information and help to access the quality of the sample. It provide information on moisture content, ash content, volatile matter, content, ash, fixed carbon etc. Ash is the inorganic residue remaining after water and organic matter has been removed by heating, which provides a measure of the total amount of minerals within the drug. Minerals are not destroyed by heating and they have a low volatility as compared to other food components. Total ash may vary within wide limits for specimen of genuine drugs due to variable natural or physiological ash. Ashes give us an idea of the mineral matter contained in a plant. Measuring it is important, because mineral matter may be the cause of a pharmacological effect [24].

The aim of this study was to determine the mineral contents of ethanolic extract of *Myristica fragrans* which is a principal member of Indian households. The proximate analysis was determined using fresh, dried and powdered sample of the seed.

2. Material and Methods

2.1 Plant material

Fresh seeds of *Myristica fragrans* were collected from Kerala. Plant sample was washed and shade dried at room temperature. The dried and ground plant part extracted with ethanol by Soxhlet extraction. This was used for the estimation of minerals.

2.2 Proximate Analysis

The parameters determined for proximate analysis include ash value, moisture content and crude fiber content of the drug. The moisture content was determined by keeping the dry and ground samples in an oven at 105 ºC for 6 hours. The ash content was estimated [25] by keeping 2 g sample in a muffle furnace at 550 ºC for 3 hours and the crude lipid content was determined by extracting the samples using ethyl ether in a Soxhlet for 6 hours. Determinations of all parameters were carried out in triplicate.

Table: 1 proximate analysis of *Myristica fragrans*

Parameters	References
Ash	Raghuramalu, *et al.*,2003 [26]
Moisture	
Fat	
Crude Fiber	

2.3 Estimation of mineral content

Extract Preparation: Measured amount of the powdered plant material was successively extracted in a Soxhlet extractor at elevated temperature using ethanol. The extracts were filtered through filter paper and poured on petri dishes to evaporate the liquid solvents from the extract to get dry extracts. This extract was used for the estimation of minerals in the plant sample.

Table 2: Mineral content in *Myristica fragrans*

Parameters	References
Iron	Sadasivam and Manickam, 1996 [27]
Calcium	Raghuramulu et al., 1983 [28]
Magnesium	Neil and Neely, 1956 [29]
Phosphorus	Fiske and Subarrow, 1925 [30]

2.4 Estimation of mineral content in ash

Ash composition and the amount obtained by the plant combustion material depend upon the age and the part of the plant taken. Ash usually represents the inorganic part of the plant. As minerals fall into this class of elements their amount can be clearly scrutinized rather than in the extracted plant sample. As the solvent extracted samples may be a mixture of various other organic compounds, thus, causing hindrance to the estimation of minerals in the plant sample standard spectrometric methods were followed.

2.5 Statistical Analysis

All the analyses were performed in triplicates and the results were statistically analyzed and expressed as mean (n=3) ± standard deviation (SD).

3. Results and Discussion

3.1 Proximate Analysis

Proximate analyses were carried out of the selected spice to know the nutritional significance of these frequently consumed species in the traditional medicines. These analyses revealed some interesting findings and the results obtained from are presented in Table 4.

Ash content was found to be low (4.44 ± 0.11 mg/g) when compared to the fibre, moisture and fat content in nutmeg. As a nutritive value of food, fibers in the diet are necessary for digestion and for effective elimination of wastes, and can lower the serum cholesterol, the risk of coronary heart disease, hypertension, constipation, diabetes, and colon and breast cancer [31]. Intake of such medicinal plants in traditional recipes showed evidence that dietary fiber is associated with enhanced insulin sensitivity and therefore may have a role in the prevention and control of Type 2 diabetes [32]. Thus, these medicinal plants can be considered as a valuable source of dietary fiber in human nutrition.

Moisture content depends on the environmental conditions such as humidity, temperature, harvest time, and climate as well as storage conditions. Thus, it is important for food scientists to be able to reliably measure moisture contents. The results (table: 3) indicated that 14.91 ± 0.3 mg/g of moisture was present in nutmeg. Hussain et al. [33] suggested a strong correlation between moisture contents and fiber, which could be of interest to human health as the fibrous are easily digested and disintegrated.

The results of the fat analysis indicated that the spice contains a moderate amount of fat (31.37 ± 1.24) and the results are represented in table: 3.

Table 3: Proximate analysis of *Myristica fragrans*

Parameters	Amount (%)
Ash	4.44 ± 0.11
Crude Fiber	51.03 ± 0.25
Moisture	14.91 ± 0.3
Fat	31.37 ± 1.24

Values are expressed by mean ± SD of 3 Samples

Table 4: Mineral content analysis of *Myristica fragrans* (ethanolic extract)

Parameters	Amount (mg/ 100 g)
Iron	43.19 ± 3.06
Calcium	452.95 ± 11.25
Magnesium	89.1 ± 6.3
Phosphorus	124.49 ± 7.06

Values are expressed by mean ± SD of 3 Samples

Table 5: Mineral content analysis of *Myristica fragrans* (ash)

Parameters	Amount (mg/g)
Iron	56.28 ± 3.03
Calcium	512.71 ± 7.48
Phosphorus	134.82 ± 4.05

Values are expressed by mean ± SD of 3 Samples

Calcium was high in *Myristica fragrans* seeds. Ca constitutes a large proportion of the bone, human blood and extracellular fluid; it is necessary for the normal functioning of cardiac muscles, blood coagulation and milk clotting, and the regulation of cell permeability. It also plays an important part in nerve-impulse transmission and in the mechanism of the neuromuscular system [33].

Magnesium was found to be moderate in nutmeg seeds. In humans, Mg is required in the plasma and extracellular fluid, where it helps maintain osmotic equilibrium. It is required in many enzyme-catalyzed reactions, especially those in which nucleotides participate where the reactive species is the magnesium salt, e.g., Mg ATP^{2-}.It can also prevent some heart disorders and lower blood pressure. Lack of Mg is associated with abnormal irritability of muscle and convulsions and excess Mg with depression of the central nervous system [34].

Iron is an essential element for human beings and animals and is an essential component of hemoglobin. It facilitates the oxidation of carbohydrates, protein and fat to control body weight, which is a very important factor in diabetes. It is essential for hemoglobin formation, but excess is harmful [35]. Results in table-5 reveal that nutmeg seeds have 0.19 ± 0.006 mg/g of iron. The dietary limit of Fe in the food is 10-60 mg/day. Low Fe content causes gastrointestinal infection, nose bleeding and myocardial infarction. The role of iron in the body is clearly associated with hemoglobin and the transfer of oxygen from lungs to the tissue cells. Iron deficiency is the most prevalent nutritional deficiency in humans and is commonly caused by insufficient dietary intake, excessive menstrual flow or multiple births. In this case, it results, especially an anemia [36, 37]. The element iron has many functions in the body. This element is used by the body to make tendons and ligaments. Certain chemicals in our brain are controlled by the presence or absence of iron. It is also important for maintaining a healthy immune system.

Phosphorous maintain blood sugar level, normal heart contraction dependent on phosphorous [38] also important for normal cell growth and repair, needed for bone growth, kidney function and cell growth. It plays an important role in maintaining the body's acid-alkaline balance [39].

Myristica fragrans seeds have a good amount of fat and sufficient amount of fiber and moisture with suitable mineral element and showing high nutritive value. This in turn indicates that nutmeg seems to be good for younger people and anemic people.

4. Conclusions

Conservation and use of medicinal plants has taken considerable amount of attention in recent years. The indigenous and marginal communities for curing various diseases from time immemorial have used it globally. Most of the plant species are also used as food supplement along with its oral decoctions. However, few have been done so far to verify the uses in this regard. The present research is an effort in doing so.

Medicines contain trace elements in a bioavailable form. The data obtained in the present work on elemental compositions of the medicinal plants will be useful in deciding the dosage of the drugs prepared from these plants and thus will be helpful in the synthesis of new drugs which can be used for the control and cure of various diseases. Our current study on nutritional evaluation of *Myristica fragrans* seeds have revealed that these plants are good source of nutrients (moisture, ash, fats, fiber and minerals) and can be used as substrates deficit in either of these nutrients. Nutmeg seeds seem to have good nutritive and suitable mineral element value.

5. References

1. Siddiqui HH. Safety of herbal drugs-an overview. Drugs News & Views 1993; 1(2):7–10.
2. WHO survey. In medicinal plants (Eds. Haq. I.). Karachi: Hamdard Foundation Press, 1993.
3. Obiajunwa EI, Adebajo AC, Omobuwajo OR. Essential and trace element contents of some Nigerian medicinal plants J. Radioanal Nucl Chem 2002; 252:473–476.
4. Başgel S, Erdemoğlu SB. Determination of mineral and trace elements in some medicinal herbs and their infusions consumed in Turkey. Sci Tot Env 2005; 359:82–89.
5. Anke M, Groppel B, Kronemann H, Bratter P, Schramel P (Eds.). Significance of newer essential trace elements (like Si, Ni, As, Li, V,) for the nutrition of man and animals: Trace elem anal chem med Biol., Berlin 1984, 3, 421.
6. Mertz W. Food fortification in United States. Nutritional reviews 1982; 41(11):2807-2812.
7. Sanchez-Castillo CP, Dewey PJS, Aguirre A, Lara JJ, Vaca R, Leon de la Barra. The mineral content in Mexican fruits and vegetables. J Food Comp Anal 1998; 11, 340–356.
8. Kılıç S, Köse G. Ca in milk and the dairy products and female health. World Food 5, World Food 2001; (5):72–75 (in Turkish).
9. Baysal A. Fundamentals of Nutrition, Hatipoğlu Press, Ankara (in Turkish) 2002, 14.
10. Macrae R, Robinson RK, Sadler MJ. Encyclopedia of food science, food technol nutr Academic Press Inc, San Diego, California. 5, 1993a.
11. Smith KT. Trace minerals in foods. , Marcel Dekker, New York, 1988.
12. Nielsen FH. New essential trace elements in life science. Annu Rev Nutr 1984, 4, 21–41.
13. Venugopal B, Luckey TD. Metal Toxicity in Mammals, Chemical Toxicity of Metal and Metalloids. S Plenum Press, New York. 2, 1988, 101.

14. Quin J, Zi-Jian W, Xia-Quan S, Tu Q, Bei W, Chen B. Environ Pollut 1996; 91(3):309-315.
15. Chiej R. Guia de las plantas medicinales., Grijalbo, Barcelone, 1992.
16. Ezeala DD, Trop Agric, 25, 1985, 213.
17. Guierrero JLG, Martirey JJG, Irosa MET. J Comp Anal 1998, 11, 322.
18. Gupta K, Wagle DS. Nutritional and ant nutritional factors of green leafy vegetables, Journal of Agricultural and. Food Chem 1998; 36(3):472-474.
19. Özcan M, Akgul A, Nahrung. Influence of species harvest data and size on composition of capers (Capparis spp.) flower buds Obst Gemuse u. Kartoffelverarbeit -. 1998, 42, 102.
20. Özcan M, Akgul A, Bağci˙ Y, Dural H, Echologists Publ. No.15. Ankara, Turkey [in Turkish]. SU Sci J 1998, 15, 72.
21. Al-Kharusi LM, Elmardi MO, Ali A, Al-Said FAJ, Abdelbasit KM, Al-Rawahi S. Effect of mineral and organic fertilizers on the chemical characteristics and quality of date fruits. Int J Agric Biol 2009; 11:290-295.
22. Akgül A. Spice science and technology (Baharat Bilimi ve Teknolojisi), Turkish Association of Food Technologists, Ankara in Turkish. 15, 1993. 106-115.
23. Khanum F, Sudarshanakrishna KR, Semwal AD, Vishwanathan KR. Ind J Nutr Dietet 2001, 38, 93.
24. Okeke EC. Spices Medic Plants. Journal of Herbs 1998, 5, 51–63.
25. Hussain J, Rehman N, Al-Harrasi A, Ali L, Ullah R, Mabood F *et al*. Nutritional prospects and mineral compositions of selected vegetables from Dhoda sharif–Kohat. J Med Plants Res 2011; 5(29):6509-6514.
26. Raghuramalu N, Nair MK, Kalyanasundaram SA. Manual of laboratory techniques, First edition, National Institute of Nutrition, KMR, Hyderabad, 1983, 31–32.
27. Sadasivam S, Manickam A. Biochemical methods for agricultural science, Wiley Eastern Ltd., Madras, 1996, 187–188.
28. Raghuramalu N, Nair MK, Kalyanasundaram SA. Manual of laboratory techniques, second edition, national Institute of Nutrition, KMR, Hyderabad, 2003, 201.
29. Neil M, Neely M. Practical clinical chemistry, Ed Varley. H. Arnold – Heinzmann publishers Pvt. Ltd., 1956, 4, 465.
30. Fiske CJ, Subarrow Y. The colorimetric determination of phosphorus. J Biol Chem 1935, 66:375–400.
31. Hussain J, Khan AL, Rehman N, Zainullah, Khan F, Hussain ST *et al*. Proximate and nutrient investigations of selected medicinal plant species of Pakistan. Pak J Nut 2009; 8:620-624.
32. Vadivel V, Janardhanan K. Nutritional and ant nutritional characteristics of seven South Indian wild legumes. Plant Food Hum Nutri. 2005, 60:69-75.
33. FAO/WHO, Hand Book on Human Nutritional Requirements, FAO Nutritional Studies, 1974, 28, 63–64.
34. Prasad AS. Symposia from the XII International Congress on Nutrition. Prog Clin Biol Res 1981; 77:172–177.
35. Critchley M. (Editor-in-Chief), In Butterworths Medical Dictionary, ELBS, UK, 1986, 1035.
36. Sigel H. Metals in Biological Systems. Marcel Dekker, New York, 1978.
37. Reddy MB, Chidambaram MV, Bates GW. Iron Transport in Microbes, Plants and Animals. VCH, New York, 1987.
38. Linder, Manria C. Nutritional Biochemistry and metabolism with clinical applications. Appleton and Lange, Norwalk, 1991, 2, 191 - 212.
39. Johns T and Duquette M. Deficiency of phosphorus in man. Am. J. of Clin. Nutr. 1991, 53: 448 - 56. 46.