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## Studies on the physicochemical properties of fenugreek (*Trigonella Foenum-Graecum* L.) seeds

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### ABSTRACT

Fenugreek (*Trigonella foenum-graecum* L.) is one of the most promising medicinal herbs known from ancient times having nutritional value. This study aimed at determining the physicochemical properties of fenugreek seeds in order to ascertain its quality as a food and medicinal agent. The proximate analysis was carried out based on standard methods of Association of Official Analytical Chemists (AOAC), while the vitamin composition was analyzed based on the method described in CODEX. Vitamin C was determined by titration method. The moisture and ash contents of the sample had average values of  $10.91 \pm 0.85\%$  and  $2.99 \pm 0.48\%$  respectively. The protein content had an average value of  $2.74 \pm 0.35\%$ , while fat and carbohydrate contents were  $6.33 \pm 0.52\%$  and  $77.04 \pm 0.63\%$  respectively. The vitamin B1, B2, B6 and B12 gave average values of 0.1137mg/g, 0.0366 mg/g, 0.0495 mg/g and 0.8710 mg/g respectively, whereas vitamin C and folic acid contents had values of 10.5400 mg/g and 0.0386 mg/g respectively. The aqueous extract of fenugreek seeds found vitamins, carbohydrates, proteins and fats may be a very good source of food supplement and has potential for treating diverse medical ailments which supports its traditional use.

**Keywords:** Proximate composition, fenugreek, vitamins, and nutrients.

### INTRODUCTION

Plants are used as food, some of which are good sources of medicine. Fenugreek (*Trigonella faenum-graecum* Linn.) is an annual herb indigenous to the countries bordering on the eastern shores of the Mediterranean and largely cultivated in Saudi Arabia, Egypt, India, and Morocco. (Helambe and Dande, 2012). The name "fenugreek" comes from foenum-graecum, meaning "grey hay", as the plant was traditionally used to scent inferior hay (flanmang *et al.*, 2004). Fenugreek is one of the most ancient medicinal herbs that belong to the Fabaceae family. A wide range of uses were found for fenugreek in ancient times. The leaves and seeds of the plant are widely consumed as spice in food preparations and as ingredient in traditional medicine (Syeda *et al.*, 2008). Fenugreek has strong spicy and seasoning type sweet flavor (Blank, 1996). The whole seed or its ground powder is used in pickles vegetable dishes and spice powder and the dried seeds are used as condiments (Murlidhar and Goswami 2012).

Fenugreek has been reported to have antidiabetic and blood lipid lowering effect (Nithya *et al.*, 2014; Nandini *et al.*, 2007). The antioxidant activity, anti-inflammatory affects and hepatoprotective effects of fenugreek have been reported (Kumar, 2012; Mohammed and Azab, 2014; Santh *et al.*, 2008) Moreso, Fenugreek has antimicrobial and antiulcer activities as reported by Dash *et al.*, 2011 and Meera *et al.*, 2011. To be in good health, humans require a daily diet containing a balanced quality of nutrients. These nutrients may be macronutrients or micronutrients. The

principal components of the diet are carbohydrates, lipids, proteins vitamins, and minerals. Vitamins are organic molecules that are needed in small amounts in the diets. These molecules serve the same roles in all forms of life. Most vitamins either cannot be synthesized by humans or cannot be made in sufficient amounts to meet its needs. As some vitamins are not normally stored in the body in sufficient amounts, a daily supply is needed. A vitamin deficiency can generate disease due to inadequate intake of foods containing these essential nutrients. This paper reports the proximate composition and the vitamins content of Fenugreek seeds.

## MATERIALS AND METHODS

All chemicals and reagents used are of analytical grade.

### Sample collection and preparation

A fenugreek (*Trigonella foenum-graecum* L.) seed was purchased from Mubi main market, Mubi, Adamawa state, Nigeria. The seeds were authenticated by plant taxonomist from the department of Biological Sciences, University of Maiduguri, Borno State. The seeds were ground to powder form using pestle and mortar.

### Proximate analysis

The standard methods of the Association of Official Analytical Chemists (AOAC, 1995) were used to determine moisture, ash, crude protein, crude fat and carbohydrate. Moisture content was estimated by heating 6.0g of the ground Fenugreek seeds to a constant weight in a crucible at 105°C. Ash content was determined gravimetrically by incineration at 550°C for 8 hours. The crude fat was determined by Soxhlet extraction method using petroleum ether as solvent. The Kjeldahl method was used to determine the crude protein (protein factor used was 6.25). The carbohydrate was calculated by difference.

### Vitamin analysis

The analysis of vitamins in fenugreek seeds was conducted based on the methods described in CODEX (2001) for vitamin B<sub>1</sub>, B<sub>2</sub>, B<sub>6</sub>, B<sub>12</sub> and folic acid. Vitamin C was analysed by titration method in which starch served as indicator, and iodine as a base.

## RESULTS AND DISCUSSION

The proximate composition of fenugreek seed is presented in table 1. The seeds of fenugreek showed higher percentage carbohydrates, while the protein content was very low. The moisture content was 10.9% and crude fat was 6.3%. Table 2 shows the vitamins present in the fenugreek seeds. The result showed that fenugreek seed contain vitamin B<sub>1</sub>, B<sub>2</sub>, B<sub>6</sub>, B<sub>12</sub> folic acid and vitamin C. There was greater amount of vitamin C than other vitamins analysed in the fenugreek seeds.

**Table 1: Proximate composition analysis of fenugreek (*Trigonella foenum-graecum* L.) seeds extract**

Components	Percentage (%)
Moisture content	10.91±0.85
Ash content	2.99±0.48
Protein content	2.74±0.35
Fat content	6.33±0.52
Carbohydrate content	77.04±0.63

The values are expressed as Mean±SD of three determinations.

**Table 2: Vitamin analysis of fenugreek seeds**

Vitamins	Concentration (mg/g)
Vitamin B1	0.1137
Vitamin B2	0.0366
Vitamin B6	0.0495
Vitamin B12	0.8710
Vitamin C	10.5400
Folic acid	0.0386

The analysis of the proximate composition gives the basic chemical composition of the fenugreek seeds. The components include moisture, ash, crude protein, crude fat and carbohydrates. These components are essential for the

assessment of the nutritive quality of food being analysed (Adeolu and Enesi, 2013). The moisture content of the fenugreek seeds were comparatively similar to those reported by Mullaicharam *et al.*, (2013); Krishan *et al.*, (2013); Snehlata *et al.*, (2012); and Naidu *et al.*, (2011). Moisture of fresh processed foods gives an indication of its freshness and shelf life and thus high moisture content increase microbial spoilage, deterioration and short shelf life (Tressier *et al.*, 1980). The ash content was also similar to results obtained from previous studies (Mullaicharam *et al.*, 2013). Determination of ash content in food samples has no nutritional significance per se, but the value for ash is a useful check in summing up the proximate composition of food and a measure of its mineral content (Prapasiri *et al.*, 2011).

The protein content of the fenugreek seeds was significantly lower than those reported by Tori (2011); Mullaicharam *et al.*, (2013); and Isikili *et al.*, (2005), where they reported higher proportion of protein ranging from 20 to 30% as well as the presence of the amino acid 4-hydroxy isoleucine. These differences may be due to climatic condition, temperature, type of vegetation, rainfall or type of cultivation practice of the plant. However, the values of protein obtained from the present study were similar to those reported by Mathur and Choudhry (2009); and Naidu *et al.*, (2011). Protein is an essential component of diet needed for survival of animals and human beings; their basic function is to supply the adequate amount of required amino acids. Protein deficient diet causes growth retardation, muscle wasting, oedema, abnormal swelling of belly etc. (Mounts, 2000).

Crude fat determines the free fatty lipids of a product and is used as basis for determining processing temperature as well as autoxidation which can lead to rancidity. The result of the crude fat obtained from this study compares favourably with the works of Singh *et al.*, (2015); and Naidu, (2011). Low fat content in foods enhance storage life due to reduced chance of lipid peroxidation, however, it may not be a good source of fat soluble vitamins nor contribute much to energy content. High carbohydrate content (table 1) was obtained from the fenugreek seeds used for this study and can be a good source of energy.

The fenugreek seeds sample contained vitamins B<sub>1</sub>, B<sub>2</sub>, B<sub>6</sub>, B<sub>12</sub> folic acid, and vitamin C (table 2). Absence of vitamins in the body leads to characteristic deficiency states and diseases. Deficiency of a single vitamin of the B complex is rare, since poor diets are most often associated with multiple deficiency states. The concentrations of vitamins obtained from this study imply that the sample is a good source of such vitamins. Sharma (2012) and Murlidhar and Goswami (2012) reported the presence of vitamins but at a lower concentration than that obtained from this study. These differences may reflect the variation in environmental factors such as soil type, temperature and rainfall and the time of collection of seeds as well as varieties of seeds. This study detected the presence of vitamin B<sub>12</sub> but it is normally obtained from foods derived from animal sources. Hydrochloric acid in the stomach releases the vitamin from proteins that contain it. Vitamin B<sub>12</sub>, folic acid and methionine are essential for the metabolism of all rapidly dividing cells particularly those of the bone marrow and nervous system (Teal and Sagers, 1997).

Mammalian tissues are able to metabolize many of the B-group vitamins, and incorporate them into the structure of important coenzymes or prosthetic groups that are bound to protein apoenzymes. These can take an active part in the mechanism of enzyme catalysis, often acting as donors or acceptors of specific chemic group. Based on this study, fenugreek seeds contain vitamin C (10.54mg/g). Boiling in water or streaming and frying the fenugreek lose 10.8% of the vitamin C content (Murlidhar and Goswami, 2012).

## CONCLUSION

The result of this study suggested that the aqueous extract of fenugreek (*Trigonella foenum-graecum* L.) contains bioactive constituents that may be beneficial as a spice in food and management of diseases. This supports the traditional use of the plant as food supplement and in the management of diseases. Data generated from this study could form a baseline in which other studies could be built upon that can facilitate the integration of fenugreek seeds into modern medical practice.

## REFERENCES

- [1] Adeolu, A.T and Enesi, D.O (2013). *International Research Journal of plant science* 4(7); 192-197.
- [2] AOAC. Official methods of analysis. Horwitz, W. (ed.) *Association of Official Analytical Chemists International*, Vol. 2 No. 44, 16th Edition. Washington, DC 22-33.

- [3] Blank, I. (1996). *The flavor principle of fenugreek*. Nestle research center. 211<sup>th</sup> ACS Symposium. New Orleans, pp24-28.
- [4] *Codex Alimentarius Commission (2001)*. Codex Standard 12, Revised Codex Standard for vitamins, Standards and Standard Methods 11th edition.
- [5] Dash, B.K; Sultana, S; Sultana, N. (2011). *Life Sciences and Medicine Research*. 27: 2- 8.
- [6] Flammang, A.M., Cifone, M.A., Erexson, G.L., Stankowshi, L.F. (2004). *Food and Chemical Toxicology*, 42: 1769-1775.
- [7] Helambe, S. S. and Dande, R.P. (2012). *Journal of Current pharmaceutical Review and Research*, 2(4): 169-187.
- [8] Isikili, N.D. and Karababa, E. (2005). *J Food Eng*, 69: 185-190.
- [9] Krishan P.S, Beena, Prem C; and Naidu A.K. (2013). *Journal of medicinal plant research*. 7(141), 3052-3058.
- [10] Kumar, P., Kale, R.K., Mclean, P. and Baquer, N.Z. (2012). *Prague Med Rep* 113: 33-43.
- [11] Mathur, P. and Choudhry, M. (2009). *J Hum Ecol* 25: 9-12.
- [12] Meera, S, Patel K, and Patel M. (2011) *International Journal of Research in Pharmaceutical and Biomedical Science*, 2(3):1085-1089.
- [13] Mohammed O.A. and Azab E, A (2014) *Cell biology*, 2(2): 34 – 44.
- [14] Mounts TL (2000). *The chemistry of Components*, 2<sup>nd</sup> edition. Royal Society of Chemistry.
- [15] Mullaicharam, A.R., Geetali, D. and Uma Maheswari, R. (2013). *Research journal of pharmaceutical, biological and chemical sciences*. 4(1): 1304-1312.
- [16] Murlidhar, M. and Goswami, T.K. (2012). *J food process technol* 3(9): 1-9.
- [17] Naidu, M.M., Shyamala, B.N., Naik, J.P., Sulochanamma, G. and Srinivas, P (2011). *LWT-Food Sci and Technol*, 44: 451-456.
- [18] Nandini V, Niranjali DS, and Devaraj H (2007). *Molecular and Cellular Biochemistry*, 294: 145-153.
- [19] Nithya N, Madanagopal N, Russel, J.S, and Rob M.D (2014). *Nutritional Journal* 13(7).
- [20] Prapasri, P; Tee, E.S, Julia, K; Graham, C., Rafael, R.F and Kunchit J. (2011). ASEAN Manual of food analysis Regional centre of ASEAN Network of food Data System, institute of Nutrition, Mahidd University, Thailand.
- [21] Santh R.T, Saraswahy GR, Maheswarit, sunil, Nk, Hazarahia T, sowmya K, Dwarakanadha R.P, and Ramesh K. (2007) *Natural product radiance*, B91): 11-17.
- [22] Singh, K.G.; Colaco, M and Mosquith S. (2015). *Research Journal of Chemistry and Environment*, 19(1):16 - 21.
- [23] Snehlata, H.S., Payal, D.R. and Dande, R. (2012). *Int. J. Curr. Pharm. Res* 2(4): 169-187.
- [24] Syeda, B.B., Muhammad, I.B., Shahabuddin, M. (2008). Antioxidant activity Teal AR and Sagers. BA (1997) *Biochemical Basis of Diseases: Nutrition and disease*. The biochemical society chapter 2.
- [25] Tressier, D.K., van Arsdel WB, Copley MJ (1980). *The freezing preservation of foods*, 4<sup>th</sup> edition, vol 23, AVI Publishing Co. Westport, Conn.