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## Effect of processing on sensory and nutritional quality of fenugreek supplemented biscuits

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**Abstract**

The present study was conducted to develop sweet biscuits using processed fenugreek seed powder and to analyze sensory and nutritional profile of developed biscuits. The soaked seeds (8h) were germinated in sterile petri dishes lined with wet filter paper for 48 hrs at 37°C with frequent watering. Debittering of seeds was done by soaking them in milk:water (3:1) for 8 hrs., and both the combinations were used in last treatment i.e. debittering followed by germination. Sweet biscuits were developed using 5 and 10 per cent powder of seed belong to all three treatments. Developed biscuits were found acceptable and were adjudged between 'liked moderately' to 'liked very much' by panelist. The crude fiber, crude protein and ash content of biscuits prepared using 5 and 10 per cent of each debittered, germinated and debittered followed by germinated seed powder increased significantly ( $P < 0.05$ ) as compared control biscuits. It was concluded that biscuits of higher nutritional value with additional medicinal benefits can be developed using processed fenugreek seed powder without compromising its sensory attributes.

**Keywords:** Biscuits, fenugreek, germination, debittering, sensory, nutritional, processing

**Introduction**

Over centuries, fenugreek seeds have been used to cure a wide range of human ailments. Animal studies have clearly demonstrated the cholesterol lowering and hypoglycemic effects of fenugreek seeds. The mature seeds of it are pale yellow in colour, have maple flavor and bitter in taste and have been used as culinary and medicinal purpose worldwide since ancient times. Though it belongs to the legumes however has been used extensively as a condiment. Fenugreek seeds serve as a preservative and are added to pickles, chutneys and other similar products. It is also used as seasoning in Indian culinary.

The seeds are packed with an excellent amounts of protein (25.41%), fiber (30%), fat (5.72%), ash (2.93%), available lysine (5.7 g/16 g N), the limiting amino acid in commonly consumed cereals, calcium (135 mg), iron (8.47 mg), zinc (3.80 mg), essential fatty acids such as linoleic acid (2051mg) and linolenic acid (1082 mg) (Longvah *et al.* 2017) [11].

Fenugreek has received recognition for its nutritional and medicinal properties however its bitter taste (due to presence of saponins and fixed and volatile bitter oils) and presence of anti-nutrients restrict its acceptability in different foods. It has been possible to debitter fenugreek seeds by employing some processing techniques such as soaking (with water, acesulfame solution, sucrose solution, curd), autoclaving, germination and roasting in separation or in combination (Pandey & Awasthi 2015; Mabrouki *et al.* 2015; Rajni *et al.* 2016; Manju *et al.* 2016; Chaubey *et al.* 2017; Atlaw *et al.*, 2018) [3, 5, 12, 14, 15, 17]. Conventional processing including soaking, dehulling, boiling, and pressure cooking as well as germination and fermentation reduce the levels of phytate, protease inhibitors, phenolics, condensed tannins, lectins, and saponins (Patterson *et al.* 2017) [16].

Using fenugreek seed as such in diet even after processing may not be acceptable due to its distinct bitter taste, therefore, it may be incorporated in the development of staple food products so that it may mask the bitter taste of fenugreek. In modern food practices, the seeds or the extracts have been used in the development of baked products such as biscuits, bread, muffins and in the development of traditional products such as *chapatti*, *dhokla*, *idli*, *laddoo* and *suhali*. (Srivastava *et al.* 2012; Pandey & Awasthi 2015; Chaubey *et al.* 2017; Lakshmi 2017; Bandyopadhyay *et al.* 2019) [4, 5, 10, 15, 19]. Keeping in view, the nutritional and medicinal properties of fenugreek seeds, this investigation was undertaken to reduce the bitterness of seed and its utilization in biscuit preparation.

## Materials and methods

The seed samples of fenugreek (Hisar Suvarna) and wheat (WH- 1127) were procured from Department of Genetics and Plant Breeding, Chaudhary Charan Singh Haryana Agricultural University, Hisar. In treatment-I, cleaned fenugreek seeds were soaked in lukewarm distilled water for 8 hrs and germinated in sterile petri dishes lined with wet filter paper for 48 hrs at 37°C with frequent watering. In treatment-2, seeds were soaked in milk:water (3:1) for 8 hours to debitter. In treatment-3, seeds were soaked in milk:water (3:1) for 8 hours to debitter and then germinated in sterile petri dishes lined with wet filter paper for 48 hrs at 37°C with frequent watering. The sprouted, debittered and debittered followed by sprouting seeds were rinsed in distilled water and dried at 50-55°C till no further reduction in moisture content. All three types of dried and processed seeds were ground to get fine powder which was passed through 60 mesh sieve and stored in low density polyethylene (LDPE) bags till its further use in product development.

Fenugreek supplemented value added biscuits were prepared by substituting 5 and 10 per cent of germinated, debittered and debittered followed by germinated fenugreek seed powder with control formulation. Control biscuits were developed using whole wheat flour (100%). Biscuits developed using debittered, germinated and debittered followed by germinated fenugreek seed powder and wheat flour (control) were subjected to sensory evaluation with respect to color, appearance, aroma, texture, taste and overall acceptability by a panel of 25 semi trained judges, using 9 point hedonic scale.

Moisture, crude protein, crude fat, crude fiber and ash content of developed biscuits was determined by using method of AOAC (2010) [2]. Statistical analysis: The data obtained were subjected to statistical analysis for analysis of variance in a complete randomized design by OPSTAT software developed by Sheoran and Pannu (1999) [18].



**Plate I:** Biscuits prepared using wheat flour (control), germinated fenugreek seed powder @5% (GFSP-I) @10% (GFSP-II), debittered fenugreek seed powder @ 5%(DFSP-I) @10% (DFSP-II) and debittered and germinated fenugreek seed powder @ 5% (DGFSP-I) @10% (DGFSP-II)

## Results and discussion

Mean scores of taste and aroma of control biscuits were 8.86 and 8.49, respectively and were adjudged as 'liked very much' by the judges. Mean scores of taste and aroma of GFSP-I & II, DFSP-I & II and DGFSP-I & II biscuits varied from 7.00 to 7.49 and adjudged as 'liked moderately' by the judges. Mean scores of overall acceptability of GFSP-I & II, DFSP-I & II and DGFSP-I & II biscuits varied from 7.07 to 7.40, which were highest for the DFSP-I biscuits and lowest for GFSP-II biscuits. Mean scores of aroma, taste and overall acceptability of processed fenugreek supplemented biscuits decreased significantly however, all the supplemented biscuits

were acceptable by the judges and adjudged as 'liked moderately'. Results of present study are in close agreement with those of earlier workers who also incorporated processed fenugreek seed powder upto 10 per cent in the development of biscuits (Hooda & Jood, 2005; Ibrahim & Hegazy 2009; Hussein *et al.* 2011; Mahmoud *et al.* 2012; Agrawal & Syed 2017; Lalit & Kochhar, 2018) [6, 7, 8, 13, 1, 9]. Lakshmi (2017) [10] revealed that *kozhukattai* prepared with 25 per cent of fried fenugreek seed powder were found acceptable. Ibrahim & Hegazy (2009) [8] revealed that replacement of wheat flour by 15 or 20 per cent fenugreek seed flour significantly impaired the taste of biscuits due to the bitter taste of fenugreek.

**Table 1:** Mean scores of sensory characteristics of biscuits

Products	Colour	Appearance	Aroma	Texture	Taste	Overall acceptability
Control	8.71±0.17	8.71±0.09	8.86±0.12	8.89±0.20	8.49±0.12	8.73±0.17
GFSP-I	7.24±0.14	7.14±0.10	7.17±0.12	7.17±0.22	7.20±0.34	7.18±0.47
GFSP-II	7.11±0.11	7.10±0.14	7.15±0.15	7.09±0.18	7.00±0.22	7.07±0.48
DFSP-I	7.34±0.09	7.26±0.12	7.16±0.22	7.77±0.23	7.49±0.30	7.40±0.41
DFSP-II	7.20±0.13	7.15±0.08	7.08±0.12	7.57±0.12	7.29±0.23	7.26±0.38
DGFSP-I	7.33±0.12	7.20±0.14	7.17±0.12	7.15±0.13	7.22±0.33	7.21±0.47
DGFSP-II	7.18±0.16	7.12±0.13	7.15±0.11	7.09±0.20	7.15±0.31	7.13±0.38
CD ( $P \leq 0.05$ )	0.14	0.12	0.11	0.18	0.26	0.36

Values are mean ± SE of ten observations

GFSP: Germinated fenugreek seed powder; DFSP: Debitter fenugreek seed powder

DGFSP: Debittered and germinated fenugreek seed powder; I = (@ 5%); II = (@ 10%)

Results showed that the GFSP-I biscuits contained maximum contents of moisture, crude fiber and ash, whereas the contents of crude protein and crude fat were found maximum

in DFSP-I biscuits. Biscuits developed using germinated, debittered and debittered and germinated fenugreek seed powder had significantly higher ( $P \leq 0.05$ ) contents of

moisture, crude protein, crude fiber and ash than that of control biscuits. The higher crude fiber and ash contents in GFSP-I products may be due to higher contents of crude fiber and ash in germinated fenugreek seeds. The slightly higher contents of crude protein and crude fat in DFSP-I might be because during processing seeds were soaked in milk which was absorbed completely. Chaubey *et al.* (2017) [5] also observed higher protein in debittered and germinated fenugreek seed flour supplemented bread than bread prepared only using germinated fenugreek seed flour at 10 per cent level of incorporation.

A similar increase in the crude protein, moisture, crude fiber and ash in the biscuits, bread, cookies and muffins developed using 5-10 per cent of processed fenugreek seed powder was also reported by Ibrahim & Hegazy (2009) [8], Hussein *et al.* (2011) [7], Mahmoud *et al.* (2012) [13], Srivastava *et al.* (2012) [19], Chaubey *et al.* (2017) [5], Agrawal & Syed (2017) [1] and Bandyopadhyay *et al.* (2019) [4].

**Table 2:** Proximate composition of processed fenugreek seed powder supplemented biscuits (% , on dry weight basis)

Types of flour	Moisture*	Crude protein	Crude fat	Crude fiber	Ash
Control	3.12±0.02	6.55±0.21	28.25±0.13	1.20±0.03	1.04±0.02
GFSP-I	3.61±0.02	7.11±0.19	28.31±0.04	2.68±0.06	1.86±0.10
GFSP-II	4.14±0.09	7.65±0.09	28.39±0.09	4.15±0.03	2.60±0.06
DFSP-I	3.48±0.03	7.73±0.10	28.94±0.08	2.50±0.07	1.45±0.05
DFSP-II	3.81±0.06	8.92±0.09	29.62±0.03	3.82±0.06	1.90±0.03
DGFSP-I	3.54±0.01	7.41±0.15	28.66±0.20	2.59±0.13	1.63±0.09
DGFSP-II	3.97±0.06	8.29±0.03	29.07±0.06	4.02±0.03	2.25±0.03
CD (P<0.05)	0.12	0.55	0.46	0.21	0.18

Values are mean ± SE of three independent determinations; \*Fresh weight basis

GFSP: Germinated fenugreek seed powder; DFSP: Debitter fenugreek seed powder; DGFSP: Debittered and germinated fenugreek seed powder; I = (@ 5% II = (@ 10%)

## Conclusion

It may be concluded that incorporation of fenugreek seed powder yielded from debittered, germinated and combination of both the treatment did not affect the sensory attributes of biscuits much rather has enhanced the nutritional profile. Soaking of fenugreek seeds in milk for 8 hours had reduced the bitterness significantly. The processed fenugreek seeds @ 10 per cent level may be used successfully in the development of food products however it may not be acceptable beyond this level as it impart quite bitter taste in products. The consumption of such functional foods having medicinal value along with nutritional benefits may improve the overall health status of healthy as well as people suffering from degenerative diseases.

## References

- Agrawal R, Syed H. Quality evaluation of cookies supplemented with germinated fenugreek seed flour. *J. Life Sci.* 2017; 12(1):125-128.
- AOAC. Official methods of analysis. Association of official analytical chemist. 2010. Washington, D.C.
- Atlaw TK, Kumar JY Satheesh N. Effect of germination on nutritional composition and functional properties of fenugreek (*Trigonella foenum-graecum* Linn.) seed flour. *Int. J. Nutr. Fd. Sci.* 2018; 7(3):110.
- Bandyopadhyay K, Ganguly S, Chakraborty C, Roychowdhury R. A relative study on utilisation of

fenugreek seeds for enhancement of the antioxidant activities in various baked products *Int. J. Agri.& Environ. Sci.* 2019; 1:67-70.

- Chaubey PS, Somani G, Kanchan D, Sathaye S, Varakumar S, Singhal RS. Evaluation of debittered and germinated fenugreek (*Trigonella foenum graecum* L.) seed flour on the chemical characteristics, biological activities, and sensory profile of fortified bread. *J. Fd. Processing Preservation.* 2017; 42:18-21.
- Hooda S, Jood S. Organoleptic and nutritional evaluation of wheat biscuits supplemented with untreated and treated fenugreek flour. *J. Fd Chem.* 2005; 90:427-435.
- Hussein AMS, El-Azeem ASA, Hegazy AM, Abeer AA, Gamal H. Physiochemical, sensory and nutritional properties of corn-fenugreek flour composite biscuits. *Australian J. Basic and Applied Sci.* 2011; 5(4):84-95.
- Ibrahim MI, Hegazy AI. Iron bioavailability of wheat biscuit supplemented by fenugreek seed flour. *World J. Agricultural Sci.* 2009; 5(6):769-776.
- Lalit, Kochhar A. Development and organoleptic evaluation of bread formulated by using wheat flour, barley flour and germinated fenugreek seed powder for diabetics. *Chemical Sci. Review and Letters.* 2018; 6(23):1728-1734.
- Laxmi P, Veenu S. Nutritional composition of value added cake developed from newly released wheat varieties: a comparative study. *J. Agri. Bio. Research.* 2016; 21(1):79-82.
- Longvah T, Anantan I, Bhaskarachary K, Venkaiah K. Indian food composition tables. National Institute of Nutrition, Hyderabad, Indian Council of Medical Research, 2017.
- Mabrouki S, Omri B, Abdouli H, Tayachi L. Chemical, functional and nutritional characteristics of raw, autoclaved, and germinated fenugreek seeds. *J. of New Sci.* 2015; 16:541-551.
- Mahmoud Y, Nabila, Salem RH, Mater AA. Nutritional and biological assessment of wheat biscuits supplemented by fenugreek plant to improve diet of anaemic rats. *Academic J. Nutr.* 2012; 1(1):01-09.
- Manju, Parveen, Khatkhar BS. Effect of Germination and Roasting on Nutritive Composition and Anti-Nutrients in Fenugreek Seeds. *Int. J. Sci. Technol. Eng.* 2016; 3:31-35.
- Pandey H, Awasthi P. Effect of processing techniques on nutritional composition and antioxidant activity of fenugreek (*Trigonella foenum-graecum*) seed flour. *J. fd sci. techn.* 2015; 52(2): 1054-1060.
- Patterson CA, Curran J, Der T. Effect of processing on antinutrients compounds in pulses. *J. Cereal Chemistry.* 2016; 94(1): 2-10.
- Rajni, Giridhar K, Kumari A, Sarada C, Naidu L. Identification of potential genotypes of fenugreek in rainfed vertisols for yield and diosgenin content. *Indian J. Agricultural Res.* 2016; 50(4): 311-317.
- Sheoran OP, Pannu RS. Statistical package for agricultural researchers. "O.P. State" College of Agricultural, CCSHAU, Hisar, 1999.
- Srivastava D, Jyotsna R, Mahadevamma R, Naidu M. Effect of fenugreek seed husk on the rheology and quality characteristics of muffins. *Fd and Nutr. Sci.* 2012; 3:1473-1479.