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Comparison of raw and fermented fenugreek seed powders to study any changes in nutrition content

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Abstract
The present study was carried out to compare the physical parameters and proximate composition of raw fenugreek seed and fermented fenugreek seed powders to study the changes in nutrition content, if any. Samples of fenugreek seeds were collected from local shops of kalapet, Pondicherry. Raw fenugreek seeds were considered as the control sample and the comparison was done with that of fermented fenugreek seeds. *Idli* batter of composition containing 4 portions of *idli* rice and 1 portion of *urad dhal* by weight served as the medium of fermentation. Sample analysis was done using standard AOAC methods for proximate composition such as total carbohydrate, total fat, moisture, crude fiber and ash; physical parameters such as bulk density, tapped density, solubility, water holding capacity, oil holding capacity, color measurement, water activity, swelling index. The findings showed that there is no significant difference between raw fenugreek seeds and fermented fenugreek seeds and fermentation has a very minute effect on physical and proximate composition of fenugreek seeds.

Keywords: Fenugreek seeds, fermentation, Idli, proximate composition

Introduction
Fenugreek, an annual plant of the family Fabaceae is one of the oldest known medicinal plants (Farnsworth, 1966). Based on the variety, it has compound pinnate, trifoliate leaves, axillary white to yellow flowers, and 3-15 cm long thin pointed hoop- like beaked pods. Each pod contains 10-20 oblong greenish-brown seeds with unique hooplike groves (Srinivasan, 2006).
It is cultivated worldwide as a semi-arid crop. India is the major fenugreek exporting country, followed by France, Egypt and Argentina. Its seeds and leaves are common ingredients in dishes from south and central Asia. Fenugreek seeds are commonly used in India and in oriental countries as a spice in various food preparations because of its strong flavor and aroma. The seeds are reported to have restorative and nutritive properties and to stimulate digestive processes (Khosla *et al*., 1995) [6]. Moreover, it is also known to possess a number of medicinal properties (S.N. Acharya & J.E. Thomas & S.K. Basu *et al*., 2006) [3].
As fenugreek is known for its medicinal benefits, the chemical composition of fenugreek seeds were studied, analyzed and hence it was found out that the medicinal benefits of fenugreek seeds were closely associated with its phytochemicals such as galactomannans, phenolic compounds, alkaloids, proteins, vitamins (A, B1, C and nicotinic acid) and volatile oils (Acharya *et al*., 2008).
Fenugreek is mostly used as traditional food, functional food and nutraceuticals which provides natural fibre and other nutrients required for the body (CO Olaiya, KO Soetan - Am. J Soc. *et al*., 2014).
Besides the non-medicinal properties of fenugreek such as carminative, gastric stimulant, antidiabetic and galactagogue (lactation inducer) effects, it also has been identified to provide hypocholesterolemic, antilipidemic, antioxidant, hepatoprotective, anti-inflammatory, antibacterial, antifungal, antiulcer, and anti lithogenic, anticarcinogenic and other miscellaneous effects (Umesh C.S. Yadav & Najma Z. Baquer *et al*., 2013).

Material and Methods
Sample selection
Fenugreek seeds of good quality, idli rice and decorticated black gram dhal were procured from local shops of Kalapet, Pondicherry.

Preparation of fermentation media
Idli rice and urad dhal in the ratio of 4:1 by weight were taken, carefully washed and soaked

separately for 4 hours. After draining the water, idli rice and urad dhal were separately grounded such as fine grinding for urad dhal and coarse grinding for rice for 8 minutes. Water was added as and when necessary. 2% of Nacl (salt) of total weight of raw material was added to the ground batter.

Addition of fenugreek seeds and fermentation of the batter: 500g of raw fenugreek seeds were added to the batter and the batter was kept for fermentation for a period of 14 hrs. in a stainless steel vessel. The fermentation was allowed to happen in room temperature.

Preparation of fermented fenugreek seed powder

The fermented batter was dispensed in special idli pans and allowed to steam for 10 minutes. After steaming the *idli*, allow it to cool for some time and then pick out the fenugreek seeds and lightly wipe it with tissue paper. These fenugreek seeds are kept for tray drying at 60°C overnight. And these tray dried Fenugreek seeds are finally ground into powder and finely sieved. This Fenugreek seed powder was stored in airtight container such that it cannot pick up the moisture until the nutrient analysis was carried out.

Preparation of raw fenugreek seed powder

The raw fenugreek seeds were kept for tray drying at 60°C overnight, ground into powder and finely sieved and stored in airtight container such that it cannot pick up the moisture until the nutrient analysis was carried out.

Sample analysis

The grounded fermented fenugreek seed powder and raw fenugreek seed powder were subjected to physicochemical characterization. The proximate analyses such as moisture, carbohydrates, fat, crude fiber and ash; the physical parameters such as bulk density, tapped density, solubility, water holding capacity, oil holding capacity and color were carried out in triplicates and mean, standard deviation values were reported. All the analyses were estimated using the standard methods of AOAC.

Moisture content was determined according to Oven method (AOAC, 1969). Total Carbohydrate content was estimated by Anthrone method (AOAC, 1990). Fat content was determined using Soxhlet method (AOAC, 1990). Crude Fiber was determined by using alkali method. Ash content was estimated by using Muffle furnace.

Bulk Density was determined according to the method of Onuma-Okezie and Bello, (1998). Solubility was determined according to the method of Dakia *et al*., (2008). Water holding Capacity and Oil Holding Capacity was determined according to the method described by Galla and Dubasi (2010). Color measurement was done using a Hunter Lab COLOR Flex EZ 45/0 color spectrophotometer, USA.

Results and Discussion

The proximate composition and physical parameters were mentioned in Table 1 and Table 2.

Table 1: Proximate composition of raw and fermented fenugreek seed powders

Sl. No.	Parameters	Raw fenugreek seed powder	Fermented fenugreek seed powder
1.	Moisture content (% d.b.)	12.25 ± 0.07	12.09 ± 0.10
2.	Total ash (%)	3.51 ± 0.017	3.5 ± 0.05
3.	Total carbohydrate (%)	90.3 ± 5.44	90.6 ± 5.02
4.	Crude fiber (%)	0.137 ± 0.015	0.32 ± 0.11
5.	Total fat (%)	7.63 ± 0.20	2.62 ± 0.14

Values are mean ± standard deviation (n = 3).

Table 2: Physical parameters of raw and fermented fenugreek seed powders

Sl. No.	Parameters	Raw fenugreek seed powder		Fermented fenugreek seed powder	
1.	Bulk density (g/ml)	5.73 ± 0.05		4.66 ± 0.23	
2.	Tapped density (g/ml)	3.76 ± 0.11		3.16 ± 0.05	
3.	Solubility (%)	72.51 ± 5.26		70.50 ± 2.53	
4.	Water holding capacity (g/100g)	8.18 ± 0.68		6.22 ± 1.90	
5.	Oil holding capacity (g/100g)	1.12 ± 0.002		1.12 ± 0.005	
6.	Color measurement	Hue	Chroma	Hue	Chroma
		4.89 ± 0.08	35.26 ± 0.1	5.59 ± 0.25	25.58 ± 0.43
7.	Water activity	0.68 ± 0.007		0.66 ± 0.01	

Values are mean ± standard deviation (n = 3).

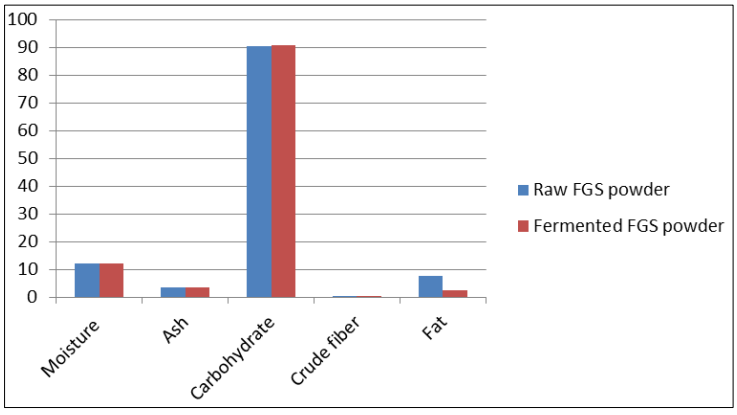

Fig 1: Proximates of raw and fermented fenugreek seed powders

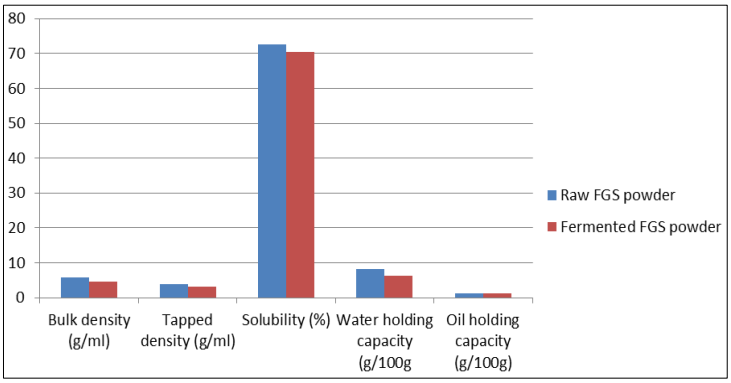

Fig 2: Physical parameters of raw and fermented fenugreek seed powders

Results revealed that the raw fenugreek seed powder contain 12.25% d.b. moisture content, 3.51% ash content, 90.3g of carbohydrate, 0.137g of crude fiber and 7.63g of total fat content whereas the fermented fenugreek seed powder contain 12.09% moisture content, 3.5% total Ash, 90.6g of carbohydrate, 0.13g of crude fiber and 2.62g of total fat. These results revealed that except fat content all the other proximate composition was same for raw and fermented fenugreek seeds.

Results revealed that raw fenugreek seed powder contain bulk density of 5.73 g/ml, tapped density of 3.76 g/ml, 72.5% solubility, water holding capacity of 8.18 g/100g and oil holding capacity of 1.12 g/100g; whereas fermented fenugreek seed powder contain bulk density of 4.66 g/ml, tapped density of 3.16 g/ml, 70.5% solubility, water holding capacity of 6.22 g/100g and oil holding capacity of 1.12 g/100g.

Conclusion

The result obtained from the present study concluded that there is no significant difference between raw and fermented fenugreek seed powders except a change in fat content. Fermented fenugreek seed powder has shown a decrease in fat content in comparison with raw fenugreek seed powder.

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