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Organoleptic properties and the utilization raw and germinated fenugreek seed pickle

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Abstract
The present study was conducted to study Preparation, Processing and Nutritional Attributes of Raw and Germinated Fenugreek Seed Pickles. Energy value of raw fenugreek seed pickle ranged from 333 to 603 Kcal per 100 g. protein content of pickle ranged 26.20 to 26.50 g, carbohydrate from 44 to 47 g, fat 5.8 to 35.8 g, fibre 7.20 to 7.71g, total ash 3.00 to 3.09 g. Calcium and iron contents in different pickles ranged from 160 to 181 mg and 6.50 to 6.58 mg per 100 g. The nutritional composition of all the pickles varied significantly except protein, total ash and iron contents. The energy, protein, carbohydrate, fat, fibre, total ash, calcium and iron contents of the germinated pickles ranged from 312 to 575 Kcal, 32.34 to 32.64 g, 35 to 38 g, 4.73 to 34.73 g, 15.00 to 15.51 g, 6.32 to 6.41 g, 160.20 to 181.20 mg and 6.40 to 6.48, respectively. The energy, carbohydrate, crude fat and calcium were found to be significant whereas, protein, fibre, total ash and iron were non-significant.

Keywords: Fenugreek seeds, raw, germinated, treatments, nutritional value, organoleptic properties

Introduction
Fenugreek (*Trigonella foenum-graecum*) is an annual plant in the family *Fabaceae*, with leaves consisting of three small obviate to oblong leaflets. It is cultivated worldwide as a semiarid crop. Its seeds and leaves are common ingredients in dishes from South and Central Asia, namely Iran and Afghanistan. It is widely cultivated in warm temperate and tropical regions in the Mediterranean, Europe, and Asia. It is largely cultivated in Argentina, Egypt, Brazil, Southern France, Morocco, Algeria, Ethiopia and Lebanon besides India (Spice India, 2012) [6].

Over 80 per cent of the world's production of this seed is contributed by India, one of the major producer and exporter of fenugreek in the world (Hooda and Jood, 2002) [2].

Its seeds contain 25.2 to 30.1 per cent protein, 7.2 to 9.3 per cent lipids, 20.1 to 25.3 per cent insoluble fibre, 20.4 to 30.2 per cent galactomannan and 5.3 to 7.3 per cent saponins along with ample amounts of volatile oils, free amino acids, mucilaginous fibre and flavonoids (Raju and Bird, 2006) [5].

It is used as a herb (dried or fresh leaves), spice (seeds), and vegetable (fresh leaves, sprouts, and microgreens). Sotolon is the chemical responsible for fenugreek's distinctive sweet smell. Both whole and powdered forms are used in the preparation of pickles, vegetable dishes, dal, and spice mixes such as *panch phoron* and *sambar* powder. They are often roasted to reduce bitterness and enhance flavor (BBC 2017) [1].

Raw fenugreek seeds have maple flavor and bitter taste but by the process of germination and roasting, their bitterness can be reduced and flavor can be enhanced. Dried seeds are used as condiments (Murlidhar and Goswami, 2012) [4].

Diosgenin content of fenugreek helps in lessening certain effects of menopause, such as hot flashes or mood swing. Its seeds have been used since long time in treating certain reproductive and hormonal disorders, facilitate breast enlargement and reduce the problem of menstrual pain. People suffering from sour throat or acid reflux experience relief by taking fenugreek. The use of fenugreek seeds is very useful in maintaining the level of both cholesterol and blood sugar. It is found to be effective in treating diabetes (Verma, 2014) [7]. The seeds of fenugreek have been used as an orally as insulin substitute for reduction in blood glucose, and the extract from seed lowered blood glucose level (Madar and Stark, 2002) [3].

Materials and method
Methodology is the systematic method or process dealing with identifying problem, collecting facts or data, analysing these data and reaching at certain conclusion either in the form of solution towards the problem concerned or certain generalization for some theoretical formulation. Moreover, research methodology describes the method used to collect the data

and analyses it by following research design, sampling techniques, measurement and instrumentation.

Study Area
The study was conducted in the laboratory of the Department of Food Science and Nutrition, Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya. The different tools and techniques used during experimental process were broadly described in this chapter.

Period of the study: The present study conducted during the period of 2018-2019 session in the whole work comprising period of January 2018 - June 2019.

Sampling research Design: Research design is a coherent plan in conducting research which deals with investigation so conceived to obtain sample to research. Research design is used to conduct research with objectively of accuracy. The research design followed in the present study.

Study sample: The present study carried out with the experimental Research Design. Phases are incorporated to finish the research work

Sampling Techniques: Sampling techniques was carried by according to objective wise.

- To prepare raw and germinated fenugreek seed pickle & its utilization
- To know nutritional profile of raw and germinated fenugreek seed pickle
- To evaluate developed product by using sensory characteristics

Preparation of raw and germinated fenugreek seed pickle: Fenugreek seeds, salt, pickle masala (containing fennel seeds, onion seeds, fenugreek seeds, cumin seeds, mustard seeds), lemon juice/vinegar/oil.

The flow chart describe the technique used for the development of raw and germinated fenugreek seed pickle.

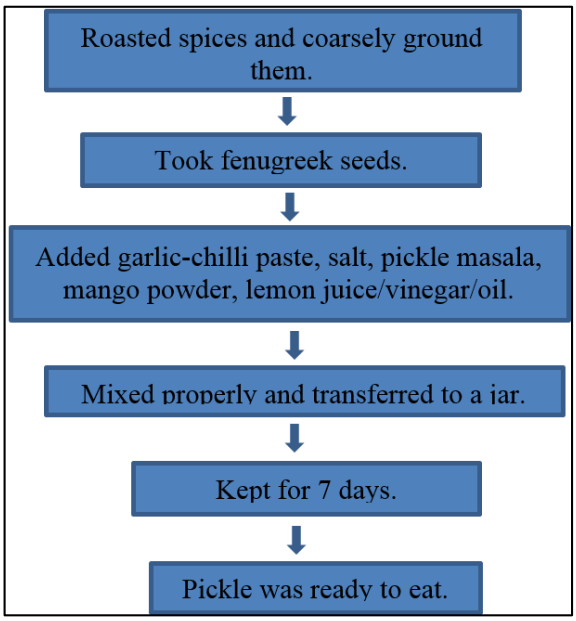

Fig 1: Processing of raw and germinated fenugreek seed pickle

Results and Discussion
The result and discussion chapter is divided into various parts for the result obtained in various stages.

- Nutritional composition of raw fenugreek seed pickle
- Nutritional composition of germinated fenugreek seed pickle

Nutritional Value
Nutritional Value of the developed raw and germinated fenugreek seed pickle are assessed i by food composition table for each nutritional parameters like: energy, protein carbohydrate, fat, crude fibre, total ash, calcium iron.

Table 1: Nutritional composition of raw fenugreek seed pickle

S. No.	Treatments	Energy (Kcal)	Protein (g)	CHO (g)	Fat (g)	Fibre (g)	Total Ash (g)	Calcium (mg)	Iron (mg)
1.	Pickle in Lemon Juice	350	26.50	47	6.07	7.71	3.09	181	6.58
2.	Pickle in Vinegar	333	26.20	44	5.8	7.20	3.00	160	6.50
3.	Pickle in Oil	603	26.20	44	35.8	7.20	3.00	160	6.50
C.D. (0.05)		20.27	NS	2.22	1.12	0.36	0.27	8.84	NS

Table 2: Sensory score of germinated fenugreek seed pickle

S. No.	Treatments	Colour	Appearance	Aroma	Texture	Taste	Overall acceptability
1.	Pickle in Lemon Juice	8.10	8.10	8.50	8.50	8.30	8.30
2.	Pickle in Vinegar	8.90	8.80	8.90	8.80	8.70	8.82
3.	Pickle in Oil	8.10	8.20	7.80	7.70	7.50	7.86
C.D. (0.05)		0.41	0.41	0.41	0.41	0.40	0.44

Utilization and recommendation of fenugreek seeds:
Fenugreek seeds are considered good for diabetic patients. Thus, to suggest ways to utilize fenugreek seed for pickle preparation raw and germinated seeds were utilized. Research revealed that consumption of 25 g fenugreek seeds per day are good for diabetic patients to control their glucose level.

Conclusion
Raw and germinated fenugreek seed pickle containing lemon juice and vinegar are most suitable for diabetic and others who want to restrict calories.

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