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Changes in quality attributes of germinated fenugreek seed flour on storage

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ABSTRACT : Germinated fenugreek seed flour was prepared and stored in glass and plastic bottles at ambient temperature for the period of 30 days. The developed flour was evaluated for changes during storage *i.e.* chemical and microbiological characteristics. Peroxide value, free fatty acid and microbiological changes were in the range of PFA prescription up to 30 days of storage. The results indicated that germinated fenugreek seed flour can be used up to 30 days without any change in its microbiological and chemical attributes. Developed flour may be used as a good supplement for type 2 diabetic subjects.

KEY WORDS: Germinated, Microbiological, Supplement, Free fatty acid, Peroxide value

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Storage is an important phase for qualitative characteristic preservation during a long period of time, by proper storage we can avoid, significant deteriorations that occur (Rupollo, 2003). Various factors determine the shelf-life of commodities such as inherent composition, environment of storage, method of processing and packaging material. Shelf stability involves the capability of the product as presented to the consumer, to remain in a desirably consumable form or ready to prepare during the period of time required for delivery to the consumer and sufficient time thereafter. In the case of grain products shelf stability rely chiefly on the suppression of enzymatic and oxidation reactions which may occur within the grain.

Generally, the spices are stored in very small scale by farmers/processors without processing. But the processed grains of spices turn rancid due to auto-oxidation and are easily infested by insects. Information on effect of storage on shelf-life of germinated fenugreek seed flour is scanty. Hence, it becomes imperative to study the effect of storage on keeping quality of fenugreek seed flour. Such information would help in promotion of germinated fenugreek seed flour utilization for therapeutic purposes. Therefore, an attempt was made in the present investigation to assess the shelf-life of germinated fenugreek seed flour.

Preparation of sample:

The cleaned fenugreek seeds were soaked in tap water at the ratio of 1:5 (w/v) at room temperature for 12 hr. The water was changed after 6 hr. The soaked seeds were tied in a muslin cloth for germination in the dark at ambient temperature for 24 hr till the length of the rootlets was about 1 cm. The germinated seeds were oven dried at 40^0 C in aluminum trays for 6 hr. Flour was prepared by grinding dried germinated fenugreek seeds in grinder. Flour was sieved with a metal sieve of 80 mesh size.

Storage:

Formulated fenugreek seed flour was stored in glass and plastic food grade containers for 30 days at ambient temperature. Samples were analyzed at the interval of 15 days for any change in its quality. During storage this flour was evaluated for changes in microbiological and chemical characteristics. Total viable count/ total bacterial count of developed flour was assessed according to the recommended method for microbiological examination of food published by American Public Health Association (Busta *et al*., 1984).

Table 1: Changes in chemical and microbiological characteristics of germinated fenugreek seed flour (GFSF) during storage

Period of storage (days)	Sample code	Moisture content (%)	Peroxide value (meq/100g)	Free fatty acid (mg/g fat)	Microbial load cfu/g	Yeast and mold cfu/g	Remarks
0 day	Glass, bottle	5.28 ± 0.40	0.21	0.10	3.26×10^1	0	Good
	Plastic, bottle	5.28 ± 0.40	0.21	0.10	4.00×10^1	0	Good
't' value		0.00	0.00	0.43	16		
15 days	Glass, bottle	5.31 ± 0.20	0.21	0.10	4.53×10^2	0	Good
	Plastic, bottle	5.56 ± 0.25	0.23	0.11	5.00×10^3	0	Good
't' value		1.73	0.65	1.0	0.95		
30 days	Glass, bottle	5.77 ± 0.17	0.22	0.11	1.70×10^4	0	Good
	Plastic, bottle	6.26 ± 0.17	0.24	0.12	2.36×10^4	0	Good
't' value		2.49	6.99	1.7	9.99		

Moisture, free fatty acid (FFA) and peroxide value of fenugreek seed flour was analyzed by AOAC (1995). All the determinations were done in triplicates and the results were expressed as mean value.

Statistical analysis:

't' test was used to make comparison between both the samples stored in glass and plastic bottles.

Data on moisture, peroxide value, FFA, total bacterial count and yeast and mold count of germinated fenugreek seed flour during 30 days of storage period are presented in Table 1.

It was found that moisture content increased from 5.28 per cent at 0 day of storage to 6.26 per cent at 30 days of storage in plastic bottle whereas in glass bottle moisture content increased from 5.28 per cent at 0 day of storage to 5.77 per cent at 30 days of storage. The moisture content of GFSF increased during storage in both plastic and glass bottles however, the moisture content in glass bottle was lesser than the moisture content of plastic bottle. No significant difference was found for moisture content of GFSF stored in plastic bottle and glass bottle after 30 days of storage (Table 1). Sharma (2011) reported increase in moisture content of germinated fenugreek seed flour from 8.54 per cent to 9.95 per cent in plastic bottle and 8.51 per cent 9.65 % in glass bottle after 45 days of storage. The primary products of lipid oxidation are hydro peroxides which are generally present as peroxides. Thus, it is necessary to determine peroxide value of food sample while conducting storage trial. The peroxide value of GFSF stored in glass bottle was 0.21meq/100g on 0 day which increased to 0.22meq/100g after 30 days. Whereas increase in peroxide value in GFSF stored in plastic bottle was 0.24 meq/100g after 30 days of storage from 0.21 meq/100g at 0 day (Table 1). Lower rate of increase in peroxide value was observed in both samples stored in glass bottle and plastic bottle. This might be attributed to lower lipid content of fenugreek seeds.

The changes in lipid during storage were recorded by determining free fatty acid values. The increase in free fatty acid value in GFSF stored in glass bottle was from 0.10 to 0.11 mg/g fat after 30 days whereas increase in plastic bottle was from 0.10 to 0.12 mg/g fat after 30 days of storage. Sulieman *et al*. (2008) reported 16.7 per cent free fatty acid in raw fenugreek seed oil in terms of oleic acid. Value obtained for free fatty acid content in present study is much lower than the value reported by Sulieman *et al*. (2008) in fenugreek seed oil. It was found that total viable count increased from 4.00×10^1 at 0 day of storage to 2.36×10^4 cfu /g at 30 days of storage in plastic bottle whereas in glass bottle total viable count increased from 3.26×10^1 at 0 day of storage to 1.70×10^4 at 30 days of storage. There was significant difference between the both samples at 30th day of storage for total viable count. In general, the total viable count for spices is reported as 1×10^5 cfu/g of the sample and the total viable count should not exceed more than this value as given by PFA standard (1956). Value above 10^6 cfu/g lie in the danger zone. In the present study the total viable count (cfu/g) in germinated fenugreek seed flour was found to be less than the specifications given by the Prevention of Food Adulteration Act (PFA) (1956). Sharma (2011) reported total bacterial count of 6.2×10^4 and 4.5×10^4 in plastic and glass containers after 45 days of storage. No growth of yeast and mould was observed in the germinated fenugreek seed flour till 30th days of storage.

Conclusion:

Germinated fenugreek seed flour developed has the potential of being locally produced and adaptable for household consumption. No remarkable change in moisture content, peroxide, free fatty acid and microbiological load were observed up to one month. They can be stored safely in ordinary packing up to one month. Thus, this flour could be of great help for type 2 diabetic subjects by serving as a good food supplement.

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