

Physico-chemical and sensory evaluation of fenugreek enriched salted biscuits

SANJEET KUMAR, AVANISH KUMAR, ATUL ANAND MISHRA, R.N. SHUKLA AND A.K. GAUTAM

Biscuit are convenient food products, becoming very popular among both rural and urban populations of India. Some of the reasons for such wide popularity are low cost among other processed foods. India is the second largest wheat producing nation after China in the world and contributes approximately 12 per cent to the world wheat production. The principle basis of most baked products that can be regarded, as snack food is wheat flour. The flour quality is defined as ability of flour to produce uniformly good product and it will be very misleading to define the product. This may be also because of good quality of one product may not be good quality of another baked product. Fenugreek seeds are rich in carbohydrates, and especially mucilaginous fibre. This soluble fibre is comprised of galactomannans, similar to properties in that of guar gum. Fenugreek also contains a rich variety of steroid saponins and flavonoids all of these substances are known to lower blood lipid levels. Fenugreek seeds also contain 4-hydroxyisoleucine, an unusual amino acid that initiates insulin release from the pancreas. The ability of fenugreek to improve glucose tolerance is further enhanced by its rich content of soluble fibre. Biscuit prepared from the blends containing different proportions (0%, 5%, 10%, 15% and 20%) of germinated fenugreek seed flour were evaluated for width, thickness, spread ratio and sensory characteristics. The thickness of fenugreek supplemented biscuits increased, whereas width and spread ratio of biscuits decreased with the increasing level of fenugreek flour. The sensory results showed that a maximum of 10 per cent fenugreek flour can be incorporated to prepare acceptable quality biscuits. Addition of germinated fenugreek flour to wheat flour increased the content of protein (10.5%, 10.4% and 11.0%) lysine (2.15, 2.20 and 2.25 g/100 g protein), dietary fibre (12.7%, 11.3% and 10.9%) total Ca (58.3, 57.1, 57.7 mg/100 g) and total iron (7.40, 7.26 and 7.36 mg/ 100g), respectively, at 10 per cent level of substitution. These biscuits can be safely stored in polypropylene bags upto 1 month without altering their organoleptic properties.

Key Words : Biscuit, Wheat, Fenugreek, Physical, Sensory, Nutritional analysis

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INTRODUCTION

A biscuit is a baked edible flour based product. It is

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small and hard, often sweetened, flour based product, most akin to a cookie. Wheat flour has been extensively and widely used for preparation of various products throughout world. This has been attributed to the property of wheat flour to form dough and retain gases. In view of this efforts have been made in improving the nutritional quality of wheat product by supplementation with staple cereal and pulses. Protein is an essential element for the formation of body muscles and plays important role in development of body. Fenugreek has a history of use as

a gastrointestinal remedy, as a mild laxative, for dyspepsia, and for the loss of appetite. Fenugreek is a very warming seed. It is used to treat constipation, high cholesterol, diabetes and obesity. Its smell is very pungent, and it is a nourishing seed. It is used to treat constipation, high cholesterol, diabetes and obesity. Its beneficial effect on the urinary system indicates its use in diabetes. It can help to clear some of the fatty deposits that accumulate in the channels that should be nourishing to the pancreas. It helps to balance sugar levels in both types 1 and 2 diabetes. Cholesterol its direct action on medovahasrotas makes it useful as part of a formula to reduce cholesterol. Digestion it is an invaluable remedy to treat sluggish and gaseous digestion. It can benefit diarrhoea and inflammation in the intestines. Its high mucilage content acts as a soothing demulcent that can heal ulcers and also increase the bulk of the stool; it is a useful mild laxative. Fenugreek seed has a particular affinity for the uterus and female reproductive system as a whole. Its saponin containing phyto-estrogen precursor, diosgenin, plays an important role in female health. It is taken post-partum to encourage bowel movements and clean the uterus. Its nourishing effect on rasa dhatu also helps to encourage a healthy flow of breast milk. Reproduction used in formulas to treat impotence, premature ejaculation and low libido. Its heating energetic stimulates the reproductive system, while its unctuousness and sweet nature nourish sukra dhatu. Pain as a superb remedy to settle vata it is indicated in lower back problems, sciatica and arthritis with swelling and pain. Its ability to strengthen asthi dhatu indicates its use in osteoporosis, back pain, structural weaknesses and hair loss. A poultice made from the powder is very useful for drawing infections, boils, splinters and arthritic swelling from the body. In addition, its use during pregnancy is discouraged. For diabetics who are insulin-dependent, a higher level of fenugreek is needed to significantly reduce fasting blood glucose levels, decrease urinary glucose levels, and decrease daily insulin requirements, as well as reduce LDL cholesterol and triglyceride levels. The cholesterol-lowering effect of fenugreek should be considered a valuable feature for the diabetic who usually has elevated blood lipids. Healthy individuals consuming 5g of fenugreek per day for 3 months did not experience any change either in their blood lipids or their fasting or post prandial blood sugar levels. However, the chronic ingestion of fenugreek for three weeks did produce an

improvement in blood glucose and insulin responses in healthy individuals. Recently it was observed that consumption of 12-18g of germinated fenugreek seed powder for 30 days resulted in a significant reduction in blood cholesterol and LDL cholesterol levels, but not HDL cholesterol levels, in 20 adults who had normal cholesterol levels initially. However, subjects with elevated blood cholesterol levels who consumed powdered fenugreek seeds experienced significant reductions of total and LDL cholesterol and triglyceride levels. While fenugreek is useful for lowering blood cholesterol levels, it does not appear to have any effect on blood clotting. Fenugreek seeds are rich in carbohydrates, and especially mucilaginous fibre. While no side effects have been reported, diabetic patients should be aware that fenugreek could interfere with other therapies that control blood sugar. Repeated external application of fenugreek may result in undesirable skin reactions; In addition, its use during pregnancy is discouraged. The beneficial effects were sustained over five to six months. With only 5g of fenugreek per day, fasting and post meal blood glucose levels were significantly reduced in those persons with diabetes. Today, fenugreek is used as a useful botanical aid in the treatment of persons with diabetes. Fenugreek seeds are rich in carbohydrates, and especially mucilaginous fiber. This soluble fiber is comprised of galactomannans, similar to properties in that of guar gum. Fenugreek also contains a rich variety of steroid saponins and flavonoids. All of these substances are known to lower blood lipid levels. Fenugreek seeds also contain 4-hydroxyisoleucine; an unusual amino acid that initiates insulin release from the pancreas. The ability of fenugreek to improve glucose tolerance is further enhanced by its rich content of soluble fiber. The enrichment of protein may be achieved through incorporation of protein rich non-wheat flours (Gandhi *et al.*, 2011; Patel and Rao, 1996. Singh and Chauhan, 1996) fenugreek seed flour has a great potential, due to its high and good quality protein (20-25%), lysine (5 -6%) soluble (20%) and insoluble dietary fibre, it also possesses hypercholesterolemic (Sharma, 1986) and hypoglycemic (Neeraja and Rajyalakshmi, 1996) properties. Hence, development and consumption of such therapeutic bakery products would help to raise the nutritional status of the population. The present investigation was carried out to determine physico-chemical and sensory characteristics

of fenugreek enriched salted biscuit and to check the shelf life of fenugreek enriched salted biscuit

METHODOLOGY

Raw materials :

Fresh good quality of wheat flour and fresh fenugreek was procured from the local market of Allahabad. Care was taken to ensure that the fenugreek was free from any spoilage and damage.

Treatments :

T₀ -Biscuit made by 100 per cent wheat flour

T₁ - 95 per cent wheat flour and 5 per cent Germinated fenugreek seed flour (95:5)

T₂ - 90 per cent wheat flour and 10 per cent Germinated fenugreek seed flour (90:10)

T₃ - 85 per cent wheat flour and 15 per cent Germinated fenugreek seed flour (85:15)

Method of preparation of fenugreek enriched salted biscuits :

The fenugreek powder at 5, 10, and 15 per cent was incorporated in the standardized treatment of biscuits with slight modification of standardized process. Sieve the refined wheat flour and fenugreek flour mix them according to treatment. Ghee was taken in clean steel vessels and was rubbed properly by table spoon up to cream like paste form. Salt powder and baking powder were added in mixed flour. Fenugreek added wheat flour was kneaded with cream layer of ghee mixture and water was added as per requirement to form soft dough. Flat sheet (0.4 cm) was prepared and cut into round shape of

diameter (cm) and placed on trays. Tray were kept in baking oven for 15 minute at temperature 200⁰ C and observed changes during baking by using iron rod and was kept for 20 minutes at room temperature for cooling and packed in low density polyethylene pack.

OBSERVATIONS AND ASSESSMENT

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Product standardization :

The product standardization was done by the panel of judges with the help of nine point Hedonic scale. The data were summarized in the following section. The three ratios of wheat flour and fenugreek flour were taken in which best one was selected for further studies. The ratio were taken as 100:0 (T₀), 95:5 (T₁), 90:10 (T₂), 90:15 (T₃) and time interval during storage was (0 day, 10 days, 20 days and 30 days). The sensory evaluation was done for general colour, taste, flavour, texture, and overall acceptability.

Physico-chemical analysis of fenugreek enriched salted Biscuit :

Weight, diameter, thickness and spread ratio of fenugreek enriched salted biscuit :

The diameter of biscuits made from 5, 10, and 15 per cent fenugreek flour was found significantly lower than that of control biscuit. The thickness of biscuit ranged from 0.6 cm to 0.73 cm. It increased with the incorporation of fenugreek flour. Increase in thickness

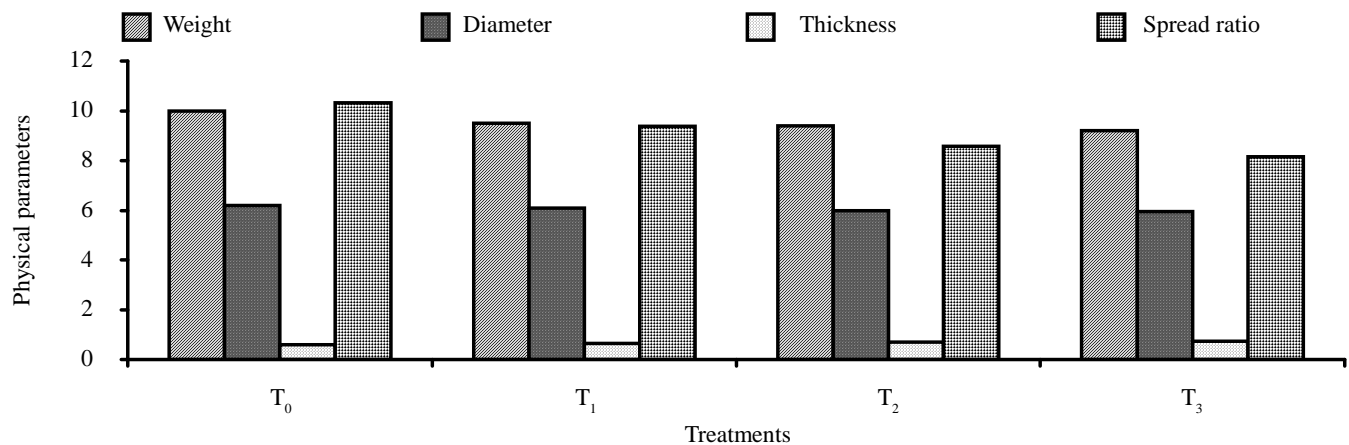


Fig. 1 : Weight (g) diameter (cm), Thickness (cm) and spread ratio of fenugreek enriched salted biscuit

may be due to the decrease in diameter. The changes in diameter and thickness were reflected in spread ratio.

Other research workers also reported reduction in spread ratio when oat bran, soy flour and black gram flour were substituted for wheat flour (Chen *et al.*, 1998; Sharma and Chauhan, 2002; Singh and Chauhan, 1996). Reduced spread ratio of fenugreek enriched biscuit were attributed to the fact that composite flours apparently form aggregate with increased number of hydrophilic sites available for competing for the limited free water

in cookie dough (Mc Watters, 1978). Moisture content of control (T_0) and experimental sample (T_1 , T_2 and T_3) at 10 days intervals during storage. The per cent moisture score of control T_0 was 1.93 per cent on zero day, 1.96 per cent after 10 days, 1.99 per cent after 20 days and 2.0 per cent after 30 days and experimental sample T_1 scored 2.3 per cent on zero days, 1.96 per cent on 10 days, 1.98 per cent on 20 days and after 30 days score was 2.3 per cent, T_2 scored 2.39 per cent on zero day, 2.41 per cent after 10 days, 2.42 per cent after 20 days and 2.45 per

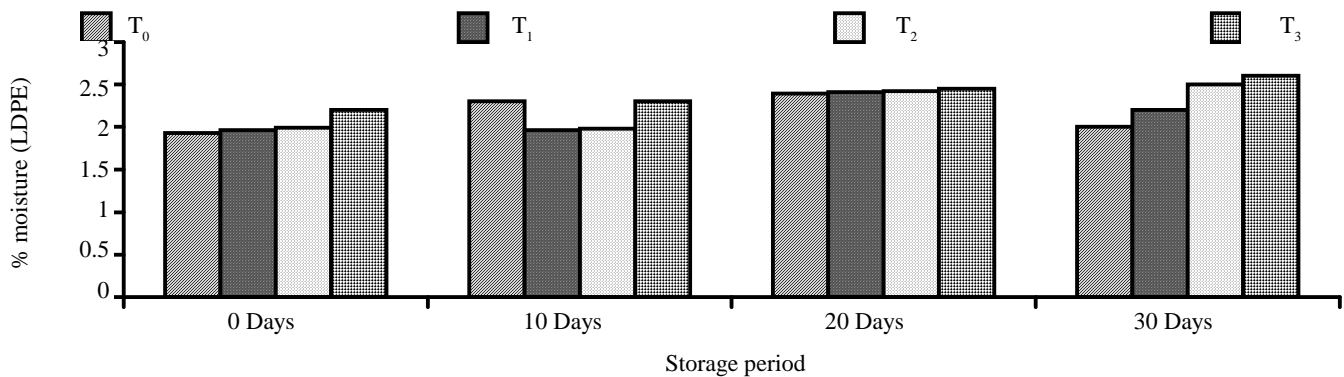


Fig. 2 : Effect on moisture content (%) of fenugreek enriched salted biscuits during storage (LDPE)

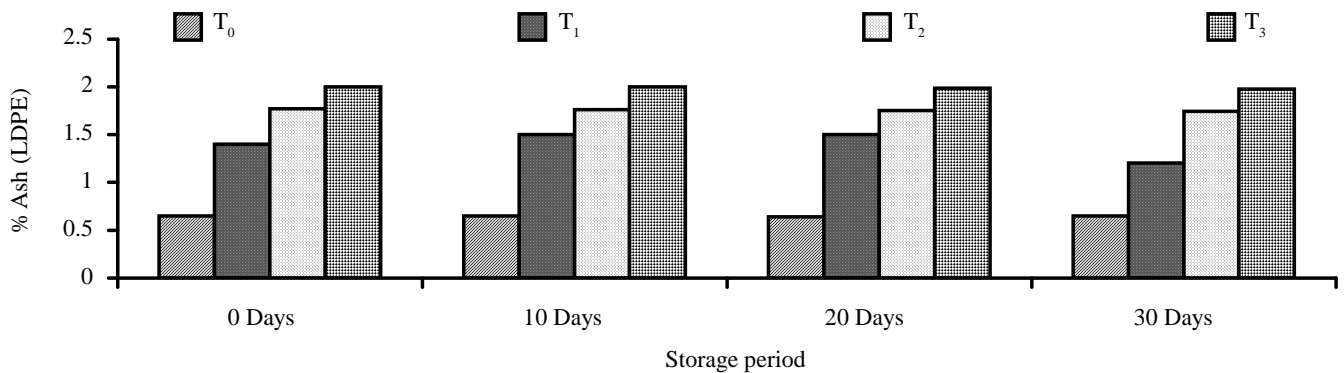


Fig. 3 : Effect on ash content (%) of Fenugreek enriched salted biscuits during storage (LDPE)

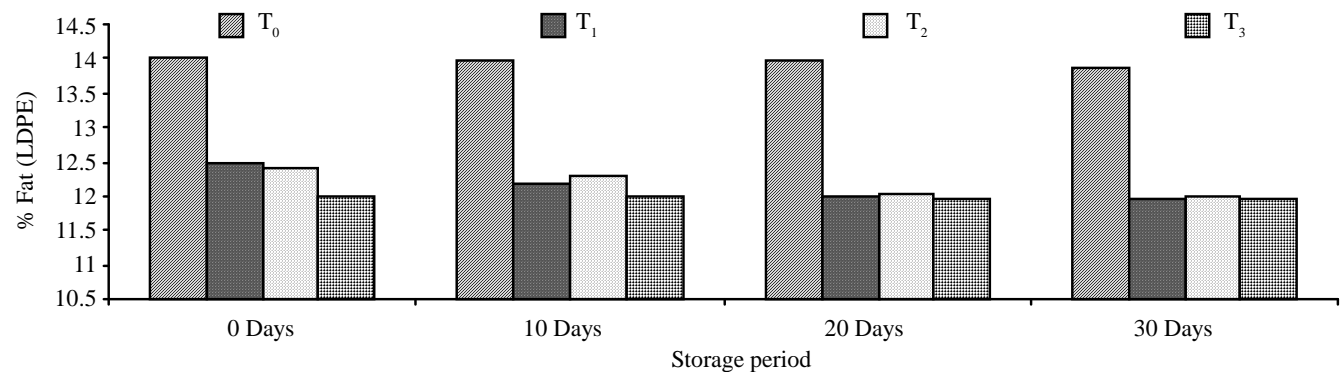


Fig. 4 : Effect on fat content (%) of Fenugreek enriched salted biscuits during storage (LDPE)

cent on 30 days, T_3 scored 2.0 per cent on zero days, 2.2 per cent after 10 days, 2.5 per cent after 20 days and after 30 days score was 2.6 per cent.

The data clearly indicates that the per cent score of ash content of control (T_0) was not found any increase or decrease from zero to 30 days storage but experimental sample T_1 , T_2 and T_3 were found slightly decrease from 20 to 30 days storage.

The present score of ash content of control (T_0) was found 0.65 per cent from zero to 10 days, 0.64 per cent on 20 days and after 20 to 30 days score was 0.65 compare

to experimental sample T_1 scored 1.4 per cent from zero to 10 days, 1.5 per cent on 20 days and after 30 days score was 1.2 per cent, T_2 scored 1.77 per cent from zero to 10 days, 1.76 per cent on 20 days and after 30 days score was 1.75 per cent, T_3 scored 2.0 per cent from zero to 20 days and after 20 to 30 days score was 1.99. The fat content of T_0 (control) scored 14.0 per cent on zero day, 13.98 per cent on 10 days, 13.96 per cent on 20 days and after 30 days score was 13.88 per cent compared to experimental sample T_1 scored 12.5 per cent on zero day, 12.2 per cent on 10 days, 12.0 per cent on 20 days

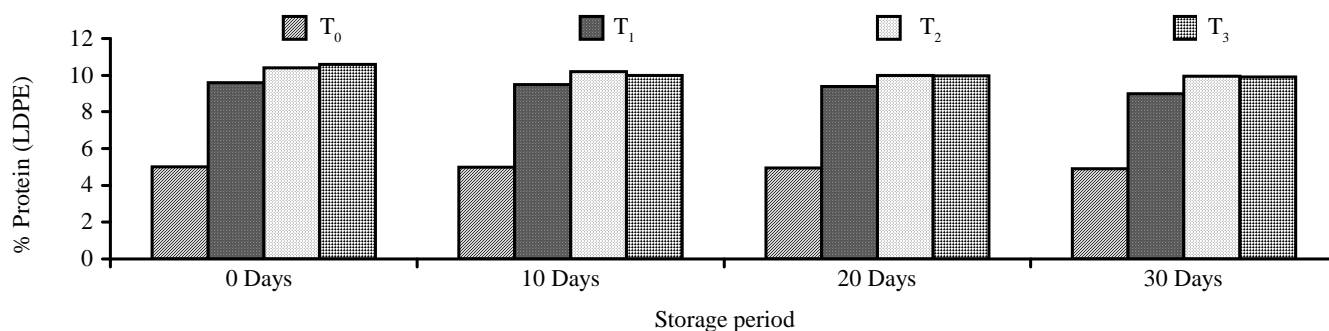


Fig. 5 : Effect on protein content (%) of fenugreek enriched salted biscuits during storage (LDPE)

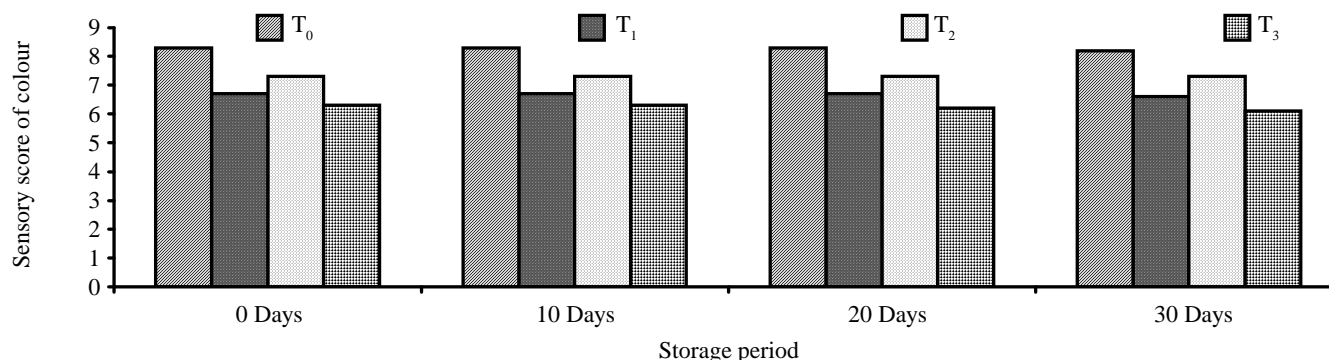


Fig. 6 : Sensory characteristics of colour of fenugreek enriched salted biscuit

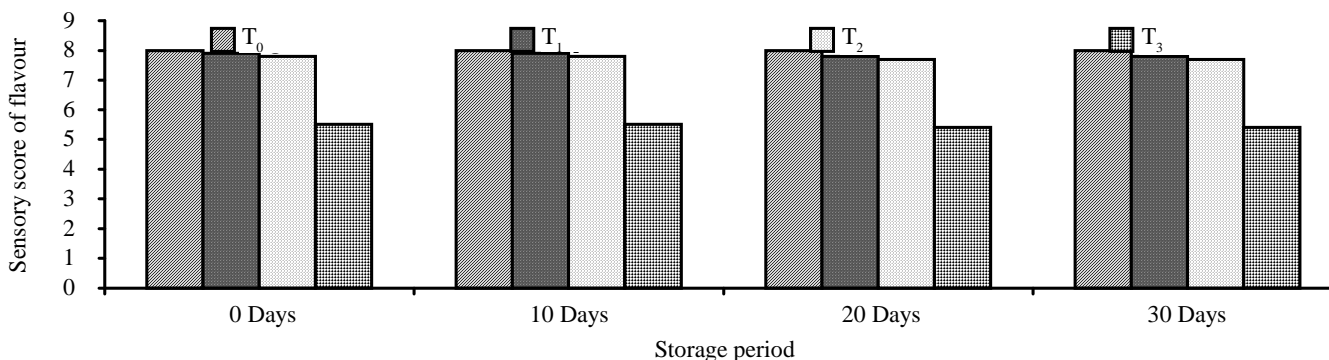


Fig. 7 : Sensory characteristics of flavour of fenugreek enriched salted biscuit

and after 30 days score was 11.97 per cent, T_2 scored 12.4 per cent on zero day, 12.3 per cent on 10 days, 12.02 per cent on 20 days and after 30 days score was 12.0 per cent, T_3 scored 12.0 per cent on zero day, 11.99 per cent on 10 days, 11.97 per cent on 20 days and after 30 days score was 11.95 per cent. The per cent score of protein content of control (T_0) was found 5.0 per cent on zero day, 4.98 per cent on 10 days, 4.95 per cent on 20 days and after 30 days score was 4.91 per cent compare to

experimental sample T_1 scored 9.6 per cent on zero day, 9.5 per cent on 10 days, 9.4 per cent on 20 days, and 9.0 per cent on 30 days storage, T_2 scored 10.4 per cent on zero day, 10.2 per cent on 10 days, 9.99 per cent on 20 days and 9.95 per cent on 30 days storage, T_3 scored 10.6 per cent on zero day, 10.0 per cent on 10 days, 9.98 per cent on 20 days and after 30 days score was 9.90 per cent. The data clearly indicated that sensory score of flavor of control (T_0) were constant throughout the

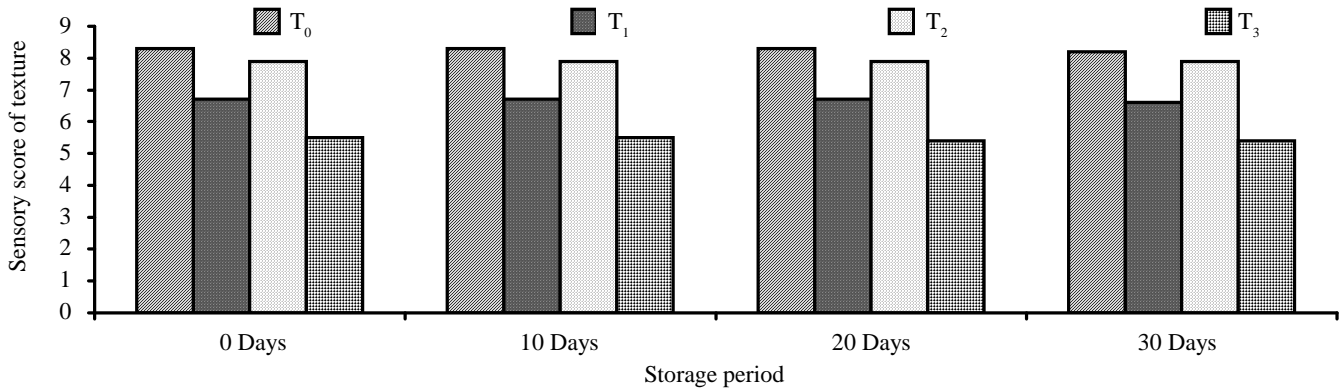


Fig. 8 : Sensory characteristics of texture of fenugreek enriched salted biscuit

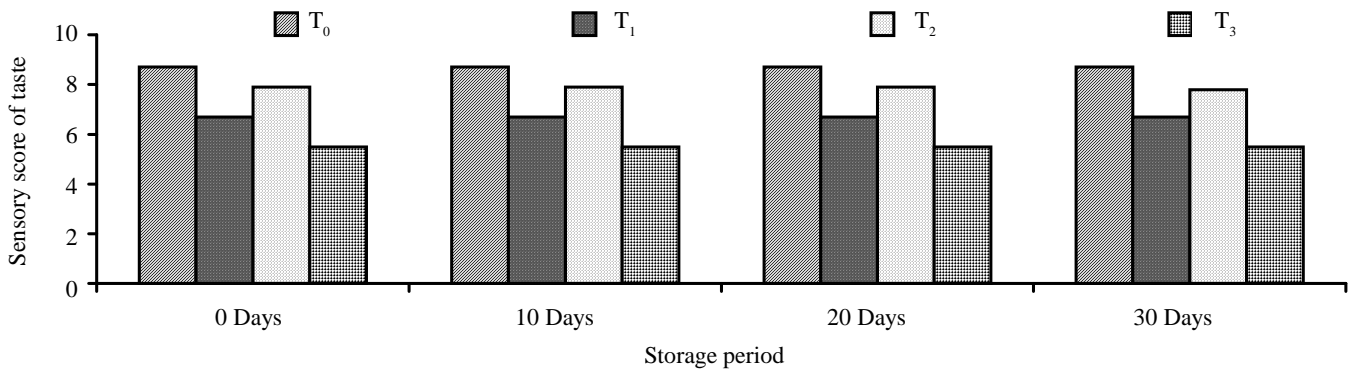


Fig. 9 : Sensory characteristics of taste of fenugreek enriched salted biscuit

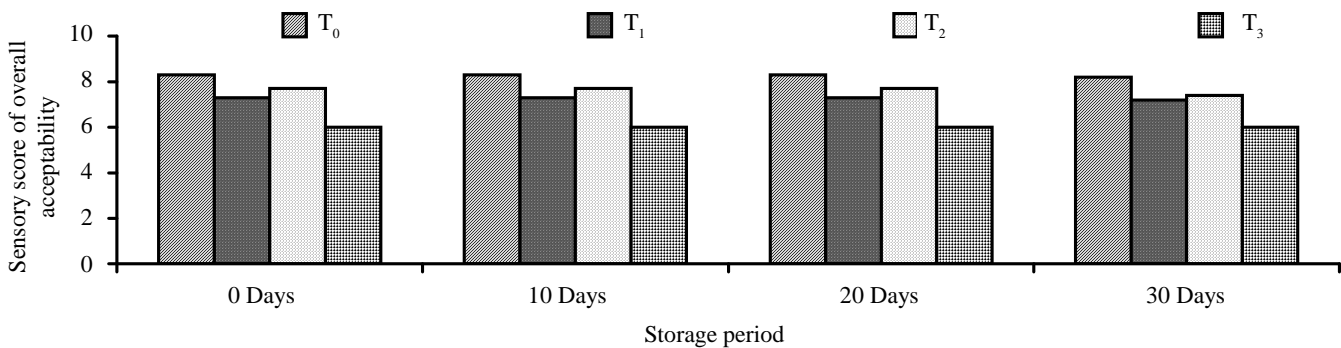


Fig. 10 : Sensory characteristics of overall acceptability of fenugreek enriched salted biscuit

storage period and score for T_0 was 8.0, and for experimental sample T_1 scored 7.9 and after 30 days score was 7.8, T_2 scored 7.8 and after 30 days score was 7.7, T_3 scored 5.5 and after 30 days score was 5.4.

The study showed the sensory score of texture of fenugreek enriched salted biscuit was less than control biscuit but its value was minimum for 15 per cent fenugreek enriched salted biscuit and maximum for 10 per cent fenugreek enriched salted biscuit. The data clearly indicates that sensory score of texture of control (T_0) was 8.3 from zero to 10 days and 8.2 from 20 to 30 days

The study the sensory score of taste of fenugreek enriched salted biscuit was less than control biscuit but its value was minimum for 15 per cent fenugreek enriched salted biscuit and maximum for 10 per cent fenugreek enriched salted biscuit. The data clearly indicated that sensory score of taste of control (T_0), and experimental sample (T_1 and T_3) were constant through storage period and score for T_0 was 8.7 and experimental sample T_1 scored 6.1 for T_3 scored 5.5 and T_2 scored 7.9 from zero to 10 days and 7.8 on 30 days. The study showed that overall acceptabilities of control and supplemented biscuits did not differ significantly up to 30 days of storage. Control biscuit had 8.3, 8.3, 8.3 and 8.2 overall acceptability score at 0, 10, 20 and 30 days of storage. Germinated fenugreek-supplemented biscuit at 10 per cent treated level had higher overall acceptability scores 7.7, 7.7, 7.7 and 7.4 at 0, 10, 20 and 30 days of storage. Hence supplemented biscuits can be stored safely in LDPE bags at room temperature for 30 days without any adverse changes.

Conclusion :

Supplementation of wheat flour with fenugreek flour at 5 per cent, 10 per cent and 15 per cent levels along with salt, fat and baking powder to improve the nutritional and sensory quality of biscuit. It was observed that the diameter of biscuit decreased gradually with increase in the level of fenugreek flour and thickness increased in proportion. During shelf life study it was observed that moisture content of control biscuit was less than the fenugreek rich salted biscuit and it was increased during storage. Protein content in experimental sample was minimum 5 in T_0 sample and maximum 10.6 in T_3 sample. It was observed that after 10 days of storage protein content of biscuit reduced and maximum protein content

was in T_2 sample after 30 days of storage. Fat content in experimental decreased from zero to 30 days. Fat content of biscuit sample was maximum 14.0 per cent in T_0 sample for LDPE packed biscuit and minimum 12.0 per cent in T_3 sample for LDPE packed biscuit. The ash content of fenugreek enriched salted biscuit was more than control biscuit and it increased with incorporation of fenugreek flour. It was higher in 15 per cent treated biscuit for LDPE packed biscuit. The sensory attributes of T_2 sample (90:10) was satisfactory during storage period of 30 days.

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