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Development and Quality Evaluation of Banana Bread

Uttam Singh Bhadana[1*], Ajay Singh Parmar[1] and Chitra Sonkar[2]

[1]Student, SHUATS, [2]Assistant Professor, SHUATS

Sam Higginbottom University of Agriculture, Technology & Sciences, Allahabad 211007 (U.P) India

*Corresponding Author E-mail: kksmfmp@gmail.com

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ABSTRACT

Composite bread from wheat flour and ripe banana was produced in this study. Five different bread formulations from the composition were produced, containing 0%, 20%, 30%, 40% and 50% ripe banana. Bread samples were analyzed for their physicochemical properties (moisture, ash, fat and protein) sensory characteristics and shelf life study compared with control bread made from 100% wheat flour. LDPE polyethylene was used to pack the bread samples were stored the ambient temperature for 6 days. The rate of moisture content was observed due to temperature fluctuations that may have caused migration of moisture into pack as samples were stored at ambient temperature. On evaluation during storage, it was found that the ash content of bread packed in LDPE decreased considerably with increase in storage periodduring storage fat content of banana bread packed in LDPE decreased considerably with increase in storage period. On critical evaluation of results it was found that protein content of the bread was considerably decreased as the proportion of banana is incorporated. Sensory evaluation results showed that up to 60% wheat flour with 40% ripe banana produced acceptable bread according to the overall acceptance scores of the panelists Increases however, were noted in all sensory properties except appearance.

Key word: *Bread, Ripe Banana (Musa paradisiaca) and Dough.*

INTRODUCTION

The demand of bakery products is increasing day by day. India is a developing country with large segment of population depending on wheat as staple food and 25% of wheat is used in the preparation of baked foods.

Bread is a food prepared by baking dough of flour and water. It is popular around the world and is one of the world's oldest foods. Bread is the staple food in Europe, European-derived cultures such as the Americas, the Middle East, North Africa and Southern Africa, as opposed to East Asia whose staple is rice. Bread is usually made from wheat flour dough that is cultured with yeast, allowed to rise, and finally baked in an oven. Owing to its high levels of gluten (which give the dough sponginess and elasticity), common wheat (also known as bread wheat) is the most common grain used for the preparation of bread[6].

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A wide variety of additives may be used, from fruits and nuts to various fats, to chemical additives designed to improve flavor, texture, color, and/or shelf life. Bread may be served in different forms at any meal of the day, eaten as a snack, and is even used as an ingredient in other culinary preparations.

Bread is a cheap and basic instant food available for consumption. In India it is still a secondary staple food when compared to chapatti, puri or rice. A rough estimate of the regional consumption of bread indicates that the southern states lead with 32% consumption while North, West and East zones consumes about 27%, 23% and 18% respectively of the total bread production.

Effective quality control of dough based products should therefore include its characterization during all stages of processing. Additionally the rheological properties of dough at many stages in processing can be indicative of the quality of the finished product[13].

Ripe banana is very perishable and subject to fast deterioration after harvesting, more susceptible to mechanical injuries and increasing the losses further due to spoilage. Dried banana flour prepared from ripe banana is suitable for incorporation into food products as sweetener, solubility, high energy contents[3], sugar-rich and easily digested[3], enriched with minerals such as K and P and recognized for its desirable flavor. It also contains various antioxidants, for instance vitamins (pro-vitamin A β–carotene, B, C and E) and phenolic compounds such as catechin, epicatechin, lignin and anthocyanins.

Abbas *et al.*[1] recommended that incorporation studies of ripe banana flour into strategic food products should be attempted.

To develop value added banana bread. Study the physico-chemical properties and sensory evaluation of the developed bread and quantify the shelf life and storage stability of the developed bread packed in low density polyethylene packaging material.

MATERIAL AND METHODS

The experiment was carried out in the research laboratory, Department of Food Processing engineering "Vaugh Institute of Agriculture Engineering and Technology", Sam Higginbottom University of Agriculture, Technology and Sciences. The details of materials and methods used during the course of the project are as follows:-

Materials

Ripe Banana of the local variety andwheat flour were blended in different ratios n this study. Other ingredients used were yeast (instant dry yeast was obtained from the local market), Sugar (Sucrose, finely granulate, white, commercial grade), Salt (NaCl, finely granulated commercial grade), Enzymes and refined oil. All chemicals used for analysis were of analytical grade.

Method

Bread making procedure:

Bread was made by using a sponge-dough procedure following the method of Cauvain. Wheat flour was blended with 0, 20, 30, 40 and 50 % ripe banana. The standard formula used for pan bread was 100 gm flour, 40 gm ripe banana, 1.5 gm yeast, 2 gm salt, 8 gm shortening, 12 gm sugar and variable water. All dry ingredients were weighed and placed in a mixer for 5 sec. Then a suspension of the yeast in water was added. The mixture was further run at high speed for 90 sec. Water was added to the mixture as indicated by the farinogram result. The dough temperature was 28.5 ^{0}C – 33 ^{0}C following mixing. The dough was allowed to rest for 30, then baked in a microwave oven at 180 ^{0}C for 45 min. the bread was left to cool for 10 min, then kept closed in polyethylene bags at ambient temperature (25 ^{0}C) for physic-chemical and sensory evaluation.

Quality Parameters:

Physico-Chemical Parameters

Ash Content

Percent ash was calculated using the formula under.

$$\text{Ash } \% = \frac{\mathrm{w_2 - w_1}}{\mathrm{w}} \times 100$$

Where,

w_2 = final weight, in g, of the dish with the ash

w_1 = weight, in g, of the empty dish

w = weight, in g, of the sample

Moisture content

Determination of moisture content was done by hot air oven method. The percent moisture content was calculated by the following formula.

$$Moisture\% = \frac{w_1 - w_2}{w_1 - w} \times 100$$

Where,

w_1 = weight, in g, of the dish with the material before drying

w_2 = weight, in g, of the dish with the material after drying

w = weight, in g, of the empty dish

Crude protein

The protein content was determined by using the following formula:

$$Nitrogen\ \% = \frac{(\mathrm{S - B}) \times 14 \times 100 \times 100}{\text{Weight of the sample taken } \times 10 \times 100}$$

Protein % = N % * empirical factor

Where,

S = sample titrate reading

B = blank titrate reading

Fat content

The fat content was determined according to AOAC (1990) method. It is calculated by

$$Fat\ \% = \frac{m_1 - m_2}{w} \times 100$$

Where,

m_1 = initial weight, in g, of round bottom flask

m_2 = final weight, in g, of the flask and the fat extracted

w = weight, in g, of the sample

Sensory evaluation

Semi trained panelists were given a hedonic scale questionnaire to evaluate the bread using a 9 points scale (9- extremely like, 8- like very much, 7- like moderate, 6- like slightly, 5- neither like nor dislike, 4- dislike slightly, 3- dislike moderate, 2- dislike very much and 1- extremely dislike). Bread was evaluated for general appearance, color, flavor, taste, texture and overall acceptability measures. Sensory evaluation was done on the same day that the breads were prepared.

Shelf life analysis

Statiscal Analysis

The analysis of variance (ANOVA) was performed to examine the significance level of all parameters measured. Analytical variation was established through a one-way ANOVA. Data were reported as the mean ± standard deviations. Comparison of mean was performed using Duncan's multiple range test with a 0.05 level of significance.

Microbial Analysis

The banana bread was examined for microbial contamination. Total viable count of the final bread was determined by using standard plate count technique (0.1 ml) of the appropriate dilution was placed on nutrients agar plates. The plate was incubated at 35^0C for 48 hr and colony forming units per gram sample (cfu/gm) was estimated. For mould and yeast count; the above procedure was repeated using potato dextrose agar and incubation was done at 25^0C for 72 hrs.

RESULT AND DISCUSSION

Physico-Chemical Characteristics of Bread:

Moisture Content

On evaluation of result i.e. on 0^{th} day it was found that there was an increase in moisture content in the bread sample with increasing the level of ripe banana. Increase in moisture content was observed due to temperature fluctuations that may have caused migration of moisture into pack as samples were stored at ambient temperature. On comparing the results of moisture with Latif *et al.,* we found that the finding were in accordance with present study in which there is a decrease of moisture content with the passage of time.

Ash Content

On evaluation of result it was found that the increased ash content was due to high percentage of mineral content present in banana, the average maximum ash content for 6 days was found in sample 5 (50% Maida& 50% ripe banana) and average minimum ash content for 6 days was found in sample 1 (100% Maida).On the first ash analysis of the developed bread i.e. on 0 day, ash content of sample 1, 2, 3, 4, and 5 was found to 0.15, 0.17, 0.18, 0.20, and 0.21. From Anova it was found that the values obtained were significant at $p<0.05$.On evaluation during storage, it was found that the ash content of bread packed in LDPE decreased considerably with increase in storage period. On comparison it was found that the ash content as reported by in this current study was found ranging from 0.1333-0.19 while the total average ash content was found to be 0.1626 which was in close similarity to Latif *et al.*

Fat Content

On critical evaluation of results it was found that fat content of the banana bread was considerably increased as the proportion of ripe banana is incorporated and banana is a good source of fat. Maximum fat content was found in sample 5 (50% ripe banana) as banana is rich in fat and minimum fat content was found in sample 1 (Maida-100%). The fat content decrease during storage due to the incorporation of moisture in banana bread this result obtained agreed with result reported by Lubna Masoodi *et al.* 2012.

Protein Content

On critical evaluation of results it was found that protein content of the bread was considerably decreased as the proportion of banana is incorporated. Maximum protein content was found in sample 1(Maida-100%) and minimum protein content was found in sample 5 (50% Maida and 50% ripe banana).The decrease in protein content during storage was due to the reaction between sugars and amino acids whichleads to breakdown of protein molecules, reported by Bennion[4].

Sensory Evaluation of Bread:

Sensory attributes of breadwas influenced by storage period and different proportion of *Maida*& ripe banana, packed in LDP Ewere evaluated for fresh condition and at 3 days interval up to 6 days of ambient storage. 9 point hedonic rating test method was used for the evaluation of different samples of bread. Different attributes such as color, taste, texture and overall acceptability. According to the study sample 4 (60% maida and 40% ripe banana) was found to the most acceptable.

Colour:

The color of bread is an important sensory attributes. The variation in the colour is due to incorporation of ripe banana in various proportions. The color of sample 2, sample 3 & sample 4 were more or less similar, whereas sample 1 was light brown in color. On comparing the results obtained in this present study with the results obtained by Latif *et al*. it was found that during storage period the colour reduces in descending order of magnitude as the storage period increases.

Taste:

The taste of bread was reduced, may be due to gradual decrease in moisture content with increasing storage period. On comparison of the present study with the results obtained by Tarar *et al*. it was found that taste deterioration was quite evident during the storage period as it becomes more unacceptable as time increases.

Flavour:

Flavor losses and changes occur assome flavor components diminish fasterthan others. The taste of fresh bread is usuallya combination of sweet, salty, and slightly sour attributes, but with storage period the sweet and the salty start diminishing and the remaining sournessst arts to become unpleasant. On comparison of the results obtained with that of Tarar *et al*. it was found that the flavor deterioration is similar as observed in the current study.

Overall Acceptability:

Overall acceptability is entirely dependent upon the factors like colour, taste, flavor and texture which make a compatible impact on the acceptability of product. As it was observed that the taste and flavor were greatly dependent upon the amount of ripe banana added.

Table 6: Organoleptic Characteristics of Bread Samples after 6 Days

Organoleptic characteristics	**LDPE**
Shape	Round, slightly bulging, with no defects.
Crust **aspect** **color**	 Smooth and rigid crust becomes wrinkled, elastic and soft. Characteristic for colored spotted product
Core **aspect/section** **color**	 Soft, compressing, when stored turned into brittle and became less compressing and rigid. Characteristic for colored spotted product, according to the mould species.
Smell	Strange or rancid smell.
Taste	The odor and the taste gradually disappear; the taste becomes flat or stuffy and at times sour.

Microbiological study of banana fortified bread:

The values of yeast and mold count as observed on the storage time period which gives an idea of level off spoilage that may be observed during storage and the ultimate life span of the banana pulp fortified bread. The colonies were not observed on the first day of incubation but after 48 hr of incubation the colonies were apparently evident in sample 4 and sample 5 which means that bread may be unsafe for consumption just before 5 days but sample 4 was found fit for consumption as it was under permissible limit. Sample 4 can thus

be said to have a shelf life of 4 days while sample 5 was not satisfy the permissible limit. The bread may be said best fit for consumption within 4 days as for the safety point of view. On comparing the characteristics features of the results obtained by Malomo *et al*. it was found quite similar. As the level of enrichment of extra added ingredients is increased it has an inhibiting effect on the number of colonies.

Table 1: Effect of Storage Period on Moisture Content (%) of LDPE-Packed Banana Bread.

Product	0 day	3 days	6 days
Sample 1	28	27.5	25
Sample 2	29	28.5	27
Sample 3	30.5	28.7	27.5
Sample 4	32	29.5	29
Sample 5	35	33.4	31.2
F-Test	S		
S.ED(±)	0.514		
C.D	0.00074		

Table 2: Effect of Storage Conditions on Ash Content (%) of LDPE-Packed Banana Bread.

Product	0 day	03 days	06 days
Sample 1	0.15	0.13	0.12
Sample 2	0.17	0.15	0.13
Sample 3	0.18	0.16	0.15
Sample 4	0.2	0.17	0.16
Sample 5	0.21	0.19	0.17
F-Test	S		
S.ED(±)	0.036		
CD	0.0000047		

Table 3: Effect of Storage Period on Fat Content (%) of LDPE-Packed Banana Bread.

Product	0 day	3 days	6 days
Sample 1	2.7	2.6	2.3
Sample 2	3.3	3.21	3
Sample 3	3.9	3.7	3.2
Sample 4	4.8	4.2	4.1
Sample 5	4.9	4.8	4.6
F-test	S		
S.ED(±)	0.1507		
CD	0.00267		

Table 4: Effect of Storage Period on Protein Content (%) of LDPE-Packed Banana Bread.

Product	00 day	03 days	06 days
Sample 1	7.26	7.15	7.1
Sample 2	6.67	6.6	6.56
Sample 3	6.56	6.53	6.5
Sample 4	6.32	6.27	6.25
Sample 5	5.02	5.12	5.15
Result	**S**		
S.ED(±)	0.000685		
CD	0.000129		

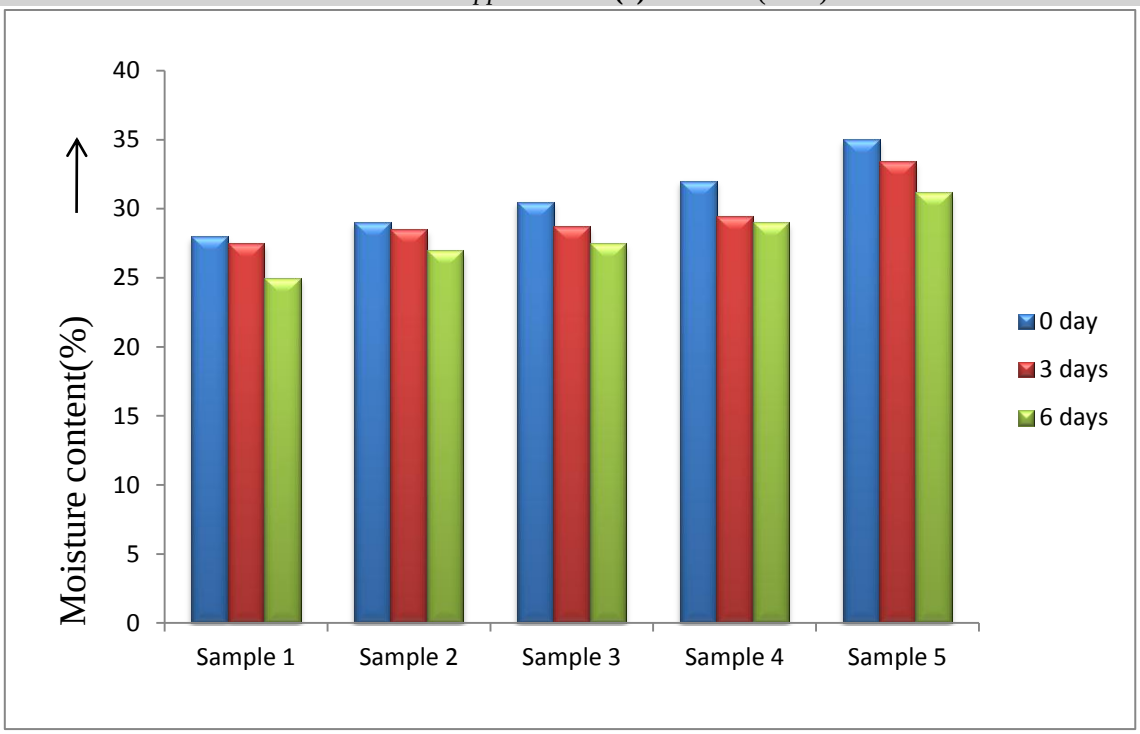

Fig. 1: Effect of Storage Period on Moisture Content (%) of Banana Bread.

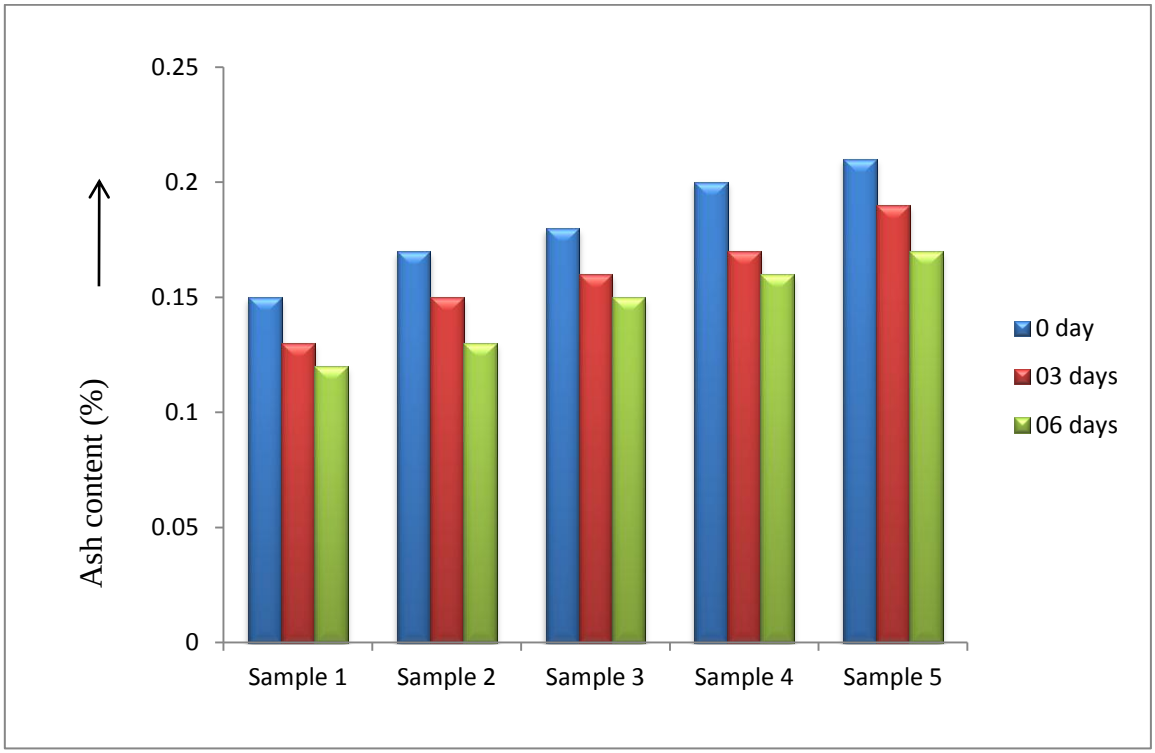

Fig. 2: Effect of Storage Period on Ash Content (%) of Banana Bread.

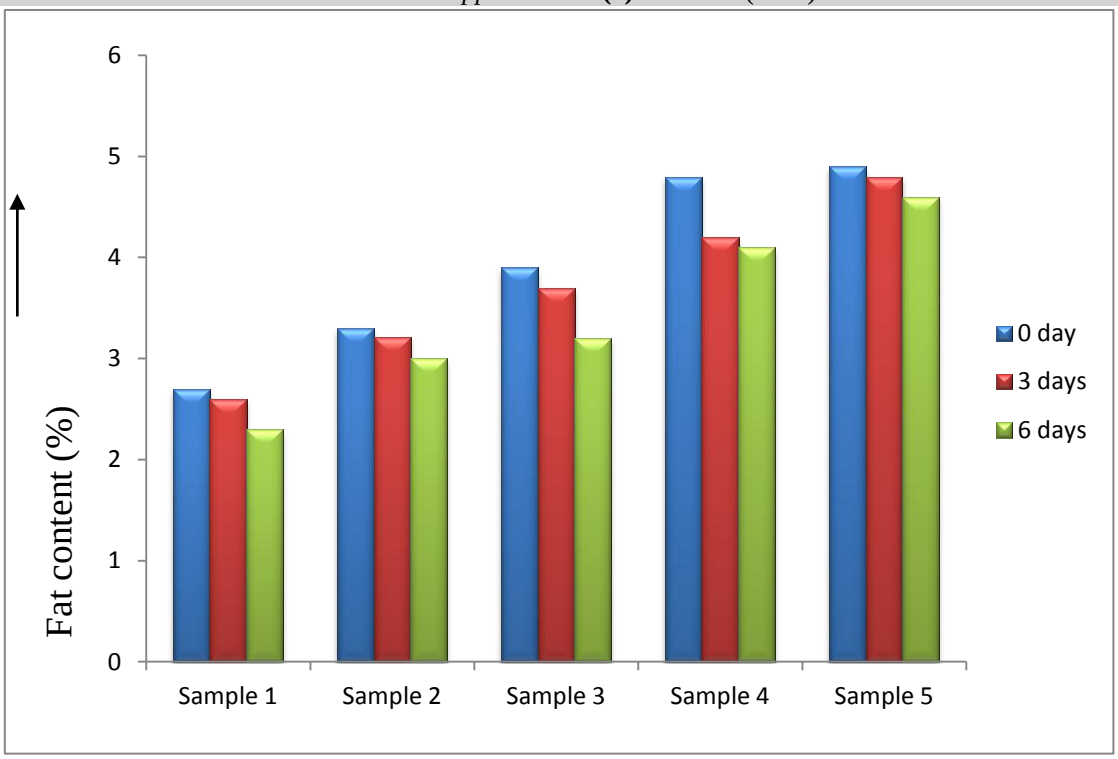

Fig. 3: Effect of Storage Period on Fat Content (%) of Banana Bread.

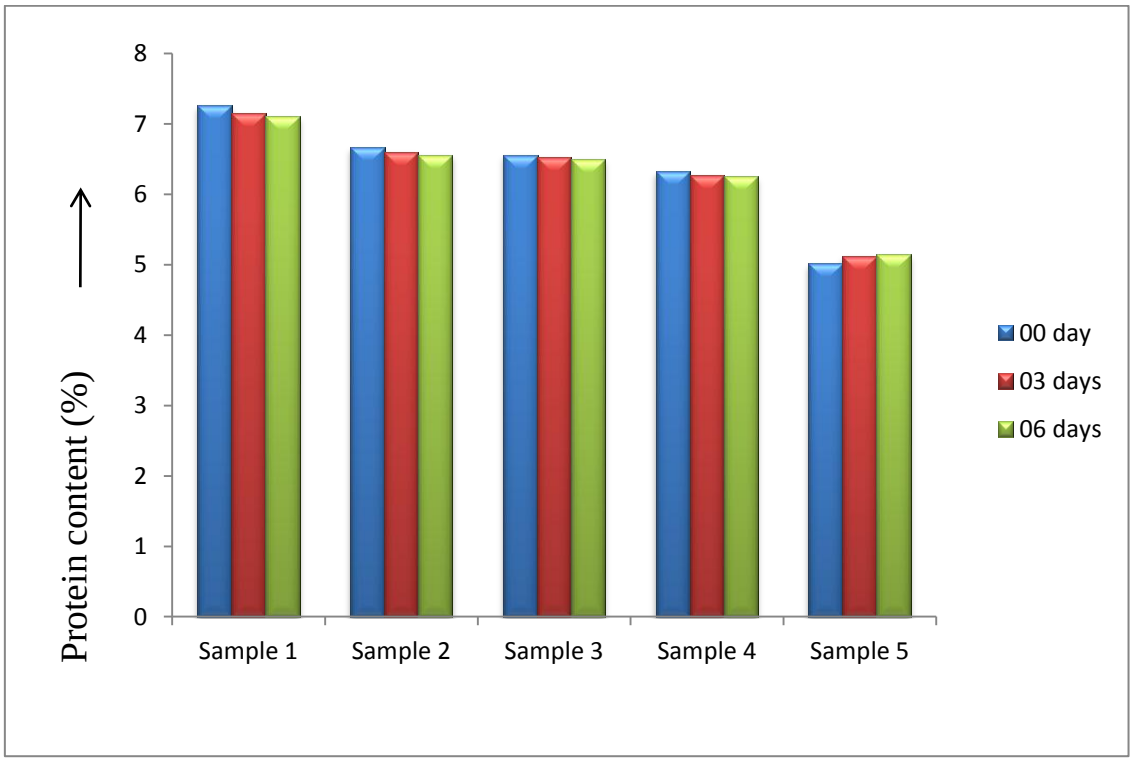

Fig. 4: Effect of Storage Period on Protein Content (%) of Banana Bread

CONCLUSION

The moisture content of bread packed in LDPE increased considerably with the increased content of ripe banana but it decreased with the increase in storage period.The ash content of bread packed in LDPE increased considerably with the increase in content of ripe banana. The ambient storage period, conditions and packaging material had no significant effect on the ash content of bread. The fat content of bread packed in LDPE increased considerably with the increased content of ripe banana and it decreased with the increase in the ambient

storage period. The protein content of bread packed in LDPE decreased considerably with the increased content of ripe banana and it decreased with the increase in the ambient storage period. The sensory attributes such as color, taste, flavor, texture, appearance and overall acceptability of bread packed in LDPE varied considerably with the variation in content of ripe banana and it decreased with the increase in the ambient storage period and it was found that during microbial analysis colony count of bread increased as the storage time of bread was increased.

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