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Storage studies on effect of packaging material on changes in nutritional qualities of browntop millet enriched biscuits

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Abstract

The quality biscuits were prepared from 50% browntop millet flour and 50% maida ($BMBF_{50}$). The selected treatments were packed in LDPE and PP and stored at ambient (30 ± 4 ^{0} C) for 90 days to study their storage feasibility. Chemical composition of the fresh biscuits prepared from 50% browntop millet flour and 50% maida ($BMBF_{50}$) showed that moisture content was moisture content was 4.05 %, protein 11.40 %, crude fat 24.76 %, crude fiber 4.36 %, carbohydrates 59.03 %, calcium 24.84 mg/100g, iron 5.77 mg/100g and 176.48 µg/100g β-carotene. The sensory evaluation was carried at monthly interval during storage period of three months. The results on overall acceptability score of biscuits are influenced by storage. The results indicated that score $BMBF_0$ for overall acceptability of biscuits was decreased for control from 8.01 to 7.73 in LDPE and from 7.97 to 7.65 in PP as storage period get increased. For $BMBF_{50}$ treatment score decreased from 8.31 to 8.01 in LDPE and 8.30 to 7.92 in PP was observed for 90 days of storage. Storage study of biscuits showed that the biscuits prepared by incorporation of browntop millet flour and maida can be stored up to 3 months in LDPE with minimum losses in sensory, nutritional and textural characteristics than PP. There was significant difference in protein, crude fiber, β-carotene calcium and iron content with advancement of storage period during 3 months. The biscuits were found to be acceptable up to 3 months storage at ambient temperature. The total cost of production of biscuits prepared from browntop millet flour and maida ($BMBF_{50}$) for 1 kg was Rs. 168/-.

Keywords: browntop millet, biscuits, nutritional value, organoleptic properties

Introduction

Millet is a word that refers to a variety of tiny seeded annual grasses that are produced as grain crops, especially on marginal land in dry temperate, tropical and subtropical climates (Baker,1996) [8]. The origins of small millets found in Africa and Asia. Eastern Asia, Indian subcontinent and the territories from the southern bank of Sahara to the highlands of Ethiopia in Africa are the most dominated (Seetharam and Gowda, 2007) [43]. The millets are composed of five Poaceae family genera (*Echinochloa*, *Panicum*, *Eleusine*, *Pennesetum* and *Setaria*). The different species grown are browntop millet (*Panicum ramosa*), foxtail millet (*Setaria italica*), proso millet (*Panicum miliaceum*), japanese barnyard millet (*Echinochloa frumenacea*), kodo millet (*Paspalum scrobiculatum*) and finger millet (*Eleusine coracana*).

Brown top millet (*Urochloa ramosa*) is an annual warm-season grass. It's a tetraploid with basic chromosome number of four (Basappa *et al.*, 1987) [9]. There are two types of browntop millet, one which contains compact (2n =38) and other of which has open panicle types (2n=28). Browntop millet grains matures within 75-90 days. In case forage, it hardly takes 50 days span with rapid forage production. It's one of the forgotten crop which was primarily utilized as food and fodder in India. In late history it seems to have been one of the major staple crop in Deccans wider region (Fuller *et al*., 2004) [6]. Origin of browntop milet is South-east Asia. It's cultivated in parts of Africa, Western Asia, Arabia, China and Australia (Clayton *et al*., 2006) [15]. It was introduced to United States from India around 1915 (Oelke *et al.*, 1990) [33]. It's mainly grown in the South-east US for pasture, hay and game bird feed. Browntop millet typically grows only to 2 -5 ft height.

The nutritional content of millets is superior to cereals. Millets are a mineral-rich food. Iron and phosphorus are abundant in them. B complex vitamins are abundant in whole grains. This is mostly seen in the grain's outer bran layer. Comparison to kodo millet and finger millet, the colour of browntop millet is extremely attractive and highly appreciated. Browntop millet has a similar nutritional profile to the other millets. It is an excellent source of iron and zinc, as well as a good source of fiber.

Browntop millet grains are great source of protein (11.5%), dietary fiber (12.5%) and minerals (4.2%) (Indian Institute of Millets Research, 2019) [21]. In compared to wheat and rice, millets have a significant number of anti-nutritional elements. These anti-nutritional factors are phytochemicals derived from plants that have medicinal properties. As a result, they're suggested for a variety of degenerative disorders including diabetes and hypertension (Yenagi, 2003) [56].

Minor millets have an important part in the treatment of intestinal and stomach disorders. The presence of phytochemical components and dietary fiber in small millets can assist to avoid altering lifestyle diseases if taken frequently. Millets can be processed further to increase bioavailability and decrease anti-nutritional components.

Millet consumption is gradually declining in everyday life, although it remains a basic meal for small households and millets producers. In various regions of south India, browntop millet is historically used in a number of culinary dishes. The most widely consumed foods in daily life are rice made from decorticated foxtail millet and tiny millet, mudde and chapati made from finger millet. In rural communities, the preparation of a few selected millet byproducts during festivals is valued and continued, as it contributes significantly to the preservation of millet's traditional and cultural significance in their daily food and lives. Millets' traditional goods are well-known in rural regions. They are unaware of the availability of processing technologies and secondary processed millets goods such as bread products, fryums, extruded products, biscuits, cookies, papad and malt in their immediate region and marketplaces (Yenagi *et al*., 2003) [56].

Millets are more difficult to process at home or on a local level. Millet must go through a number of processing steps before being consumed. As a result, developing value-added goods, processed products, or byproducts from millets is critical. Popped grains have a lower bulk density and better *in vitro* protein digestibility, as well as a pleasant texture and flavour (Malleshi and Deshikar, 1981) [24]. Millet processing extends the shelf life of millets and its products.

When thinking about bakery items, Cookies and biscuits are becoming more popular at all levels of society due to their ready-to-eat nature, nutritious quality and simple availability in a variety of flavours at a reasonable price. Bakery goods allow for the inclusion of a wide range of nutritionally beneficial components.

Water, maida, sugar and fat are the main components of biscuit dough. They're combined with minor components like baking powder, skimmed milk, emulsifier and sodium metabisulphite to create a high-quality dough with a well-developed gluten network. The kind and quantity of components used in the dough production determine the biscuit's quality. The influence of main components in the biscuit dough system on the end product has been discussed by researchers (Blanco *et al*., 2016) [13].

Biscuits are a tiny baked food produced from basic ingredients such as oil, flour and sugar (Manley, 1998) [25]. Biscuits vary from other bakery items such as bread and cakes in that they contain very little moisture. Because it contains less than 4% moisture, it has a longer shelf life, maybe six months or more and minute microbiological degradation.

Browntop millet is an underutilised millet that the monocrop system overlooks. As a result of the current climate change scenario, which has resulted in water shortages and drought threats, millets are the most common crop grown in dry land rainfed areas and our farmers are working hard to keep them alive. Browntop millet planting, production, consumption and utilising the benefits of millets in guaranteeing the daily dietary are all traditional and cultural practises in Karnataka. Despite its storage stability, high nutritional potential and fodder quality, browntop millet is only grown in a few places in Karnataka and Maharashtra. There is necessity to explore the utility of browntop millet in diet by value addition.

Materials and Methods Materials

Ingredients: The major ingredients for the preparation of products were browntop millet procured from Zonal Agriculture Research Station, Kolhapur. The maida was procured from local market.

Packaging material: The packaging material *viz*., LDPE and PP bags were procured from local market and used for packaging of biscuits for storage study.

Treatment details: The browntop millet biscuits were prepared by using different levels of browntop millet flour with maida as shown below:

Table 1: Treatment details for preparation of browntop millet biscuits

Treatments	Browntop millet flour (%)	Maida (%)
T0 (Control)	0	100
T1	10	90
T2	20	80
T3	30	70
T4	40	60
T5	50	50
T6	60	40
T7	70	30
T8	80	20
T9	90	10
T10	100	0

Method

Procedure for preparation of browntop millet flour

The browntop millet grains were cleaned to remove extraneous matter and taken in small bowel and then attached to the electric decorticator to remove brans. The dried dehusked browntop millet grains were grinded in to flour and passed through sieve of 80 mesh to get uniform flour.

Preparation of browntop millet flour biscuits

The biscuits were prepared using standard levels of ingredients as per the traditional creaming process.

Browntop millet flour+ Maida + Ammonium bicarbonate + Sodium bicarbonate mix both well together
↓
Sieve the ingredients twice
↓
Sugar and creamed fat are mixed together.
↓
Knead to soft dough with water
↓
Spreading (Uniform thickness)
↓
Cut with a fancy biscuits cutter
↓
Bake at 160 °C for 15-20 min
↓
Cooling and packaging
↓
Storage

Fig 1: Flow chart for preparation of biscuits from Browntop millet flour and maida

Physical characteristics of raw material

The raw material browntop millet grains were analyzed for different physical characteristics like colour, thousand grains weight, bulk density, true density and porosity.

Chemical properties of raw materials and biscuits

Chemical constituents like moisture, fat, protein, carbohydrate, crude fiber, β-carotene and minerals like iron and calcium content of raw material and biscuits were determined as per the standard procedure.

Physico-chemical analysis of raw material biscuits

The method described in AACC (2000) [1] for determining moisture was used. The protein content of biscuits was estimated by determining total nitrogen content using standard Micro-Kjeldhal method and fat content of the biscuits was estimated by the soxhlet method AACC (2000) [1]. The crude fiber content in the products was estimated by AACC (2000) [1]. The carbohydrate content in the selected biscuits were obtained by subtracting from 100 the sum of values of moisture, protein and fat content per 100 g of the sample (Raghuramulu *et al.*, 1993) [35]. β-carotene content of biscuits was estimated by AOAC (2000)[6]. Calcium and iron were analyzed using atomic absorption spectrometry (AAS). These methods give a good precision and accuracy (Ojeka and Ayodele 1995.) [18].

Packaging and storage of browntop millet biscuits

The selected treatments of browntop millet biscuits were packed in LDPE and PP and stored at ambient (30+4^{0}C) for 3 months. The samples were drawn at an interval of 1 month and evaluated for chemical and sensory quality.

Sensory evaluation of biscuits

Sensory evaluation of browntop millet biscuits was carried on 9 point hedonic scale. The average scores of the ten judges for different quality characteristics *viz.* colour and appearance, flavour, texture, taste and overall acceptability were recorded.

Statistical analysis

All experiments were carried out by using Completely Randomized Design (CRD). And Factorial Completely Randomized Design (FCRD). The results obtained in the present investigation were analyzed for the statistical significance according to the procedure given by Rangaswamy (2010) [37].

Results and Discussion

Physical characteristics of raw materials

The results obtained for physical characteristics of browntop millet grains are presented below:

Table 2: Physical characteristics of raw materials

Parameter	Browntop millet
Colour	Light brown
1000 Grain Weight (g)	2.49
Bulk density (kg/m^3)	545
True density (kg/m^3)	1247.7
Porosity (%)	58.34

The seed colour was light brown which indicated good quality. Bulk density of seeds was found to be 545 kg/m^3. The variations in density of browntop millet may be due to random harvesting of browntop millet at different maturity stages. This factor is important because it determines the capacity of storage, packaging and transport systems. The weight of 1000 grains is 2.49 g. The shape of grain and rice are spheroid. Similar results also reported by Srinivasa *et al.*, 2018 [50], Nagaraju *et al*., 2020, [31] and Sravani *et al.*, 2020 [49].

Chemical characters of raw materials

The results obtained for chemical characteristics of browntop millet flour maida are presented here:

Table 3: Chemical characters of raw materials

Chemical constituent	Browntop millet flour	Maida
Moisture (%)	11.70	13.59
Protein (%)	11.07	11.29
Fat (%)	1.88	0.45
Crude fiber (%)	8.40	0.86
Carbohydrates (%)	66.57	73.49
β-carotene (µg/100g)	-	376.00
Calcium (mg/100g)	27.00	22.94
Iron (mg/100g)	8.85	2.68

Whereas; not detected. Each value is the average of three determinations

Chemical characters of various raw materials are comparable with findings reported by Tosco, (2004) [52] Gopalan *et al.*, (2006) [17], Mayela *et al.* (2007) [26] and Salazar *et al.* (2011) [41]. Similar conclusions for browntop millet had been reported by [24] Amadou *et al.*, (2013) [3], Roopa *et al.* (2016) [40] and Niharika (2020). β-Carotene content was not detected in the brown top millet (Siridhanya and Kashayas for leading healthy life and curing diseases) [54]. Asharani *et al*. (2019) [7] reported that β-carotene content was not detected in the mior millet.

Sensory evaluations of fresh browntop millet biscuits

The organoleptic evaluation of biscuits prepared by different combination of browntop millet flour and maida were carried out. Browntop millet biscuits were prepared and presented to panel of ten judge for assessing the quality and acceptability of product. Organoleptic evaluation of biscuits was carried out using a 9 point hedonic scale of sensory characteristics such as colour, flavour texture, taste and overall acceptability. The score obtained for sensory evaluation for browntop millet flour and maida biscuits are shown in Table 4. Browntop millet and maida biscuits (50 browntop millet flour: 50 maida) were found the best for preparation of biscuits and stored at ambient temperature (30 ± 4°C) for 3 months.

Organoleptic quality parameters of a product assume pivotal role in anticipating the consumer response to the product (Rey, 2006) [39]. Colour and appearance uniformity are vital components of visual quality of fresh as well as processed foods and play a major role in consumer choice (Alistair, 2005) [2]. Flavour being a combination of taste, smell and mouth feel, has multifaceted impact on sensory quality of a product (Amerine *et al.*, 1980) [4]. Overall acceptability of product is a function of various factors including colour and appearance, flavour, texture and taste. Amongst all samples for both biscuits containing browntop millet 50 per cent and maida 50 per cent combination was found to be more acceptable. Singh *et al.* (2000) [48] reported overall acceptability of product like cookies is a function of various factors including colour and appearance, flavour, texture and taste in the soy fortified biscuits storage. Gupta and Singh, (2005) [18] reported overall acceptability of biscuits containing colour and appearance, flavour, texture and taste which gives overall acceptance by considering above all attributes.

Selection of Best Combination for Preparation of Browntop Millet Fortified biscuits

On the basis of organoleptic properties (colour and appearance, flavour, texture, taste and overall acceptability) the best combination from browntop millet flour and maida was 50:50. For the storage study these combinations along with control (100% maida) were selected and the biscuits prepared from them were used for further storage study. During storage study their nutritional composition, organoleptic properties and microbial quality were analysed using standard procedures.

Table 4: Sensory evaluation of fresh browntop millet flour and maida biscuits

Sample code	Sensory attributes*					
	Colour and appearance	Flavour	Texture	Taste	Overall acceptability	Rank
$BMBF_0$	8.21	8.11	8.08	8.16	8.14	6
$BMBF_{10}$	8.21	8.19	8.11	8.23	8.19	5
$BMBF_{20}$	8.25	8.29	8.14	8.27	8.24	4
$BMBF_{30}$	8.30	8.29	8.25	8.31	8.29	3
$BMBF_{40}$	8.36	8.35	8.36	8.42	8.37	2
$BMBF_{50}$	8.47	8.40	8.41	8.49	8.44	1
$BMBF_{60}$	7.46	7.51	7.31	7.30	7.40	7
$BMBF_{70}$	7.22	7.24	7.22	7.18	7.22	8
$BMBF_{80}$	7.09	7.08	7.14	6.89	7.05	9
$BMBF_{90}$	6.79	6.81	6.71	6.71	6.76	10
$BMBF_{100}$	6.50	6.65	6.51	6.50	6.54	11
Mean	7.895	7.888	7.832	7.855	7.868	
S.E.±	0.0161	0.0115	0.0115	0.0138	0.0083	
C.D at 5%	0.0473	0.0339	0.0339	0.0405	0.0339	

Maximum score out of 9. All results are mean value of ten determinations

Nutritional value changes in browntop millet biscuits during storage: The average values of fresh biscuits (100% maida) was moisture increased for treatment $BMBF_0$ from 4.12 to 4.17 per cent in LDPE and 4.13 to 4.21 per cent in PP was observed for 90 days of the storage. The sample $BMBF_{50}$ showed increase in the moisture content 4.07 to 4.15 per cent in LDPE and 4.08 to 4.17 per cent in PP. Protein decreased for $BMBF_0$ treatment from 11.70 to 11.55 per cent in LDPE and from 11.71 to 11.50 per cent in PP was observed for 90 days of storage. The sample $BMBF_{50}$ showed from 11.37 to 11.28 per cent in LDPE and from 11.36 to 11.23 per cent in PP. Fat decreased for treatment $BMBF_0$ from 23.78 to 23.69 per cent in LDPE and from 23.78 to 23.69 per cent in PP was observed for 90 days of storage. The sample $BMBF_{50}$ showed from 24.73 to 24.65 in LDPE and from 24.73 to 24.64 in PP. Crude fiber decreased for treatment $BMBF_0$ from 0.38 to 0.31 per cent in LDPE and from 0.38 to 0.31 per cent in PP was observed for 90 days of storage. The sample $BMBF_{50}$ showed crude fiber content 4.34 to 4.25 per cent in LDPE and from 4.33 to 4.24 per cent in PP. Carbohydrates decreased for $BMBF_0$ from 59.26 to 59.16 per cent LDPE and from 59.27 to 59.19 per cent in PP was observed for 90 days of storage. The sample $BMBF_{50}$ showed carbohydrate content 59.01 to 58.93 per cent in LDPE and from 59.01 to 58.92 per cent in PP. Calcium decreased for treatment $BMBF_0$ from 22.66 to 22.59 mg⁄100g in LDPE and from 22.66 to 22.59 mg⁄100g in PP was observed for 90 days. The sample $BMBF_{50}$ showed from 24.82 to 24.75 mg⁄100g in LDPE and from 24.82 to 24.74 mg⁄100g in PP. Iron decreased for treatment $BMBF_0$ from 2.59 to 2.53 mg⁄100g in LDPE and 2.59 to 2.52 mg⁄100g in PP was observed for 90 days. The sample $BMBF_{50}$ showed from 5.75 to 5.69 mg⁄100g in LDPE and from 5.75 to 5.67 mg⁄100g in PP. β-carotene decreased for treatment $BMBF_0$ from 359.61 to 359.38 mg⁄100g in LDPE and 359.59 to 359.33 mg⁄100g in PP was observed for 90 days. The sample $BMBF_{50}$ showed from 176.39 to 176.19 mg⁄100g in LDPE and from 1176.38 to 176.14 mg⁄100g in PP (Table 7). Protein, fat, crude fiber, carbohydrate, β-carotene, calcium and iron decreased in ambient temperature during storage period of 3 months. The decrease in protein, fat, carbohydrate, crude fiber, calcium and iron was more rapid in the samples stored in PP than LDPE during the storage period.

Table 5: Nutritional changes in brown top millet biscuits during storage at ambient temperature

Parameter	Moisture (%)	Protein (%)	Fat (%)	Crude fiber (%)	Carbohydrate (%)	Calcium (mg/100 g)	Iron (mg/ 100 g)	β –carotene (µ/100g)
Treatment								
T_0: $BMBF_0$	4.16	11.61	23.73	0.35	59.22	22.63	2.56	359.48
T_1: $BMBF_{50}$	4.12	11.31	24.69	4.29	58.97	24.79	5.71	175.44
S.E. ±	0.002	0.003	0.003	0.002	0.003	0.004	0.003	0.004
CD at 5%	0.006	0.009	0.009	0.007	0.008	0.012	0.008	0.010
Packaging material								
P_1: Low Density Polyethylene	4.13	11.47	24.21	2.32	59.09	23.71	4.14	267.06
P_2: Polypropylene	4.15	11.44	24.21	2.32	59.09	23.71	4.13	267.86
S.E. ±	0.002	0.003	0.003	0.005	0.003	0.004	0.005	0.004
CD at 5%	0.006	0.009	NS	0.013	0.010	NS	0.012	0.010
Storage period								
C_1: 30 days	4.10	11.54	24.26	2.36	59.14	23.74	4.17	267.99
C_2: 60 days	4.14	11.45	24.21	2.32	59.11	23.71	4.14	267.87
C_3: 90 days	4.18	11.39	24.17	2.28	59.05	23.67	4.10	266.51
S.E. ±	0.003	0.004	0.004	0.003	0.003	0.005	0.004	0.004
CD at 5%	0.007	0.011	0.011	0.010	0.009	0.015	0.011	0.013
Interaction								
$T_0P_0C_1$	4.12	11.70	23.78	0.38	59.26	22.66	2.59	359.61
$T_0P_0C_2$	4.15	11.61	23.71	0.35	59.20	22.63	2.56	359.50
$T_0P_0C_3$	4.17	11.55	23.69	0.31	59.16	22.59	2.53	359.38
$T_0P_1C_1$	4.13	11.71	23.78	0.38	59.27	22.66	2.59	359.59
$T_0P_1C_2$	4.17	11.57	23.73	0.34	59.23	22.64	2.56	359.46
$T_0P_1C_3$	4.21	11.50	23.69	0.31	59.19	22.59	2.52	359.33
$T_1P_0C_1$	4.07	11.37	24.73	4.34	59.01	24.82	5.75	176.39
$T_1P_0C_2$	4.10	11.32	24.69	4.30	58.98	24.79	5.72	176.28
$T_1P_0C_3$	4.15	11.28	24.65	4.25	58.93	24.75	5.69	171.19
$T_1P_1C_1$	4.08	11.36	24.73	4.33	59.01	24.82	5.75	176.38
$T_1P_1C_2$	4.12	11.29	24.69	4.29	58.97	24.79	5.72	176.25
$T_1P_1C_3$	4.17	11.23	24.64	4.24	58.92	24.74	5.67	176.14
S.E. ±	0.005	0.008	0.008	0.010	0.006	0.010	0.009	0.009
CD at 5%	NS	0.023	NS	0.029	NS	0.028	0.026	0.025

Whereas; BMBF0: biscuits with 100% maida

BMBF50: biscuits with 50% maida and 50% brown top millet flour.

Mirasaeedghazi *et al*. (2008) [27] reported that increase of protein in dough causes greater consistency of dough. The interaction including physical and chemical forces among protein molecules play key role on the rheological properties (Shiau and Yeh, 2001) [47]. The increase in protein content is acceptable for better rheological characteristics. Similar results were also reported by Selvaraj *et al*. (2002) [44], Raju *et al.* (2007) [36], Tyagi *et al.* (2007) [53] and Mridula *et al.* (2008) [29].

Biradar *et al.* (2021) [12] reported that PP has a higher gas transmission rate (GTR) and water vapour transmission rate (WVTR) than LDPE. Which indicated that increasing WTTR value had greater permeability and lower ability to kept dry products dry and moist products moist. Also GTR indicates gas crosses surface in unit time under unit pressure which would relates loss in nutrients. Comparable results also given by Butt *et al.* (2004) [14], Shariff, *et al.* (2005) [45]and Salunke *et al.* (2019) [42].

Mitkal *et al.* (2021) [28] Carbohydrate content was observed to be decreased throughout storage which may due to breakdown by amylase and reduction in amount of fat over time due to cookies absorbing moisture from the atmosphere and lipid breakdown into other various molecules by lipase enzyme. In cookies production, addition of fat imparts tenderness making it more palatable; assist in texture improvements. External added fat during preparation of cookies have plasticizing effects reported by Mulvancey and Cohen, (1997) [30]. Comparable results were also given by Narender *et al.* (2007) [32], Bhise *et al.*, (2019) [11] and Belose *et al.* (2021) [10].

Sharoon, *et al.* (2014) [46] reported considerable increment the moisture content in all cookies with increasing storage duration. This increase was primarily due to packaging material (polythene bags). Sujitha and Thirumani, (2014) [51] also reported increase in moisture content from 3.6-5.6% of flaxseed cookies during the storage period of 60 days. This increase was primarily due to packaging material (polythene bags). The packaging was not airtight and lack of temperature control resulted in an increase in moisture contents of cookies. Moreover, cookies absorbed moisture from surrounding atmosphere due to hygroscopic behavior of wheat flour. An increase in moisture contents of cookies samples during storage has also been reported by Leelavathi and Rao, (1993) [23], Rao, *et al*. (1995) [38] Pasha *et al*. (2002) [34], Hemalatha *et al.* (2006) [20], Gurung *et al.* (2016) [19] and Kumar *et al.* (2016) [22] either due to atmosphere or packaging materials.

Conclusion

These results indicated that $BMBF_{50}$ biscuits (50 per cent browntop millet flour and 50 per cent maida) with constant levels of other ingredients *viz.* sugar 50 g, vanspati ghee 50g, sodium bicarbonate 0.5 g, ammonium bicarbonate 0.5 g and water 20 ml respectively. $BMBF_{50}$ biscuits were stored at ambient temperature had better acceptability till 90th day. It was evident from all the physico-chemical properties that $BMBF_{50}$ biscuits (50 per cent browntop millet flour and 50 per cent maida) were the best in LDPE than PP for preparation of browntop millet biscuits of good quality.

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