



## Standardization and Shelf Life of Organic Jaggery Based Millet Cookies

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### ABSTRACT

Jaggery is the natural sweetener and available in solid, liquid & powder form. The micronutrients which are present in Jaggery has many nutritional & medicinal aspects like its anti carcinogenic & antitoxic activity. Jaggery has proved itself better as compared to white sugar. Jaggery is known to produce heat and give instant energy to a human body. Millets are highly nutritious and are known to have good nutritive value and therapeutic use. In developing countries like India with increasing urbanization, the demand for processed food is increasing popularly. Among them, bakery products particularly cookies command wide popularity in both urban and rural mass. Hence, an attempt was made to develop value added jaggery millet cookies with acceptable sensory attributes. The present study was conducted for formulating cookies by substituting sugar with non-organic jaggery and organic jaggery, standardization of cookies and shelf life of selected and accepted products were evaluated. The findings revealed that, the little millet jaggery based cookies with ratio of 75:25 of sugar: non organic jaggery incorporated little millet cookie and 100:0 of organic-jaggery: sugar incorporated little millet cookie was selected for further evaluations. Storage of cookies in HDPE covers at ambient temperature increased in moisture content and free fatty acid in little millet sugar cookies, non-organic jaggery cookies and organic jaggery cookies respectively. The cookies were well accepted up to 45 days. Organic jaggery cookies could be stored upto 60 days.

**Key words:** Jaggery, Standardization, Shelf life.

### INTRODUCTION

An organic food is free of synthetic additives like pesticides, chemical fertilizers and also contains less heavy metal. Jaggery is a natural traditional sweetener, made by concentrating the extracted sugarcane juice. Jaggery been widely used in parts of India, Africa, Latin

America, Japan etc. and is technically known as Non Centrifugal Sugar<sup>9</sup>. India's climatic conditions are more conducive for sugarcane production thus providing the much needed raw material for jaggery production. Almost 3/4th of the cane produced in India is being utilized for producing jaggery.

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Jaggery is widely used in making sweets and syrups in India and jaggery is a popular part of the cuisines of the Indian subcontinent in preparing various sweet dishes like candy, toffees, jaggery cakes and other similar sweet preparations. Its regular usage is advocated in the daily diet as it is a healthy and unrefined form of sugar.

The awareness among the general public regarding the organic food products has been catching up fast. Consumers are opting more for organic food products due to higher health consciousness. Higher the demand, higher is the supply of new varieties of organic food. Thus giving scope to develop new products with organic value. Bakery products are one of the areas which require higher diversification in organic food products. There is higher potential to develop bakery products with organic ingredients, which can enhance the qualitative and quantitative factors of the food product, hence the study was undertaken with the objective of development, standardization and shelf life of jaggery based cookies.

## MATERIAL AND METHODS

### Procurement of sample

**Ingredients:** Little millet was purchased from the local market and milled in the Department of Food Science. Refined wheat flour, unsalted butter, eggs, non-organic jaggery, organic-jaggery and other additives like sodium bicarbonate, vanilla flavors etc were procured from the local market.

### Standardization of little millet cookies

Refined wheat flour cookies recipe developed by Bakery unit, UAS, Dharwad was adopted and varied by replacing refined wheat flour with little millet flour (0, 20, 40, 60, 80 and 100) at various ratios keeping the other ingredients constant.

### Method of preparation of cookies

Flour was sieved with 0.5 per cent baking powder. Fat (50 g) and powdered sugar (60 g) was creamed, blended with the flour and made to dough, sheeted for uniform thickness of 0.5 mm, punched manually into circular shapes of 3 mm diameter, baked at top temperature of

180 °C and bottom temperature 150 °C for 20 min, allowed to cool and evaluated.

### Optimization for incorporation of jaggery

The most acceptable proportion of little millet to refined wheat flour cookie was further used to standardize optimum addition of jaggery. Cookies were evaluated for physical and organoleptic characters. Standardization of jaggery based cookies was carried out by replacing sugar with non-organic or organic jaggery by 0, 25, 50, 75, 100, 125 and 150 per cent.

### Shelf life evaluation of cookies

The cookies and muffins were packed in high-density polyethylene pouches and stored at room temperature. The products were estimated for sensory evaluation, moisture uptake and free fatty acids.

### Statistical analysis

Obtained experimental values were analyzed by analysis of variance (ANOVA) and student's t test for comparisons. SPSS software (version 16.0) was used to analyze the data.

## 1. EXPERIMENTAL RESULTS

### Optimization for incorporation of little millet flour

For optimization of little millet cookie, the standard recipe with refined wheat flour was adopted (Variation I, Table 1). Keeping the other ingredients constant, variations replacing refined wheat flour with little millet flour at various levels were tried (Table 1). The cookies with these variations were prepared and subjected to descriptive sensory evaluation (Table 2). The maximum acceptable incorporation at 40:60 proportions was selected for further studies and was used as little millet control sample for further studies. Although lower proportions were acceptable, the maximum acceptable incorporation of little millet level was chosen

### Optimization of incorporation of non-organic-jaggery in little millet cookies

To the selected little millet cookie (40:60), variation III recipe, sugar was replaced with non-organic jaggery as per the proportions given in (Table3) keeping the other ingredients

flour, butter, curds, essence constant. The cookies were evaluated for organoleptic parameters on a 9 point hedonic scale. The results of the organoleptic evaluations indicate that 75:25 of sugar: non-organic jaggery was on par with the little millet cookie with sugar.

#### **Shelf life of little millet cookies with sugar, non- organic and organic jaggery**

The shelf life of cookies and muffins were studied based on organoleptic evaluation, moisture uptake and free fatty acid content.

Little millet cookies with sugar, non-organic jaggery and organic jaggery were packed in HDPE pouches and stored at ambient conditions. The samples were drawn at 15 days interval. The results of impact of storage on the sensory attributes of cookies in comparison with refined sugar with organic jaggery and non-organic jaggery cookies are depicted in Fig. 1. Among the three different cookies evaluated for storage quality, the little millet cookies with sugar and non-organic jaggery exhibited shelf life of 45 days, while organic jaggery cookies had a shelf life of 60 days. It was observed that during storage, appearance and color scores did not vary significantly in all the types cookies.

With respect to the taste of the stored cookies, the mean score for little millet sugar cookies at the beginning of storage was 7.9 while at the end of the storage period of 60 days, the score decline to 6.0. Similarly in case of organic- jaggery cookie and non-organic jaggery cookie the scores decreased from 7.9 to 6.9 and 7.8 to 6.8, respectively.

With regard to texture, the scores decreased significantly ( $p < 5\%$ ) as the storage day increased. The little millet sugar cookies initially recorded a mean score of 7.8 which reduced gradually to 6.5 at the end of the storage period. Similar reduction from 7.7 to 6.9 and 7.8 to 6.3 were recorded in organic jaggery cookies and non-organic jaggery cookies.

Sensory scores for flavor decreased significantly as the storage day increased. Scores of little millet sugar cookies and organic jaggery cookies reduced from 7.80 to 6.5 and 7.7 to 7.0 respectively. Non-organic

jaggery cookie initially recorded a mean score of 7.6 and it reduced to 6.7 at the end of the storage.

Over all acceptability of little millet sugar cookies, organic jaggery cookies and non-organic jaggery cookies decreased over a period of 60 days. Little millet sugar cookies recorded highest score 7.8 on zero day which decreased to 6.0 at the end of the storage period of 60 days. Similarly in organic jaggery cookies and non-organic jaggery cookies, scores decreased from 7.7 to 6.7 and 7.6 to 6.5 at the end of 60 days.

Fig. 2 shows the moisture content of little millet cookies during storage. The moisture content in little millet sugar cookies and non-organic jaggery gradually increased from 4.2, to 4.3; 7.5, to 7.4 per cent. In case of organic jaggery, the increase in moisture content was comparatively less *i.e.* 4.6 to 7 per cent. With regard to free fatty acid content, an indicator for rancidity of the product, the content increased gradually during the storage period from 1.2 to 5.5 meq/kg of fat in sugar cookie, 1.3 to 5.00 meq/kg in non-organic jaggery cookie and in organic jaggery cookie from 1.5 to 6.2 meq/kg respectively (Fig. 3).

## **DISCUSSION**

### **Shelf life of little millet cookies with sugar, non- organic and organic jaggery**

Little millet cookies with a flour ratio of 40:60 refined flour: little millet flour cookies with 100 per cent sugar, 75: 25 sugar: non-organic jaggery and 25: 75 sugar: organic jaggery were stored in HDPE bags at ambient temperature. The products were evaluated for sensory parameters, moisture uptake and free fatty acid liberation at regular intervals. The sensory scores revealed that as the storage period increased the acceptability in terms of texture, flavor and taste decreased while colour and appearance did not affect much. Moisture uptake increased gradually and so also free fatty acid content in all the types, however the uptake was higher in sugar and non-organic little millet cookies. This could be due to higher hygroscopic nature of sugar and the non- organic cookies had lesser per cent of

jaggery in it. The little millet non organic jaggery and sugar cookies could be stored upto 45 days without affecting the texture, while organic jaggery could be stored upto 60 days due to lesser moisture absorption. Free fatty acid content was high in organic cookies from 0 to 60 days and it was increased during storage. Similarly Surekha *et al.* reported that

relatively higher levels of moisture and free fatty acid content were observed in cookies stored in polyethylene packages than the aluminum laminated packaging materials. This may be attributed to the hygroscopic nature of LDPE (low-density polyethylene) material, when stored for longer duration.

**Table 1: Standardization of cookies with little millet flour**

Variations	Refined wheat flour (g)	Little millet flour (g)	Butter (g)	Sugar (g)	Curd Tsp	Baking powder (g)	Essence (vanilla) Drops
I	100	0	50	60	2	0.5	2-3
II	60	40					
III	40	60					
IV	20	80					

**Table 2: Descriptive profile of little millet flour incorporated cookies**

Variations	Refined flour: little millet flour (g)	Descriptive profile of cookies
Control	100:00	Golden brown, evenly baked, attractive, well spread, light and crisp, pleasant baked aroma and flavor, smooth in mouth feel and acceptable.
I	80:20	Creamish, evenly baked, attractive, well spread, slightly compact, pleasant baked aroma and flavor, slight coarse mouth feel and acceptable.
II	60:40	Dull creamish, evenly baked, slight compact, crisp, pleasant baked aroma and flavor slightly coarse mouth feel and acceptable.
III	40:60	Dull creamish, evenly baked, slight compact, crisp, pleasant baked aroma and flavor slightly coarse mouth feel and acceptable.
IV	20:80	Off white, evenly baked, less spread, highly compact, brittle and gritty mouths feel, unacceptable.

**Table 3: Incorporation of non-organic and organic jaggery in little millet cookies**

Variations	Sugar (g)	Non-organic jaggery (g)	Organic jaggery (g)	Ratio (sugar : jaggery) Per cent
1	60	0	0	100:00
2	45	15	15	75:25
3	30	30	30	50:50
4	15	45	45	25:75
5	-	60	60	00:100
6	-	70	70	00:125
7	-	90	90	00:150

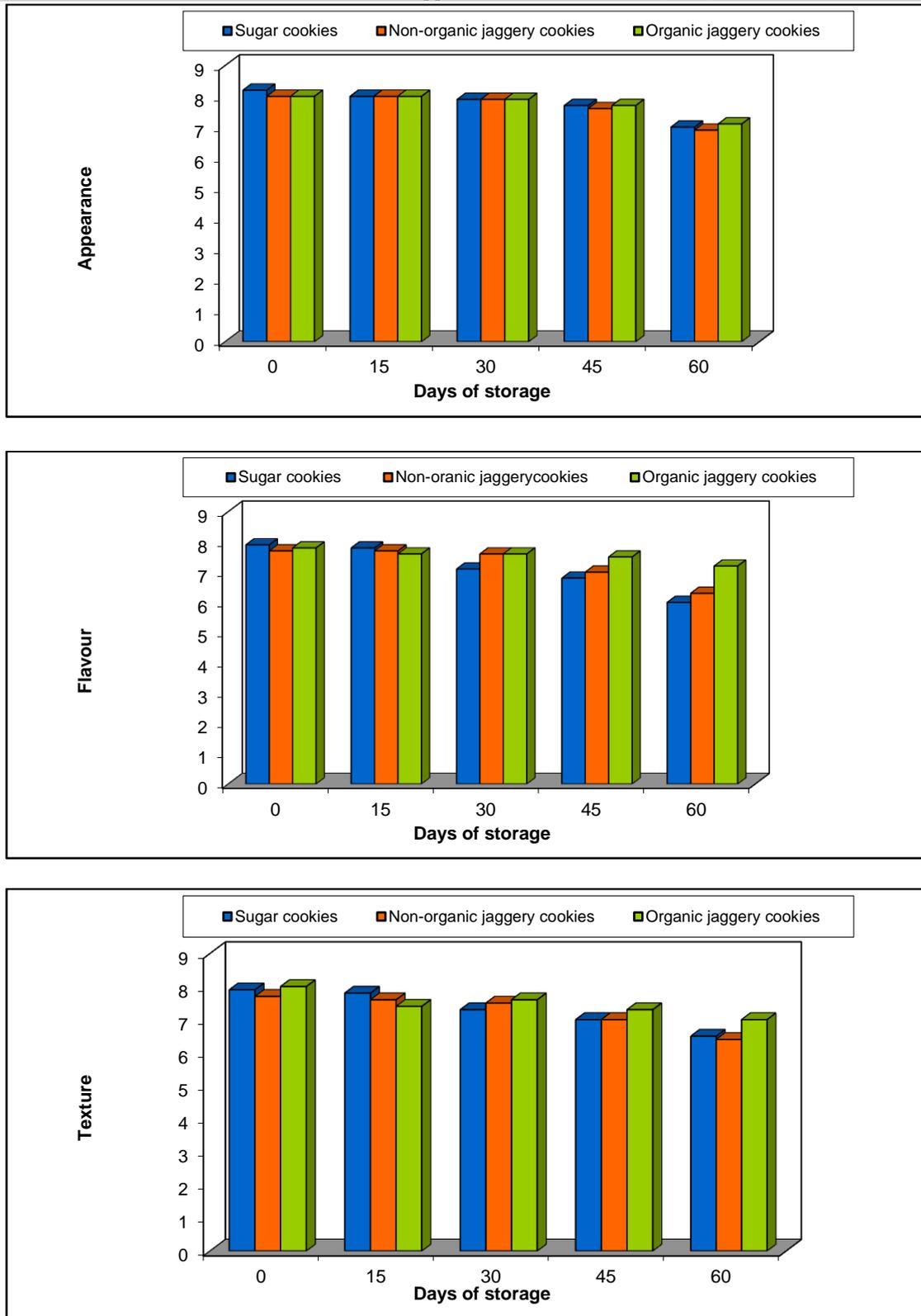


Fig. 1: Effect of storage on sensory parameters of cookies

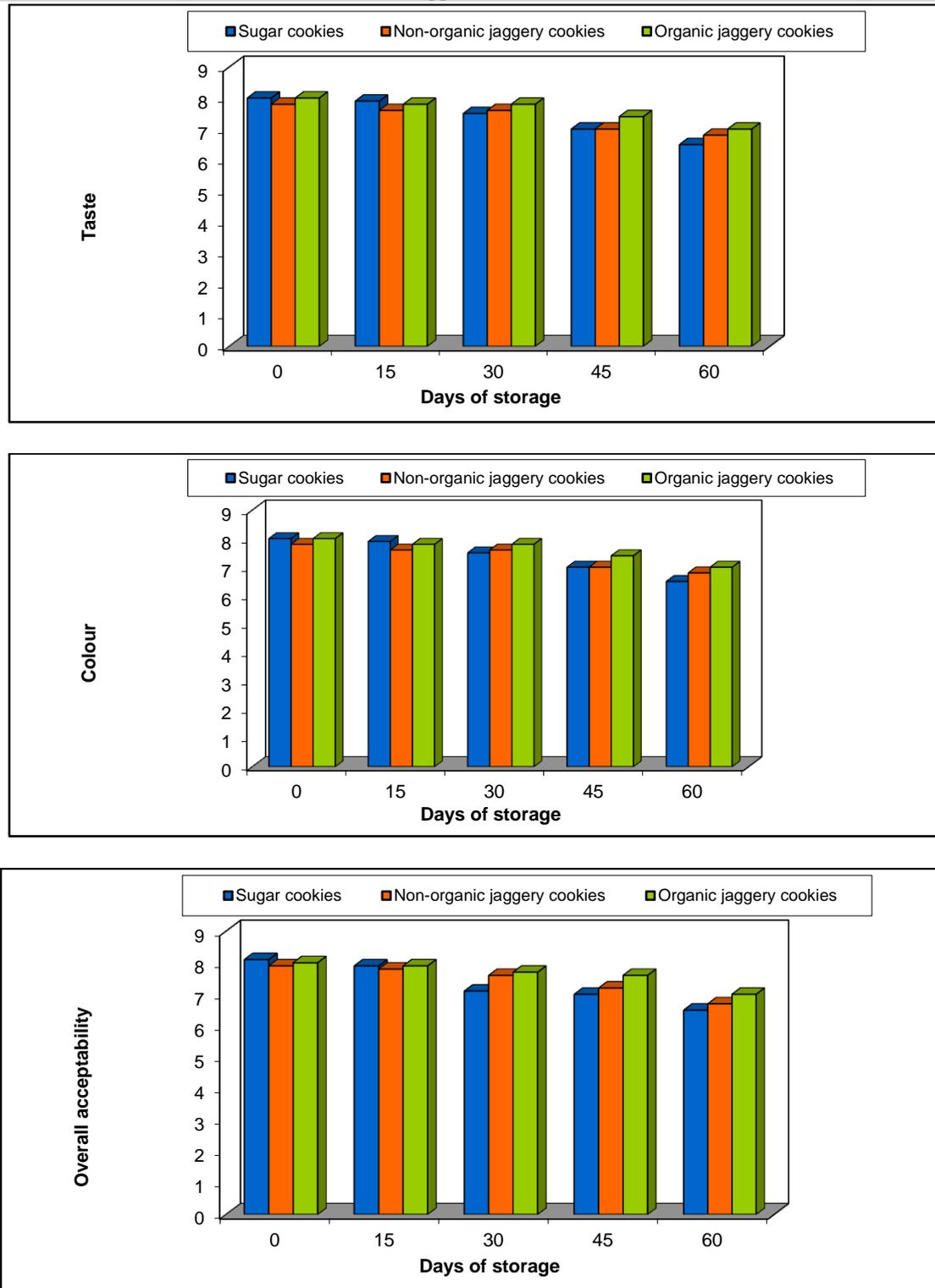


Fig. 1: Effect of storage on sensory parameters of cookies (Contd...)

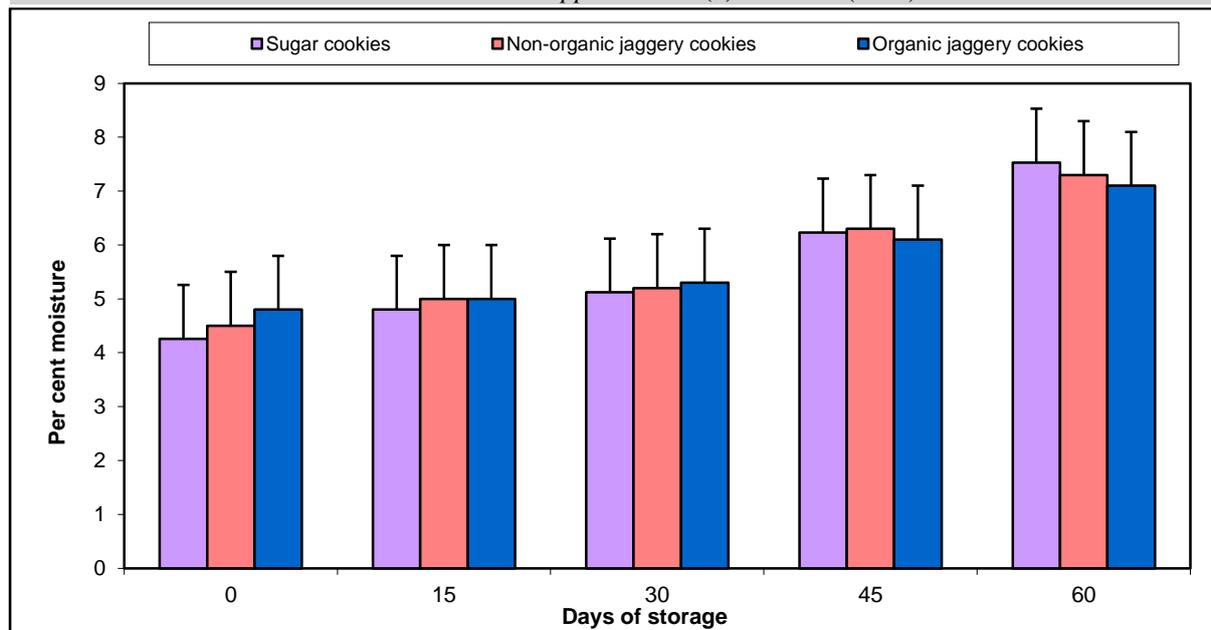


Fig. 2: Moisture content of the stored little millet cookies

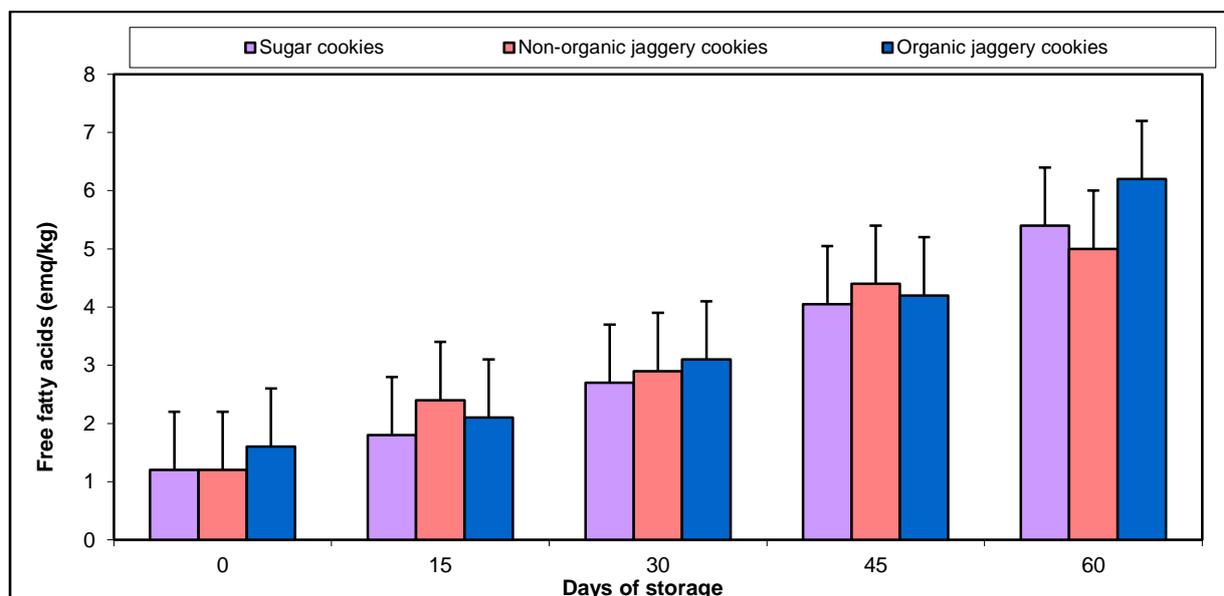


Fig. 3: Free fatty acid content of stored little millet cookies

### CONCLUSION

Little millet flour was incorporated at 20, 40, 60 and 80 per cent to refined wheat flour. The incorporation of 60 per cent little millet flour was selected for further optimization of cookies. Storage of cookies in HDPE covers at ambient temperature increased in moisture content and free fatty acid in little millet sugar cookies, non-organic jaggery cookies and organic jaggery cookies respectively. The cookies were well accepted up to 45 days. Organic jaggery cookies could be stored upto 60 days.

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