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## Shelf life evaluation of ready to cook idli mix prepared from little millet and flaxseed powder

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### Abstract

Idli is a traditional cereal/legume based fermented steamed product having a soft and spongy texture which is highly popular and widely consumed as a breakfast food item in India. It has a spongy texture, attractive appearance, appetizing taste, flavour and is easy to digest. In the present investigation, idli mix powder was prepared using combination of Rava, Little Millet powder, Flaxseed powder and Black Gram powder. In the standardized product, Rava @ 32.5%, Little Millet powder @ 32.5%, Flaxseed powder @ 5%, Black gram powder @ 20%, Salt @ 2%, Mustard seed @ 1%, Curry leaves @ 1%, Baking powder @ 2%, and Oil @ 4% were mixed, which was then stored at room temperature. During this storage period, organoleptic evaluation, chemical and microbial analysis of the product was carried out. The sensory evaluation of optimized product during the storage showed that there was continuous decrease in scores of all the sensory parameters. The chemical analysis of idli mix during storage showed that fat, protein, carbohydrate, free fatty acid and crude fiber increased while ash and moisture decreased.

**Keywords:** Idli mix, little millet, flaxseed, black gram, shelf life study, chemical composition

### Introduction

Ready-to-cook foods are those foods which need less time preparation and it is simple, convenient, easy and fast to prepare for example, rava idli mix, gulab jamun mix, etc. (Bawa 2007) [7]. Fermented foods provide health beneficial micro flora to the diet and also supplies nutrients like proteins and amino acids. Idli is a popular and commonly consumed breakfast food item in India. It is a traditional cereal/legume-based fermented steamed meal with a soft and spongy feel. It has a spongy texture, a pleasing look, a delectable taste and flavour, and it is simple to digest. Its appeal as a breakfast food is due to its organoleptic characteristics and its nutritional value. (Susheelamma and Rao 1979; Steinkraus, 1967; Steinkraus and Van Veen, 1971; Van Veen and Steinkraus 1970) [16, 14, 15, 19]. In India, Little millet is one of the important staple cereal crops mainly grown in Karnataka and Tamil Nadu. Millets are grains which are used for food, feed and forage. Little millets are major source of dietary fibres, are non-glutinous and are considered to be less allergenic. Little millet has 5.2 g fat, 9.8g protein, 61g carbohydrate, 7.7g crude fiber, 220mg phosphorus and 9.3mg iron /100 gm which are comparable to cereals and other millets. Little millet is high in dietary fibre, which helps to prevent lower cholesterol and relieve indigestion. It lowers the risk of heart attack, improves digestion, and protects against breast cancer and children asthma. Dietary fiber content of little millet is the contributing factor for its low glycaemic index and a recent study conducted on little millet indicated that it exhibits hypoglycaemic effect due to its higher proportion of dietary fiber (Itagi, 2013) [8]. It has a significant role in providing significant amounts of antioxidants and phytochemicals in the diet (Sumathi *et al.*, 2007; Pradeep and Guha, 2011) [18, 11]. Flaxseed has been used as a precious nutritional food grain and traditional medicine in human diets for thousands of years and more recently it has been used as a source of nutraceuticals and identified as a functional food, whose benefits on health are generally attributed to high concentration of linolenic acids (Omega 3) and lignans as well as significant quantities of dietary fiber including soluble and insoluble fibers (Anon, 2003) [3]. Black gram has a major role in idli fermentation as a source of microorganisms and as fermenting substrate (Radhakrishnamurthy, 1961) [12]. The present investigation was conducted to study the effect of Little millet powder, Flaxseed powder, Rava and Black gram powder addition on shelf life of ready to cook idli mix

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## Materials and Methods

### Procurement of raw materials

Little millet, Flaxseed, rava, black gram, salt, mustard seed, curry leaves, baking powder and oil were collected from local stores of Prayagraj. All reagent used for analysis were of AR grade.

### Preparation of ready to cook idli mix

Different ingredients like rava, little millet powder, flaxseed powder, and black gram powder were added in different percents as per treatments combination and then they were mixed properly. Oil @ 4% was added to a hot pan in which curry leaves, mustard seeds were roasted. The mixture of rava, little millet powder, flaxseed powder and black gram powder were mixed with curry leaves, mustard seed and then roasted at 90°C for 5 minutes. Salt @ 2%, and baking powder @ 2%, was also added. The mixture was allowed to cool and then filled into sanitized aluminium laminate pouches, sealed and kept for storage at room temperature. Storage study of ready to cook idli mix supplemented with rava, little millet powder, flaxseed powder and black gram powder was carried out only for the standardized product. The standardized product was prepared using combination of Rava @ 32.5%, Little Millet powder @ 32.5%, Flaxseed powder @ 5% and Black gram powder @ 20%. Storage study was carried out at room temperature for six month and the sample was analyzed at a regular interval of one month for chemical, microbial and organoleptic parameters.

### Chemical analysis

Idli mix powder samples were analyzed for fat, protein, carbohydrate and crude fiber content by following the method of AOAC (2000) [4] for wheat flour which certain modification. Determination of ash content was done as per procedure of AACC (2000) [1]. Total solids of idli mix powder were determined as per procedure laid down in Rangana (1986) [13]. Free fatty acid of idli mix powder was carried out as per procedure of AOCS (1998) [5].

### Organoleptic analysis

Idli were prepared from idli mix powder supplemented with rava, little millet powder, flaxseed powder and black gram powder was evaluated for organoleptic scores by using 9-point Hedonic scale of Amerine *et al.*, (1965) [2]

### Microbiological analysis

Standard plate count and Coliform count of idli mix powder were determined as per the procedure of Morton (2001) [9]. Yeast and Mold counts of idli mix powder were determined as per the procedure of Batool *et al.* (2012) [6].

### Statistical analysis

Data was analyzed using Analysis of Variance (ANOVA) at 5 percent level of significance and critical differences (CD) were calculated in MS office, 2007.

## Results and Discussions

**Effects of storage on carbohydrate content of idli mix powder:** Carbohydrate content of idli mix powder sample during storage was found to range from 56.74 to 57.66 percent. The carbohydrate content of 0<sup>th</sup>Month, 1<sup>st</sup>Month, 2<sup>nd</sup>Month, 3<sup>rd</sup>Month, 4<sup>th</sup>Month, 5<sup>th</sup>Month and 6<sup>th</sup>Month was

found to be 56.74, 56.76, 56.84, 56.98, 57.21, 57.4 and 57.66 percent respectively. There is significant difference ( $P < 0.05$ ) in carbohydrate percentage of idli mix powder sample at different interval of storage period.

### Effects of storage on protein content of idli mix powder

Protein content of idli mix powder sample during storage was found to range from 13.32 to 13.92 percent. The protein content of 0<sup>th</sup>Month, 1<sup>st</sup>Month, 2<sup>nd</sup>Month, 3<sup>rd</sup>Month, 4<sup>th</sup>Month, 5<sup>th</sup>Month and 6<sup>th</sup>Month was found to be 13.32, 13.33, 13.37, 13.45, 13.57, 13.74 and 13.92 percent respectively. There is significant difference ( $P < 0.05$ ) in protein percentage of idli mix powder sample at different interval of storage period.

### Effects of storage on fat content of idli mix powder

Fat content of idli mix powder sample during storage was found to range from 7.96 to 8.84 percent. The fat content of 0<sup>th</sup>Month, 1<sup>st</sup>Month, 2<sup>nd</sup>Month, 3<sup>rd</sup>Month, 4<sup>th</sup>Month, 5<sup>th</sup>Month and 6<sup>th</sup>Month was found to be 7.96, 7.98, 8.06, 8.20, 8.43, 8.62 and 8.84 percent respectively. There is significant difference ( $P < 0.05$ ) in fat percentage of idli mix powder sample at different interval of storage period.

### Effects of storage on ash content of idli mix powder

Ash content of idli mix powder sample during storage was found to range from 2.46 to 2.58 percent. The ash content of 0<sup>th</sup>Month, 1<sup>st</sup>Month, 2<sup>nd</sup>Month, 3<sup>rd</sup>Month, 4<sup>th</sup>Month, 5<sup>th</sup>Month and 6<sup>th</sup>Month was found to be 2.58, 2.58, 2.57, 2.56, 2.54, 2.51 and 2.46 percent respectively. There is significant difference ( $P < 0.05$ ) in ash percentage of idli mix powder sample at different interval of storage period.

### Effects of storage on total solids content of idli mix powder

Total solids content of idli mix powder sample during storage was found to range from 80.60 to 82.88 percent. The total solids content of 0<sup>th</sup>Month, 1<sup>st</sup>Month, 2<sup>nd</sup>Month, 3<sup>rd</sup>Month, 4<sup>th</sup>Month, 5<sup>th</sup>Month and 6<sup>th</sup>Month was found to be of 80.60, 80.65, 80.84, 81.13, 81.72, 82.26 and 82.42 percent respectively. There is significant difference ( $P < 0.05$ ) in total solids percentage of idli mix powder sample at different interval of storage period.

### Effects of storage on free fatty acid percentage of idli mix powder

Free fatty acid percentage of idli mix powder sample during storage was found to range from 0.59 to 0.76 percent. The free fatty acid percentage of 0<sup>th</sup>Month, 1<sup>st</sup>Month, 2<sup>nd</sup>Month, 3<sup>rd</sup>Month, 4<sup>th</sup>Month, 5<sup>th</sup>Month and 6<sup>th</sup>Month was found to be 0.59, 0.59, 0.60, 0.62, 0.65, 0.69 and 0.76 percent respectively. There is significant difference ( $P < 0.05$ ) in free fatty acid percentage of idli mix powder sample at different interval of storage period.

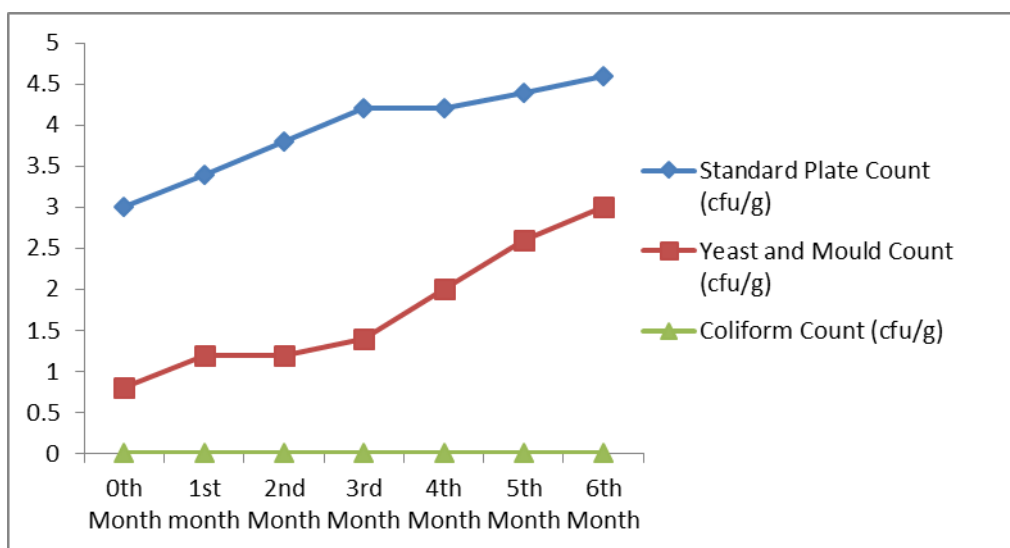
### Effects of storage on crude fiber content of idli mix powder

Crude fiber content of idli mix powder sample during storage was found to range from 7.64 to 7.81 percent. The crude fiber content of 0<sup>th</sup>Month, 1<sup>st</sup>Month, 2<sup>nd</sup>Month, 3<sup>rd</sup>Month, 4<sup>th</sup>Month, 5<sup>th</sup>Month and 6<sup>th</sup>Month was found to be 7.64, 7.64, 7.66, 7.69, 7.71, 7.75 and 7.81 percent respectively. There is significant difference ( $P < 0.05$ ) in free crude fiber percentage of idli mix powder sample at different interval of storage period.

**Effects of storage on organoleptic properties of idli mix powder**

Idlies were prepared from the respective idli mix powder and then it was subjected to organoleptic evaluation. The organoleptic properties of the idli prepared from idli mix

powder were studied upto 6<sup>th</sup> months at an interval of every one month during storage at room temperature. The observations of organoleptic evaluation with respect to colour and appearance, flavour, body and texture and overall acceptability are presented in fig. 1.



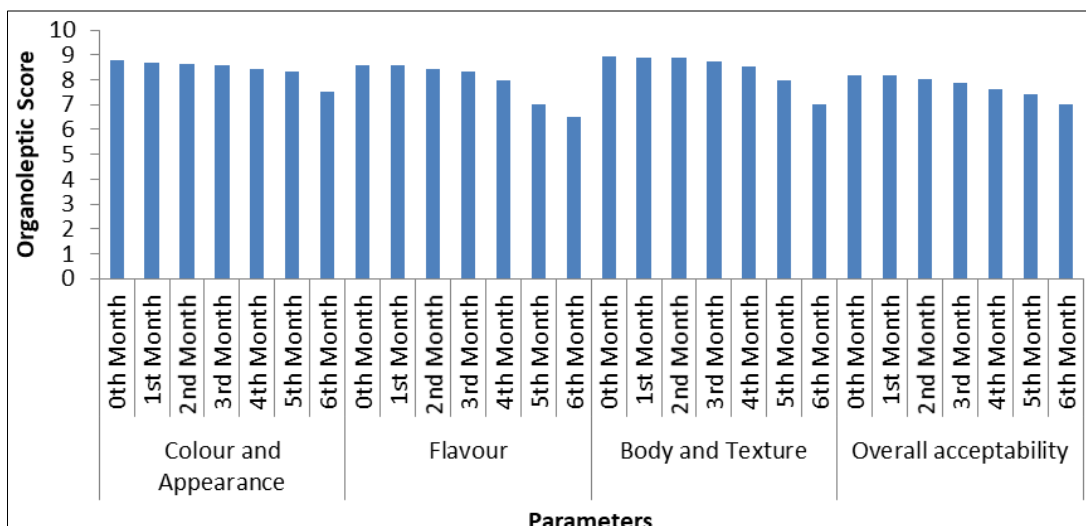
**Fig 1:** Graph showing microbial count of idli mix powder at different interval of storage

Colour and appearance score of idli prepared from idli mix powder during storage was found to range from 7.50 to 8.80. There is significant difference ( $P < 0.05$ ) in colour and appearance score of idli sample prepared from idli mix powder at different interval of storage period. Vishakha 2006 [20], reported semolina idli mixes with 40% maize grits of different maize varieties showed non-significant difference in colour and appearance scores of reconstituted idli. Flavour score of idli prepared from idli mix powder during storage was found to range from 6.50 to 8.58. There is significant difference ( $P < 0.05$ ) in flavour score of idli sample prepared from idli mix powder at different interval of storage period. Nazni and Shalini 2010, observed incorporation of pearl millet up to 31.5% in rice idli had no significant difference in flavour scores. Body and texture score of idli prepared from idli mix powder during storage was found to range from 7.00 to 8.92. There is significant difference ( $P < 0.05$ ) in body and texture score of idli sample prepared from idli mix powder at

different interval of storage period. Vishakha 2006 [20], reported semolina idli mixes with 40% maize grits of different maize varieties showed significant decline in texture scores of reconstituted idli. Overall acceptability score of idli prepared from idli mix powder during storage was found to range from 7.00 to 8.20. There is significant difference ( $P < 0.05$ ) in overall acceptability score of idli sample prepared from idli mix powder at different interval of storage period. Nazni and Shalini 2010, observed incorporation of pearl millet up to 31.5% in rice idli had significant decline in overall acceptability.

**Effects of storage on microbial count of idli mix powder**

The microbial count of the sample was studied upto 6<sup>th</sup> months of storage at room temperature. The result of standard plate count ( $\times 10^3$ cfu/g), yeast and mould count ( $\times 10^1$ cfu/g) and coliform count ( $\times 10^1$ cfu/g) of the idli mix powder sample are presented in fig. 2.



**Fig 2:** Organoleptic scores of idli sample prepared from idli mix powder at different interval of storage period

## Conclusion

The Physico-chemical analysis of optimized idli mix powder during storage shows that carbohydrate, protein, fat, total solids, free fatty acid and crude fiber increased while ash and moisture decreased. The sensory evaluation of idli prepared from optimized idli mix powder during storage shows that there was continuous decrease in all the sensory scores. The microbial analysis of optimized idli mix powder revealed that there was no growth of coliform during storage while there was increased in standard plate count and yeast and mould count which gradually increased during storage period. Storage study suggested that the idli mix powder was acceptable upto 6<sup>th</sup> months at room temperature. From this study it can be concluded that little millet and flaxseed fortified idli mix powder has similar shelf-life period as that of idli mix powder and addition of rava, little millet, flaxseed and black gram powder do not affect storage period of the product.

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