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RESEARCH ARTICLE :

Development and influence of physical and textural parameter for standardization of all millet bun

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SUMMARY : For the development of millet bun eight types of grains were used *i.e.* Jowar, ragi, pearl, little, kodo, foxtail, proso and barnyard. Mix flour was prepared by using different level of millet (20, 30, 40 and 50%) and wheat flour (20, 30, 40 and 50%) and with baking temperature of 160°C at 30 min were chosen as independent variables to develop bun. The physical (weight, thickness, spread ratio, specific volume, weight loss, texture and yield) attributes were determined for control andbun. Sensory attributes were conducted on the bun. Increasing the level of substitution from milletflour significantly increased the hardness of bun. Volume and weight of treated bun were significantly different to that of the control treatment. Sensory evaluation results indicated that bun with 40% millet flour 60% refined wheat flour was rated the most acceptable from each millet.

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KEY WORDS :
Millets, Bunand physical, Textural parameter

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BACKGROUND AND OBJECTIVES

Bun is one of themost popular and wide spread baked products in the world and its quality depends on several physical and organoleptic characteristics, which could be influenced by many factors, such as flour type andother ingredients, bun-making procedure, fermentation, cooking time and temperature. Thus, industries and researchers areinvolved in optimizing bun-making technology to improve the variety, quality, taste and availability of active compounds, addingsuch components with nutritional and functional properties with the final aim to formulate a product with physiological effectiveness encountering consumer'sacceptance in terms of appearance,taste andtexture. The utilization of flours derived from minor cereals, pseudo cereals, other non-traditional crops and herbs that could be included in bun formulation to obtain a healthier product with excellent sensorial properties (Asta *et al.*, 2013).

Millets are a group of crops grown in semi-arid regions of Asian and African countries. They form a staple food for a large segment of the population, mainly those with low socio-economic status, especially during drought or famine. They are generally included in the group of coarse cereals. Conventionally, in India, the term coarse cereals cover all cereals except rice and wheat. These millets are valuable in traditional

food and feed. They are not usually traded in the international markets or even in local markets in many countries.

Hence, the study was aimed at assessing millet flour for supplement in bun formulations and assesses the quality of bun.

RESOURCES AND METHODS

The millets were procured farmers and other basic ingredients namely wheat, yeast, salt and butter were procured from Hyderabad local market India.

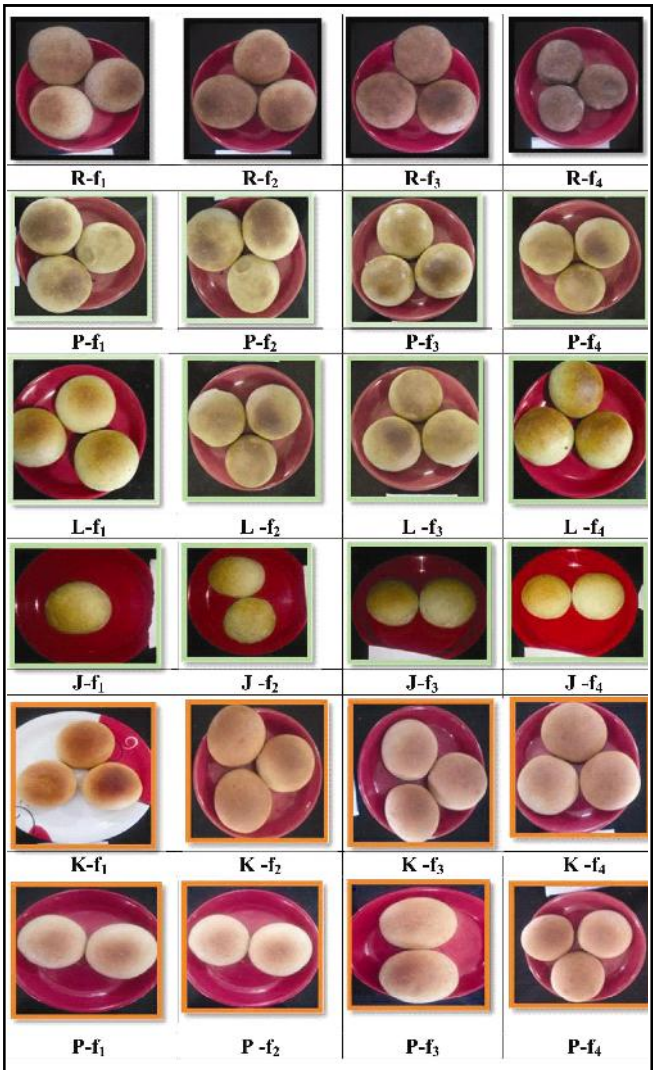
Bun were prepared with varying levels of ingredients such as yeast, salt, millet flour (20, 30, 40 and 50%) and refined wheat flour (80, 70, 60, and 50%) baking time (30 min) and temperature (160^{0}C) Fig. A.

The composition of the millet bun was prepared by the combination of the refined wheat flour, and other ingredients depending upon their level of acceptance from the previous study reports. All the experiments were carried out in triplicate and the average values were reported. Experimental data obtained was statistically analysed.

Chemical composition such as moisture content,protein, fat, and ash was determined according to AOAC standard method (AOAC, 2005). Moisture was determined using hot air oven at 100-105^{0}C for 3 hours (AOAC, Method 945.43). Protein content (% N x 6.25) was determined by the Kjedahl method (AOAC, Method 950.36). Fat test was carried out based on Soxhlet Extraction Method utilizing petroleum ether 40^{0}C–60^{0}C (AOAC, Method 922.06). The ash content was measured according to dry ashing procedure (AOAC, Method 925.23). All analyses were carried out in triplicate and average value was recorded for further analysis.

The thickness of the bun was measured by using a digital verneircaliper (absolute digimatic, Mitutoyo Corp. Japan). The weight was determined using electronic balance (Easse), spread ratio and specific volume (Assefaw and Fu, 2014) and weight loss, yields (Arora and Saini, 2016) weight loss before and after baking and volume was calculated.

Sensory evaluation was used to determine millet bun was the most appropriate to way to make comparison phase of the study. The buns were analyzed by a 15 member's panelist consisting of faculty of IIMR staff. Millet bun was judged for attributes *viz.*, colour, shape, flavour, taste, hardness and overall acceptability. Panelists worked in partitioned booths (32±1°C), without air flow, free from noise and odours and under off white light in order to mask different attributes of the bun samples and therefore to prevent bias. A nine-point hedonic scale was used to point out the differences among the bun samples.



f_1–Millet flour (20%): Maida flour (80 %)
f_2 - Milletflour (30%): Maida flour (70 %)
f_3 - Millet flour (40%): Maida flour (60 %)
f_4 -Millet flour (50%): Maida flour (50 %)

R- Ragi	L: Litte Millet	F: Foxtail Millet
K: Kodo Millet	B: Barnyard Millet	P: Proso Millet
J: Jowar	PM: Pearl Millet	

Fig. A : Millet based bun

OBSERVATIONS AND ANALYSIS

The results obtained from the present study as well as discussions have been summarized under following heads:

Effect of enzyme activity (Falling number) on bun flour :

A certain amount of alpha-amylase is necessary for proper baking to occur. The alpha-amylase breaks down starches to provide sugars to help fuel the fermentation process. The amount of enzyme present can have a direct bearing upon the quality of bun produced. When the alpha-amylase activity is right, a high volume bun with firm and soft texture is achieved (FN = 250 in picture). If the activity is too high, a sticky bread crumb and low volume may result (FN = 62 in picture). If the activity is too low, a dry bread crumb with diminished volume may result (FN = 400 in picture). The FN value has an inverse relationship with the alpha-amylase activity meaning the higher the alpha-amylase activity the lower the FN value, and *vice-versa* Table 1.

The Enzyme activity of bun flour was found in the range of 280 for all treatments and 281 for kodo (f_3) and pearl millet flour (f_3) Table. It indicated that enzyme activity is normal in case of all treatment Fig. 1.

Fig. 1: Baking bun result related to falling number

Effect of spread ratio on millet based bun :

Spread ratio is significantly influenced millet based bun. The spread ratios obtained for different millet based products were appreciable and were over 1.65 and as high as 2.0. However, the spread ratio was affected by the millet flour, increase in millet flour level decrease in the spread ratio.

Effect of specific volume on millet based bun :

Spread volume is significantly influenced millet based

Table 1 : Effect of falling number on millet based bun

Treatments	Enzyme activity (FN)	Temperature
Foxtail millet		
F-f1	280	90°C
F-f2	280	99°C
F-f3	280	90°C
F-f4	280	90°C
Little millet		
L-f1	280	90°C
L-f2	280	99°C
L-f3	280	90°C
L-f4	280	90°C
Kodo millet		
K-f1	280	90°C
K-f2	280	99°C
K-f3	281	90°C
K-f4	280	90°C
Barnyard millet		
B-f1	280	90°C
B-f2	280	99°C
B-f3	280	90°C
B-f4	280	90°C
Proso millet		
P-f1	280	90°C
P-f2	280	99°C
P-f3	280	90°C
P-f4	280	90°C
Jowar		
J-f1	280	90°C
J-f2	280	99°C
J-f3	280	90°C
J- f4	280	90°C
Pear Millet		
PM-f1	280	90°C
PM-f2	280	99°C
PM-f3	281	90°C
PM-f4	280	90°C

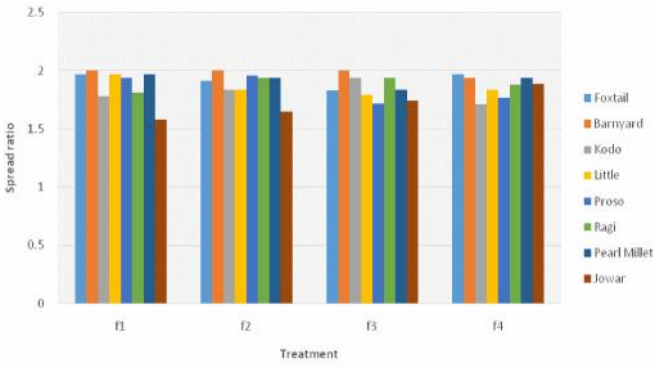


Fig. 2 : Effect of spread ratio on millet based bun

bun. The specific volume obtained for different millet based products were ranged from 0.065-0.085 cm^3/g, the specific volume.

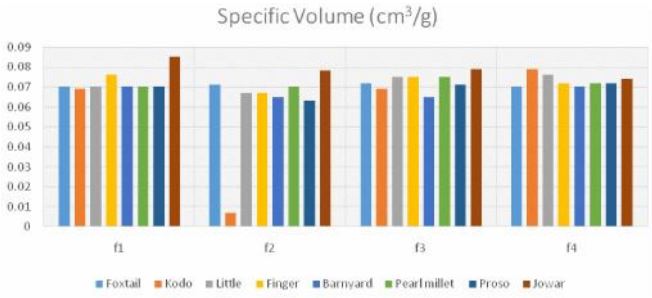


Fig. 3 : Effect of Specific volume (cm^3/g) on millet based bun

Effect of weight loss (%) on millet based Bun, Burger bun and Doughnut Bun :

Weight loss is the removal of moisture during baking process. It was found that with the increase of substitution percentage, the weight loss after baking also decreased. This may be due to the high water holding capacity of the composite flour constituent. It was ranged 3.33%-12.72%. The highest was found in P—f_4 treatment and lowest recorded was L-f_3 treatment. Similar result was found in Raihan and Saini, 2016 (Fig. 4).

Effect of millet based Bun on Yield (%) :

Yield in baking product is the percentage of the product obtained after baking. It was found that 89.09% to 94.50%. The highest was recorded in case of kodo, barnyard millet, pearl millet, proso and finger millet. This happened due to less water loss during baking process. Similar result was found in Raihan and Saini (2016) (Fig. 5).

Bun :

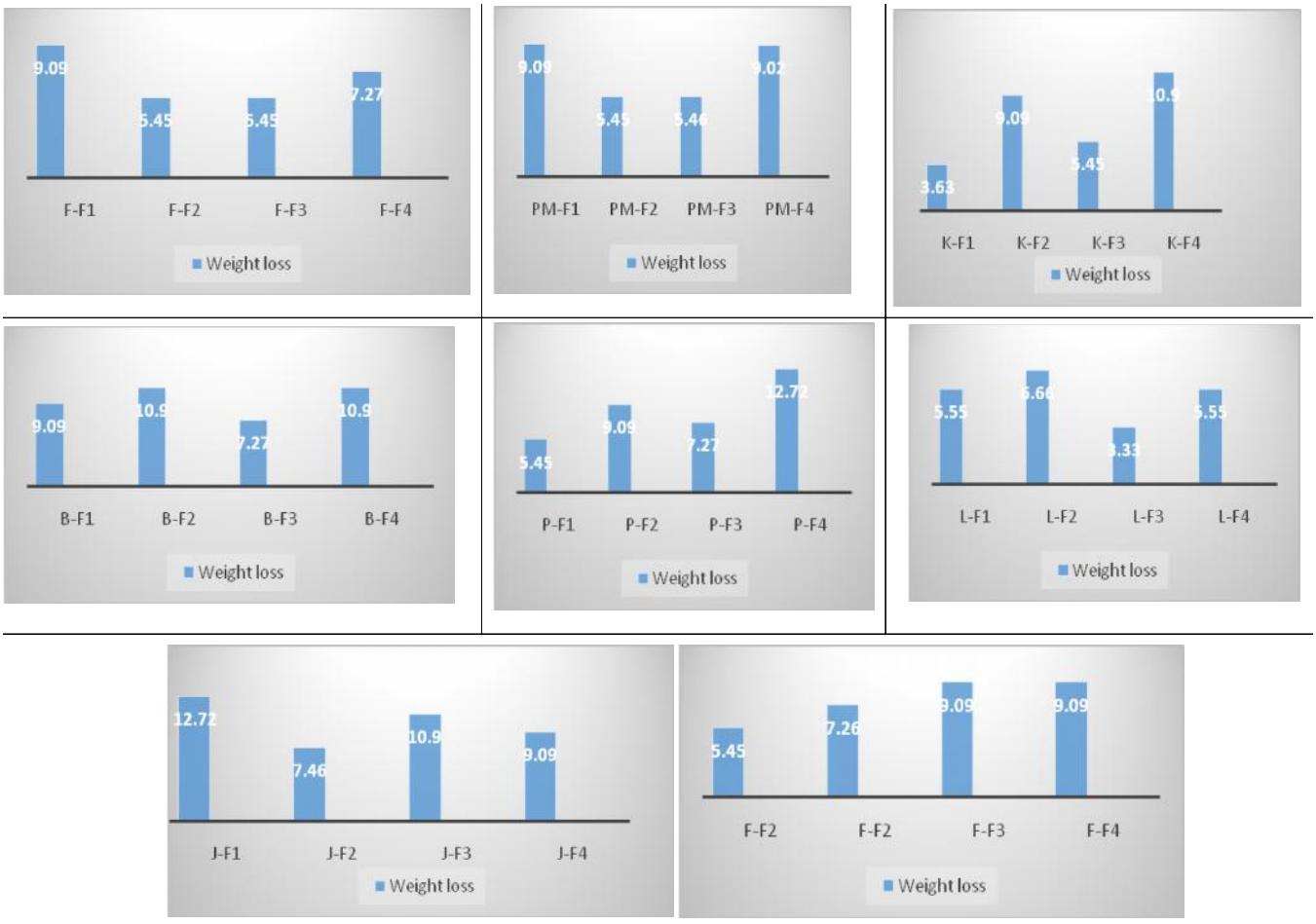


Fig. 4 : Effect of millet based bun on weight loss (%)

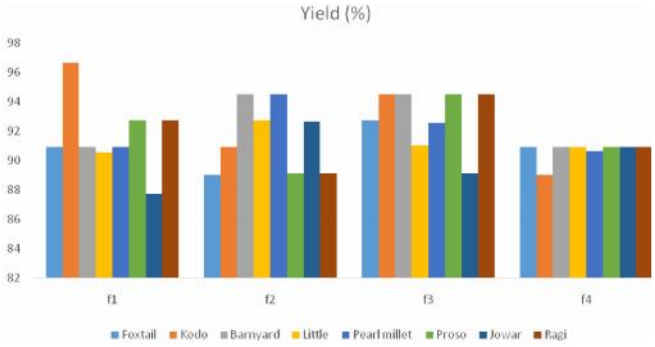


Fig. 5 : Effect of millet based bun on yield (%)

Effect on textural properties of Bun :

Fracturability(gr-s) of a product is basically a measure of total force to crush / penetrate a solid probe through the product and is measured as the area under the Force-Deformation (Time) Curve. Hardness(g) is a characteristic of a product by which it resists compressive failure. It is determined by measuring the maximum force to compress the given layer of the product.

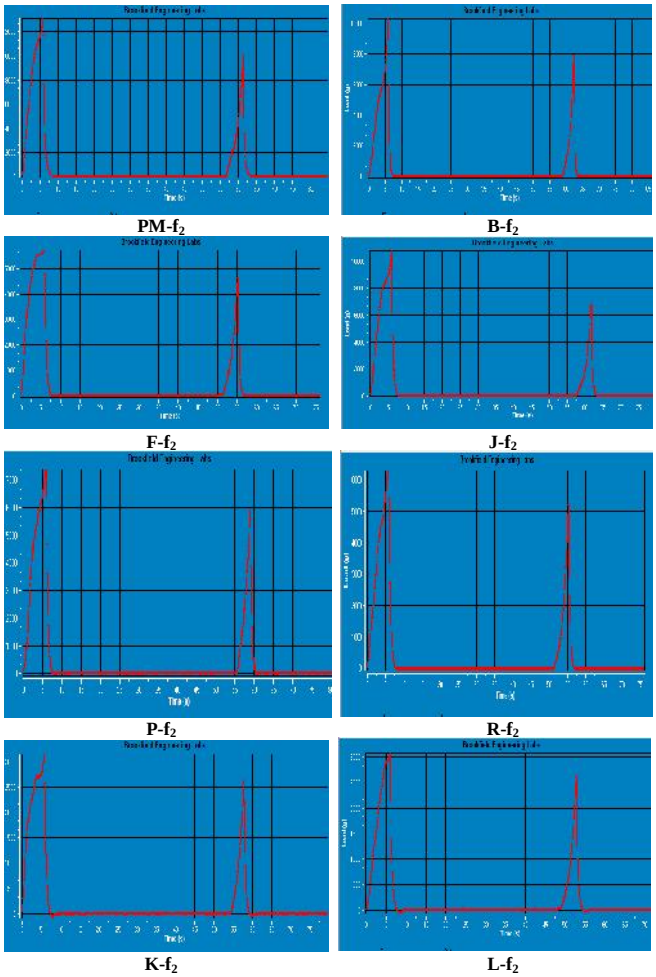


Fig. 6 : Textural characteristics of bun

The textural characteristics (Hardness) of millets based bun products are presented in Fig. 6. It ranges from 1400g-7050g. The highest peak force was recorded in J-f_2 and B-f_2 fallowed by P-f_2, R-$f_2$and other treatment.

The textural characteristics (Fracturability) of foxtail and kodo millets based bun products are The foxtail and kodo millet based bun was recorded as 5500g-s and 2550g-s.

Conclusion :

The maximum scores for colour, texture, taste, hardness were given to bun made by 30% substitution, overall bun prepared from 30% substitution was having maximum acceptability. The enzyme activity of bun flour was found in the range of 280-281 in all the treatment, it indicated that enzymes activity is normal in case of all the treatment. The spread ratio was having maximum in barnyard millet formulation and specific volume was found good in f1 formulation in all the treatment. The bun prepared by 30% substitution was having maximum yield barnyard, pearl millet, jowar. The hardness increase by increasing the millet flour.

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