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Development and quality assessment of multigrain bread prepared by using wheat flour, buck wheat flour and pearl millet flour

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Abstract
Baking industry is currently seeking to expand its products range, but also to constitute a way of maintain and improving people's general health. Bakery products are manly prepared from wheat as its main ingredient. Bread is widely consumed and is an ideal vehicle for functional delivery. The aim of prepared bread by this work was to develop buckwheat and pearl millet flour based multigrain bread. The use of wheat flour, buck wheat flour and pearl millet flour blends as a source of high protein, fat and low gluten content in production of multigrain bread was studied. The flour blends of wheat, buck wheat and pearl millet were composites at replacement levels of 85:15:5 (T_1), 80:15:5 (T_2), 75:20:5 (T_3), % while the wheat flour bread 100:00:00 (T_0) served as control bread. Various texture profile analysis parameters were analyzed by two way ANOVA to obtained a predicted optimum result Prepared bread was subjected to chemical, microbial, sensory and rheological analysis to evaluate the suitability of breads were T_3 protein (15.61%), fat (5.19%), ash (4.29%), moisture (32.18%) and carbohydrate (42.72%) as comparable to control without adversely affecting the sensory parameters. Based on the result it was indicated that beneficial components of buck wheat and pearl millet made them more favorable choice for food technologist to develop multigrain bread especially for celiac disease.

Keywords: Quality assessment, multigrain breads

1. Introduction
Bakery Products are used as a vehicle for incorporation of different nutritionally rich ingredients. Fortification of wheat flour with non-wheat proteins increases protein quality by improving its amino profiles. Multigrain bread has picked up a market share because it has superior taste of its own and has desirable sensory and nutritional qualities. Multigrain bread has been developed through a combination of factors and offers consumer's choice of flavor and textures. Wheat is principle cereal used for bread making, because of its wheat baking properties, as well as its valuable chemical constitution. Nowadays, the quality of raw material is the most important problem for bakers. They require flour, which has the ability to produce bread with large loaf volume and good crumb texture, with good maintenance properties. Research on determining relationships between the flour properties and the characteristics of the final product remain a challenge for scientist.

The food industry is facing the challenge of developing new food products with special health enhancing characteristics. The nutraceuticals come from a wide variety of plant consumable products (lee *et al*,. 2004).

Breads are define as a fermented bakery product produced mainly from wheat flour, water, yeast and salt by a series of process involving mixing, kneading, proofing, shaping, and baking (Dewettnck, *et al*,. 2000).

The Wheat (*Triticum spp*.) is cultivated worldwide. The wheat flour has a crucial role in manufacturing of bread. Wheat flour mixed with water has a unique attribute to create dough with three-dimensional structure (Gavurnikova, *et al*,. 2011).

The high content of starch, about 60-70% of whole grain and 65-70% of white flour, means that wheat is often considered to be little more than a source of calories, and this is certainly true for animal feed production, with-yielding, low-protein feed varieties being supplemented by other protein-rich crops (notably soybeans and oilseed residues). Therefore, the nutritional importance of wheat proteins should not be underestimated, particularly in less developed countries where bread, noodles and other products (e.g. bulgur, couscous) may provide a substantial propotion of the diet (Shewry, *et al*,. 2009).

Buckwheat (Fagopyrum esculentum Moench) grains containg 7-21% of proteins (lysine and sterols), 15-25% of amylase and total dietry fiber is around 7%. There are also relatively high level of chemicals elements such as potassium, magnesium, calcium, natrium, iron, magananese, zinc, and vitamins (B1, B2 and B6) & contains intresting biologically active compounds, e.g. flavonoids, flavons, phenolic acids, tannins, phytosterols, and fagopyrins (Christa, *et al,*. 2008)
Buckwheat (BW) is a traditional crop in central and eastern Europe and Asia. BW belongs to the Polygonaceae family and is taxonomically different from the Gramineae family to which belong cereals such as wheat, maize, and rice. However, BW seed has chemical, structural, and utilization characteristics similar to those of cereal grains,. Thus is usually classified as a cereal (Campbell, *et al,*. 1997).
The millet is considered as a raw material for dietary foods production. The millet has a favorable ratio of nutrients approaching to the recommended ratio between proteins, lipids, and sugars (Karabinova, *et al,*. 2001).
Millets are rich in vitamins, minerals, sulphur containing amino acids and phytochemicals, and hence are termed as nutria-cereals. They have higher proportions of non-starchy polysaccharides and fibre Millets release sugars slowly and thus have a low glycemic index (Karuppasamy, *et al,*. 2013).

Material and Methods
The experimental work based on "Development and Quality Assessment of multigrain Bread prepared by using Wheat Flour, Buck Wheat Flour and Pearl Millet Flour" was carried out in the research laboratory of department of Warner School of food and dairy technology, SHIATS Allahabad. The experimental samples used for this study were wheat flour, buck wheat flour and pearl millet flour.

Multigrain bread Manufacturing Materials

Wheat
↓
Cleaning (to remove the dirt)
↓
Sun Drying (2 days)
↓
Grinding
↓
Wheat Flour (Gavurnikova, *et al,*. 2011).

Preparation of Buck Wheat Flour

Buckwheat
↓
Cleaning (to remove the dirt)
↓
Sun Drying (2 days)
↓
Grinding
↓
Buckwheat flour (Christa, *et al,*. 2008)

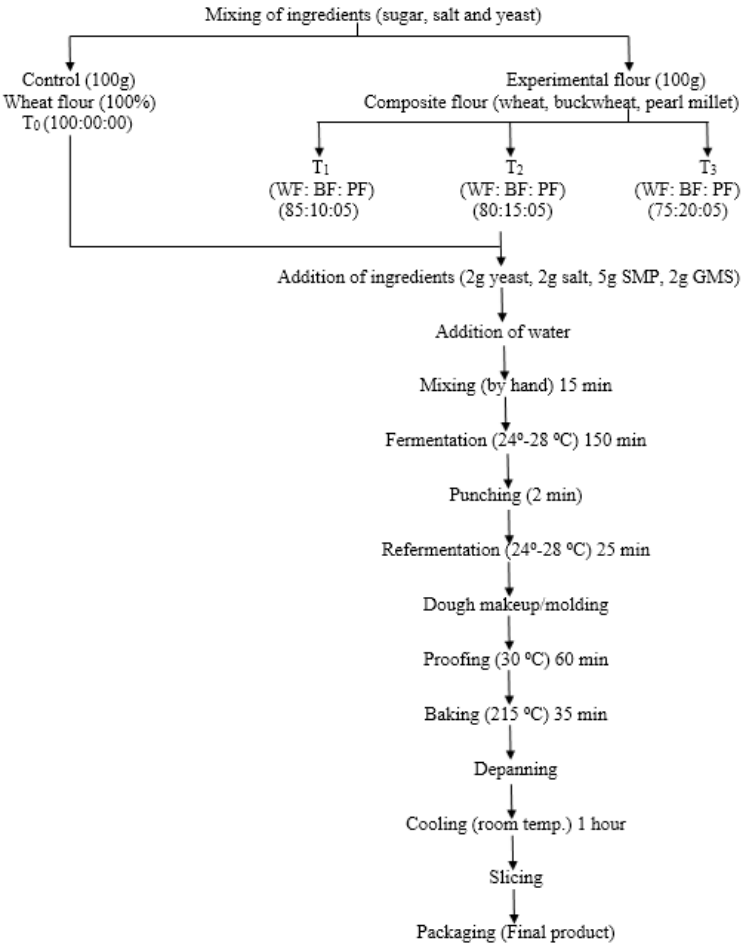
Preparation of Pearl Millet Flour:

Pearl millet
↓
Cleaning (to remove the dirt)
↓
Sun Drying (2 days)
↓
Grinding
↓
Pearl millet flour (Rai 2008)

Treatment
T_0 – Bread was prepared by blending of wheat flour. (100:00:00)
T_1– Multigrain bread was prepared by blending of wheat flour, buckwheat flour and pearl millet. (85:10:05)
T_2– Multigrain bread was prepared by blending of wheat flour, buckwheat flour and pearl millet. (80:15:05)
T_3– Multigrain bread was prepared by blending of wheat flour, buckwheat flour and pearl millet. (75:20:05)

Plan of layout:
Number of replication: 5
Number of treatment: 4

Plan of work



Average data for different Parameters of control and experimental multigrain bread:

Parameters	Treatments			
	T_0	T_1	T_2	T_3
1. Physic- Chemical analysis (in present)				
Moisture	31.66	31.98	32.02	32.18
Fat	3.25	4.12	4.59	5.19
Protein	7.42	12.62	14.34	15.61
Ash	2.74	3.39	3.86	4.29
Alcoholic Acidity	0.21	0.22	0.23	0.23
2. Microbiological analysis				
Yeast & molds count (cfu/gm)	1.40	1.60	1.60	1.80
SPC x 10^3 cfu/gm	4.60	4.80	4.20	5.00
Coliform Count	Nil	Nil	Nil	Nil
3. Organoleptic Score (9-Point hedonic scale)				
Color and appearance	7.68	7.36	7.64	7.22
Body and texture	7.84	7.46	7.62	7.88
Flavor and taste	7.82	7.66	8.00	7.58
Overall Acceptability	8.04	7.74	7.92	7.87
4. Texture profile analysis				
Hardness	8.82	9.73	9.96	10.54
Fracturability	2.75	2.77	2.90	3.04
Springiness	0.88	0.84	0.89	0.90
Cohesiveness	0.86	0.67	0.71	0.72
Gumminess	7.70	7.18	6.03	6.21
Chewiness	7.04	6.8	5.97	5.45
Resilience	0.44	0.38	0.37	0.42
5. Cost analysis				
Cost in Rs./100g	6.15	7.38	7.98	8.60

Result and Discussion

Moisture percentage: There was significant difference in moisture content of different treatment combinations. Maximum moisture percent was recorded in the sample of T3 (32.18) followed by T_2 (32.02), T_1 (31.98) and T_0 (31.66).
The difference in moisture was due to the composition difference of wheat flour, buckwheat flour and pearl millet flour which are used in different propositions in different treatments.

Ash percentage: There was significant difference in ash content of different treatment combinations. Maximum ash percent was recorded in the sample of T_3 (4.29) followed by T_2 (3.86), T_1 (3.39) and T_0 (2.74).
The difference in ash was due to the composition difference of wheat flour, buckwheat flour and pearl millet flour which are used in different propositions in different treatments.

Protein percentage: There was significant difference in protein content of different treatment combinations. Maximum ash percent was recorded in the sample of T_3 (15.61) followed by T_2 (14.34), T_1 (12.61) and T_0 (7.42).
The difference in protein was due to the composition difference of wheat flour, buckwheat flour and pearl millet flour which are used in different propositions in different treatments.

Fat percentage: There was significant difference in fat content of different treatment combinations. Maximum ash percent was recorded in the sample of T_3 (5.19) followed by T_2 (4.59), T_1 (4.12) and T_0 (3.25).
The difference in fat was due to the composition difference of wheat flour, buckwheat flour and pearl millet flour which are used in different propositions in different treatments.

Carbohydrate percentage: There was significant difference in carbohydrate content of different treatment combinations. Maximum ash percent was recorded in the sample of T_0 (54.93) followed by T_1 (47.90), T_2 (45.19) and T_3 (42.72).
The difference in carbohydrate was due to the composition difference of wheat flour, buckwheat flour and pearl millet flour which are used in different propositions in different treatments.

Alcoholic acidity percentage: There was significant difference in alcoholic acidity content of different treatment combinations. Maximum ash percent was recorded in the sample of T_3 and T_2 (0.23) followed by T_1 (0.22) and T_0 (0.21).
The difference in alcoholic acidity was due to the composition difference of wheat flour, buckwheat flour and pearl millet flour which are used in different propositions in different treatments.

Organoleptic analysis

Color and appearance score: There was non-significant difference in color and appearance score of different treatment combinations. Maximum ash percent was recorded in the sample of T_0 (7.68) followed by T_2 (7.64), T_1 (7.36) and T_3 (7.22).
The difference in color and appearance was due to the composition difference of wheat flour, buckwheat flour and pearl millet flour which are used in different propositions in different treatments.

Body and texture score: There was non-significant difference in body and texture score of different treatment combinations. Maximum ash percent was recorded in the sample of T_3 (7.68) followed by T_0 (7.84), T_2 (7.62) and T_1 (7.46).
The difference in body and texture was due to the composition difference of wheat flour, buckwheat flour and pearl millet flour which are used in different propositions in different treatments.

Flavor and taste score: There was non-significant difference

in flavor and taste score of different treatment combinations. Maximum ash percent was recorded in the sample of T_2 (8.00) followed by T_0 (7.82), T_1 (7.66) and T_3 (7.58).
The difference in flavor and taste was due to the composition difference of wheat flour, buckwheat flour and pearl millet flour which are used in different propositions in different treatments.

Overall acceptability score: There was non-significant difference in overall acceptability score of different treatment combinations. Maximum ash percent was recorded in the sample of T_0 (8.04) followed by T_2 (7.92), T_3 (7.87) and T_1 (7.74).
The difference in overall acceptability was due to the composition difference of wheat flour, buckwheat flour and pearl millet flour which are used in different propositions in different treatments.

Cost analysis: The cost price of buckwheat and pearl millet flour based multigrain bread samples were nearer to market price of local area supplied bread (MRP 10Rs./200gm). The highest cost price was found in the sample T_3 (8.60 Rs/100g) followed by T_2 (7.98Rs/100g), T_1 (7.38Rs/100g) and T_0 (6.15Rs/100g).

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