

Formulation and Utilization of Composite Flour For the Development of Multigrain Bread and Bun

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Submitted: 25-10-2022

Accepted: 05-11-2022

ABSTRACT

The present study entitled “Development of multigrain bread and bun from composite flour” was carried out with the objective to prepare the bread and bun using wheat, buckwheat, barley, sorghum flour, to assess the acceptability of prepared products and to determine the nutritive value of prepared products. The products prepared were Bread and Bun by composite flour prepared by incorporation of wheat flour, buckwheat flour, barley flour and sorghum flour in different proportion and served as treatments and, T₁, T₂ and T₃ respectively and products prepared without incorporation of dried mix powder wheat, buckwheat, barley and sorghum seed served as control (T₀). Sensory evaluation was carried out using nine point hedonic scale based score card. Nutritional composition was determined by using the food composition table (Gopalan et al., 2007). Data obtained was analyzed using analysis of variance (ANOVA), (t) test and critical differences [CD] techniques. Sensory evaluation showed that the treatment T₂ was the most acceptable in Bread and in Bun the treatment T₁ was found most highly acceptable. The content protein, energy, carbohydrate, calcium, carbs and iron increased significantly in bread and bun due to incorporation of different flour. The total cost of Bread and bun per 100g for treatment T₀ was Rs.9.87, T₁ Rs.12.67, T₂ Rs.13.22 and T₃ Rs.14.645. These products can also be helpful for providing variety in the daily dietary in addition to their nutritional benefit.

Keywords: Refined wheat flour, buckwheat flour, barley flour, and sorghum flour, Bread, Bun, nutritional composition, value addition.

I. INTRODUCTION

Multigrain bread and bun is a nutritious and healthy bread made using different flours. Multigrain bread easy, quick and healthy bread recipe made with multigrain flour. As the name suggests, multigrain is made from combining a bunch of whole grains instead of one type, in order

to add more nutrition to our diets. Multigrain flour or atta is prepared with a combination of wholesome flours such as buckwheat, barely flour, sorghum etc. Multigrain bread and other products are widely known as great sources of dietary fiber, vitamins, minerals, iron, selenium, magnesium and so much more. Consuming healthy snacks throughout the day leaves you feeling energized and aids in weight management (Mace et.al., 2017).

Buckwheat is highly nutritious pseudo-cereal known as a dietary source of protein with favourable amino acid composition and vitamins, starch and dietary fiber, essential minerals and trace elements. Phenolic compounds are also found in abundance in buckwheat, including rutin, orientin, vitexin, quercetin, isovitexin, kaempferol-3-rutinoside, isoorientin, and catechins. In comparison to most frequently used cereals, buckwheat has been reported to possess higher antioxidant activity, mainly due to high rutin content that may inhibit lipid peroxidation. Buckwheat flour is a free-flowing white to gray powder with black speckles. It has good nutritional value and a unique taste which adds complexity to baked products. Traditionally, it's used in pancakes, noodles and unleavened breads in Asia, Eastern Europe United States and also India. It is gluten free, has a sweet aroma and the flavor is nutty, earthy, bitter and intense. Buckwheat flour is best in combination with other flours and despite its name, has no relation to wheat (Hussain et.al., 2003).

Buckwheat flour is a nutritional powerhouse in comparison to rice and maize, the grains traditionally used in gluten free products. The flour is rich in minerals, antioxidants, and has a well balanced amino acids profile. There is a higher amount of fat in buckwheat flour, but it is primarily unsaturated fat, oleic and linoleic acid. A half cup serving of roasted buckwheat groats contains: energy: 77kcal, protein: 3.0 g, fat: 1.0 g, carbohydrates: 17.0 g, fiber: 2.0 g, sugar: 1.0 g (Brennan et. al., 2020).

Barley is also a rich source of B vitamins, including niacin, thiamin, and pyridoxine (vitamin B6). It also contains beta-glucans, a type of fiber that scientists have linked Trusted Source to various health benefits. Serving Size:1 cup – energy: 345 kcal, protein: 10g, Total fat: 1.0g, Total carbohydrates: 74g, dietary fiber: 10g, sugars: 0g, potassium: 309mg, sodium: 4mg, cholesterol: 0mg (Gopalan et.al., 2007).

Sorghum is a nutrient-packed grain that you can use in many ways. It's rich in vitamins and minerals like B vitamins, magnesium, potassium, phosphorus, iron, and zinc. It's likewise an excellent source of fiber, antioxidants, and protein. Sorghum is increasingly gaining acceptance as an edible cereal grain in its own right. High in protein, gluten-free, and full of antioxidants, sorghum can be a healthy addition to most diets. Composition of sorghum flour is approximately energy 316 kcal, fat 3.0g, sodium 2.0mg, carbohydrates 69g, fiber 7.5g, sugars 2.5g, protein 10g, carbs 77.5g of daily recommended value (Garone et. al. 2021).

Consuming a diet rich in whole grains may help reduce the risk of obesity, diabetes, heart disease, certain types of cancer, and other chronic health concerns. Barley has a lower glycemic index and is lower in calories. It is richer in fibers, and vitamins B₂, B₃, and B₆. On the other hand, oats are richer in phosphorus, zinc, copper, magnesium, iron, potassium, vitamins B₁, B₅, and folate (Anwar et.al., 2010).

Therefore, in view of the above present study has been undertaken with the following objectives, to prepare bread and bun using buckwheat, barely and sorghum flour, to assess the sensory acceptability of prepared product and to determine the nutritive value and cost of products.

II. MATERIALS AND METHODS

The study entitled “DEVELOPMENT OF MULTIGRAIN BREAD AND BUN FROM COMPOSITE FLOUR” was conducted in Nutrition Research Laboratory of Department of Food Nutrition and Public Health, Ethelind College of Home Science, Sam Higginbottom University of Agriculture, Technology and Sciences Prayagraj, Uttar Pradesh.

PREPARATION OF FLOURS

Buckwheat flour was prepared using the procedure given by Sahai and Singh et.al.,(1991), Sorghum flour was prepared as the procedure given by Lateefahet,al., (2015) and barley flour was

prepared as procedure given by Adriana et.al., (2018).

DEVELOPMENT OF FOOD PRODUCTS

Buckwheat flour, Barley flour and Sorghum flour in different combination were used for the development of the value added food products namely bread and bun and served as the whole experiment was replicated three times treatments T₁, T₂, and T₃. Basic recipe of bread and bun served as control T₀.

DETAILS OF CONTROL AND TREATMENT OF BREAD AND BUN.

- **Control (T₀):** Bread prepared from refined wheat flour in ratio of 50:50.
- **Treatment (T₁):** Bread prepared from refined wheat flour, buckwheat flour, barley, sorghum flour in ratio of 70:10:10:10.
- **Treatment (T₂):** Bread prepared from refined wheat flour, buckwheat flour, barley, sorghum flour in ratio of 55:15:15:15.
- **Treatment (T₃):** Bread prepared from refined wheat flour, buckwheat flour, barley, sorghum flour in ratio of 40:20:20:20.

ORGANOLEPTIC EVALUATION

The organoleptic evaluation of the prepared food products was done by panel of 5 judges selected from the Department of Food Nutrition and Public Health to assess the acceptability of the products based on the various sensory attributes like colour and appearance, body and texture, flavor and taste and overall acceptability. The evaluation was done on 9point Hedonic scale-based score card (Srilakshmi, 2007).

DETERMINATION OF NUTRITIVE VALUE OF COST

Cost of the prepared product was calculated by taking into account the cost of individual raw ingredients used in the preparation of food products as the prevailing market price.

STATISTICAL ANALYSIS

Analysis of variance (ANOVA), Critical Difference and t- test were used to analyze the data by using the procedure given by Gupta and Kapoor, 2002.

III. RESULTS AND DISCUSSION

SENSORY EVALUATION OF BREAD COLOR AND APPEARANCE

Sensory scores obtained (Table 1)for Bread in relation to color and appearance, express that T₂ has the highest score (8.58), followed by T₁ (7.28), T₃ (7.68) and T₀ (6.26). It indicates that the treatment T₂, was liked very much by the respondents, whereas T₁ was liked moderately regarding the color and appearance of Bread by the respondents.

It express that there is a significant difference between the all three treatments of Bread regarding the color and appearance, so it can be easily concluded that that Bread incorporated with 55g wheat flour, 15g buckwheat flour, 15g barley flour, 15g sorghum flour i.e. T₂ (7.53) has improved color and appearance and is best in certain amount of treatments.

BODY AND TEXTURE

Sensory scores obtained and analyzed for bread in relation to Body and Texture, shows (Table 1) that T₂ has the highest score (8.58), followed by T₁ (7.37), T₃ (7.68) and T₀ (6.27). It indicates that there is a significant differences between the all three treatments of Bread regarding their Body and Texture , so it can be easily concluded that Bread incorporated with refined wheat flour 70 percentage, buckwheat flour 10 percentage , barley flour 10 percentage ,sorghum flour 10 percentage i.e. T₂ (8.58) has good Body and Texture and is best from other 2 treatments.

It expresses that there is a significant difference between the all three treatments of bread regarding the Texture, so it can be easily concluded that bread incorporated with wheat flour 70 percentage , buckwheat flour 10 percentage, barley flour 10 percentage, sorghum flour 10 percentage, i.e. T₂ (7.53) has quiet good consistency and is best as after that body and texture starts thinning.

TASTE AND FLAVOR

Sensory scores obtained for Bread in relation to taste and flavor, shows (Table 1) that T₂ has the highest score (8.58), followed by T₁ (7.41), T₃(8.28) and T₀ (7.22). It indicates that there is a significant differences between the all three treatments of Bread regarding their Body and Texture, so it can be easily concluded that Bread incorporated with wheat flour 70 percentage, buckwheat flour 10 percentage, barley flour 10 percentage, sorghum flour 10 percentage i.e. T₂(8.43) has good body and texture and is best from other treatments.

expresses that there is a significant difference between the all three treatments of Bread regarding the taste and flavor, so it can be easily

concluded that Bread incorporated with 70 percentage wheat flour, 10 percentage buckwheat flour , 10 percentage barley flour, 10 percentage sorghum flour i.e. T₂ (8.43) has quiet good and reliable taste and flavor and is best from other two.

OVERALL ACCEPTABILITY

Sensory scores obtained (Table 1) for bread in relation to overall acceptability, indicates that T₂ has the highest score (8.58), followed by T₂ (8.45), T₁ (6.41) and T₀ (6.60). It indicates that there is a significant differences between the all three treatments of bread regarding their Body and Texture , so it can be easily concluded that bread incorporated with 70 percentage wheat flour, 10 percentage buckwheat flour , 10 percentage barley flour, 10 percentage sorghum flour i.e. T₂ (8.58) has good in overall acceptability.

It shows that there is a significant difference between the all three treatments of Bread made, regarding the overall acceptability, so it can be easily concluded that Bread incorporated with 70 percentage wheat flour, 10 percentage buckwheat flour , 10 percentage barley flour, 10 percentage sorghum flour i.e. T₂ (7.6) has good overall acceptability from other two.

SENSORY EVALUATION OF BUN COLOR AND APPEARANCE

Sensory scores obtained (Table 2) and analyzed for bun in relation to color and appearance, expresses that T₁ has the highest score (7.41), followed by T₂ (8.58), T₃ (8.06) and T₀ (6.10). It indicates that the treatment T₁, was liked and flavoured very much by the respondents, whereas T₁ was liked moderately regarding the color and appearance of spreader by the respondents.

It shows that there is a significant difference between the all three treatments of bun regarding the color and appearance, so it can be easily concluded that bun incorporated with 55 percentage refined wheat flour, 15 percentage buckwheat flour , 15 percentage barley flour, 15 percentage sorghum flour i.e. T₁ (8.63) has good color and appearance from the other two treatments.

BODY AND TEXTURE

Sensory scores obtained and analyzed for spreader in relation to consistency, shows (Table 2) that T₁ has the highest score (8.63), followed by T₂(7.64), T₃ (7.24) and T₀ (6.49). It shows that there is significant difference between the all three treatments of the bun made, regarding their Body

and Texture, so it can be easily concluded that bun incorporated with 55 percent refined wheat flour, 15 percentage buckwheat flour , 15 percentage barley flour, 15 percentage sorghum flour i.e. T₁ (8.63) has good and fine consistency from other two treatments.

It shows that there is a significant difference between the all three treatments of bun regarding their Body and Texture, so it can be easily concluded that Bun incorporated with 55 percent refined wheat flour, 15 percent buckwheat flour , 15 percent barley flour, 15 percent sorghum flour i.e. T₁ (8.63) has good and fine consistency from the other two treatments.

TASTE AND FLAVOR

Sensory scores obtained and analyzed for bun in relation to taste and flavor, tells that T₁ has the highest score (8.50), followed by T₂ (8.28), T₃ (7.33) and T₀ (6.27). It shows (Table 2) that there is significant difference between the all three treatments of the spreader made, regarding their Body and Texture, so it can be easily concluded that bun incorporated with 55 percent refined wheat flour, 15 percent buckwheat flour , 15 percent barley flour, 15 percent sorghum flour i.e. T₁ 8.50) has good taste and flavor from other two treatments.

It shows that there is a significant difference between the all three treatments of bun regarding their taste and flavor, so it can be easily concluded that bun incorporated with 55 percent refined wheat flour, 15 percent buckwheat flour, 15 percent barley flour, 15 percent sorghum flour i.e. T₁(8.50) has good taste and flavor from the other two treatments.

OVERALL ACCEPTABILITY

Sensory scores obtained and analyzed for bun in relation to overall acceptability, indicates that T₁ has the highest score (8.63), followed by T₂ (8.04), T₃ (7.54) and T₀ (6.28). It shows (Table 2) that there is a significant difference between the all three treatments of bun regarding the overall acceptability, so it can be easily concluded that bun incorporated with 55 percent refined wheat flour, 15 percent buckwheat flour , 15 percent barley flour, 15 percent sorghum flour i.e. T₁ (8.62) has accepted majorly from the other two treatments, by the respondents.

It shows that there is a significant difference between the all three treatments of bun regarding their taste and flavor, so it can be easily concluded that bun incorporated with 55 percent refined wheat flour, 15 percent buckwheat flour ,

15 percent barley flour, 15 percent sorghum flour i.e. T₁ (8.63) has accepted majorly from the other two treatments, by the respondents.

Table 1. shows the mean of sensory scores obtain and analyzed for Bread. According to the different sensory attributes, T₂ has the highest scores, regarding the color and appearance, it gains 8.58, for body and texture it gains 8.50, for taste and flavor 8.43 and for overall acceptability it obtained 8.45 scores.

Table 2. shows the mean of sensory scores obtain and analyzed for Bun. According to the different sensory attributes, T₁ has the highest scores, regarding the color and appearance it gains 8.88, for body and texture it gains 8.52, for taste and flavor 8.50 and for overall acceptability it gains 8.63 scores.

NUTRITIVE VALUE OF BREAD AND BUN

Table 3.depicts the chemical components of Bread (T₀) control and (T₂). It shows that the energy content of the product i.e.Bread, (T₂) got increased to 358 kcal in comparison to the control (T₀) which was 340 kcal. The iron, calcium, carbohydrates, fiber and content of the product also got increased to 4.8 mg from 3.9 and 82.9 mg from 14 mg respectively in control. The protein content of Bread also got increased from 12.29 to 13.1.

Table 3.depicts the chemical components of Bun (T₀) control and (T₁). It shows that the energy content of the product i.e.Bun, (T₁) got increased to 342 kcal in comparison to the control (T₀) which was 340 kcal. The iron, calcium, carbohydrates, fiber and content of the product also got increased to 4.9 mg from 4.2 and 84.9 mg from 11.5 mg respectively in control. The protein content of Bun also got increased from 12.29 to 13.5.

COST OF PREPARED PRODUCT

The total cost of Bread and bun per 100g for treatment T₀ is Rs.9.87, T₁ is Rs.12.67, T₂ is Rs.13.22 and T₃ is Rs.14.645. It is therefore concluded that the treatment T₃ (Wheat flour + Buckwheat + Barley + Sorghum) has the high cost and T₁ (Wheat flour + Buckwheat + Barley + Sorghum) has the low cost.

IV. CONCLUSION

On the basis findings, it is concluded wheat flour and buckwheat, sorghum and barley can successfully incorporated in preparation of the products like bread and bun. Sensory evaluation

showed that the treatment T₂ of (Bread). (Refined wheat flour + Buckwheat + Barley + Sorghum) was most acceptable and the treatment T₁ of Bun (Refined wheat flour + Buckwheat + Barley + Sorghum) was most highly acceptable. The content protein, energy, carbohydrate, calcium, carbs and

iron increased significantly in bread. The incorporation levels of refined wheat flour and buckwheat, sorghum, barley in increased the cost but it is comparatively cheaper than the control even through it was marginal.

Table:1 ORGANOLEPTIC CHARACTERISTIC OF THE PREPARED BREAD

Control Treatments	Organoleptic test			
	Colour and appearance	Body and Texture	Flavor and taste	Overall acceptability
T ₀	6.26	7.22	6.60	6.70
T ₁	7.28	7.37	7.41	6.41
T ₂	8.58	8.50	8.43	8.45
T ₃	7.68	8.20	8.42	8.10
Mean	7.45	7.82	7.71	7.41
F-Test	S	S	S	S
C.D. at 5%	0.34	0.23	0.36	0.90

TABLE :2 ORGANOLEPTIC CHARACTERISTIC OF THE PREPARED BUN

Treatments	Organoleptic test			
	Colour and appearance	Body and Texture	Taste and flavor	Overall acceptability
T ₀	6.10	6.49	6.27	6.28
T ₁	8.88	8.52	8.50	8.63

T2	8.19	7.64	8.28	8.04
T ₃	8.06	7.24	7.33	7.54
Mean	7.80	7.47	7.59	7.62
F-Test	S	S	S	S
C.D. at5%	0.20	0.35	0.35	0.15

Table.3 NUTRITIONAL COMPOSITION OF THE PRODUCTS

Table. 3. Nutrient content of (wheat flour, buckwheat flour, sorghum flour, barley flour bread and bun per 100g. (On the basis of raw ingredients).

Nutrients / 100g	Control and Treatments			
	T ₀	T ₁	T ₂	T ₃
Energy(kcal)	340	342	356	358
Protein (g)	13.29	12.5	13.1	14.2
Fat (g)	2.39	2.1	2.6	2.8
Carbohydrates (g)	61.39	84.9	82.9	84.19
Calcium (mg)	39	42	39	43
Iron (mg)	4.32	4.9	4.8	4.92
Fibre (g)	10.79	11.5	14	14.2

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