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Evaluation of Sensory Attributes in Composite Flour Blends for Biscuits, Chapattis, and Instant Upma Mix

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Abstract: *While bio-accessibility is ascertained by in vitro experiments that examine the quantity of compounds accessible for intestinal absorption, bioavailability is evaluated by in vivo examinations of blood and/or urine metabolites after ingestion of targeted compounds. The study's primary goal is to evaluate the sensory quality of products made using composite flour blends. Upma Mix, Chapattis, and Biscuits. All of the participants in the research, who were adult females between the ages of 22 and 26, gave permission for a blood sample to be taken. Composite flour blend 1 had the following nutrient composition: 12.05 percent moisture, 22.16 percent crude protein, 2.78 percent total ash, 3.05 percent crude fat, 12.21 percent crude fiber, 56.34 percent carbohydrates, 343.5 kcal/100g energy, and 13.89 percent total dietary fiber.*

Keywords: Compounds, Composite, Nutrient, Carbohydrates

I. INTRODUCTION

According to scientific research, bran and germ fractions benefit human and animal health through two different mechanisms: first, they release indigestible fibers, which alter the composition and activities of the gut microbiota; and second, they supply substrates like phenols, non-starch polysaccharides, and resistant starch, which the microbiota can metabolize into useful metabolites. While aleurone is a crucial component that is often disregarded in favor of indigestible fiber, cereal bran provides a significant source of phenolic acids, antioxidants, fibers, and minerals. Apart from that, it has the largest concentration of bioactive substances with notable antioxidant activity, ferulic acid being the main one. In addition to being an inexpensive and easily accessible by-product of the cereal business, cereal bran's concentrated concentration of phenolic compounds has anti-inflammatory qualities that may be advantageous for the gastrointestinal system. Consuming whole grains may help reduce the risk of colon cancer. In particular, phenolic acids—which are mostly covalently cross-linked with cell wall polymers—are abundant in wheat bran. Phenolic acids must withstand food processing conditions, be liberated from the food matrix, be bio-accessible in the gastrointestinal system, be susceptible to metabolism, and reach the target in order to demonstrate their beneficial effects on health. As a result, the present trend of valorizing waste chemicals and increasing bioavailability and accessibility is gaining traction. From a nutritional perspective, bioavailability describes how well the body uses nutrients and bioactive chemicals, while bio-accessibility refers to the solubilized fraction that has been released into the gastrointestinal fluid and is now ready for intestinal absorption.

While bio-accessibility is ascertained by in vitro experiments that examine the quantity of compounds accessible for intestinal absorption, bioavailability is evaluated by in vivo examinations of blood and/or urine metabolites after ingestion of targeted compounds. Scholars are endeavoring to discover methodologies and processing techniques that might augment the nutritional value and bioavailability of cereal-based diets. Compounds' bioavailability is determined by their inaccessibility, absorption, transformation, disposition, and excretion. The primary factor affecting bioavailability is inaccessibility, which is influenced by how food preparation affects the nutrients that are accessible for the gastrointestinal tract to absorb and digest. An evaluation of the alterations brought about by processing is also required to confirm the bioactive potential of phenolic acids in humans and their nutritional significance in food that has

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previously undergone processing. The use of bran as a functional food ingredient in baking and pasta processes is of great interest, as are methods to boost the phenolic acids' bioavailability or inaccessibility, given the latest research on the health-related effects of bran components.

Nonetheless, a number of research examined methods for evaluating the bioavailability and accessibility of phenolic chemicals, the impact of food processing, and new approaches and technologies to overcome these limitations. Lastly, our effort aims to stimulate further research in a field that has quickly shown promising results. Throughout human history, whole grains such as wheat, rye, rice, oats, and barley have been a primary source of nourishment. All of these grains have a structural similarity and are separated into three different fractions: the starchy main "body," the micronutrient-rich germ, and the outer, fiber-rich bran.

II. LITERATURE REVIEW

Bhatia et al 1972: Over the last three decades, there has been a notable decrease in the consumption of sorghum and other millets as a source of food. The amount of millets produced in India has significantly decreased as a result of the drop in demand. India produced 4.2 million tonnes of sorghum in 2015–16, down from 7 million tonnes in 2010–11; bajra production decreased from 10.4 million tonnes to 8.1 million tonnes, ragi production decreased from 2.2 million tonnes to 1.8 million tonnes, and small millets production decreased from 0.44 million tonnes to 0.39 million tonnes in the same period.

Carnovale and Quaglie (1973): Sorghum was the fifth major cereal of the world after maize, paddy, wheat and barley as per FAO production data of 2014. Almost all the millets are used for human consumption in most of the developing countries, but their use has been primarily restricted to animal feed in developed countries.

Jambunathana and Mertz (1973): Sorghum and millets are gluten free, hence, are useful dietary cereals. In general millets are rich source of fibre, minerals, and B-complex vitamins. High fibre content and presence of some anti-nutritional factors like phytates and tannins in millets affect bioavailability of minerals. Few studies in humans have suggested that absorption of iron tends to be lower from millets than from rice or even wheat.

Singh and Popli (1973): Millets are also rich in health promoting phytochemicals like polyphenols, lignans, phytosterols, phyto- oestrogens, phytocyanins. These function as antioxidants, immune modulators, detoxifying agents etc. and hence protect against age- related degenerative diseases like cardiovascular diseases diabetes, cancer etc.

Some of the known nutrients viz. vitamins, minerals, essential fatty acids also have benefits in terms of prevention of degenerative diseases besides their known functions of preventing nutritional deficiency diseases. Being gluten free, millets are recommended for patients of celiac disease.

Featherson and Rogler (1975): Millets are non-acid forming, easy to digest and non- allergenic grains. Millets have potential for protection against age-onset degenerative diseases. Consumption of millets reduces risk of heart disease, protects from diabetes, improves digestive system, lowers the risk of cancer, detoxifie` the body, increases immunity and respiratory health, increases energy levels and improves muscular and neural systems and are protective against several degenerative diseases such as Metabolic Syndrome and Parkinson's disease.

III. METHODOLOGY

The appropriateness of food goods' formulations for a diabetic diet The appropriateness of all the created food items, including chapattis and biscuits, for diabetics was assessed. Food items were assessed for their hypoglycemic impact. A sample of one hundred healthy individuals was chosen at random from the O.P.J.S. University Hostel to determine the designed food items' Glycemic Index over the course of five days using a glucose tolerance test.

All of the participants in the research, who were adult females between the ages of 22 and 26, gave permission for a blood sample to be taken.

Study Design

Ten participants had their food items' glycemic response examined, and general data was collected. A glucose tolerance test was performed on the first research day on overnight fasting nights. The individuals were given 50 grams of glucose dissolved in 200 milliliters of water. Throughout the experiment, the volunteers were told not to move and to consume the glucose solution in fifteen minutes. Using a glucometer, the blood glucose level was monitored at 0, 30, 60, 90, and 120 minutes.

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Ten participants who had fasted overnight were given one 50 g meal product each day. 200 milliliters of water were supplied with the meal item. The same guidelines as for the glucose tolerance test were given to the individuals. After consuming the food product, blood glucose was tested immediately and again 30, 60, 90, and 120 minutes later.

Procedure

Blood was drawn using finger prick method. Disposable needles were used for finger pricking. Spirit was used to clean puncture site with a cotton swab. Finger was pricked and a drop of blood was taken for measuring glucose concentration using glucometer.

IV. RESULTS

Nutritional Composition of formulated Biscuits, Chapatti, and Instant Upma Mix

Proximate Composition

The results of the proximate composition of CFB 1 CFB 2 and Mix 3 biscuits, chapattis and instant upma mix are presented in Table 4.1, 4.2 and 4.3 respectively.

Table 4.1 Proximate analysis of Biscuits (per 100 g)

Parameters	CFB 1 WSP	CFB 2 SWP	CFB 3 PSW
Moisture (%)	4.5±0.1	2.03±0.15	4.0±0.16
Crude protein (%)	19.67±0.03	23.38±0.04	20.03±0.02
Crude fat (%)	8.42±0.32	8.41±0.25	8.91±0.32
Total ash (%)	2.17±0.24	2.62±0.76	2.51±0.22
Crude fibre (%)	13.45±0.01	12.46±0.02	12.17±0.01
Carbohydrates (%)	63.26±0.04	57.07±0.04	63.15±0.08
Energy (kcal/100g)	435.45±0.03	431.54±0.03	425.29±0.03

Moisture ContentBiscuits

The average moisture content of three composite flour blend formulated biscuits was found to be 4.5±0.1, 2.03±0.15 and 4.0±0.16 per cent in CFB 1, CFB 2 and Mix 3 biscuits, respectively. Semwal *et al.* reported 4.84 per cent moisture content in glucose biscuits which was slightly higher than obtained values.

Chapatti

The moisture content of CFB 1 chapatti was 21.02±0.30, CFB 2 chapatti 23.03±0.16 and CFB 3 chapatti 26.0±0.08 per cent. The moisture content of CFB 3 chapattis was highest among all three. Raghuvanshi and Verma reported 38.98 per cent moisture content in whole wheat flour chapatti which was much higher than obtained values.

Instant Upma Mix

The moisture content of CFB 1 instant upma was 4.6±0.10, CFB 2 instant upma 3.91±0.15 and CFB 3 instant upma 4.10 ±0.16 per cent.The moisture content of CFB 1 instant upma was highest amongst all three.

Crude proteinBiscuits

The average value of protein content of CFB 1 CFB 2 and CFB 3 was 19.67±0.03, 23.38±0.04 and 20.03±0.02 per cent, respectively. These values are much higher than the value reported by Semwal *et al.* of 7.42 in glucose biscuits. it may be due to incorporation of millets used for biscuit formulation.

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Chapatti

The values for crude protein content of CFB 1 CFB 2 and CFB 3 chapattis was 19.37±0.03, 23.71±0.04 and 21.06 ± 0.03 per cent, respectively. The protein content of CFB 2 chapatti was highest among all the three, which may be due to incorporation of millet flour. These values are higher than the values reported by Raghuvanshi and Verma 8.52 in wheat chapatti.

Instant Upma mix The values of crude protein content of CFB1, CFB2 and CFB3 instantupma mix were 19.76, 23.30 and 21.03 per cent respectively.

Crude fatBiscuits

The values for crude fat content of CFB 1 CF 2 and CFB 3 biscuits were 8.42±0.32, 8.41±0.25 and8.91±0.32 per cent, respectively. Semwal *et al.* reported crude fat of 24.66 per cent in glucose biscuits which was much higher than the obtained values in the present study.

Chapatti

The values for crude fat content of CFB 1 CFB 2 and CFB 3 were 2.09±0.04, 2.41±0.25 and 2.91±0.32 per cent, respectively. The results indicate that CFB 3 chapatti had highest content of crude fat amongst all three. Raghuvanshi and Verma reported crude fat of 1.26 per cent in wheat flour chapatti which was lower than the obtained values.

Instant upma

The values of instant upma derived from CFB1 , CFB2 and CFB3 were 3.82, 3.81 and 3.80 respectively.

Total ashBiscuits

The values for total ash content of CFB 1 CFB 2 and CFB 3biscuits were 2.17±0.24, 2.62±0.76 and 2.51±0.22 per cent, respectively. The results obtained are higher than the value of 1.20 per cent in glucose biscuits as reported by Semwal *et al.*.

Chapatti

The values for total ash content of CFB 1 CFB 2 and CFB 3 chapattis were 2.17±0.24, 2.72±0.76 and 2.35 ±0.22 per cent, respectively. CFB 2 xhibited ash content of 2.72 per cent is highest among all the three. The results obtained are higher the value reported by Raghuvanshi and Verma.

Instant Upma

The values of total ash for instant upma formulated from CFB 1, CFB 2 and CFB3were 2.17, 2.62 and 2.51 respectively.

Crude fibre Biscuits

The values for crude fibre for CFB 1 CFB 2 and CFB 3 biscuits were 13.45±0.01, 12.46±0.02 and 12.17±0.01 per cent, respectively. The value for crude fibre reported by Semwal *et al.* (1996) was 1.05 per cent in glucose biscuits was steeply lower than the obtained values for flour blend formulated biscuits.

Chapatti

The values for crude fibre for CFB 1 CFB 2 and CFB 3 chapattis were 12.46±0.01, 12.49±0.02 and 12.12±0.01 per cent, respectively. The values of crude fibre for CFB 2 chapatti was highest among all the three. The value of the crude fibre reported by Raghuvanshi and Verma (2002) in of whole wheat chapatti was lower than the obtained value for flour blend chapattis The higher values of crude fibre in formulated chapattis in the present study could be attributed to the presence of sorghum and pearl millet.

Instant Upma

The values obtained for crude fibre of CFB1, CFB2 and CFB3 are 13.45, 12.46 and 12.17 respectively.

Carbohydrate by difference Biscuits

The values of CFB 1 CFB 2 and CFB 3 biscuits were 63.26±0.04, 57.07±0.04 and 63.15±0.08 per cent, respectively. Semwal *et al.* reported the carbohydrate content of glucose biscuits in the range of 50.48 to 60.68 per cent. The values obtained in the study are comparable to the reported values.

Chapatti

The values of CFB 1 , CFB 2 and CFB 3 chapattis were 49.08±0.03, 38.05±0.04 and 41.08±0.03 per cent carbohydrate content, respectively. CFB1 chapatti exhibited highest carbohydrate content among all the three.

Raghuvanshi and Verma (2002) reported the carbohydrate content of whole wheat chapatti The values obtained in the study are comparable to the reported value.

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Instant Upma

The values reported for CFB1, CFB2 AND CFB3 instant upma types were 63.26, 57.07 and 63.15 respectively.

Energy valueBiscuits

The energy values for CFB 1 CFB 2 and CFB 3 were 435.45±0.03, 431.54±0.03 and 425.29±0.03 kcal per 100 g, respectively. Semwal *et al.* (1996) reported the energy value of glucose biscuits in the range of 420.25 to 435.26 kcal per 100 g. the obtained values in the present study are comparable to reported values.

Chapatti

The energy values for CFB 1 CFB 2 and CFB 3 chapattis were 339.45±0.03, 324.23±0.03 and 314.29±0.03 kcal/100 g, respectively. CFB 1 chapatti exhibited highest energy among the three.

Raghuvanshi and Verma (2002) reported the energy value of whole wheat flour chapatti. The values obtained in this study are slightly higher to reported value.

Instant Upma

The values of CFB1, 2 and 3 Instant upma types had been reported to be 435.45, 431.54 and 425.29 kcal per 100g respectively.

Biscuits

The total dietary fibre content of CFB 1 CFB 2 and CFB 3 flour blend formulated biscuits was 12.11, 12.21 and 12.91 percent, respectively. The total dietary fibre content of CFB 3 biscuit was found to be highest among thethree.

Chapattis

The total dietary fibre content of CFB 1, CFB 2 and CFB 3 flour blend formulated chapattis was 12.09, 12.12 and 12.13 percent, respectively. The total dietary fibre content of CFB 3 chapattis was found to be highest among the three.

Instant Upma Mix

The total dietary fibre of CFB1, 2 and 3 were reported to be 13.14, 13.41and 13.45 per cent respectively.

Soluble dietary fibreBiscuits

The soluble dietary fibre content of CFB 1 , CFB 2 and CFB 3 flour blend formulated biscuits was 1.78, 1.70 and 1.96 per cent, respectively.

The soluble dietary fibre content of CFB 3 biscuits was found to be highest among the three.

Chapattis

The soluble dietary fibre content of CFB 1, CFB 2 and CFB 3 chapattis was 1.40, 1.43 and 1.32 per cent, respectively. The soluble dietary fibre content of CFB 2 of 1.43 per cent was found to be highest among all three.

Instant Upma Mix

The soluble dietary fibre content of CFB1, 2 and 3 are 1.56, 1.57 and 1.59.

Insoluble dietary fibreBiscuits

The insoluble dietary fibre of CFB 1CFB 2 and CFB 3 biscuits was 11.21, 11.11 and 11.01 per cent, respectively.

The insoluble dietary fibre of CFB 1 was found to be highest amongst thethree.

Chapattis

The insoluble dietary fibre of CFB 1, CFB 2 and CFB 3 biscuits was 10.98, 10.76 and 10.65 per cent, respectively.

The insoluble dietary fibre of CFB 1 was found to be highest amongst the three.

Instant upma mix

The insoluble dietary fibre content of CFB1,2 and 3 were reportedly found to be 10.32, 11.20 and 11.41.

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Table 4.2 Proximate analysis of Composite Flour Blend Chapatti

Parameters	CFB 1 WSP	CFB 2 SWP	CFB 3 PSW
Moisture (%)	21.02±0.30	23.03±0.16	26.0±0.08
Crude protein (%)	19.37±0.03	23.71±0.04	21.06±0.03
Crude fat (%)	2.09±0.04	2.41±0.25	2.91±0.32
Total ash (%)	2.17±0.24	2.72±0.76	2.35±0.22
Crude fibre (%)	12.46±0.01	12.49±0.02	12.12±0.01
Carbohydrates (%)	48.26±0.04	39.07±0.04	42.15±0.08
Energy (kcal/100g)	339.45±0.03	324.23±0.03	314.29±0.03

Table 4.3 Proximate analysis of Composite Flour Blend Instant Upma Mix (per 100 g)

Parameters	CFB 1 WSP	CFB 2 SWP	CFB 3 PSW
Moisture (%)	4.6±0.1	3.91±0.15	4.10±0.16
Crude protein (%)	19.76±0.02	23.30±0.05	21.03±0.03
Crude fat (%)	3.82±0.32	3.81±0.25	3.80±0.32
Total ash (%)	2.14±0.24	2.63±0.76	2.45±0.25
Crude fibre (%)	11.45±0.01	11.42±0.02	11.17±0.01
Carbohydrates (%)	61.26±0.04	59.07±0.04	60.15±0.08
Energy (kcal/100g)	430.40±0.03	430.50±0.03	429.20±0.03

Sensory Quality Evaluation of Composite Flour Blends formulated products Biscuits, Chapattis, and Instant Upma Mix.

Three types of Composite Flour Blend formulated biscuits, chapattis and Instant Upma Mix were prepared using method discussed earlier and were subjected to sensory analysis through Score Card Method and Nine Point Hedonic Scale by a panel of fifteen members as given by Amerine *et al.* (1965).

Sensory quality evaluation by Score Card Method

The mean scores for sensory quality characteristics of biscuits, chapattis and Instant Upma Mix through Score Card Method are presented in Table 4.10.

Biscuits

The biscuits were judged based on colour, taste, flavor, texture, appearance and overall acceptability. CFB 3 biscuits has the highest scores for colour, taste and flavor of 7.8. Texture appearance and overall acceptability of CFB 3 biscuits

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had significant differences when compared against characteristics of CFB 1 biscuits. The non- significant difference was observed between CFB 2 biscuits with CFB 1 and CFB 3 biscuits. The CFB 3 biscuits were selected for the purpose of detection of Glycemic response and Glycemic index.

Chapattis

Three types of composite flour blends were used to formulate chapattis using the method discussed earlier and were subjected to sensory analysis through Score Card Method by a panel of fifteen members. The chapattis were judged based on colour, taste, texture, flavor, appearance and overall acceptability. CFBchapattis had highest scores of colour taste flavor texture appearance and overall acceptability.

The non-significant difference was observed among three types of chapattis. Therefore, CFB 1 chapattis were selected for determination of glycemic response and glycemic index.

Instant Upma

Using the previously described approach, three kinds of composite flour mixes were utilized to make Instant Upma, which were then taste-tested using the Score Card approach by a fifteen-member panel. After being reconstituted, the Instant Upma Mix was evaluated for color, flavor, texture, appearance, and acceptability as a whole. The Instant Upma prepared with CFB 1 was determined to have the greatest scores for color, texture, and appearance. On the other side, CFB 2 Instant Upma received the top ratings for flavor and taste. For all three categories, the overall acceptance was about equal.

Three different Instant Upma kinds were found to vary non-significantly from one another. Consequently, CFB 1 Instant Upma was used to determine the glycemic index and glycemic response.

Table 4.4 Sensory Quality Characteristics of formulated food products (ScoreCard Method)

Product	Colour	Taste	Flavour	Texture	Appearance	Overall acceptability
Biscuits						
CFB 1	7.2*	6.8*	6.8*	7.0*	7.4*	7.1*
CFB 2	7.6	7.5	7.8	7.6	7.7	7.6
CFB 3	7.8*	7.8*	7.8*	7.7*	8.0*	8.0*
S.E.M.±C.D.	0.184	0.160	0.320	0.278	0.144	0.289
at 5%	0.54	0.480	0.893	0.778	0.404	0.801
Chapattis						
CFB 1	7.4	7.33	7.40	7.6	7.4	7.2
CFB 2	7.3	7.10	7.30	7.5	7.3	7.1
CFB 3	7.4	7.10	7.20	7.4	7.1	7.1
S.E.M.±C.D.	0.266	0.294	0.321	0.220	0.206	0.265
at 5%	0.761	0.841	0.918	0.629	0.588	0.757
Instant Upma Mix						
CFB 1	7.8	7.32	7.50	7.60	7.4	7.4
CFB 2	7.6	7.4	7.60	7.50	7.3	7.3
CFB 3	7.4	7.10	7.40	7.34	7.2	7.4
S.E.M.±C.D.	0.214	0.246	0.310	0.210	0.210	0.246
at 5%	0.726	0.832	0.860	0.598	0.501	0.766

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Table 4.5 Ranking of sensory quality characteristics of formulated foodproducts by Nine Point Hedonic Scale.

Product	Score	Preference
CFB 1	6.6*	Like slightly-Like moderately
CFB 2	7.4	Like moderately
CFB 3	7.7*	Like moderately-Like very much
S.E.M.± C.D. at 5%	0.135 0.379	
Chapattis		
CFB 1	7.06	Like moderately
CFB 2	7.0	Like moderately
CFB 3	7.0	Like moderately
S.E.M.± C.D. at 5%	0.198 0.567	
Instant Upma		
CFB 1	7.3	Like moderately
CFB 2	7.1	Like moderately
CFB 3	7.1	Like moderately

B

V. CONCLUSION

Composite flour blend 1 had the following nutrient composition: 12.05 percent moisture, 22.16 percent crude protein, 2.78 percent total ash, 3.05 percent crude fat, 12.21 percent crude fiber, 56.34 percent carbohydrates, 343.5 kcal/100g energy, and 13.89 percent total dietary fiber.

11.08 percent moisture, 25.34 percent crude protein, 2.85 percent total ash, 9.77 percent crude fat, 12.43 percent crude fiber, 50.01 percent carbohydrate, 378.5 kcal/100g energy, and 13.12 percent total dietary fiber were the nutrients found in composite flour blends CFB 2.

12.07 percent of moisture, 22.22 percent of crude protein, 2.86 percent of total ash, 3.07 percent of crude fat, 12.17 percent of crude fiber, 53.98 percent of carbohydrates, 332.2 kcal/100g of energy, and 13.78 percent of total dietary fiber were the nutrients found in CFB 3.

The nutritional value of the composite flour blends, CFB 2 and CFB 3, was found to be nearly the same or greater than that of CFB 1. CFB 3 had the highest value for total dietary fiber.

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