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Research Article

Study on the Sensory Quality Evaluation of Composite Flour Blends Formulated ProductsBiscuits, Chapattis, and Instant Upma Mix

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Abstract

Bioavailability is assessed by in vivo studies of blood and/or urine metabolites afterconsumption of targeted compounds, while bio-accessibility is determined by in vitro studies that analyze the number of compounds available for intestinal uptake. The main aim of the study is Study on The Sensory Quality Evaluation of Composite Flour Blends Formulated ProductsBiscuits, Chapattis, And Instant Upma Mix**.** All the subjects were female adults of the age 22 to 26 years and had given consent to participate in the study and to draw their blood sample. The nutrient composition of composite flour blend 1 (WSP) included moisture 12.05 per cent, crude protein of 22.16 per cent, total ash of 2.78 per cent, crude fat of 3.05 per cent, crude fibre of 12.21 per cent, carbohydrate of 56.34 per cent, energy of 343.5 kcal/100g and total dietary fibre of 13.89 per cent.

Keywords: Compounds, Composite, Nutrient, Carbohydrates

1. INTRODUCTION

Scientific studies revealed that bran and germ fractions exhibit their positive health effects on both animal and humans by two mechanisms: First by releasing the indigestible fibers to modulate gut microbiota composition and activities; and second by delivering substrates, such as resistant starch, non-starch polysaccharides (β-glucan and arabinoxylans) and phenols to be metabolized into practical microbiota metabolites. The cereal bran is a major source of phenolic acids-antioxidants, fibers and minerals, whereas aleurone is the critical component generally overlooked in favor of indigestible fiber. Otherwise, it comprises the highest amount of bioactive compounds exhibiting significant antioxidant activity with ferulic acid as its major antioxidant. In cereals bran, besides being a cheap and readily available by-product of the cereal industry, its concentrated source of phenolic compounds have anti-inflammatory properties that can act beneficially on the gastrointestinal tract. Theintake of whole grains may lower the incidence of colon cancer. Particularly, wheat bran is rich in phenolic acids, which are mainly covalently cross-linked with cell wall polymers. Inorder to exhibit their health-related positive impact, phenolic acids have to resist food- processing conditions, be released from the food matrix, and be bio-accessible in the gastrointestinal tract, subject to metabolism, and reach the target. Therefore, the current trend on bioavailability and bio-accessibility, as well as valorization of waste compounds isbecoming more and more popular. Bioavailability, from its nutritional side, refers to the efficient use of nutrients and bioactive compounds by the body, while bio-accessibility involves the released solubilized fraction into

the gastrointestinal fluid that has become available for intestinal uptake.

Bioavailability is assessed by in vivo studies of blood and/or urine metabolites after consumption of targeted compounds, while bio-accessibility is determined by in vitro studies that analyze the number of compounds available for intestinal uptake. Researchers are searching for strategies and processing technologies to enhance the content and bioavailability of nutrients and bioactive compounds of cereal foods. The bioavailability of compounds depends on inaccessibility, absorption, transformation, disposition, and excretion, where the main issue is inaccessibility, which is affected by how food processing influences nutrients available for digestion and absorption in the gastro- intestinal tract. In order to validate phenolic acids bioactive potential in humans and their dietary importance in already processed food, an assessment of their changes during processing is also necessary. Based on the recent findings on the health-related effects of bran components, the approach of using it as a functional food ingredient in bakery and pasta processes is of major interest, as well are the strategies to increase their phenolic acids inaccessibility or bioavailability.

However various studies focused on works assessing inaccessibility and bioavailability, food processing influence and recent strategies and technologies to unlock phenolic compounds inaccessibility and bioavailability. Finally, this work is intended to encourage new research in an area with promising findings soon. Wheat, rye, rice, oats or barley are among the major whole grains representing a major source of food for humans since old times. All these grains are structurally similar and divided into three distinct fractions: The outer fiber-rich bran, the micronutrient-rich germ and the starchy main 'body'.

2. LITERATURE REVIEW

***Bhatia et al 1972*:** Sorghum and other millets consumption as direct food has significantly declined over the past three decades. The decline in demand has led to the decline in millets production considerably in India. Production of sorghum in India has come down from 7 million tonnes during 2010-11 to 4.2 million tonnes during 2015-16; bajra production was reduced from 10.4 million tonnes to 8.1 million tonnes, production of ragi reduced to 2.2 million tonnes to 1.8 million tonnes and small millets production came down to 0.39 million tonnes from 0.44 million tonnes during the same period.

Carnovale and Quaglie (1973): Sorghum (*Sorghum bicolor)* 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 (CVD), 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.

3. METHODOLOGY

3.1 Suitability of formulated food products for suitability in diabetic diet

All the developed food products viz. biscuits and chapatti were evaluated for suitability for diabetics. The evaluation of food products for their hypoglycemic effect was done. A sample of hundred normal subjects were selected randomly from Hostel of O.P.J.S. University, for determination of Glycemic index of formulated food products for five consecutive days by glucose tolerance test.

All the subjects were female adults of the age 22 to 26 years and had given consent to participate in the study and to draw their blood sample.

3.2 Study Design

The Glycemic response of food products was studied in ten subjects, the general information was taken**.** On the first day of study, glucose tolerance test (GTT) for glucose was conducted on overnight fasted nights. Fifty grams glucose dissolved in 200 ml water was given to the subjects. The subjects were instructed tofinish glucose solution within fifteen minutes and avoid physical exertion during the experimental period. The blood glucose level was measured at 0, 30, 60, 90 and 120 minutes with the help of glucometer (One Touch Life Scan, Johnson, and Johnson Company).

On every day, ten overnight fasted subjects were served with one food product of 50 g. the food product was served with 200 ml of water. The subjects were asked to follow same instructions as for glucose tolerance test. The blood glucose was measured initially and at 30,60, 90 and 120 minutes after finishing the food product.

3.3 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.

4. RESULTS

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

4.1.1 Proximate Composition

The results of the proximate composition of CFB 1 (WSP), CFB 2 (SWP) and Mix 3 (PSW) 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

4.1.1.1 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(WSP), CFB 2(SWP) and Mix 3 (PSW) biscuits, respectively. **Semwal *et al.* (1996)** reported 4.84 per cent moisture content in glucose biscuits which was slightly higher than obtained values.

Chapatti

The moisture content of CFB 1 (WSP) chapatti was 21.02±0.30, CFB 2 (SWP) chapatti 23.03±0.16 and CFB 3 (PSW) chapatti 26.0±0.08 per cent. The moisture content of CFB 3 (PSW) chapattis was highest among all three. **Raghuvanshi and Verma (2002)** 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 (WSP) instant upma was 4.6±0.10, CFB 2 (SWP) instant upma 3.91±0.15 and CFB 3 (PSW) instant upma 4.10 ±0.16 per cent.The moisture content of CFB 1 (WSP) instant upma was highest amongst all three.

4.1.1.2 Crude proteinBiscuits

The average value of protein content of CFB 1 (WSP), CFB 2 (SWP) and CFB 3 (PSW) 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.* (1996)** of 7.42 in glucose biscuits. it may be due to incorporation of millets used for biscuit formulation.

Chapatti

The values for crude protein content of CFB 1 (WSP), CFB 2 (SWP) and CFB 3 (PSW) chapattis was 19.37±0.03, 23.71±0.04 and 21.06 ± 0.03 per cent, respectively. The

protein content of CFB 2 (SWP) 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 (2002)** 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.

4.1.1.3 Crude fatBiscuits

The values for crude fat content of CFB 1(WSP), CFB 2(SWP) and CFB 3(PSW) biscuits were 8.42±0.32, 8.41±0.25 and8.91±0.32 per cent, respectively. **Semwal *et al.* (1996)** 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 (WSP), CFB 2 (SWP) and CFB 3 (PSW) were 2.09±0.04, 2.41±0.25 and 2.91±0.32 per cent, respectively. The results indicate that CFB 3 (PSW) chapatti had highest content of crude fat amongst all three. **Raghuvanshi and Verma (2002)** 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.

4.1.1.4 Total ashBiscuits

The values for total ash content of CFB 1 (WSP), CFB 2(SWP) and CFB 3(PSW) biscuits 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.*(1996).**

Chapatti

The values for total ash content of CFB 1 (WSP), CFB 2 (SWP) and CFB 3 (PSW) chapattis were 2.17±0.24, 2.72±0.76 and 2.35 ±0.22 per cent, respectively. CFB 2 (SWP) exhibited ash content of 2.72 per cent is highest among all the three. The results obtained are higher the value (1.86 per cent) reported by **Raghuvanshi and Verma (2002).**

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.

4.1.1.5 Crude fibre Biscuits

The values for crude fibre for CFB 1 (WSP), CFB 2(SWP) and CFB 3(PSW) 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 (WSP), CFB 2 (SWP) and CFB 3 (PSW) 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 (SWP) 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 (1.26 per cent). 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.

4.1.1.6 Carbohydrate by difference Biscuits

The values of CFB 1 (WSP), CFB 2 (SWP) and CFB 3 (PSW) biscuits were 63.26±0.04, 57.07±0.04 and 63.15±0.08 per cent, respectively. **Semwal *et al.* (1996)** 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 (WSP), CFB 2 (SWP) and CFB 3 (PSW) chapattis were 49.08±0.03, 38.05±0.04 and 41.08±0.03 per cent carbohydrate content, respectively. CFB1(WSP) chapatti exhibited highest carbohydrate content (49.53±0.03 per cent) among all the three.

Raghuvanshi and Verma (2002) reported the carbohydrate content of whole wheat chapatti (48.08 per cent). The values obtained in the study are comparable to the reported value.

Instant Upma

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

4.1.2 Energy valueBiscuits

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

Raghuvanshi and Verma (2002) reported the energy value of whole wheat flour chapatti (237.79 kcal/100 g). 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.

4.1.3 Total Dietary fibre

The results are presented in Table 4.6.

Biscuits

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

Chapattis

The total dietary fibre content of CFB 1 (WSP), CFB 2 (SWP) and CFB 3(PSW) flour blend formulated chapattis was 12.09, 12.12 and 12.13 percent, respectively. The total dietary fibre content of CFB 3 (PSW) 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 (WSP) , CFB 2 (SWP) and CFB 3(PSW) flour

blend formulated biscuits was 1.78, 1.70 and 1.96 per cent, respectively.

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

Chapattis

The soluble dietary fibre content of CFB 1 (WSP), CFB 2 (SWP) and CFB 3 (PSW) chapattis was 1.40, 1.43 and 1.32 per cent, respectively. The soluble dietary fibre content of CFB 2 (SWP) 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 1(WSP), CFB 2(SWP) and CFB 3(PSW) biscuits was 11.21, 11.11 and 11.01 per cent, respectively.

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

Chapattis

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

The insoluble dietary fibre of CFB 1 (WSP) 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.

Table 4.2 Proximate analysis of Composite Flour Blend Chapatti (per 100 g)

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(reconstituted) (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

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

Three types of Composite Flour Blend formulated biscuits, chapattis and Instant Upma Mix were prepared using method discussed earlier (under the head of material and methodology) 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 (reconstituted) 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 (PSW) biscuits has the highest scores for colour, taste and flavor of 7.8. Texture (7.7), appearance and overall acceptability (8.0) of CFB 3(PSW) biscuits had significant differences when compared against characteristics of CFB 1 (WSP) biscuits. The non- significant difference was observed between CFB 2 (SWP) biscuits with CFB 1 (WSP) and CFB 3 (PSW) biscuits. The CFB 3 (PSW) 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. CFB(WSP) chapattis had highest scores of colour (7.4), taste (7.3), flavor (7.4), texture (7.6), appearance (7.4) and overall acceptability (7.2).

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

Instant Upma

Three types of composite flour blends were used to formulate Instant Upma using the method discussed earlier and were subjected to sensory analysis through Score Card Method by a panel of fifteen members. The Instant Upma Mix was reconstituted and was judged based on colour, taste, texture, flavor, appearance, and overall acceptability. The colour, texture and appearance score were found to be highest in CFB 1 (WSP) formulated Instant Upma. On the other hand the highest scores for taste and flavor were obtained by CFB 2 (SWP) Instant Upma. The overall acceptability was nearly same for all the three types.

The non-significant difference was observed among three types of Instant Upma types. Therefore, CFB 1 (WSP) Instant Upma (reconstituted) was selected for determination of glycemic response and glycemic index.

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

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.±	0.135	
C.D. at 5%	0.379	
Chapattis		
CFB 1	7.06	Like moderately
CFB 2	7.0	Like moderately
CFB 3	7.0	Like moderately
S.E.M.±	0.198	
C.D. at 5%	0.567	
Instant Upma		
CFB 1	7.3	Like moderately
CFB 2	7.1	Like moderately
CFB 3	7.1	Like moderately

5. CONCLUSION

The nutrient composition of composite flour blend 1 (WSP) included moisture 12.05 per cent, crude protein of 22.16 per cent, total ash of 2.78 per cent, crude fat of 3.05 per cent, crude fibre of 12.21 per cent, carbohydrate of 56.34 per cent, energy of 343.5 kcal/100g and total dietary fibre of 13.89 per cent.

The nutrient composition of composite flour blends CFB 2 (SWP) showed 11.08 per cent moisture, 25.34 per cent crude protein, 2.85 per cent total ash, 9.77 per cent crude fat, 12.43 per cent crude fibre, 50.01 per cent carbohydrate, 378.5 kcal/100g energy and 13.12 per cent total dietary fibre.

The nutrient composition of CFB 3(PSW) showed as 12.07 per cent moisture, 22.22 per cent crude protein, 2.86 per cent total ash, 3.07 per cent crude fat, 12.17 per cent crude fibre, 53.98 per cent carbohydrate, 332.2 kcal/100g energy and 13.78 per cent total dietaryfibre.

The composite flour blends i.e. CFB 2 (SWP) and CFB 3 (PSW) relatively showed higher and approximately same nutritional value over CFB 1 (WSP). The CFB 3(PSW) reported highest value for total dietary fibre.

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