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Research Article

DEVELOPMENT OF VALUE ADDED PRODUCTS (BUN, MUFFIN, NOODLES, AND NUGGETS) BY SUBSTITUTION WITH *CARISSA SPINARUM* AND *FICUS CARICA* POWDER

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ABSTRACT

Objectives: In the present investigation, attempts have been made to develop nutrient-rich value added products (bun, muffin, noodles, and nuggets) by the substitution of *Carissa spinarum* and *Ficus carica* powder in the proportion (100:0, 100:15, 100:30, 100:45).

Methods: The nutritional composition, dietary fiber composition, and mineral composition of bun, muffin, noodles, and nuggets and organoleptic evaluation for bun and muffin (made with whole fresh fruits) were investigated by the standard selected methods.

Results: It revealed that after the substitution of selected fruits in formulated value added products the nutritional composition (moisture, ash, carbohydrates, protein, and fat content), dietary fiber (neutral detergent fiber, acid detergent fiber, hemicellulose, cellulose, and lignin content), and mineral composition (calcium, iron, and phosphorus) will increased.

Conclusions: The organoleptic test showed that the substitution of 15% fresh *C. spinarum* and 30% of F. carica were more acceptable in the case of bun and muffins.

Keywords: *Carissa spinarum, Ficus carica,* Bun and muffin.

INTRODUCTION

In this era of global industrialization and advancement of technologies, the lifestyle of the people has been changed a lot. In this changing lifestyle, the demand for ready to eat foods, such as extruded foods, has increased. Among ready to eat foods, junk food form is an important part of Indian diet. These products are rich in starch, fat, and energy but depleted in fiber. Various epidemiological studies have shown that the diet lacking in fiber may be the cause of various gastrointestinal and cardiovascular diseases [1]. Fruits and green leafy vegetables are good sources of fiber and micronutrients. Multiple micronutrient deficiencies are very common than single deficiency mainly in developing countries. Nutritional problems are more severe; mostly people in the developed countries also suffer from different forms of these nutritional problems. According to this data in India, 79% of children of age group between 6 and 35 months and women between 15 and 49 years of age are anemic [2]. Nutritionists are now trying to encourage people for supplementation of fruits in nutritional recipes to combat with these micronutrient deficiencies.

MATERIAL AND METHODS

The study was conducted in the laboratory of Department of Nutrition and Diet, Punjab, Lovely Professional University. Formulation of value added products (bun, muffin, noodles, and nuggets) has been done by the substitution of *Carissa spinarum* and *Ficus carica* fruits taken from the orchard of a local cultivar in Bilaspur (Himachal Pradesh), from January 2014 to June 2015. All materials have been explained in Tables 1, 2, 3, and 4 mentioned below in 100 g.

Nutritional analysis

The selected whole dried fruits were analyzed for proximate composition (moisture, ash, fat, protein, carbohydrates, and dietary fiber). Proximate analysis was analyzed in triplicates. Moisture, ash content, protein, and fat were determined by AOAC [3]. Carbohydrates were determined by the anthrone method [4]. Dietary fibers (cellulose, hemicelluloses, and lignin) were determined by Van Soest and Robertson [5]. Mineral content was estimated by gas chromatography-mass spectrometry [6].

Table 1: Ingredients used in the preparation of bun (in g)

S. no.	Ingredients	K	K1	K2	K3	F1	F2	F3
1.	Wheat flour	100	85	70	55	85	70	55
2.	Sample/fruit powder	0	15	30	45	15	30	45
3.	R. oil/shortening	1	1	1	1	1	1	1
4.	Yeast powder	2	2	2	2	2	2	2
5.	Salt	2	2	2	2	2	2	2

K Standard=100% wheat flour bun, K1=15% *C. spinarum* powder, K2=35% *C. spinarum* powder, K3=45% *C. spinarum* powder, F1=15% *F. carica* powder, F2=30% *F. carica* powder, F3=45% *F. carica* powder. *C. spinarum: Carissa spinarum, F. carica: Ficus carica*

Table 2: Ingredients used in the preparation of muffin (in g)

S. no.	Ingredients	K	K1	K2	K3	F1	F2	F3
1.	Wheat flour	100	85	70	55	85	70	55
2.	Sample/fruit powder	0	15	30	45	15	30	45
3.	R. oil	15	15	15	15	15	15	15
4.	Skimmed milk	25	25	25	25	25	25	25
5.	Honey	9	9	9	9	9	9	9
6.	Baking powder	1	1	1	1	1	1	1

K Standard=100% wheat flour muffin, K1=15% *C. spinarum* powder, K2=35% *C. spinarum* powder, K3=45% *C. spinarum* powder, F1=15% *F. carica* powder, F2=30% *F. carica* powder, F3=45% *F. carica* powder. *C. spinarum: Carissa spinarum, F. carica: Ficus carica*

Table 3: Ingredients used in the preparation of noodles (in g)

S. no.	Ingredients	K	K1	K2	K3	F1	F2	F3
1.	Wheat flour	100	85	70	55	85	70	55
2.	Sample/fruit powder	0	15	30	45	15	30	45

K Standard=100% wheat flour noodles, K1=15% *C. spinarum* powder, K2=35% *C. spinarum* powder, K3=45% *C. spinarum* powder, F1=15% *F. carica* powder, F2=30% *F. carica* powder, F3=45% *F. carica* powder. *C. spinarum: Carissa spinarum, F. carica: Ficus carica*

Organoleptic evaluation

Bun and muffins (samples) were evaluated for appearance, color, texture, flavor, and overall acceptability on a 9-point hedonic scale [7]. 10 panelist were selected from differ status.

Statistical analysis

Statistical analysis was conducted by using Statistical Program for Social Sciences (SPSS), (SPSS Corporation, Chicago, IL, USA) version 16.0 for windows. Data are represented as mean and standard deviation. All determinations were done at least in triplicate, and average were calculated. Where appropriate data were subjected to statistical analysis of variance to determine the significance of treatment relationship. The confidence limit used in this study were based on 95% probability ($p<0.05$).

RESULT AND DISCUSSION

Result and discussion are mentioned in Table 5 showed that the nutritional composition of bun made from wheat flour substituted with the powder of *C. spinarum* and *F. carica.* The moisture content of bun ranged from 6.84% to 9.87%. Similar results have been obtained by Alam *et al*. [8]. The ash content ranged from 0.39% to 0.72%. Consistent results were given by Kawka *et al.* [9]. The carbohydrates content ranged from 75.52% to 107.56%. The protein content ranged from 6.64% to 7.84%. The fat content ranged from 1.62% to 1.92%. Similar results have been obtained by Alam *et al*. [8]. Table 6 showed that the dietary composition of bun made from wheat flour incorporated with the powder of *C. spinarum* and *F. carica.* The neutral detergent fiber (NDF) of bun ranged from 23.8% to 25.66%. The result showed that there was a significant difference ($p<0.05$) between the samples. Similar results have been obtained by Albers *et al*. [10]. Increased the fiber content in bun with the addition of fruit powder, which effect on dough properties. It leads to increased dough development time and decreased dough stability was possibly associated with slowed water hydration rate and gluten development due to increased fiber content. Increased mixing tolerance and extension value due to the interactions between fibrous materials and gluten [11]. The acid detergent fiber (ADF) ranged from 1.30% to 1.66%. Consistent results were given by Kawka *et al.* [9]. The hemicellulose content ranged from 22.39% to 23.99%. Similar results have been obtained by Albers *et al*. [10]. The cellulose content ranged from 2.48% to 2.83%. The lignin content ranged from 0.5% to 0.75%. Similar results have been obtained by Kawka *et al.* [9]. Table 7 showed that the mineral composition of bun made from wheat flour substituted with the powder of *C. spinarum* and *F. carica.* The calcium content of bun ranged from 10.80% to 94.05%. Calcium content increased after the substitution of fruit powder in bun, and similar results have been obtained by Kashlan *et al*. [12]. The result showed that mineral content increased in bun with the addition of fruit powder due to fruit power is a good source of minerals. These results are in agreement with Aremu *et al.* [13] and Nieman *et al*. [14]. The iron content ranged from 25.83% to 369.12%. Consistent results were given by Umelo *et al.* [15]. The phosphorus content ranged from 333.39% to 501.13%. After substitution phosphorus content increased in bun as compared to the control sample and consistent results have been obtained by Harinder *et al*. [16]. Table 8 showed that the nutritional composition of a muffin made from wheat flour substituted with the powder of *C. spinarum* and *F. carica.* The moisture content of muffin ranged from 10.8% to 21.83%. Similar results have been obtained by Uchenna *et al*. [17]. The ash content ranged from 0.37% to 0.77%. The carbohydrates content ranged from 45.45% to 71.95%. The protein content ranged from 6.42% to 7.38%. The fat content ranged from 10.33% to 12.73%. Similar results have been obtained by Jauharah *et al.* [18]. Table 9 showed that the dietary composition of a muffin made from wheat flour incorporated with the powder of *C. spinarum* and *F. carica.* NDF ranged from 23.76% to 25.3%. The ADF of ranged from 5.83% to 6.56%. The hemicellulose content ranged from 17.86% to 18.42%. The cellulose content ranged from 4.19% to 4.26%. The lignin content ranged from 1.70% to 1.74%. Similar results have been obtained by Thomas *et al*. [19]. Table 10 showed that the mineral composition of a muffin made from wheat flour substituted with the powder of *C. spinarum* and *F. carica.* The calcium content of muffin ranged from 146.792% to 339.291%. The iron content ranged from 10.92% to 19.88%. The phosphorus content ranged from 62.40% to 175.435%. Consistent results have been obtained by Kiruthiga and Krishnaprabha [20]. Table 11 showed that the nutritional composition of noodles made from wheat flour substituted with the powder of *C. spinarum* and *F. carica.* The moisture content ranged from 6.84% to 9.87%. Similar results have been obtained by Alam *et al.* [8]. The ash content ranged from 2.00% to 3.67%. Consistent results were given by Kawka *et al.* [9]. The carbohydrates content ranged from 85.53% to 114.58%. Similar results have been obtained by Taneya *et al*. [21]. The protein content ranged from 6.51% to 7.84%. Similar results have been obtained by Hardi *et al*. [22]. The fat content ranged from 1.56%

Table 4: Ingredients used in the preparation of nuggets (in g)

S. no.	Ingredients	K	K1	K2	K3	F1	F2	F3
1.	Moong flour	100	85	70	55	85	70	55
2.	Sample/fruit powder	0	15	30	45	15	30	45

K Standard=100% moong flour nuggets, K1=15% *C. spinarum* powder, K2=35% *C. spinarum* powder, K3=45% *C. spinarum* powder, F1=15% *F. carica* powder, F2=30% *F. carica* powder, F3=45% *F. carica* powder. *C. spinarum: Carissa spinarum, F. carica: Ficus carica*

Table 5: Nutritional composition

Drying method	K	K1	K2	K3	F1	F2	F3
Moisture (%)	6.470±0.02^{a}	7.45±0.01^{b}	9.87±0.02^{bc}	8.24±0.66^{bc}	8.26±0.00^{bc}	6.84±0.01^{bd}	8.41±0.01^{b}
Ash (%)	0.39±0.05^{a}	0.44±0.15^{b}	0.50±0.00^{a}	0.72±0.16^{a}	0.40±0.05^{c}	0.48±0.02^{a}	0.63±0.11^{a}
Carbohydrates (g/100 g)	75.52±0.01^{a}	89.58±0.07^{b}	98.05±0.05^{bc}	107.56±0.05^{bc}	85.85±0.30^{bc}	95.6±0.1^{bd}	104.58±0.07^{b}
Protein (%)	6.64±0.14^{a}	6.79±0.08^{a}	7.1±0.1^{a}	7.52±0.08^{ab}	7.69±0.95^{ab}	7.44±0.08^{a}	7.84±0.08^{a}
Fat (%)	1.62±0.07^{a}	1.73±0.04^{a}	1.82±0.05^{a}	1.92±0.28^{a}	1.80±0.38^{a}	1.73±0.04^{a}	1.62±0.07^{a}

Where, K (Standard)=100% wheat flour bun, K1=15% *C. spinarum* powder, K2=30% C. *spinarum* powder, K3=45% *C. spinarum* powder), F1=15% *F. carica* powder, F2=30% *F. carica* powder, F3=45% *F. carica* powder. Different letters in the column indicated significant differences at $p<0.05$.

Table 6: Dietary fiber

Drying method	K	K1	K2	K3	F1	F2	F3
NDF (%)	23.8±0.10^{a}	24.23±0.05^{a}	24.83±0.98^{a}	25.66±0.23^{ab}	23.73±0.05^{ac}	24.23±0.05^{a}	24.83±0.98^{a}
ADF (%)	1.4±0.45^{a}	1.56±0.20^{a}	1.6±0.17^{a}	1.66±0.11^{a}	1.3±0.34^{a}	1.53±0.23^{a}	1.6±0.17^{a}
Hemicellulose (%)	22.39±0.00^{a}	22.69±0.00^{b}	23.22±0.00^{bc}	23.99±0.00^{bc}	22.42±0.00^{bc}	22.56±0.00^{bd}	23.22±0.00^{b}
Cellulose (%)	2.51±0.07^{a}	2.59±0.04^{a}	2.64±0.05^{a}	2.83±0.10^{ab}	2.48±0.10^{ac}	2.56±0.03^{ac}	2.62±0.01^{ac}
Lignin (%)	0.5±0.00^{a}	0.6±0.00^{a}	0.7±0.01^{a}	0.75±0.00^{a}	0.5±0.01^{a}	0.53±0.00^{ab}	0.6±0.00^{a}

Values are expressed as mean±SD (n=3) of triplicate measurement. ADF: Acid detergent fiber, NDF: Neutral detergent fiber. Different letters in the column indicated significant differences at $p<0.05$. (a,b,c)

Table 7: Mineral composition

Drying method	K	K1	K2	K3	F1	F2	F3
Calcium (mg/100 g)	10.80±0.00^{a}	49.57±0.00^{b}	57.40±0.00^{bc}	94.05±0.00^{bc}	14.96±0.00^{bc}	70.14±0.00^{bd}	73.61±0.00^{b}
Iron (mg/100 g)	25.83±0.00^{a}	307.61±0.00^{b}	355.43±0.00^{bc}	369.12±0.00^{bc}	284.91±0.00^{bc}	310.75±0.00^{bd}	344.83±0.00^{b}
Phosphorus (mg/100 g)	333.39±0.00^{a}	416.77±0.00^{ab}	443.73±0.00^{bc}	501.13±5.77^{bc}	371.70±0.00^{bc}	423.54±0.00^{bd}	444.00±0.00^{b}

Different letters in the column indicated significant differences at p<0.05 (a,b,c)

Table 8: Muffin-nutritional composition

Drying method	K	K1	K2	K3	F1	F2	F3
Moisture (%)	10.8±0.1^{a}	20.66±0.05^{b}	21.83±0.00^{bc}	19.68±0.09^{ac}	20.8±0.00^{b}	19.85±0.09^{ac}	20.15±0.09^{bc}
Ash (%)	0.37±0.02^{a}	0.41±0.15^{a}	0.5±0.00^{a}	0.72±0.03^{b}	0.51±0.01^{ac}	0.7±1.35^{b}	0.77±0.02^{ab}
Carbohydrates (g/100 g)	45.45±0.48^{a}	52.29±2.22^{b}	61.16±3.20^{bc}	70.07±0.02^{bc}	52.48±2.11^{b}	62.50±2.54^{bc}	71.95±2.58^{bc}
Protein (%)	6.42±0.12^{a}	7.16±0.05^{a}	7.52±0.08^{a}	7.76±0.08^{a}	6.92±0.11^{ab}	7.17±0.05^{a}	7.38±0.16^{ab}
Fat (%)	10.33±0.11^{a}	11.53±0.11^{b}	12.53±0.11^{bc}	12.73±0.11^{bc}	10.73±0.11^{bc}	11.13±0.11^{bc}	11.33±0.11^{bc}

Different letters in the column indicated significant differences at p<0.05 (a,b,c)

Table 9: Dietary fiber

Drying method	K	K1	K2	K3	F1	F2	F3
NDF (%)	23.76±0.11^{a}	24.1±0.34^{a}	24.46±0.86^{a}	25.3±0.86^{a}	23.66±0.15^{a}	24.06±0.32^{a}	24.46±0.86^{a}
ADF (%)	5.83±0.63^{a}	6.06±0.63^{a}	6.2±1.10^{a}	6.56±0.63^{a}	5.46±0.63^{a}	5.73±0.56^{a}	6.03±0.86^{a}
Hemicellulose (%)	17.86±0.00^{a}	18.03±0.00^{b}	18.25±0.00^{b}	18.32±0.00^{bc}	18.19±0.00^{bc}	18.32±0.00^{bc}	18.42±0.00^{bc}
Cellulose (%)	4.19±0.19^{a}	4.22±0.19^{a}	4.26±0.19^{a}	4.27±0.19^{a}	4.18±0.19^{a}	4.20±0.19^{a}	4.24±0.19^{a}
Lignin (%)	1.70±0.00^{a}	1.72±0.02^{a}	1.73±0.01^{a}	1.74±0.01^{ab}	1.60±0.01^{bc}	1.70±0.00^{ac}	1.71±0.02^{ab}

Different letters in the column indicated significant differences at p<0.05 (a,b,c)

Table 10: Mineral composition

Drying method	K	K1	K2	K3	F1	F2	F3
Calcium (mg/100 g)	146.792±0.00^{a}	148.165±0.00^{a}	172.977±0.00^{ab}	234.416±51.96^{a}	241.019±0.00^{b}	307.954±0.00^{b}	339.291±0.00^{b}
Iron (mg/100 g)	10.92±0.00^{a}	11.33±0.00^{b}	12.07±0.00^{bc}	13.31±0.00^{bc}	16.04±0.00^{bc}	18.14±0.00^{bc}	19.88±0.00^{bc}
Phosphorus (mg/100 g)	62.40±0.00^{a}	72.28±0.00^{b}	76.86±0.00^{bc}	81.74±0.00^{bc}	86.65±0.00^{bc}	120.42±0.00^{bc}	175.435±0.00^{bc}

Different letters in the column indicated significant differences at p<0.05 (a,b,c)

Table 11: Nutritional composition of noodles

Drying method	K	K1	K2	K3	F1	F2	F3
Moisture (%)	6.61±0.16^{a}	7.44±0.01^{a}	9.88±0.04^{a}	7.65±0.99^{a}	8.26±0.13^{a}	8.75±3.24^{a}	8.45±0.12^{a}
Ash (%)	2.13±0.00^{a}	2.00±0.05^{a}	2.04±0.10^{a}	2.11±0.05^{ab}	2.51±0.10^{ac}	2.84±0.09^{ac}	3.67±1.33^{ac}
Carbohydrates (g/100 g)	85.53±0.01^{a}	94.58±0.07^{b}	103.05±0.05^{bc}	112.56±0.05^{bc}	95.85±0.30^{bc}	105.6±0.1^{bc}	114.58±0.07^{bc}
Protein (%)	6.51±0.11^{a}	6.79±0.08^{a}	7.1±0.1^{a}	7.52±0.08^{a}	7.48±1.05^{a}	7.44±0.08^{a}	7.84±0.08^{a}
Fat (%)	1.56±0.02^{a}	2.20±0.07^{b}	2.70±0.39^{bc}	3.59±0.03^{bc}	1.62±0.07^{bc}	1.73±0.04^{abc}	1.82±0.05^{abc}

Different letters in the column indicated significant differences at p<0.05 (a,b,c)

Table 12: Dietary fiber

Drying method	K	K1	K2	K3	F1	F2	F3
NDF (%)	21.93±1.90^{a}	23.36±1.53^{a}	23.70±1.70^{a}	25.16±0.77^{a}	22.50±2.16^{a}	23.70±1.70^{a}	23.90±0.26^{a}
ADF (%)	0.53±0.05^{a}	0.63±0.11^{a}	0.70±0.20^{a}	0.83±0.11^{a}	0.60±0.10^{a}	0.76±0.11^{a}	0.83±0.11^{a}
Hemicellulose (%)	21.4±4.35^{a}	21.73±0.00^{a}	23.00±0.00^{a}	24.33±0.00^{a}	21.9±4.35^{a}	22.94±0.00^{a}	23.07±4.35^{a}
Cellulose (%)	3.14±0.18^{a}	3.18±0.22^{a}	3.20±0.02^{a}	3.23±0.00^{a}	3.17±0.03^{a}	3.21±0.01^{a}	3.33±0.10^{a}
Lignin (%)	0.46±0.05^{a}	0.56±0.05^{a}	0.63±0.05^{b}	0.76±0.05^{ab}	0.50±0.10^{ab}	0.53±0.05^{ab}	0.63±0.05^{ab}

Different letters in the column indicated significant differences at p<0.05 (a,b,c)

Table 13: Mineral composition

Drying method	K	K1	K2	K3	F1	F2	F3
Calcium (mg/100 g)	18.96±0.00^{a}	19.71±0.00^{b}	22.19±0.00^{bc}	22.67±0.00^{bc}	23.80±0.00^{bc}	27.89±0.00^{bc}	33.91±0.00^{bc}
Iron (mg/100 g)	0.09±0.00^{a}	0.09±0.00^{ab}	0.10±0.00^{abc}	0.16±0.00^{bc}	0.22±0.00^{bc}	0.26±0.00^{bc}	0.27±0.00^{bc}
Phosphorus (mg/100 g)	0.11±0.00^{a}	0.12±0.00^{b}	0.15±0.00^{bc}	0.15±0.00^{bc}	0.13±0.00^{bc}	0.15±0.00^{bc}	0.16±0.00^{bc}

Different letters in the column indicated significant differences at p<0.05 (a,b,c)

to 3.59%. Similar results have been obtained by Taneya *et al*. [21]. Table 12 showed that under dietary composition the NDF of noodles ranged from 21.93% to 25.16%. Similar results have been obtained by Sobota and Luczak [23]. The ADF ranged from 0.53% to 0.83%. The

hemicellulose content ranged from 21.4% to 24.33%. The cellulose content ranged from 3.14% to 3.33%. Similar results were given by Nermin [24]. The lignin content ranged from 0.46% to 0.76%. Table 13 showed that under mineral composition the calcium content of noodles ranged from 18.96% to 33.91%. The iron content ranged from 0.09% to 0.27%. Consistent results were given by Kulkarni *et al*. [25]. The phosphorus content ranged from 0.11% to 0.16%, and consistent results have been obtained by Ibitoye *et al*. [26]. Table 14 showed that the nutritional composition of nugget substituted with the powder of *C. spinarum* and *F. carica.* The moisture content of nuggets ranged from 19.8% to 21.83%. The ash ranged from 0.37% to 0.77%. The carbohydrates content ranged from 65.64% to 93.78%. The protein content of nugget substituted with the powder of *C. spinarum* and *F. carica.* It ranged from 13.34% to 14.72%. The fat content ranged from 1.85% to 3.96%. Similar results have been obtained by Pardeshi *et al*. [27]. Table 15 showed that under the dietary composition of nugget substituted with the powder of *C. spinarum* and *F. carica.* It ranged from 23.63% to 25.30%. The ADF ranged from 21.33% to 22.63%. The hemicellulose content ranged from 1.97% to 2.54%. The cellulose content ranged from 11.88% to 12.97%. The lignin content ranged from 1.70% to 1.73%. Similar results have been obtained by Rani and Kawatra [28]. Table 16 showed that under mineral composition the calcium content of nugget ranged from 146.79% to 339.29%. The iron content of nugget ranged from 10.92% to 19.88%. The phosphorus content ranged from 324.10% to 754.35%, and consistent results have been obtained by Habibullah and Hamid [29]. Table 17 showed the sensory score of bun made from wheat flour. In this study, the results of the appearance, color, texture, flavor, and overall acceptability showed that there was no significant difference between the bun made from flour blends with the powder of *C. spinarum* and *F. carica* and wheat flour. The maximum score for appearance was observed in K1 (7.5) and minimum in F1 (7.2). The

Table 14: Nutritional composition of nugget

Drying method	K	K1	K2	K3	F1	F2	F3
Moisture (%)	19.8±0.1^{a}	20.66±0.05^{b}	21.83±0.00^{bc}	19.68±0.09^{ac}	20.8±0.00^{b}	19.85±0.09^{ac}	20.15±0.09^{bc}
Ash (%)	0.37±0.02^{a}	0.41±0.15^{a}	0.5±0.00^{ab}	0.72±0.03^{b}	0.51±0.01^{a}	0.7±1.35^{b}	0.77±0.02^{b}
Carbohydrates (g/100 g)	65.64±0.22^{a}	74.53±0.40^{b}	82.99±0.24^{bc}	93.30±1.04^{bc}	72.48±2.11^{b}	82.50±1.09^{bc}	93.78±0.63^{bc}
Protein (%)	13.34±0.08^{a}	14.00±0.1^{b}	14.1±0.1^{bc}	14.37±0.12^{bc}	13.59±0.08^{abc}	14.39±0.08^{bc}	14.72±0.08^{bc}
Fat (%)	1.85±2.71^{a}	2.74±0.05^{b}	3.31±0.24^{bc}	3.96±0.30^{bc}	2.20±0.05^{bc}	2.27±0.02^{bc}	2.33±0.07^{bc}

Different letters in the column indicated significant differences at p<0.05 (a,b,c)

Table 15: Dietary fiber

Drying method	K	K1	K2	K3	F1	F2	F3
NDF (%)	23.63±0.11^{a}	23.93±0.32^{a}	24.3±0.95^{a}	25.3±0.86^{a}	23.56±0.11^{a}	24.06±0.32^{a}	24.2±1.04^{a}
ADF (%)	21.33±1.15^{a}	21.73±0.23^{a}	21.76±1.85^{a}	22.63±1.45^{a}	21.06±0.92^{a}	21.76±1.85^{a}	21.73±0.23^{a}
Hemicellulose (%)	1.97±0.00^{bc}	2.20±0.00^{b}	2.33±0.00^{a}	2.54±0.00^{bc}	2.36±0.00^{bc}	2.47±0.00^{bc}	2.50±0.00^{bc}
Cellulose (%)	11.88±0.65^{a}	12.23±0.00^{a}	12.67±0.58^{a}	12.97±0.63^{a}	11.51±0.65^{a}	11.89±0.61^{a}	12.54±0.66^{a}
Lignin (%)	1.70±0.00^{a}	1.72±0.01^{a}	1.73±0.01^{a}	1.74±0.01^{ab}	1.68±0.00^{b}	1.70±0.01^{a}	1.71±0.00^{ab}

Different letters in the column indicated significant differences at p<0.05 (a,b,c)

Table 16: Mineral composition

Drying method	K	K1	K2	K3	F1	F2	F3
Calcium (mg/100 g)	146.79±0.00^{a}	148.16±0.00^{b}	172.97±0.00^{bc}	204.41±0.00^{bc}	241.01±0.00^{bc}	307.95±0.00^{bc}	339.29±0.00^{bc}
Iron (mg/100 g)	10.92±0.00^{a}	11.33±0.00^{b}	12.07±0.00^{bc}	13.31±0.00^{bc}	16.04±0.00^{bc}	18.14±0.00^{bc}	19.88±0.00^{bc}
Phosphorus (mg/100 g)	324.1±0.00^{a}	422.81±0.00^{b}	468.62±0.00^{bc}	517.43±0.00^{bc}	666.54±0.00^{bc}	704.27±0.00^{bc}	754.35±0.00^{bc}

Different letters in the column indicated significant differences at p<0.05 (a,b,c)

Table 17: Organoleptic evaluation for bun

Drying method	K	K1	K2	K3	F1	F2	F3
Appearance	7.4±0.69^{a}	7.5±0.52^{a}	7.4±0.51^{a}	7.4±0.63^{a}	7.2±0.63^{a}	7.4±0.69^{a}	7.4±0.69^{a}
Color	7.2±0.42^{a}	7.4±0.51^{a}	7.5±0.52^{a}	7.6±0.51^{a}	7.0±0.47^{a}	7.1±0.31^{a}	7.0±0.66^{a}
Texture	7.2±0.63^{a}	7.5±0.52^{a}	7.4±0.51^{a}	7.5±0.52^{a}	7.2±0.63^{a}	7.3±0.48^{a}	7.4±0.51^{a}
Flavor	7.5±0.52^{a}	7.4±0.51^{a}	7.5±0.52^{a}	7.6±0.51^{a}	7.2±0.42^{a}	7.3±0.67^{a}	7.1±0.31^{a}
Overall acceptability	7.9±0.31^{a}	7.6±0.51^{a}	7.5±0.52^{a}	7.5±0.52^{a}	7.4±0.51^{a}	7.5±0.52^{a}	7.4±0.51^{a}

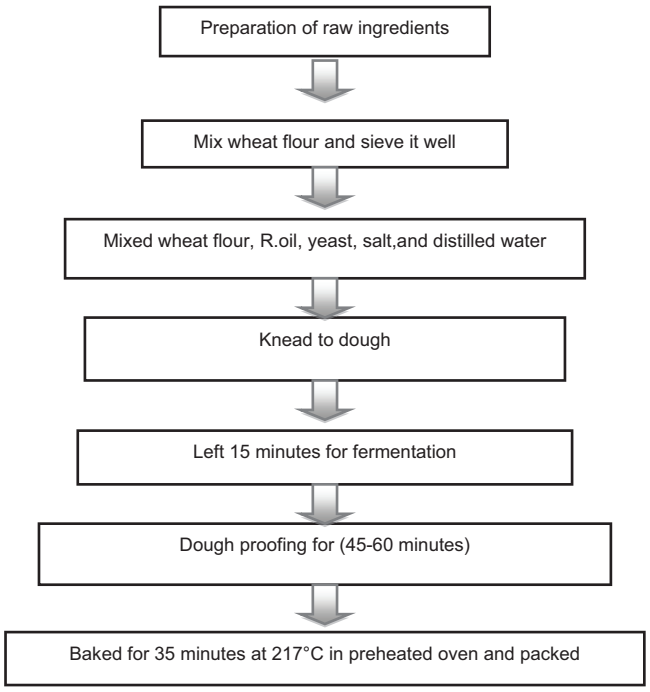
Different letters in the column indicated significant differences at p<0.05 (a,b,c)

Table 18: Organoleptic evaluation for muffin

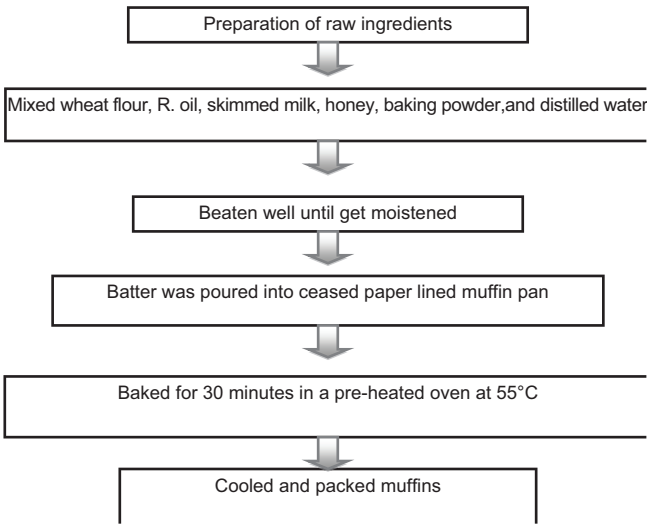
Drying method	K	K1	K2	K3	F1	F2	F3
Appearance	7.9±0.31^{a}	7.6±0.51^{a}	7.3±0.48^{a}	7.6±0.51^{a}	7.4±0.51^{a}	7.7±0.48^{a}	7.4±0.51^{a}
Color	7.2±0.42^{a}	7.4±0.51^{a}	7.6±0.51^{a}	7.1±0.56^{a}	7.6±0.51^{a}	7.4±0.51^{a}	7.2±0.42^{a}
Texture	7.3±0.48^{a}	7.7±0.48^{a}	7.5±0.52^{a}	7.5±0.52^{a}	7.4±0.51^{a}	7.4±0.51^{a}	7.7±0.48^{a}
Flavor	7.8±0.42^{a}	7.5±0.52^{a}	7.4±0.51^{a}	7.6±0.51^{a}	7.3±0.48^{a}	7.6±0.51^{a}	7.4±0.51^{a}
Overall acceptability	7.7±0.48^{a}	7.7±0.48^{a}	7.6±0.51^{a}	7.4±0.51^{a}	7.5±0.52^{a}	7.7±0.48^{a}	7.5±0.52^{a}

Different letters in the column indicated significant differences at p<0.05 (a,b,c)

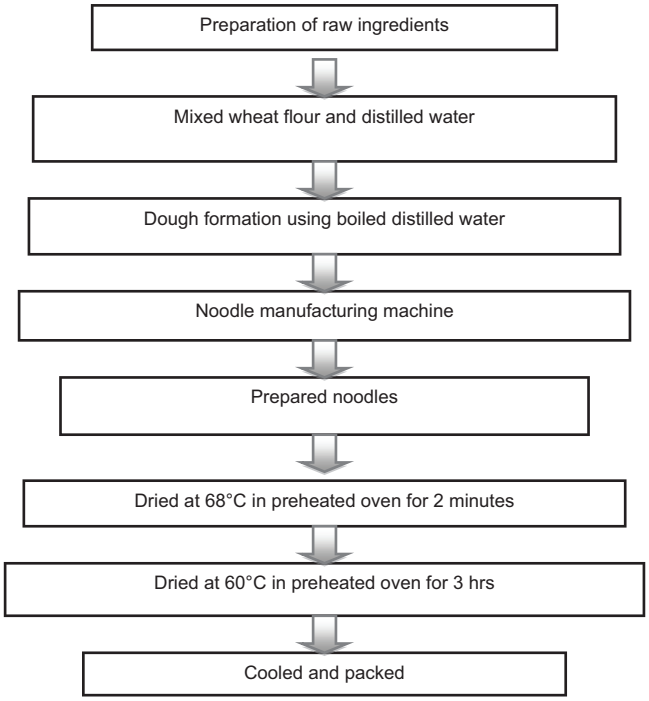
maximum score for color was K3 (7.6) and minimum in F1 and F3 (7.0). The data for the score of the texture of the bun ranged from 7.2 to 7.5 with K1 and K3 being the highest with 7.5 scores and minimum in 7 K with 7.2 scores. The maximum score for flavor was observed in K3 (7.6) and minimum in F3 (7.1). Moreover, overall acceptability was observed maximum in K (7.9) and minimum in F1 and F3 (7.4). Table 18 showed the sensory score of a muffin made from wheat flour. In this study, the results of the appearance, color, texture, flavor, and overall acceptability showed that there was no significant difference between the muffin made from flour blends with the powder of *C. spinarum* and *F. carica* and wheat flour. The maximum score for appearance was observed in K (7.9) and minimum in K2 (7.3). The maximum score for color was K2 (7.6) and minimum in K3 (7.1). The data for the score of the texture of the bun ranged from 7.3 to 7.7 with K1 being the highest with 7.7 scores and minimum in K with 7.3 scores. The maximum score for flavor was observed in K (7.8) and minimum in F1 (7.3). Moreover, overall acceptability was observed maximum in K, K1, and F2 (7.7) and minimum in F1 and F3 (7.5).



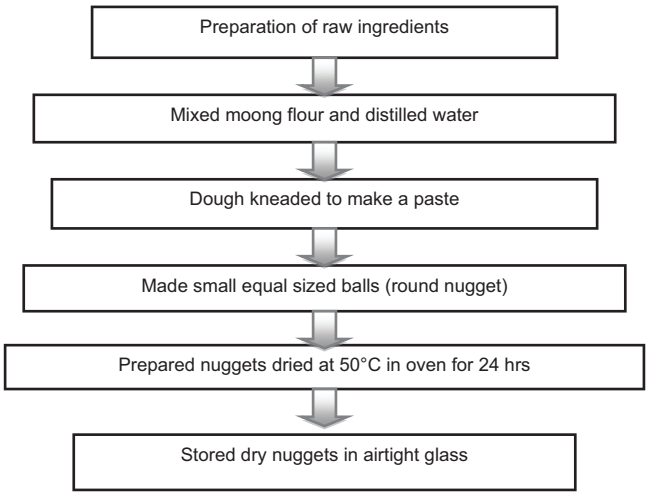
Bun development [8]



Muffin development [17]



Noodles development [26]



Nugget development (Pandey et al., 2012)

Procedure for the formulation of value added product (bun, muffin, noodles, and nuggets) and Figure (1-6) showed sensory evaluation of all selected value added products.

Organoleptic analysis of Bun and Muffin

CONCLUSION

Among all the formulation (value added products) after the substitution of selected fruits the nutritional composition (moisture, ash, carbohydrates, protein, and fat content), dietary fiber (NDF, ADF, hemicellulose, cellulose, and lignin content), and mineral composition (calcium, iron, and phosphorus) will increased as compared to control sample. The organoleptic test showed that the substitution of 15% fresh *C. spinarum* and 30% of *F. carica* were more acceptable in the case of bun and muffins. This study will help people to generate awareness for

Fig. 1: Standard (1)=100% wheat flour bun, 2-F=15% *Ficus carica* powder, 3-F=30% *F. carica* powder, 4-F=45% *F. carica* powder, 1-K=15% *Carissa spinarum* powder, 2-K=30% *C. spinarum* powder, 3-K=45% *C. spinarum* powder

Fig. 2: Standard=100% wheat flour muffin, 15-F=15% *Ficus carica* powder, 30-F=30% *F. carica* powder, 45-F=45% *F. carica* powder, 15-K=15% *Carissa spinarum* powder, 30-K=30% *C. spinarum* powder, 45-K=45% *C. spinarum* powder

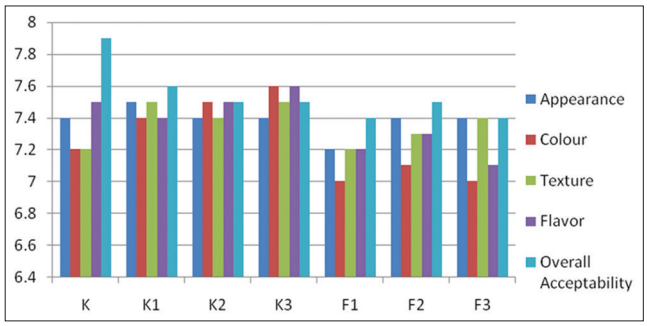


Fig. 3: Index of acceptance of bun made from fruit sample blends

the supplementation fruits in their daily diet to control micronutrient deficiency and increase nutritional status in a better way.

REFERENCES

1. Grewal RB. Nutritional evaluation and utilization of carrot pomace powder for preparation of high Fibre biscuits. J Food Sci Technol 2007;44:56-8.
2. Krishnaswamy K. The problem and consequences of the double burden - A brief overview Programme and abstracts, Symposium on Nutritional Security for India-Issues an Way Forward. New Delhi: Indian National Science Academy; 2009. p. 5-6.

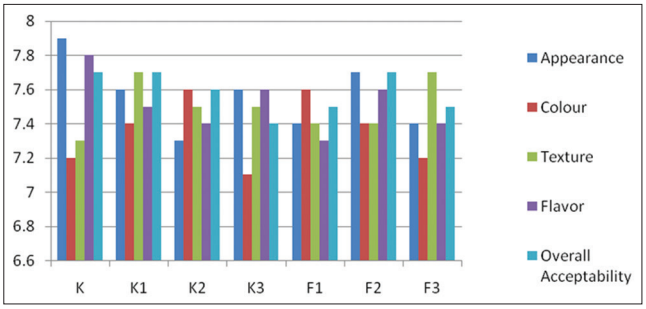


Fig. 4: Index of acceptance of bun made from fruit sample blends

Fig. 5: Standard=100% wheat flour noodles, 15-F=15% *Ficus carica* powder, 30-F=30% *F. carica* powder, 45-F=45% *F. carica* powder, 15-K=15% *Carissa spinarum* powder, 30-K=30% *C. spinarum* powder, 45-K=45% *C. spinarum* powder

Fig. 6: Standard=100% moong dal nuggets, 15-K=15% *Carissa spinarum* powder, 30-K=30% *C. spinarum* powder, 45-K=45% *C. spinarum* powder, 15-F=15% *Ficus carica* powder, 30-F=30% *F. carica* powder, 45-F=45% *F. carica* powder

3. AOAC. Official method of analysis international. Spectrophotometric Method 2000;7:161-4.
4. Hedge JE, Hofreiter BT. In: Carbohydrate Chemistry its Stability in Model Systems. Vol. 30. New York: Academic Press; 1962. p. 246-8.
5. Van Soest PJ, Robertson JB. What is fibre and fibre in food? Nutr Rev 1977;35(3):12-22.
6. Ministry of Health and Family Welfare. Department of Ayurveda yoga and neuropathy, Unani siddha homoeopathy, New Delhi, First edition (AYUSH) 2008; VI (1), 340.
7. Schutz HG, Cardello AV. A labeled affective magnitude (LAM) scale for assessing food liking/disliking. J Sens Stud 2001;16:117-59.
8. Alam MJ, Talukder MU, Rahman MN. Evaluation of the nutritional and sensory quality of functional breads prepared from whole wheat and soyabean flour. Ann Food Sci Technol 2013;14(2):171-5.
9. Kawka A, Gorecka D, Gasiorowski H. The effects of commercial

barley flakes on dough characteristic and bread composition. Food Sci Technol 1999;2(2):1-2.
10. Albers S, Muchova Z, Fikselova M. The effects of different treated brans additions on bread quality. Sci Agric Biochem 2009;40(2):67-72.
11. Sudha ML, Vetrimani R, Leelavathi K. Influence of fibre from different cereals on the rheological characteristics of wheat flour dough and on biscuit quality. Food Chem 2007;100:1365-70.
12. Kashlan NB, Srivastava NA, Mohana NA, Motawa YK, Mameesh MS. The proximate and elemental composition of wheat flour and major types of bread consumed in Kuwait. J Food Chem 1991;39:205-10.
13. Aremu MO, Olaofe O, Akintayo TE. A comparative study on the chemical and amino acid composition of some Nigerian under-utilized legume flours. Pak J Nutr 2006;5:34-8.
14. Nieman DC, Butterworth DE, Nieman CN. Nutrition. Dubugye, USA: WC Brown Publishers; 1992. p. 237-312.
15. Umelo MC, Nsofor AE, Akajiaku LO, Odimegwu EN, Uzoukwu AE, Eluchie CN, *et al*. Effect of different dough improves on the proximate composition, minerals, vitamins and sensory properties of wheat bread. Int J Sci Res Innov Technol 2014;1(3):1-126.
16. Harinder K, Kaur B, Sharma S. Studies on the baking properties of wheat: Pigeon pea flour blends. Plant Food Hum Nutr 1999;54(3):217-26.
17. Uchenna OA, Nkiruka IV, Eme EP, Ossai CC. Nutritional, phytochemical composition and sensory evaluation of formulated diabetic snacks made from Nigeria foods, *Afzelia Africana* and *Detarium Microcapium* seed flour. Int J Basic Appl Sci 2013;13(2):40-4.
18. Jauharah MZ, Rosli WI, Robert DS. Physicochemical and sensorial evaluation of biscuit and muffin incorporated with young corn powder. Sains Malays 2014;43(1):45-52.
19. Thomas LR, William E, Connor DS, Warner S. The interaction of dietary fibers and cholesterol upon the plasma lipids and lipoproteins, sterol balance and bowel function in human subjects. J Clin Invest 2015;60:1429-37.
20. Kiruthiga V, Krishnaprabha V. Development and analysis of nutrients, antioxidants in sweet potato and pumpkin powder incorporated value added products. Int J Adv Res Biol Sci 2015;2(4):65-71.
21. Taneya ML, Biswas MM, Din SU. The studies on the preparation of instant noodles from wheat flour supplementing with sweet potato flour. J Bangladesh Agric Univ 2014;12(1):135-42.
22. Hardi ZU, Zukic M, Komlenic DK, Sabo M, Hardi J. Quality parameters of noodles made with various supplements. Czech J Food Sci 2007;25(3):151-7.
23. Sobota A, Luczak J. Badania skladu chemicnego makaronow instant. Bromatol Chem Toksykol 2010;XLIII(4):515-22.
24. Nermin B. Utilization of buckwheat flour in gluten-free noodles production. J Food Agric Environ 2008;62(20):113-5.
25. Kulkarni SS, Desai AD, Ranveer RC, Sahoo AK. Development of nutrient rich noodles by supplementation with malted ragi flour. Int Food Res J 2012;19(1):309-13.
26. Ibitoye WO, Afolabi MO, Otegbayo BO, Akintola AC. Preliminary studies of the chemical composition and sensory properties of sweet potato starch-wheat flour blend noodles. Nigerian Food Journal 2013;31(1):48-51.
27. Pardeshi IL, Bhuskade SA, Kalmegh VB. Development of cold extruded ready to cook (*Vigna radiate L.)* nuggets. J Food Res Technol 2013;1(1):21-8.
28. Rani B, Kawatra A. Fibre constituents of some foods. Plant Foods Hum Nutr 1994;45:343-7.
29. Habibullah MA, Hamid US. Proximate and mineral composition of mung bean. Sarhad J Agric 2007;23:463-6.