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Research Article

Comparative proximate analysis of fiber-rich bread and biscuit developed from fig powder

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ABSTRACT

This study was completed on the usage of the fig in the nutritional enrichment of bread and biscuit. To develop high fiber soft dough for bread and biscuit, they were fortified with fig powder at 5% and 10% level(w/w) of wheat flour respectively. Fig powder was prepared through the process of convective dehydration. The sensory evaluation shows that 5% level of fig for bread and 10% level of fig for biscuit produce acceptable quality. The nutritive value of the normal biscuits was moisture content 3.80%, fiber 0.84%, and ash 0.52%. Whereas, prepared biscuits contain 1.162% moisture, 3.3% fiber and 1.78% ash. Similarly, the nutritive value of the normal bread was moisture content 11.15%, fiber 2%, and ash 1.7%. On the contrast, prepared bread contains 9.871% moisture, 3.1% fiber and 2.58% ash. It was noted that quality characteristics were improved due to the incorporation of acceptable level fig powder.

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1. INTRODUCTION

Non-communicable diseases (NCDs), alongside wounds and violence, are responsible for 60% of deaths worldwide (Pekka *et al.* 2002). Strong evidence shows that an unhealthy diet and insufficient physical activity are major causal factors in NCDs such as coronary heart diseases, cerebrovascular strokes, several forms of cancers, type 2 diabetes, hypertension, obesity, osteoporosis, dental caries, and other conditions. Such unhealthy eating regimens incorporate a high measure of salt, fat, sugar and less measure of dietary fiber (DF). Dietary fiber is an individual from a group of dietary complex starch which impervious to assimilation and retention in the human small intestine (Marika, 2006). Dietary fiber has a defensive action against various wellbeing issue, for example, diabetes mellitus, cardiovascular diseases, constipation, appendicitis, hemorrhoids, and colon cancer (Bhawna *et al.* 2013). Fruits, vegetables, cereals (especially in the outer layer) and seaweeds are rich in dietary fiber. Recommended dietary allowance of DF for a grown-up is 20-35g/day and it ought to be satisfied from the sustenance to keep up a solid life (Wijewardene *et al.* 2005).

The two types of fiber are soluble and insoluble. While they work diversely, both are required for appropriate bowel function. Diverticular disease, colon cancer, hemorrhoids, and constipation can be prevented by insoluble fiber. Cellulose, hemicellulose, and lignin are insoluble fibers (Jenkins *et al.* 1978). As of late, there has been expanding enthusiasm for the utilization of natural

food additives and fuse of wellbeing advancing substances into the diet as dietary fiber (Marles, 1995).

Fig (*Ficus hispida*) is the fruit of the fig tree, of the Mulberry family (Moraceae) has a fleshy and succulent pulp. One serving of figs is 100 g, about 1/4 cup. Figs are fat-free, sodium-free and, like other plant foods, cholesterol-free (Lisanju *et al.* 2003). Figs are one of the richest plant sources of a variety of vitamins and minerals, including vitamin A, vitamin C, potassium, magnesium, manganese, iron, copper (Nayak and Bosak, 2015).

Bread is a significant food product for many cultures, prepared by the cooking of dough from refined wheat flour, water, and other ingredients. In the refining of wheat into flour, the bran and germ are inclination or expelled from the grain which are the real wellsprings of nutrients. Hence the bread produced using refined wheat flour, possess low nutritional quality. A few examinations announced the incorporation of various nutritionally rich ingredients to bread to improve its nourishing quality. Hesham *et al.* (2007) developed nutritionally rich bread and biscuit with legume seed flour. Fortification of bread should be possible by dietary fiber, including wheat bran, carob fiber, inulin and pea fiber (Wanga *et al.* 2002), guar gum and modified celluloses (Pomeranz *et al.* 1977) to develop the fiber-rich bread.

The nutritive value, palatability, compactness, and convenience of biscuits make it an ideal food (Kulkarni *et al.* 1997). Having low moisture content than cakes and bread, biscuits are commonly more secure from microbiological spoilage and have a long period of usability (Akubor, 2003). The present examination was intended to developan item with high fiber content. Nowadays, the emphasis is on healthy biscuits with the low glycemic index, more protein and will expand the dietary fiber intake, high resistant starch and diminishing in calorie and carbohydrates of baked goods (McCleary, 2011).

So, it is suitable to incorporate fig powder as an ingredient for bakery products which increases the nutritional value. As bakery products made from non-enriched wheat flour lacks essential nutritional components such as fiber, vitamins, minerals which are lost during the refinement process of wheat flour (Chong and Aziz, 2008).

The aims of this study were to develop bread and biscuit by the addition of fig powder and to evaluate proximate composition of these products.

2. MATERIALS AND METHODS

Place of experiment

The bread and biscuits were prepared in the Department of Food Processing and Engineering of Chattogram Veterinary and Animal Sciences University. Analysis was conducted in the Phytochemistry Research Division, Bangladesh Council of Scientific and Industrial Research (BCSIR), Chattogram.

Raw Materials

Fig, wheat flour, sugar, vegetable oil, butter, baking powder, milk, and other general ingredients were bought from the local market.

Fig Powder Preparation

The figs were cut into small pieces (1cm × 1cm) for better drying conditions. Then all the fig pieces were soaked in 2% KMS (Potassium Meta Bisulfate) solution for 3 min to prevent enzymatic blackening. After soaking, the pieces were washed with running water to remove the KMS solution.

The flowchart of fig preparation is given below:

Raw fig
⇩
Washing and Cutting (1cm x 1cm)
⇩
Dipping into 2% KMS solution
⇩
Blanching for 100°C for 3min
⇩
Straining of water
⇩
Spreading on tray
⇩
Drying in cabinet dryer for 60°C for 2 days
⇩
Grinding
⇩
Fig powder

The samples were then dehydrated by using a cabinet dryer. Drying was carried out at 60°C for 24 hours for fig (Piga *et al.* 2004). The dried pieces were grounded by using a mixer grinder (Panasonic MX-AC555). Grinding was carried out at medium speed for 5 min. The ground powder was sieved using mesh containing a 20mm pore size. The diameter of the pore. Finally, fine powder was produced.

Storge

The fig powder was stored in a airtight glass container and kept at room temperature until further used.

Bread Preparation

The flowchart of bread preparation is given below (Gundu *et al.* 2012):

Weighing of all ingredients
⇩
Mixing
⇩
Dough making
⇩
Bulk fermentation (37ºC 2 hr)
⇩
Degassing
⇩
Proofing (37ºC 1 hr)
⇩
Baking (200ºC 25 mins)
⇩
Final Product

Table 1. Formulation of Bread (Myriam *et al.* 2003)

Ingredients	Sample A (Control)	Sample B	Sample C
Flour(g)	100	95	90
Fig powder(g)	0	5	10
Salt(g)	2	2	2
Water (ml)	60.5	60.5	60.5
Milk (ml)	3	3	3
Sugar (g)	6	6	6
Butter (g)	3	3	3
Yeast(g)	0.8	0.8	0.8

Storage

The bread was stored in an airtight container so that it will not absorb moisture from the surrounding.

Preparation of Biscuit

The flowchart of bread preparation is given below (Raju *et al.* 2007):

Preheating of oven to 200ºC
⇩
Weighing
⇩
Mixing of dry ingredients
⇩
Addition of wet ingredients
⇩
Dough making
⇩
Spreading the sheet
⇩
Shaping
⇩
Baking (210°C 5 mins)
⇩
Final product

Table 2. Formulation of Biscuit (Raju *et al.* 2007)

Ingredients	Sample A (Control)	Sample B	Sample C
Flour (g)	100	95	90
Fig Powder (g)	0	5	10
Sugar (g)	46.88	46.88	46.88
Salt(g)	0.625	0.625	0.625
Baking Powder(g)	0.9375	0.9375	0.9375
Milk(ml)	5	5	5
Butter(g)	3.125	3.125	3.125
Egg (piece)	1	1	1

Proximate Analysis

The proximate composition of developed bread and biscuit was carried out using the official methods of AOAC (2000) and replicated. The samples were analyzed for moisture, ash, crude fiber, crude protein, crude fat, carbohydrate, and mineral content. All analyses were carriedout in duplicate for each sample and results obtained were computed into means.

Sensory Evaluation

Sensory evaluation of the bread and biscuits were determined using 20 panelists consisting of staff and students of Food Science and Technology, Chattogram Veterinary and Animal Sciences University, Khulshi, Chattogram. The panelists were either regular or

occasionally consumers of bread and biscuits and were not allergic to any food. They were asked to evaluate the appearance, aroma, texture, taste and overall acceptance of each sample using 7 points hedonic scale with a corresponding descriptive term ranging from 7 'like extremely' to 1 'dislike extremely'(Peryam *et al.* 1957).

Statistical Analysis

Statistical analyses were done using the Minitab (version 14). The difference in sensory scores was detected using a one-way analysis of variances (ANOVA) with Turkey's comparison at 95% confidence level (Odunlade *et al.* 2016).

3. RESULTS AND DISCUSSION

Sensory Evaluation

The sensory evaluation scores of bread and biscuit are shown in Table 3 and Table 4 respectively.

Table 3. Sensory scores of bread

Sample	Appearance	Aroma	Flavor	Taste	Texture	Overall acceptance
A	5.62±0.17[a]	5.52±0.06[a]	5.85±0.12[a]	4.5±0.06[c]	5.5±0.08[a]	5.65±0.12[a]
B	5.2±0.12[b]	5.25±0.12[b]	5.80±0.06[a]	4.9±0.12[a]	5.1±0.06[c]	5.5±0.06[b]
C	4.9±0.06[c]	5.13±0.17[c]	5.40±0.06[b]	4.7±0.12[b]	5.3±0.07[b]	5.3±0.06[c]

* Values represent mean ±SD and the presence of different superscript along a column indicates a significant difference at P<0.05. Where, Sample A= Wheat flour (100%); Sample B= Fig at 5% level and Sample C= Fig at 10% level.

After doing the ANOVA test for bread it was clear that there were significant differences among the samples in terms of appearance, aroma, tasteand texture. There was no significant diffeences between sample A and sample B in terms of flavor. However, overall acceptability of sample B was higher than sample C. Due to lack of fund and time, sample Bcontaining fig powder at 5% level was preferred for proximate analysis.

Table 4. Sensory scores of biscuits

Sample	Appearance	Aroma	Taste	Texture	Overall acceptance
A	6.10±0.885[a]	5.567±1.194[a]	5.60±1.167[a]	5.233±1.33[a]	5.50±1.137[a]
B	4.467±1.332[b]	4.50±1.225[b]	4.967±1.326[a]	4.767±1.357[a]	4.767±1.251[b]
C	5.467±1.167[a]	4.90±1.125[b]	5.067±1.015[a]	5.30±1.236[a]	5.233±0.937[a]

Table 5. Proximate analysis result of bread

Sample	Bread (5%) Mean±SD	Bread (Control) Mean±SD
Moisture%	9.87±0.02	11.15±1.5
Crude Protein%	9.6±0.01	9.4± 0.01
Fiber%	3.1±0.06	2± 0.05
Crude Fat%	1.22±0.17	1±0.15
Carbohydrate%	73.63±0.15	74.75±0.10
Ash%	2.58±0.00	1.7±0.06
Ca (ppm)	10.25±0.09	4.48±0.10
Mg (ppm)	1.56±0.26	1.00±0.11
Fe (ppm)	0.68±0.22	0.1±0.06
Mn (ppm)	0.25±0.03	0.1±0.19
K (ppm)	10.84±0.08	3.58±0.13

* Values represent mean± SD and the presence of different superscript along a column indicates a significant difference at P<0.05. Where, Sample A= Wheat flour (100%); Sample B= Fig at 5% level and Sample C= Fig at 10% level.

From the Table 4, it was interpreted that, there were no significant differences between A and C in terms of aroma, taste, and texture. There is a difference between sample B and C in terms of aroma. But overall acceptability of sample C was higher. So, sample C was selected for proximate analysis.

Table 6. Proximate analysis result of biscuit

Sample	Biscuit (10%) Mean±SD	Biscuit (control) Mean±SD
Moisture%	1.162±0.01	3.80±1.0
Crude Protein%	9.2±0.12	8.81±0.17
Crude Fat%	3.46±0.06	2±0.08
Fiber%	3.3±0.19	0.84±0.13
Carbohydrate%	81.098±0.2	84.03±0.09
Ash%	1.78±0.01	0.52±0.02
Ca (ppm)	13.26±0.12	5.91±0.03
Mg (ppm)	1.66±0.05	1.13±0.06
Fe (ppm)	0.71±0.10	0.50±0.19
Mn (ppm)	0.35±0.16	0.16±0.11
K (ppm)	12.76±0.01	5.15±0.05

From the Tables 5 and 6, it was clear that the moisture content of developed bread and biscuit samples were lower than that of control (11.15 and 3.80 respectively). The relatively low moisture content observed in developed bread and biscuit might be due to the incorporation of fig powder. Therefore, the lower moisture content observed in developed bread and biscuit samples will promote its longer shelf life than conventional bread and biscuit when stored under the same condition (Odedeji, A. *et al.* 2014).

The protein content of each sample did not increase significantly with the addition of fig powder. For bread and biscuit, it was 9.6% and 9.2% respectively, whereas they normally contain 9.4% and 8.81% fiber respectively. As fig contains lower level of protein (2%), therefore by addition of fig powder protein content in biscuit did not increase significantly (Nayak and Bosak, 2015).

The fat content of the samples was found higher than conventional bread and biscuit due to the addition of fig powder.

The crude fiber of the biscuit and bread samples shows a significant increase. Because figs provide more fiber than all of the common fruits (Lisanju *et al.* 2003). The fiber contents of the bread and biscuit were within the recommended range of not more than 5g dietary fiber / 100g of dry matter (Odedeji, A. *et al.* 2014). Dietary fiber has a protective action against various disorders (FAO/WHO, 1994).

The ash content of the fortified bread and biscuit samples was increased. An ash content gives an insight into the mineral (Odedeji, A. *et al.* 2014). The bread and biscuit samples contain a higher amount of Ca, K than control. Other minerals content didn't increase significantly. This may be due to the fortification of products with fig powder. Of the common fruits, figs have the highest overall content of minerals (Nayak and Bosak, 2015).

The carbohydrate content of the samples decreases with the addition of fig powder.

4. CONCLUSIONS

The addition of fig powder did not affect hugely on the quality of bread and biscuit. However, 5% and 10% fig powder in bread and biscuit increased fiber, crude protein and fat in those products. The strong smell of fig from the products may limit the consumption rate. Further investigation may be continued to overcome this limitation.

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6. REFERENCES

Akubor, P. 2003. Functional properties and performance of cowpea/ plantain/ wheat flour blends in biscuits. Springer. 58 (3):1-8.

AOAC. Official methods of Analysis of AOAC, International, Washington, DC: Association of Official Analytical Chemist (1990). 16: 1546.

Bhawna, C., Gurmukh, S. and Kumbhar, B. K. 2013. Development of Low-Fat Soft Dough Biscuits Using Carbohydrate-Based Fat Replacers. International Journal of Food Science.

Chong, C. and Aziz, N. A. A. 2008. Influence of partial substitution of wheat flour with banana flour on the physico-chemical and sensory characteristics of doughnuts. International food research journal. 15.

Chopra, M. 2002. Globalization Diets and Non-commu nicable Diseases. World Health Organization.

Gundu, R.,Datta, A. K. and Jayashree, G. C. 2012. Optimization of Bread Baking Parameters in Conventional Oven, Journal of Agricultural Engineering Vol. 49(2): April – June.

Hesham, A., Eissa, A. S. and Hussein, B. E. 2007. Rheological properties and quality evaluation of Egyptian balady bread and biscuits supplemented with flours of ungerminated and germinated legume seeds or mushroom. Polish Journal of Food and Nutrition Sciences, 57: 487-496

Jenkins, D. J. A., Wolever, T. M. S., Leeds, A. R., Gassull, M. A. and Haisman, P. J. B. 1978. Dietary fibres, fibre analogues, and glucose tolerance: importance of viscosity. Brit. Med. J. 1:1392-94.

Kulkarni, S. D. 1997. Roasted soybean in cookies. Influence on product quality. J. Food Sci. Technol., 34: 503-505.

Lisanju, W., Weibin, J., Kai, M., Zhifenger, L. and Yelin, W. 2003. The production and research of fig (*Ficus hispida* L.) in China, Acta Horticulturae, 605, pp. 191-196.

Marika, L. 2006. Added β -glucan as a source of fibre for consumers. Journal of Human Nutrition and Dietetics 17: 231-239.

Marles, R. J. and Farnsworth, N. R. 1995. Antidiabetic plants and their active constituents. Phytomedicine 2: 137-189

McCleary, B. V. 2011. The evolution of dietary fiber definitions and methods and the role of AACC international. Cereal Foods Worlds, 56,103.

Myriam, M., Mellado, S. and Chang, Y. K. 2003. Effect of formulation on the quality of frozen bread dough. Brazillian Archives of Biology and Technology, 46(3), 461-468.

Nayak, J. and Bosak U. C. 2015. Analysis of some nutritional properties in eight wild edible fruits of Odissa, India, 14: E 55-62.

Odedeji, J. O., Arogundade, L. A. and yeleke, G. O. 2014. Proximate composition and consumers acceptability of bread produced from blends of soy-cheese and wheat flour. Environmental Science, Toxicology and Food Technology, pp. 41-44.

Odunlade, T. V., Taiwo, K. A. and Adeniran, H. A. 2016. Functional and antioxidative properties of sorghum ogi flour enriched with cocoa. Food Science and Technology, vol. 17, no. 2, pp. 497-506.

Pekka, P, Pirjo P. and Ulla U. 2002. Influencing public nutrition for non-communicable disease prevention: from community intervention to national program-experiences from Finland. Public Health Nutrition 5: 245-251.

Peryam, D. R. and Pilgrim, F. J. 1957. Hedonic scale method of measuring food preferences. Food Technol., 11, pp. 9-14.

Piga, A., Pinna, I., Özer K. B., Agabbio M. and Aksoy U. 2004. Hot air dehydration of figs (*Ficus carica* L.): drying kinetics and quality loss. International Journal of Food Science & Technology 39(7): 793-799.

Pomeranz, Noort, M. W. J. and Hamer, J. 2010. The effect of particle size of wheat bran fractions on bread quality- evidence for fiber protein interactions. Journal of cereal science. Vol 52, pp 59-64.

Raju, P. N., Rao, K. H. and Devi, N. L. 2007. Preparation of high protein biscuits containing whey protein concentrate.J. Food Science and Technol.,44, pp. 532-535.

Wanga, Vogel, S. D., Valk, R. V. D. and Nzyuko, S. M. 2002. Intermittent administration of iron and sulfadoxine pyrimethamine to control anaemia in Kenyan children:a randomized control trial. 360: 908-914

Wijewardene, K. Mohideen M. R. Mendis S, Fernando D. S. and Kulathilaka, T. 2005. Prevalence of hypertension, diabetes, and obesity: baseline findings of a population-based survey in four provinces in Sri Lanka. Ceylon Med J 50: 62-70.