The Pharma Innovation Journal 2022; SP-11(4): 766-770

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; SP-11(4): 766-770
© 2022 TPI
www.thepharmajournal.com
Received: 13-02-2022
Accepted: 15-03-2022

Jyoti
Ph.D. Scholar, Department of Foods and Nutrition, CCS HAU, Hisar, Haryana, India

Sudesh Jood
Professor, Department of Foods and Nutrition, CCS HAU, Hisar, Haryana, India

Veenu Sangwan
Assistant Scientist, Department of Foods and Nutrition, CCS HAU, Hisar, Haryana, India

Corresponding Author
Jyoti
Ph.D. Scholar, Department of Foods and Nutrition, CCS HAU, Hisar, Haryana, India

Nutritional composition and sensory characteristics of *Burfi* supplemented with spinach leaves powder

Jyoti, Sudesh Jood and Veenu Sangwan

Abstract
The present investigation was undertaken to determine the nutrient content of *burfi* supplemented with spinach leaves powder in different ratio. Green leafy vegetable namely Palak was mixed with wheat flour and Bengal gram flour for preparation of *burfi*. The *burfi* were analysed for fat, protein, fiber, total sugar, reducing sugar, non-reducing sugar, total mineral and dietary fibre content. These recipes were also evaluated organoleptically using nine point scale. Incorporation of spinach leaves powder in traditional recipes preparations are recommended to enhance the β-carotene, minerals, dietary fibre and anti-oxidant activity of diets for combating micronutrient deficiencies.

Keywords: Organoleptic, micronutrient, supplemented, incorporation

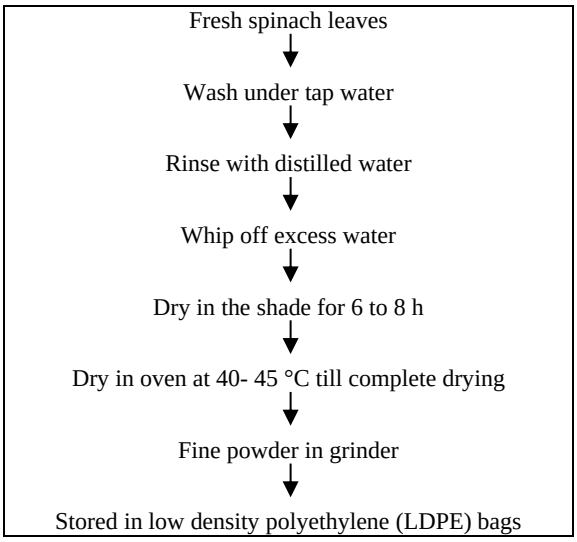
Introduction
Food is a part of man's culture and is filled with different meanings and symbolisms for individuals of different age groups. The food should be nutritious, attractive in flavour and appearance, to be eaten and enjoyed. Green leaves contain significant amount of iron and leaf concentrates made from fractionating fresh green is one of the richest source of this element. Besides, it also contains large amounts of β-carotene, folic acid and protein as well as a considerable amount of pyridoxine, riboflavin and copper. Leaf concentrates can be an excellent dietary factor for the prevention of anaemia (Mathur *et al.*, 1989) [16]. Over 30 per cent of the world's population are anaemic. Iron deficiency also compromises the immune system and is associated with limited cognitive development in children. Among pre-school children worldwide, 23 per cent suffer from iron deficiency anaemia (WHO 2013) [26]. In India, 79 per cent of children between 6 to 35 months and women between 15 to 49 years of age are anaemic (Krishnaswamy 2009) [12]. The most sustainable approaches to increase the micronutrient status of populations are food based strategies, which include food production, dietary diversification and food fortification/supplementation. The food based approach for combating micronutrient malnutrition, is difficult and of a long duration, although its effect is predicted to be long lasting (Singh *et al.* 2014; Gupta *et al.* 2015; Singh *et al*. 2018) [10, 19-21].
In the recent years there is growing concern regarding the nutritive value of foods and to nourish the ever increasing population and the inadequacy of essential nutrients can be improved through fortifications and enrichment of food vehicles. A balance of nutrients may be obtained by including whole cereals, vegetables, pulses and milk and milk products etc. Such a diet provides a large proportion of our need for energy, carbohydrate, protein, dietary fiber, amino acid and minerals. Traditional preparations when modified like *burfi* when incorporated with leafy vegetables could serve a means of enhancing nutritive value of food. Therefore, the present study was undertaken to know the effect of addition of green leaves on the nutritive value of *burfi*.
For value addition nutrient rich foods like chickpea flour and green leafy vegetables can be used along with wheat for enhancing the nutritional quality of wheat based traditional recipes (Pant *et al.*, 2012; Lohekar 2014) [18, 15]. Chickpea is one of the most important crops in the world because of their high nutritional quality. Chickpea flour (*kabuli* and *desi*), both are rich source of complex carbohydrates, proteins, vitamins, minerals and dietary fibre (Wang *et al.* 2010; Gonzales *et al.* 2016) [25, 8]. Chickpea flour has numerous health benefits such as lower glycemic index for people with diabetes, increased satiation and cancer precaution as well as protection against cardiovascular diseases due to their dietary fibre content (Chillo *et al.* 2008; Gonzales *et al.* 2016) [4, 8]. In India, various leafy vegetables such as spinach, amaranth, bengalgram leaves, fenugreek leaves etc. are available in abundance which contain a variety of

vitamins, minerals, phytochemicals, dietary fibre and antioxidants. Among them, spinach leaves are less expensive, easily available and good source of micronutrients (Pant *et al.* 2012; Nkesiga & Okafor 2015) [18].

Material and Method: The present study was conducted at Department of Foods and Nutrition, COHS, CCS Haryana Agricultural University, Hisar.

Material: Grain samples of a wheat variety (WH-1105) and a bengal gram variety (HC-1) were procured from the Department of Genetics and Plant Breeding, CCS Haryana Agricultural University, Hisar. The grain samples were cleaned, bengal gram seeds were dehulled and ground into flour. The ground samples were stored in plastic container till further use.

Spinach leaves (*Spinacia oleracea* L.) were procured in a single lot from local market of Hisar. Healthy mature and disease-free leaves were selected and washed under running tap water followed by distilled water. Excess water was wiped off with muslin cloth. Then the leaves were dried in the shade for 6 to 8 h to remove excess moisture followed by oven drying at 40-45 ^{0}C till complete drying. The dried leaves were ground in an electric grinder to obtain a fine powder. The ground powder was stored in low density polyethylene (LDPE) bags for further use.



Preparation of spinach leaves powder

Preparation of Products

The spinach, bengal gram and wheat flour incorporated *burfi* were prepared by replacing the main cereal used in basic recipe by spinach and chickpea flour. Five combinations were used for preparation of *burfi*. The standard recipe of *burfi* was taken as control. *Burfi* were organoleptically evaluated by a panel of semi trained judges using 9 point hedonic scale. It was observed that *burfi* were found acceptable up to 10 per cent level of incorporation of spinach leaves powder. These spinach and bengal gram incorporated *burfi* were oven dried at 60 °C and ground to fine powder and stored in air tight container for nutritional evaluation.

Nutritional Evaluation: The moisture content of fresh *burfi* was determined. The *burfi* were then dried at 100 °C in hot air oven, powdered and stored for further nutritional studies. The dried samples were then analysed for protein (AOAC, 2000), crude fat (AOAC, 2000), crude fiber (AOAC, 2000), reducing (Somogyi, 1945), non reducing and total sugar content, Yemm & Willis (1954) [27], starch Cerning & Guilbot (1973) [3], minerals (Lindsey and Norwell, 1969) [14], Dietary fibre, Furda (1981) [6] method.

Fig 1: Organoleptic characteristics of *burfi*

Results and Discussion

Sensory evaluation: Mean scores of sensory characteristics (colour, appearance, aroma, texture, taste and overall acceptability) of micronutrient rich *burfi* are presented in the Table 1.

Overall acceptability scores in term of colour, appearance, texture, aroma and taste of control buns, *burfi* was in the range of 'liked very much' to 'liked moderately'. *Burfi* was found acceptable up to 10 per cent level. Other workers also reported that biscuits and cookies were found acceptable up to 10 per cent level of incorporation of green leafy vegetables (Drisya 2015; Ajibola *et al.* 2015) [5, 1]. Galla *et al.* (2017) [7] also reported that biscuits with 10 per cent spinach leaves powder found acceptable by the panellists. It was reported that darkness in the composite flour based *burfi* increased with increase in spinach leaves powder and also bitterness was noticed as after taste in *burfi* with 15 per cent level of spinach leaves powder. Further increase in the incorporation level caused significant reduction in colour, appearance and taste with regard to results of organoleptic acceptability of traditional products like *sev* and *burfi* are also found similar as reported earlier by various workers in traditional products with incorporation of green leafy vegetables powder up to 10 per cent level (Lakshmi & Radhapriya 2004; Singh *et al.* 2007; Kaur & Kochar 2009; Gupta & Prakash 2011; Verma & Jain 2012; Singh & Grover 2014; Singh *et al.* 2018) [11, 13, 10, 19-22].

Table 1: Mean scores of organoleptic characteristics of *burfi*

Types of *Burfi*	Colour	Appearance	Aroma	Texture	Taste	Overall Acceptability
Control	8.20±0.19	8.10±0.08	7.90±0.16	8.00±0.04	8.00±0.09	8.04±0.17
Type-I	7.60±0.16	7.60±0.17	7.70±0.06	7.75±0.17	7.55±0.03	7.64±0.13
Type-II	7.60±0.19	7.60±0.02	7.60±0.10	7.50±0.04	7.40±0.03	7.54±0.12
Type-III	7.40±0.10	7.30±0.05	7.30±0.04	7.30±0.16	7.35±0.07	7.33±0.02

Type –IV	7.20±0.06	7.32±0.03	7.22±0.14	7.02±0.18	7.26±0.17	7.20±0.17
Type-V	5.30±0.07	5.40±0.08	5.20±0.02	5.90±0.04	5.80±0.03	5.72±0.05
CD(P=0.05)	0.49	0.29	0.39	0.43	0.30	0.39

Values are mean ±SE of ten panelists
Control: BGF (100%) Type-I: WF: BGF: SP (48:48:4)
Type-II: WF: BGF: SP (47:47:6) Type-III: WF: BGF: SP (46:46:8)
Type-IV: WF: BGF: SP (45:45:10) Type-V: WF:BGF:SP (44:44:12)
WF: Wheat flour BGF: Bengal gram flour SP: Spinach powder

Overall acceptability scores of control *burfi* was 8.04 (liked very much) followed by Type-I, Type-II Type-III and Type-IV composite flour made *burfi* i.e. 7.64, 7.54, 7.33 and 7.20, respectively which fell in the category of 'liked moderately'. On other hand *burfi* made from Type-V composite flour got lowest scores of overall acceptability i.e. 5.72 which fell in the category of 'neither liked nor disliked'. On the basis of above organoleptic scores of *burfi*, it was observed that the acceptability of *burfi* decreased significantly with incorporation of spinach powder in wheat- bengal gram flour blend.

Proximate Composition

The data in respect of proximate composition of biscuits are presented in Table 2. *Burfi* made from 100 per cent bengal gram flour served as control. Control *burfi* exhibited 13.03 per cent moisture, 30.38 per cent crude fat, 1.93 per cent crude fibre and 2.67 per cent ash. As these values were found to be significantly (P=0.05) increased on increasing the level of spinach powder in wheat- bengal gram flour blends. Moisture, crude fat, crude fibre and ash contents of all four types of composite flour made *burfi* ranged from 13.56 to 15.14, 31.24 to 32.78, 2.56 to 3.03 and 3.37 to 4.43 per cent, respectively. While crude protein content of control *burfi* was 19.23 per cent which found to be decreased significantly in all types of composite flour made *burfi*. It ranged from 14.45 to 16.98 per cent, respectively in Type-I, Type-II, Type-III and Type-IV composite flour made *burfi*. Maximum protein was noted in Type-I while minimum in Type-IV composite flour made *burfi.*

Table 2: Proximate composition of *burfi* supplemented with spinach powder (%, on dry matter basis)

Burfi	**Moisture***	**Crude protein**	**Crude fat**	**Crude fibre**	**Ash**
Control (BGF 100%)	13.03±0.23	19.23±0.46	30.38±0.08	1.93±0.02	2.67±0.04
Type-I	13.56±0.04	14.45±0.33	31.24±0.17	2.56±0.04	3.37±0.02
Type-II	14.44±0.27	15.98±0.34	31.67±0.34	2.67±0.04	3.76±0.04
Type-III	14.89±0.21	16.35±0.27	32.03±0.36	2.78±0.05	4.01±0.01
Type-IV	15.14±0.12	16.98±0.08	32.78±0.68	3.03±0.02	4.43±0.01
CD (P=0.05)	0.72	1.19	1.09	0.12	0.09

*On wet matter basis Values are mean ± SE of three independent determinations
Type-I: WF: BGF: SP (48:48:4) Type-II: WF: BGF: SP (47:47:6)
Type-III: WF: BGF: SP (46:46:8) Type-IV: WF: BGF: SP (45:45:10)
WF: Wheat flour BGF: Bengal gram flour SP: Spinach powder

Sugar and Starch Contents

The results of sugar and starch contents of *burfi* are presented in Table 3. *Burfi* made from 100 per cent bengal gram flour served as control contained 34.62 per cent total sugar, 8.25 per cent reducing sugar and 26.37 per cent non- reducing sugar. All the sugar contents increased gradually in composite flour made *burfi*. Among composite flour made *burfi*, total, reducing and non- reducing sugar content ranged from 35.71 to 37.65, 8.28 to 8.90, and 27.43 to 28.75 per cent, respectively. Maximum in Type-IV composite flour based *burfi while* minimum in Type-I composite flour made *burfi.* Starch content of control *burfi* was 60.17 per cent which significantly decreased on addition of spinach powder in wheat flour and bengal gram flour blends at different levels. The values ranged from 59.32 to 56.09 per cent, respectively in all the four types of *burfi* made from composite flour.

Table 3: Sugar and starch contents of *burfi* supplemented with spinach powder (%, on dry matter basis)

Burfi	**Total sugar**	**Reducing sugar**	**Non- reducing sugar**	**Starch**
Control (BGF 100%)	34.62±0.79	8.25±0.07	26.37±0.53	60.17±1.31
Type-I	35.71±0.48	8.28±0.15	27.43±0.07	59.32±0.43
Type-II	35.99±0.18	8.47±0.01	27.52±0.02	58.30±0.33
Type-III	36.42±0.72	8.89±0.02	27.53±0.32	57.12±0.47
Type-IV	37.65±0.14	8.90±0.12	28.75±0.06	56.09±0.23
CD (P=0.05)	1.75	0.32	1.01	1.20

Values are mean ± SE of three independent determinations
Type-I: WF: BGF: SP (48:48:4) Type-II: WF: BGF: SP (47:47:6)
Type-III: WF: BGF: SP (46:46:8) Type-IV: WF: BGF: SP (45:45:10)
WF: Wheat flour BGF: Bengal gram flour SP: Spinach powder

Total Mineral

The results of total calcium, iron, zinc and phosphorus contents of burfi are presented in Table 4. *Burfi* made from bengal gram flour (control) contained 4.26, 40.12, 1.76 and 301.79 mg/100g iron, calcium, zinc and phosphorus contents, respectively. Total mineral content improved on increasing the supplementation of spinach powder in wheat-bengal gram flour. In case of composite flour made *burfi* iron, calcium, zinc and phosphorus contents ranged from 5.71 to 8.05, 76.89 to 94.08, 2.21 to 3.11, and 307.45 to 321.81, respectively in *burfi* made from Type-I, Type-II, Type-III and Type-IV composite flour. Type-IV composite flour made *burfi*

contained maximum and Type-I composite flour made *burfi* contained minimum content of all minerals. Significant (P=0.05) variations were found among contents of all minerals of control and composite flour based *burfi.*

Table 4: Total mineral content of *burfi* supplemented with spinach powder (mg/100g, on dry matter basis)

Burfi	Iron	Calcium	Zinc	Phosphorus
Control (BGF 100%)	4.26±0.03	40.12±0.16	1.76±0.03	301.79±1.00
Type-I	5.71±0.13	76.89±1.56	2.21±0.04	307.45±0.64
Type-II	6.48±0.14	81.22±1.16	2.65±0.06	311.18±0.63
Type-III	7.13±0.06	89.16±0.75	2.98±0.06	316.79±0.32
Type-IV	8.05±0.11	94.08±0.94	3.11±0.08	321.81±0.61
C.D (P=0.05)	0.31	3.77	0.17	1.98

Values are mean ± SE of three independent determinations
Type-I: WF: BGF: SP (48:48:4) Type-II: WF: BGF: SP (47:47:6)
Type-III: WF: BGF: SP (46:46:8) Type-IV: WF: BGF: SP (45:45:10)
WF: Wheat flour BGF: Bengal gram flour SP: Spinach powder

Dietary Fibre

The results of dietary fibre contents of burfi are presented in Table 5. Total dietary fibre content of control *burfi* made from bengal gram flour was 8.56 g/100g. Which increased significantly (P=0.05) in all types of supplemented *burfi viz*., Type-I, Type-II, Type-III and Type-IV. Total dietary fibre content of composite flour made *burfi* was in the range of 9.23 to 10.87 g/100g, respectively. Highest contents (10.87 g/100g) was observed in Type-IV *burfi* and lower content (9.23 g/100g) in Type-I *burfi.* Similar trend was also observed in case of soluble and insoluble dietary fibre contents of all types of supplemented *burfi*.

Table 5: Dietary fibre content of *burfi* supplemented with spinach powder (g/100g, dry matter basis)

Burfi	Total dietary fibre	Soluble dietary fibre	Insoluble dietary fibre
Control (BGF 100%)	8.56±0.04	1.58±0.01	6.98±0.08
Type-I	9.23±0.11	2.45±0.03	6.78±0.09
Type-II	9.83±0.23	2.99±0.05	6.84±0.12
Type-III	10.14±0.06	3.04±0.02	7.10±0.11
Type-IV	10.87±0.01	3.67±0.02	7.20±0.01
C.D (P=0.05)	0.37	0.09	0.26

Values are mean ± SE of three independent determinations
Type-I: WF: BGF: SP (48:48:4) Type-II: WF: BGF: SP (47:47:6)
Type-III: WF: BGF: SP (46:46:8) Type-IV: WF: BGF: SP (45:45:10)
WF: Wheat flour BGF: Bengal gram flour SP: Spinach powder

Conclusion

It may be concluded that spinach leaves powder could be incorporated in wheat-bengal gram flour blends up to 10 per cent level. Addition of spinach leaves powder increased the nutrient density of products. Value addition of traditional products with spinach leaves powder can be advocated as a feasible food based approach to combat micronutrient deficiency.

References

1. Ajibola CF, Oyerinde VO, Adeniyan OS. Physicochemical and antioxidant properties of whole-wheat biscuits incorporated with *Moringa oleifera* leaves and cocoa powder. Journal of Scientific Research and Reports. 2015;7(3):195-206.
2. AOAC. Official Methods of Analysis. 16th Ed. Association of Official Analytical Chemists. Arlyngton, Virginia, USA, 2000.
3. Cerning J, Guilhot J. Changes in carbohydrate composition during maturation of wheat and barley kernel. Cereal Chemistry Journal. 1973;50:220-225.
4. Chillo S, Laverse J, Falcone PM, Protopapa A, Del Nobile MA. Influence of the addition of buckwheat flour and durum wheat bran on spaghetti quality. Journal of Cereal Science. 2008;47:144-152.
5. Drisya CR, Swetha BG, Velu V, Indrani D, Singh RP. Effect of dried *Murraya koenigii* leaves on nutritional, textural and sensory characteristics of cookies. Journal of Food Science and Technology. 2015;2(1):500-506.
6. Furda I. Simultaneous analysis of soluble and insoluble dietary fiber. In: The Analysis of Dietary Fiber in Food. New York. Marcel Dekker, 1981, 163-172.
7. Galla NR, Pamidighantam PR, Karakala B. Nutritional, textural and sensory quality of biscuits supplemented with spinach (*Spinacia oleracea* L.). International Journal of Gastronomy and Food Science. 2017;7:20-26.
8. Gonzales IC, Gonzales FR, Ouindara H, Belino PH, Botangen ET. Chickpea, its nutritional and economic value. Journal of environmental Science, Toxicology and Technology. 2016;7:19-24.
9. Gupta A, Verma S, Sheikh S, Prasad R, Yadav N. Development of micronutrient rich food products by using indigenous coarse grains and green leafy vegetables. International Journal of Food and Nutritional Science. 2015;4(4):109-111.
10. Gupta S, Prakash J. Nutritional and sensory quality of micronutrient-rich traditional products incorporated with green leafy vegetables. International Food Research Journal. 2011;18:667-675.
11. Kaur TJ, Kochar GK. Development and sensory evaluation of beta carotene rich food preparations using underexploited carrot greens. Journal of Human Ecology. 2009;28(3):207-212.
12. Krishnaswamy K. The problem and consequences of the double burden: A brief overview (Programme and abstracts) In: Nutritional Security for INDIA-Issues and Way Forward, Indian National Science Academy, New Delhi, 2009, 5-6.

13. Lakshmi UK, Radhapriya D. Incorporation of dehydrated plantin and drumstick flowers into recipes and their acceptability. Indian Journal of Nutrition and Dietetics. 2004;42(7):300-307.
14. Lindsey WL, Norwell MA. A new DPTA-TEA soil test for zinc and iron. Agronomy Abstract. 1969;61:84.
15. Lohekar AS. Development of cereal pulse based valve added nutritious instant mixes. Ph.D. Thesis, VNMKV, Parbhani, 2014.
16. Mathur B, Joshi RM, Bray WJ. Impact of supplementing leaf protein concentrate on hemoglobin level of children. Indian Journal on Nutrition and Dietetics. 1989;26:267-271.
17. Nkesiga J, Okafor GI. Effect of incorporation of amaranth leaf flour on the chemical, functional and sensory properties of yellow maize/soybean based extrudates. Journal of Environmental Science, Toxicology and Food Technology. 2015;9(7):31-40.
18. Pant R, Chawla R, Sadana B, Kushwaha S. Development and nutritional evaluation of cereal pulse based snacks using drumstick leaves. Agricultural Research Journal. 2012;49(2):99-103.
19. Singh A, Grover K. Post- harvest processing and standardization of value added cereal based traditional recipes for iron security. Asian Journal of Dairy and Food Research. 2014;33(4):267-275.
20. Singh A, Grover K, Sharma N. Nutritional evaluation of value added products using dehydrated greens for security of haematinic nutrient. Food Science and Research Journal. 2014;5(2):168-173.
21. Singh L, Yadav N, Kumar AR, Gupta AK, Chacko J, Pravin K, *et al*. Preparation of value added products from dehydrated *bathua* leaves (*Chenopodium album* L.). Natural Product Radiance. 2007;6(1):6-10.
22. Singh S, Yadav A, Sony A. Nutritional evaluation and sensory characteristics of products developed from waste leaves of cauliflower. International Journal of Current Microbiology and Applied Sciences. 2018;7:4782-4790.
23. Somogyi M. A new reagent for the determination of sugar. Journal of Biological Chemistry. 1945;1:160-161.
24. Verma S, Jain S. Fortification of mathri with fresh and dehydrated vegetables and assessment of nutritional quality. Rajasthan Journal of Extension Education. 2012;20:155-158.
25. Wang N, Hatcher DW, Tyler RT, Toews R, Gawalko EJ. Effect of cooking on the composition of beans (*Phaseolus vulgaris* L.) and chickpeas (*Cicer arietinum* L.). Food Research International. 2010;43:589-594.
26. WHO. 2013. http://www.worldhunger.org/articles/Learn/world%20hunger%20facts%202002.htm# Micronutrients
27. Yemm EW, Wills AJ. The estimation of carbohydrates in plant extracts by anthrone. Journal of Biochemistry. 1954;57:508.