NUTRITIONAL AND SENSORY QUALITY OF SELECTED MICRONUTRIENT-RICH RECIPES(PANCAKE, DHOKLA AND IDLI) SUPPLEMENTED WITH DRIED CAULIFLOWER GREEN LEAF POWDER

Ambika Chauhan and Intelli
Research scholar, Lovely professional university, Jalandhar, India
*E-mail: ambikachauhan671@yahoo.com

Abstract
Background: Brassica oleracea L.var. botrytis is one of the most common and popular vegetable grown in India but still, neglected by people in their consumption pattern. Objective: In view of this, an attempt was made to utilize (cauliflower greens) to develop low cost fiber rich products for people suffering from micronutrient deficiency and to assess the sensory quality of developed products. Material and Methods: The fresh collected cauliflower green leaves were washed and sun dried for 5-7 days to dry them. Three recipes (pancake, dhokla and idli) were supplemented with 2g and 5g DCGLP (with and without) per serving and sensory evaluation was done with the help of 9 point hedonic rating scale in reference to appearance, taste, texture and flavour by 9 panel of semi trained judges. Results: Biochemical analysis of DCGLP revealed moisture 3.4%, protein 21.6%, crude fibre 10.23gm and iron 62mg (values as per 100gm). The prepared recipes were found to be acceptable at 2 g incorporation of DCGLP. Conclusions: It was concluded that increase in the incorporation of DCGLP in recipes was decreasing acceptability. DCGLP, due to its high iron content can be used as supplement to make low cost iron rich recipes.

Keywords: *Brassica oleracea, (*DCGLP) Dried cauliflower green leaf powder

Submitted: 02.09.2014 Reviewed: 11.11.2014 Accepted: 26.11.2014

1.INTRODUCTION

In this era of global industrialization and advancement of technologies, the life style of the people has changed a lot. In this changing life style, the demand for ready to eat foods like extruded foods has increased. Among ready to eat foods, junk food form 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 (Grewal, 2007). Green leafy vegetables are good source of fibre 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 to 35 months and women between 15 to 49 years of age are anemic (Krishnaswamy, 2009). Nutritionists are now trying to encourage people for supplementation of green leafy vegetables in nutritional recipes to combat with these micronutrient deficiencies. Green leafy vegetables are good source of micronutrients. India ranks second in the world in the production of vegetables and third in production of fruits (Boer and Pandey 1997). There are many varieties of green leafy vegetables, which are richest source of iron but they are discarded and not used properly for human consumption. Cauliflower greens are also come in this category of waste products which are often neglected. In its case, stalks are always used for human consumption and leaves are discarded and become a part of animal feed (Gopalan et al., 2000). Cauliflower green leaves (‘*Brassica oleracea L.var. botrytis’)* are rich source of micro nutrients and belongs to the family of Brassicaceae /Cruciferae. It comes from the Latin words *caulis*, meaning ―stalk and floris

—flower. It is cultivated mainly in Northeast from April to December (Kang *et al*. 2005). Cauliflower leaves are available for short duration but after dried, can be stored for long time (Singh *et al.* 2005). The dried cauliflower green leaves are highly nutritious and a good source of β-carotene-43.11mg, Iron-60.38mg, Copper-1.55mg, Manganese-5.86mg, Zinc-5.10mg (values as per 100gm); (Wani *et al.* 2011).

2. MATERIAL AND METHODS

2.1. Raw material

Cauliflower (*Brassica oleracea*) fresh leaves were collected from local market of Chandigarh city, India. The leaves were separated and washed under running tap water . After washing the leaves were tied together in small bunches and was hung in the direct contact of air to remove extra water. Then, sun drying method was used for 5-7 days to dry cauliflower green leaves. After that, dry matter was crushed by hand or grinded in the mixer to get a fine powder and packed in air tight container for further use.

2.2. Recipes formulation

Three recipes namely *pancake*, *dhokla* and *idli* were selected and supplemented with dried cauliflower green leaves powder.

a) Flow chart for preparation of pancake.

Besan(20gm)+carrot(20gm)+tomatoes(10gm) +onion (10gm)+ginger(5gm)+oil(5gm)

↓

Mixed all and made thick batter (with water)

↓

Added green chillis, salt and turmeric powder

↓

Incorporated with 2gm and 5 gm DCGLP

↓

Cooked it

a) Flow chart for preparation of dhokla.

Suji(10gm)+besan(15gm)+curd (15gm) + green chillis (1)+ curry leaves (a few) + mustar seeds (a few)+ eno salt(½ tsp) + turmeric powder (1/2tsp)+ oil (5gm) + salt (acording to taste) +sugar ½ tsp)

↓

Mixed all and made smooth batter (with water)

↓

Incorporated with 2gm and 5 gm DCGLP

↓

Steammed it (15 minutes)

b) Flow chart for preparation of vegetable idli.

Suji (25 gm) + curd (5gm) + carrot (10gm) +peas (10gm) +eno(¼ tsp) + salt(¼ tsp)

↓

Roasted suji and mixed all ingredients

↓

Incorporated with 2gm and 5 gm DCGLP

↓

Steammed it (15 minutes)

2.3. Composition analysis

The dried cauliflower green leaves sample were analyzed for proximate composition of moisture, protein (AOAC, 2000) and crude fibre (ASTA METHOD, No.7.0), iron (Vogel, 1961) respectively.

2.4. Sensory analysis

The recipes (pancake, dhokla and idli) were evaluated to find out the overall acceptability. The sensory evaluation was carried out by semi trained nine judges by using 9 point hedonic scale assigning scores 9 (like extremely) to 1 (dislike extremely) (Amerine *et al.* 1965).
The selected recipes were standardized before and after the supplementation of 2gm and 5 gm

dried cauliflower green leaves powder and acceptability was also evaluated with respect to the following: appearance, texture, taste and flavour. The judges were mainly asked to indicate the presence or absence of dried cauliflower green leaves aroma in these selected formulated recipes. After that data was compiled and analyzed statistically.

2.5. Statistical analysis

ANOVA and Duncan's multiple range tests (to find clearer difference in between the samples) were used to determine the statistical significant differences among selected developed recipes. MS - Excel and Minitab 11.0 were used for the above analysis.

3. RESULTS AND DISCUTION

3.1. Nutritional composition of dried cauliflower green leaves powder

Dried cauliflower green leaves powder were collected and their moisture, total protein, crude fiber and iron were determined.

Table 1. Nutritive value of dried cauliflower green leaves powder (as per 100gm)

	Moisture (%)	Total protein (%)	Crude fibre (gm)	Iron (mg)
DCGLP	3.4	21.60	10.23	62

Moisture: The moisture content of the dried sample was 3.4%. Bhuvneswari and Ramya,2014 reported moisture content of 2.52% in dry cauliflower leaf powder.

Protein: The total protein content of cauliflower leaf powder calculated from sample was 21.60gm .Similar findings were reported by Jemina and Bhavani (2004) in the dehydrated green leafy vegetables of cauliflower. The protein content of the leaf powder was equivalent to the protein content of many pulses such as moth beans, soyabeans, rajmah etc. which contain (22 - 24%) protein.

Fibre: The fibre content of cauliflower leaf powder calculated from sample was 10.23 gm Similar results were reported by (Gupta and Wagle ,1970).

Iron: The iron content of DCGLP sample was 62 mg. Bhuvneswari and Ramya,2014 reported 60.78 mg iron content in dried cauliflower leaves.

3.2. Organoleptic evaluation of formulated powder

The supplemented recipes were subjected to sensory evaluation using 9 point hedonic rating scale such as appearance, odour, taste and flavour to find the overall acceptability. The recipes were evaluated by a panel of 9 expert judges.

1) Sensory evaluation of standard recipes on 0-9 point scale: The data regarding sensory acceptability of DCGLP based products given below.

As evident from data, there was no significant ($p \leq 0.05$) difference in the acceptability of appearance, odour, taste and flavor of the treatments. All the supplemented samples were rated as acceptable by panel of judges. The sensory evaluation of *pancake* supplemented with DCGLP is presented in the above Table 2. And, data revealed all supplementation levels were significantly ($p \leq 0.05$) acceptable. It is clear from the data that appearance, odour, taste and flavour acceptance of control sample was higher (8.00) i.e. extremely liked than supplemented samples. Odour acceptability of *pancake* supplemented with DCGLP decreased with increase in levels of dried cauliflower leaves powder i.e. 8.00, 4.80, 2.80 for these samples respectively. In case of taste and flavour, samples supplemented with 2 gm and 5gm DCGLP and they were rated as neither liked nor disliked and very much disliked with these values i.e. 4.80 and 2.80, respectively. Finally, data revealed that 2gm supplementation of DCGLP was considered.

Table 2. Sensory evaluation of PanCake

Recipes	Appearance	Odour	Taste	Flavour
Pan cake	8.00	8.00	8.00	8.00
Pan cake +2gm DCGLP	4.80	4.80	4.80	4.80
Pan cake +5gm DCGLP	2.80	2.80	2.80	2.80

Table 3. Sensory evaluation of Dhokla

Recipes	Appearance	Odour	Taste	Flavour
Dhokla	8.00	8.00	8.00	8.00
Dhokla+2gm DCGLP	4.80	4.80	4.80	4.40
Dhokla+5gm DCGLP	2.40	2.60	2.40	2.40

Table 4. Sensory evaluation of Idli

Recipes	Appearance	Odour	Taste	Flavour
Idli	8.00	8.00	8.00	8.00
Idli+2gm DCGLP	4.60	4.80	4.60	4.60
Idli+5gm DCGLP	2.00	2.00	2.00	2.00

2) In case of *dhokla;* Table 3. the sensory acceptability followed the same trend as of *pancake* i.e. the control sample was adjudged as liked extremely (8.00) on 9-point hedonic scale for appearance, odour, taste and flavour than supplemented samples. Odour acceptability of *dhokla* supplemented with DCGLP decreased with increase in levels of DCGLP i.e. 8.00, 4.80, 2.60 for these samples respectively. In case of taste and flavour, samples supplemented with 2 gm and 5gm DCGLP and they were rated as neither liked nor disliked and disliked moderately with these values i.e. (4.80, 2.40) and (4.40,2.40) respectively. The data also revealed that 2gm incorporation of DCGLP was considered.

3) The data regarding acceptability of *idli* as in Table 4. revealed that the control sample was more acceptable in case of appearance, odour, taste and flavour and was rated as liked extremely (8.00) as compared to supplemented samples. A perusal of the data revealed that odour acceptability of *idli* supplemented with DCGLP decreased with increase in levels of DCGLP i.e. 8.00, 4.80, 2.00 for these samples respectively. In case of taste and flavour, samples supplemented with 2 gm and 5gm DCGLP and they were rated as neither liked nor disliked and disliked very much with these values (4.60, 2.00) respectively. The data also revealed that 2gm supplementation of DCGLP was considered. It is clear from Table that control sample was rated higher (8, 8 and 8 for appearance, odour, taste and flavor) than other samples. Sample with 2gm was rated high than 5 gm sample. Similar results were obtained by Kaur and Awasthi [Awasthi et al., 2013] who prepared chapatti, buns, cookies and pancake by incorporating 5 per cent, 10 per cent and 15 per cent fruit pomace and cauliflower greens. The study concluded that the increase in levels of both food remnants (pomace and cauliflower green) was decreasing acceptability.

4. CONCLUSIONS

Cauliflower green leaves are efficient source of dietary fiber and minerals. The present study was carried out with the aim to find out the acceptability of these recipes with the supplementation of DCGLP. Biochemical estimation found that 100 gms of DCGLP contains 34% of moisture, 10.23 gms of crude

fibre,62 mg of iron and 21.60 gms of total protein. Three commonly used recipes (pancake, dhokla and idli) were supplemented with 2gm DCGLP and 5gm DCGLP per serving and their acceptability was ascertained by panel of semi trained 9 judges with the help of 9 point hedonic rating scale in reference to appearance, odour, taste and flavour. The general acceptability was good in 2gm DCGLP as compared to 5 gm DCGLP. The study concluded that increase in the incorporation of DCGLP in recipes was decreasing acceptability. This study will help people to generate awareness for the supplementation of iron rich DCGLP in their daily diet to control anemia and increase nutritional status in a better way.

5. REFRENCES

[1] Grewal, R. B. Nutrtional evaluation and utilization of carrot pomace powder for preparation of high Fibre biscuits. Journal of Food Science and Technology, 2007;44(1): 56-58.

[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, Indian National Science Academy, New Delhi,2009; pp.5-6.

[3] Boer, K., Pandey, A. "India's Sleeping Giant: Food", The McKinsey Quarterly. New York, 1997; 83(1).

[4] Gopalan, C., Ramasastri B.V., Balasubramanim, S.C. Nutritive value of Indian foods. Nationa Institute of Nutrition, Hyderabad, 2000; 572.

[5] Kang, J.H., Ascherio, A., Grodstein, F.Fruit and vegetable consumption and cognitive decline in aging women. Ann Neurol 2005; 57: 713-720.

[6] Singh,G., Asha, K., Sehgal, S. Development and nutritional evaluation of products prepared from dried powder of cauliflower leaves. Journal of Food Science Technology, 2005; 42(2),137-139.

[7] Wani. A. T., Sood. M., Kaul, R.K. Nutritional and sensory properties of roasted wheat noodles supplemented with cauliflower leaf powder. Annals. Food Science and Technology, 2011; 12(2) 97-101

[8] AOAC, Official method of analysis international. Spectrophotometric method, 2000;7 (2), 161-4.

[9] ASTA method no. 7.0. India analysis of crude fibre. Report of the 14th meeting of committee on quality

[10] Vogel, A.I. Quantitative inorganic analysis, 3rd ed. 309, The English Language Book Of Society And Longman, London, 1961.

[11] Amerine, M.A., Pangborn, R.H., Rossler, E.B. Principles of sensory evaluation of food. Academic Press, New York, 1965; 23-45.

[12] Buvaneswari, K.M., and Ramya,G. A study on overall acceptability of *Brassica oleracea leaves* (cauliflower leaves) incorporated food products and its impact on treating anemic college going girls. International Journal of Current Research and Devlopment,2014; 2(1**),**38-47.

[13] Jemina B, Mohankumar KB.The efficacy of cauliflower greens (*Brassica oleracea var botrytis*) preparation in improving blood haemoglobin in selected adolescent girls. The Indian Journal Nutrition Dietetics, 2014; 41: 6:63.

[14] Gupta. K., and Wagle. D. S. Nutritional and antinutritional factors of green leafy vegetables. Journal Agriculture Food Chemistry, 1988; 36(3), 472-474.

[15] Kaur. S., Kaur. G, Kaur. N., Awasthi. M. Product devlopment and sensory evaluation of food remnant based low cost fibre rich foods. Annals, Food Science and Technology, 2013;59 (14).