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International Journal of Current Research
Vol. 7, Issue, 08, pp.19570-19573, August, 2015

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

FORMULATION AND NUTRIENT ANALYSIS OF CAULI FLOWER GREENS POWDER INCORPORATED DOSAI USING TRADITIONAL GRAINS

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ARTICLE INFO

Article History:
Received 20th May, 2015
Received in revised form
27th June, 2015
Accepted 11th July, 2015
Published online 31st August, 2015

Key words:

anaemia,
Adolescence,
Millets,
Supplementation.

ABSTRACT

Nutrition is the fundamental pillar of human life span. Proper nutritional care during adolescence helps to promote and maintain their overall development. In India, Iron deficiency anaemia is a significant health problem. Traditional cereals like wheat, ragi, and bajra are contain good sources of energy, protein, fibre, B-complex vitamins, calcium, iron and appreciable amount of tryptophan and lysine. Cauliflower leaves are very rich source of iron and significant source of calcium, vitamin C. It is cheapest, locally available and it has high beneficial for the anaemic adolescence and pregnant women. But lack of awareness, this wonderful leaves was not properly used by the community. So this cauliflower leaves were used for this study with the incorporation of wheat and traditional millets like bajra and ragi. The Organoleptic evaluation was conducted by the standard rating scales. The nutrient analysis were analysed by the standard procedures. According to the Organoleptic evaluation the T_1 got maximum score than others. In nutrient analysis the experimental samples shows the high value than control. The Vitamin C content was lost during drying and cooking. But cauliflower leaves contains significant amount of Vitamin C. Furthermore the supplementation of this wonderful leaves helps to prevent the anaemia in future generation. As a nutritionist we have to create the awareness about the locally available nutritious foods to the public sector.

Citation: Krishna Prabha, V. and Prajith, T. R. "Formulation and nutrient analysis of Cauliflower greens powder incorporated Dosai using traditional grains", *International Journal of Current Research*, 7, (8), 19570-19573.

INTRODUCTION

Anaemia is a condition in which a deficiency in the size or number of erythrocytes, or the amount of haemoglobin content, limits the exchange of oxygen and carbon dioxide between the blood and tissue cells (Sathya *et al*., 2002). In India, iron deficiency anaemia is a significant health problem. National and regional surveys indicate that the prevalence of anaemia could be 74 per cent in children below three years of age, 81 per cent in expectant mothers and 51.5 per cent among adolescent girls. The main reasons for iron deficiency anaemia are inadequate intake of iron and low availability (Nalwade Vijaya *et al*., 2008). The primary causes of iron deficiency anaemia are inadequate intake of iron rich foods and impaired absorption or utilization of nutrients in these foods due to partly infection or parasitic infestation, which also increases metabolic needs. Bioavailability of iron from the dietary source depends on the iron content of the diet, actual composition of the diet and the absorption rate (Sathya *et al*., 2002). The consequences of iron deficiency, especially iron deficiency anemia, are impaired motor development and coordination, impaired language development and scholastic achievement, psychological and behavioral effects (inattention, fatigue, insecurity, etc) decreased physical activity, decreased physical work and earning capacity, decreased resistance of fatigue, increased maternal morbidity and mortality, increased risk of low birth weight (Varsha Zanvar *et al*., 2008). Different strategies for eliminating and controlling iron deficiency anaemia in the community include dietary diversification, supplementation with medicinal iron and nutritional education. Iron supplementation remains an important strategy for prevention and treatment of iron deficiency anaemia, producing substantial improvement in the functional performance of the major vulnerable groups (Varsha Zanvar *et al*., 2007). Wheat is the grain most extensively cultivated and consumed. Wheat contains more protein than any other food grains. Wheat grain is a staple food used to make flour for leavened, flat and steamed breads, cookies, cakes, pasta and noodles (Joshi *et al*., 2007). Green leafy vegetables are rich sources of calcium, iron, vitamin C and folic acid. Mostly the Indian population is vegetarian; therefore, the consumption of adequate amount of leafy vegetables in daily life of the peoples can play an important role in reducing the prevalence of anaemia.

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Many types of greens are consumed all over the country (Nalwade Vijaya *et al*., 2008). Cauliflower greens are good source of iron, which contain about 40 mg of iron from 100g leaves (Jemima Berylkumar *et al*., 2004).

2. Methodology

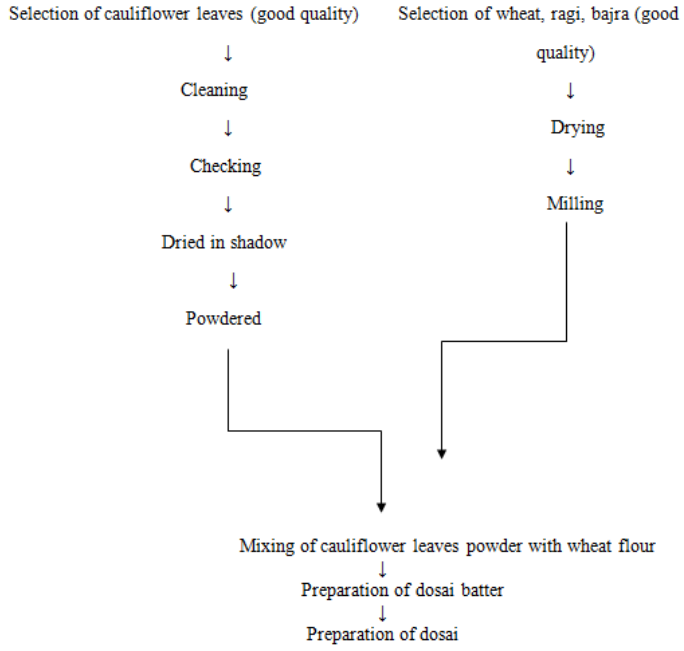
2.1 Materials used for the study

Fresh cauliflower leaves, wheat, ragi, bajra were procured from the local market of Coimbatore and it was used for this study.

2.2 Preparation of cereal flour

Wheat, ragi, bajra were cleaned, washed and dried. The dried cereals were ground into flour by local mill and stored in the cleaned jar.

2.3. Development of cauliflower leaves powder and incorporated with traditional grains



2.4 Preparation of dosai

Dosai was prepared from the batter from wheat, ragi, bajra flour. The prepared items were taken further analysis.

Formula developed for the preparation of dosai

T1 - 5 % Cauliflower greens powder incorporated wheat, bajra, ragi.
T2 - 10 % Cauliflower greens powder incorporated wheat, bajra, ragi.
C - Control (only with the wheat, bajra, ragi)

2.5 Organoleptic Evaluation of the Cauliflower leaves incorporated Value Added Products

Organoleptic evaluation attributes like appearance, colour, flavour, texture, taste and overall acceptability were evaluated using 9 point hedonic scale. Score card method was used for evaluating the sensory characteristics of the Cauliflower leaves incorporated Value added products. Five trained staff members and 25 semitrained students were evaluated sensory characteristics of foods.

2.6 Nutrient Analysis of the Cauliflower leaves incorporated Value Added Products

The nutrients like moisture, energy, carbohydrate, protein, fibre, fat, iron, calcium, phosphorus were analyzed using standard methods.

2.7 Statistical Analysis of Cauliflower leaves incorporated Value Added Products

The results of the sensory evaluation and nutrient analysis are processed by standard statistical procedures. The mean and standard deviation and t test were used for the statistical analysis.

3 RESULTS AND DISCUSSION

3.1 Sensory evaluation

Cauliflower greens are incorporated in two variations like 5% and 10%, first proportion got good score second one also got acceptable level of scores. So both these incorporation ratio were selected for nutrient analysis. The results are summarized below.

Table 1. Mean score for the sensory evaluation of cauliflower greens powder incorporated Bajra dosai

Organoleptic Properties	T1	T2	't' value	C	't' value
Colour	8 ± 1.36	6.3 ± 0.28	4.12*	7.6	0.882^{ns}
Flavour	8 ± 1.20	6.3 ± 0.42	3.79*	7.8	0.635^{ns}
Texture	7.9 ± 0.85	6.1 ± 0.40	5.20*	7.5	3.45*
Taste	7.7 ± 0.58	6.1 ± 0.48	4.12*	7.5	0.73^{ns}
Overall acceptability	8 ± 0.93	6.3 ± 0.57	3.40*	7.7	0.52^{ns}

Table 2. Mean score for the sensory evaluation of cauliflower greens powder incorporated Ragi dosai

Organoleptic Properties	T1	T2	't' value	C	't' value
Colour	7.2 ± 1.31	5.5 ± 2.47	3.23*	8.5 ± 1.02	1.64^{ns}
Flavour	6.9 ± 0.98	4.9 ± 0.49	5.88*	7.5 ± 0.83	1.53^{ns}
Texture	7.3 ± 0.65	4.8 ± 0.55	3.75*	7.6 ± 0.64	0.83^{ns}
Taste	7.5 ± 0.54	4.9 ± 0.38	4.84*	7.3 ± 0.72	1.05^{ns}
Overall acceptability	7.5 ± 0.59	5.2 ± 0.42	6.04*	7.6 ± 0.85	0.37^{ns}

Table 3. Mean score for the sensory evaluation of cauliflower greens powder incorporated wheat Dosai

Organoleptic Properties	T1	T2	't' value	C	't' value
Colour	7.9 ± 1.21	5.3 ± 0.63	3.87*	7.8	0.34^{ns}
Flavour	7.3 ± 0.67	4.8 ± 0.47	4.13*	7.0	3.58*
Texture	8.1 ± 1.36	4.3 ± 0.32	11.04*	7.8	1.03^{ns}
Taste	7.7 ± 1.02	5.2 ± 0.68	12.5*	7.6	0.94^{ns}
Overall acceptability	8.1 ± 1.45	5.4 ± 0.56	3.54*	7.5	1.42^{ns}

According to the organoleptic evaluation, the mean score for colour, flavour, texture, taste and overall acceptability for 5% cauliflower greens incorporated bajra dosai got high score while comparing with control and second variation. In case cauliflower greens incorporated ragi dosai, the overall acceptability of control is higher than test, but in case of test sample first variation (T_1) got high acceptability than T_2. In control colour, flavour and texture have higher value. For taste T_1 got high score than control and T_2. In cauliflower greens incorporated wheat dosai, the T_1 was found maximum acceptability scores in colour, flavour, texture and overall acceptability while comparing with control and second variation.

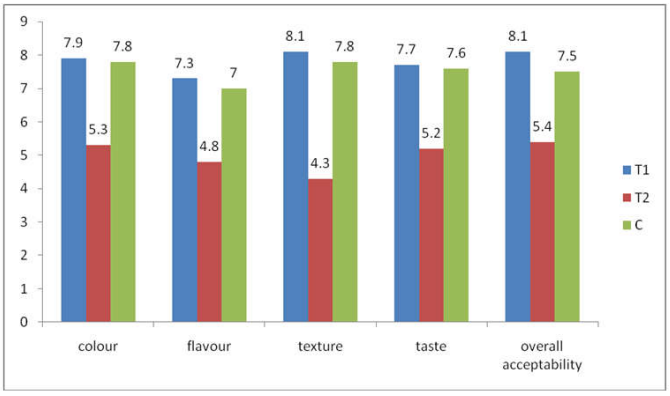


Figure 1. Mean score for the sensory evaluation of cauliflower greens powder incorporated wheat Dosai

3.2 Nutrient analysis

According to the nutrient analysis, iron content of second variation of cauliflower greens incorporated wheat dosai was higher than control and variation one also in case of cauliflower greens incorporated ragi and bajra dosai, iron content was higher in second variation and in ragi dosai T_2 has 62.5mg of iron and in bajra dosai T_2 has 50 mg of iron. In case of calcium and phosphorus also, second variation got high content, because the second variation 10g of cauliflower greens was added for incorporation. So that will increase the mineral content of the test samples.

The moisture content of the second variation of wheat, ragi and bajra dosai were high. Cauliflower greens increases the moisture content. The protein content of second variation is higher than first variation and control, in case of all types of dosai. In case of fat also the cauliflower greens incorporated dosai were increased the fat content slightly. For example second variation has higher value than T_1 and control. The addition of cauliflower greens will increases the fibre content. In control, fibre content is less, after addition of cauliflower greens the fibre content was increased in all the two variation in three cereals.

In case of carbohydrate also, after the addition of cauliflower greens the amount was increased, here also second variation has high value than others. There is no significant amount of ascorbic acid in bajra, ragi and wheat dosai.

Table 4. Nutrient composition of the cauliflower greens powder incorporated Wheat dosai

Samples	C	T1	't' value	T2	't' value
Moisture(g)	11 ± 0.27	11 ± 0.54	0	12	2.56*
Protein (g)	6.53 ± 1.31	6.88 ± 1.42	0.956^{ns}	6.96 ± 1.40	1.52^{ns}
Fat (g)	1.67 ± 0.49	1.84 ± 0.75	1.49^{ns}	1.92 ± 1.74	1.66^{ns}
Fibre (g)	0.2 ± 0.15	0.5 ± 0.21	6.85*	1 ± 0.41	4.75*
Carbohydrate	82.39 ± 1.54	84.48 ± 2.80	1.89^{ns}	85.30 ± 2.33	2.67*
Calcium (mg)	50 ± 1.52	50 ± 0.98	0	100 ± 2.57	25.037*
Phosphors (mg)	8 ± 0.69	12 ± 0.90	5.05*	20 ± 1.58	6.78*
Iron (mg)	12.5 ± 1.26	12.5 ± 1.38	0	25 ± 1.95	7.90*
Ascorbic acid	1.57 ± 0.45	1.57 ± 0.56	0	1.57 ± 0.33	0

Table 5. Nutrient composition of the cauliflower greens powder incorporated Ragi dosai

Samples	C	T1	't' value	T2	't' value
Moisture (g)	7 ± 1.20	15 ± 2.16	4.52*	31 ± 1.55	9.41*
Protein (g)	6.12 ± 0.02	6.60 ± 0.21	5.69*	6.96 ± 1.05	0.917^{ns}
Fat (g)	1.16 ± 0.18	1.32 ± 0.23	1.70^{ns}	1.34 ± 0.48	1.28^{ns}
Fibre (g)	0.2 ± 0.02	0.4 ± 0.03	7.84*	1.1 ± 0.13	12.48*
Carbohydrate	80.37 ± 1.34	81.66 ± 1.53	1.26^{ns}	82.00 ± 0.56	1.47^{ns}
Calcium (Mg)	100 ± 3.10	150 ± 5.36	13.26*	200 ± 6.40	14.99*
Phosphors (Mg)	20 ± 1.23	25 ± 1.67	2.56*	36.5 ± 2.48	7.52*
Iron (Mg)	25 ± 1.52	50 ± 2.15	9.49*	62.5 ± 3.25	13.58*
Ascorbic acid	1.57 ± 0.23	1.57 ± 0.35	0	1.57 ± 0.33	0

Table 6. Nutrient composition of the cauliflower greens powder incorporated bajra dosai

Samples	C	T1	't' value	T2	't' value
Moisture (g)	6 ± 0.69	7 ± 0.93	2.62*	8 ± 1.40	4.27*
Protein (g)	7.02 ± 0.36	7.66 ± 1.28	0.90^{ns}	7.67 ± 1.87	0.97^{ns}
Fat (g)	4.65 ± 0.98	5.0 ± 1.57	0.75^{ns}	5.2 ± 1.92	1.02^{ns}
Fibre (g)	0.15 ± 0.05	0.35 ± 0.07	2.52^{*}	0.8 ± 0.94	3.27*
Carbohydrate	83.82 ± 1.87	86.37 ± 2.46	3.79*	86.44 ± 2.72	4.50*
Calcium (mg)	100 ± 2.35	150 ± 3.87	13.35*	155 ± 4.16	14.06^{*}
Phosphors (mg)	12 ± 1.32	20 ± 1.55	5.06*	25 ± 1.78	5.73*
Iron (mg)	12.5 ± 1.04	25 ± 1.41	5.81*	50 ± 2.62	16.77*
Ascorbic acid	1.57 ± 0.23	1.57 ± 0.35	0	1.57 ± 0.33	0

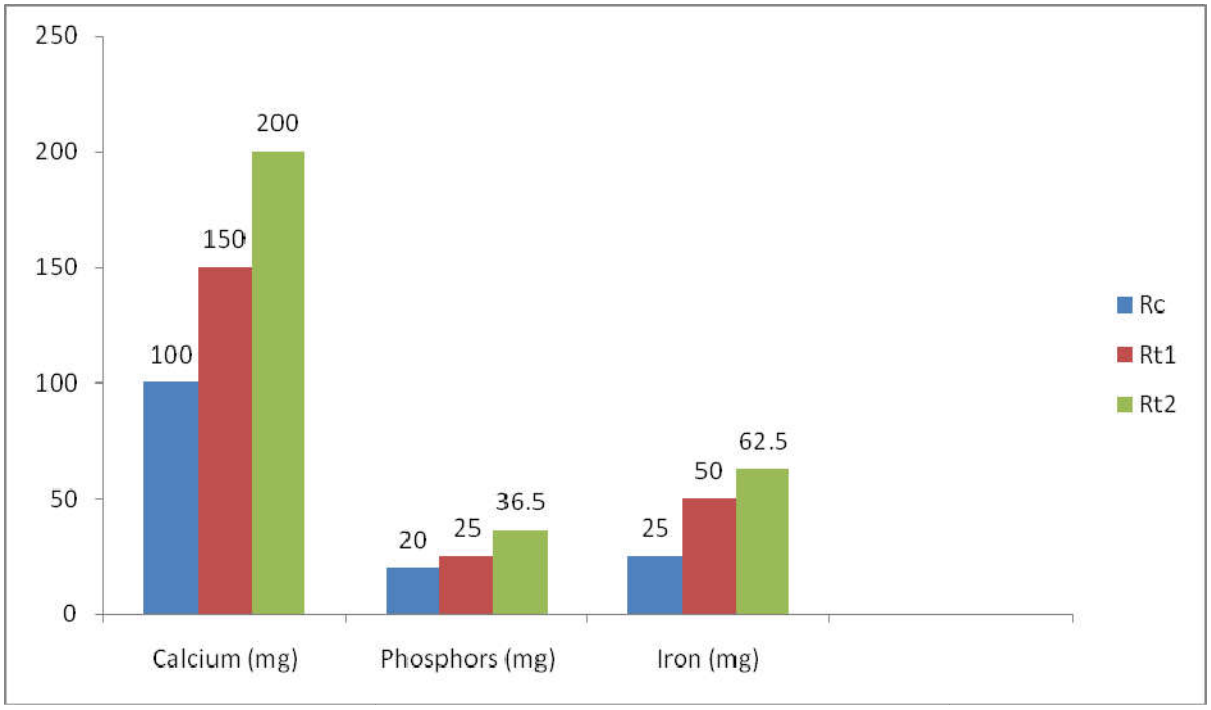


Figure 2. Mineral contents of cauliflower greens incorporated Ragi dosai

In raw form cauliflower greens are contains some good amount of ascorbic acid, but during cooking and drying the Vitamin C content was lossed.

Conclusion

The cauliflower leaves are locally available and very cheap but it is rich in iron and also good sources of vitamin C and Calcium. But because of lack of awareness, this leaves are not utilized properly by the community. So we planned to prepare some recipes to enrich the iron content of our diet. The cauliflower leaves incorporated in the traditional recipes like ragi, bajra and wheat to the preparation of dosai. In all varieties the T1 and control got maximum acceptability and nutrient analysis also done with the standard procedures. The main aim of the study was to create awareness about the outstanding benefits of the cauliflower leaves for the anaemic patients.

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