



Nutritional evaluation of iron rich *lehyams* prepared by using underutilized green leafy vegetables

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Abstract

Lehyam is a semisolid jam like product prepared by using jaggery or sugar with added flavouring such as spices, cooked with the prescribed liquid till the correct consistency is obtained. In the present investigation *lehyams* were prepared by using underutilized green leafy vegetables namely Cauliflower leaves and Colocasia leaves. The prepared products were got organoleptically evaluated and found acceptable. Iron content was found as 43.87 and 38.49 mg and calcium content as 13.40 and 194.2 mg per100g, whereas ascorbic acid was observed as 164.99 and 94.16mg and β -carotene content as 411.78 and 1267.82 μ g per100g in Cauliflower leaves and Colocasia leaves *lehyams*, respectively. Thus the developed iron rich products sufficient in essential nutrients would prove to be useful to combat iron deficiency especially in the growing children.

Key words: *Lehyam*, Colocasia leaves, Cauliflower leaves, nutrients.

Green leafy vegetables occupy an important place among the food crops as these provide adequate amounts of many vitamins and minerals for humans. They are rich source of carotene, ascorbic acid, riboflavin, folic acid and minerals like calcium, iron and phosphorous. In nature, there are many underutilized greens of promising nutritive value, which can nourish the ever increasing human population (Sheela *et al.* 2004).

India, being bestowed with a variety of natural surroundings and varying climates and seasons has a number of edible green leafy vegetables some of which are locally grown and underutilized (Saha *et al.* 2015). In spite of being rich in nutrients, the lack of knowledge regarding the nutritive value of these green leafy vegetables among the public in general is one of the reasons for their lower consumption (Ashok *et al.* 2013). Vegetables are considered essential to be included in well-balanced diets since they supply vitamins, minerals, dietary fiber, and phytochemicals. Each vegetable group contains a unique combination and amount of these phytonutraceuticals, which distinguishes them from other groups (Silva 2014). India possesses a good genetic wealth of domesticated crops and out of 20,000 angiosperm plants, 600 plant species

constitute the diversity in vegetable crops and fruits. However, presently one fourth of the major vegetable crops are utilized and the rest are considered as minor, underutilized or neglected, rare, lesser known, wild edible vegetables and fruits and so on. Most of the vegetables are short duration and quick growing crops. Vegetables make up a major portion of the diets of human beings in many parts of the world and play a significant role in their nutrition, especially as sources of vitamins (C, A, B₁, B₆, B₉, E), minerals, dietary fiber and phytochemicals (Wargovich 2000, Dias and Ryder 2011). Vegetables are convenient and economic to raise even on a small piece of land as compared to other crops. Vegetables and fruits in addition to good source of vitamins, minerals and fiber also have medicinal value which aids in digestion thus help in improving the digestion system. They possess high biological value protein with lesser amounts of carbohydrates and fats. Vegetables and fruits being rich source of phyto-chemicals with significant medicinal attributes are known as protective foods. Vegetables if consumed in sufficient amounts can play an important role for the well being of human health and national economy too. Basically *lehyams*

is a semisolid jam like product prepared by using jaggery or sugar and cooked till the correct constituency is obtained. Keeping in view the above facts, iron rich *lehyams* were prepared using cauliflower leaves and colocasia leaves. So, the present study was undertaken with the objectives to standardize and prepare the *lehyams* from underutilized green leafy vegetables, and to analyse the prepared *lehyams* for nutrient content.

Material and Methods

1. Selection of sample: The underutilized green leafy vegetables namely cauliflower leaves and colocasia leaves were selected keeping in view the important nutrient contents such as iron, calcium, ascorbic acid and β - Carotene in addition to easy availability.

2. Procurement of ingredients: The ingredients such as selected green leafy vegetables, flavouring agents, gooseberry (*amla*) and jaggery etc. were procured from the local market.

3. Preparation of *Lehyam*: The general description such as ingredients used and method employed for the preparation of *lehyams* is detailed in Table 1.

4. Organoleptic evaluation of *lehyams*: The prepared products were got evaluated organoleptically by a panel of judges using nine point hedonic scale.

5. Chemical analysis of *Lehyams*: Standard

methods were used for the analysis of moisture, protein, fat, total ash and crude fiber content (AOAC 1990), carbohydrates and energy was calculated by differential method (NIN 1983) and energy was calculated by multiplication method, iron and calcium (Piper 1950), β -carotene content, (Rangana 1986), ascorbic acid content (AOAC 1990) of the prepared products.

Results and Discussion

Mean acceptability scores of organoleptic characteristics of *lehyams* are presented in the Table 2. The overall acceptability scores of cauliflower leaves *lehyam* was observed as 6.75 in comparison to that of colocasia leaves *lehyam* as 7.88. The overall acceptability score of organoleptic characteristics of *lehyams* ranged from 5.0 to 8.6 based on nine point hedonic scale reported in Annual report, CIWA (2010).

The nutrient content in *lehyam* based on green leafy vegetables (as is basis) is presented in the Table 3. The protein content was observed as 4.49 and 3.25g per 100g whereas fat content found as 0.91 and 0.50g per 100g respectively in Cauliflower leaves *lehyam* and Colocasia leaves *lehyam*. The nutrient content of *lehyam* prepared by using cauliflower leaves, such as carbohydrates, crude fiber, ash, and energy content were estimated as 77.34, 1.04, 1.92 g per 100g and 335.50 Kcal per 100g, respectively and in Colocasia leaves *lehyam*

Table 1. General description of the *Lehyam* standardized

S No.	Name of the <i>Lehyams</i>	Ingredients used	Description of recipe
1	Cauliflower leaves <i>lehyam</i>	Cauliflower leaves, <i>amla</i> (fresh), fenugreek leaves, basil (<i>tulsi</i>) leaves, jaggery, cardamom, clove, black pepper (powdered)	Pressure cooked cauliflower leaves, basil (<i>tulsi</i>) leaves, fenugreek leaves and destoned gooseberry (<i>amla</i>). Homogenized the cooked mixture and sieved through muslin cloth. Poured the ground paste in a heavy bottomed vessel. Added jaggery and cooked the mixture for some time with continuous stirring till jam like consistency was obtained. Cardamom, clove and black pepper powder was added in the end to retain its flavour. Cooled and packed in glass bottle.
2	Colocasia leaves <i>lehyam</i>	Colocasia leaves, <i>amla</i> (fresh), ginger (fresh), black paper, cumin, omum and coriander seeds, cloves, nutmeg (<i>jaiphal</i>), jaggery and water	Pressure cooked colocasia leaves, <i>amla</i> (<i>amla</i> stones were removed) and ginger for 15 mins. Ground into paste. Coarsely ground all spices added water and kept for 1hr. After one hour again ground by using same water and extracted the juice by using muslin cloth. Poured paste of colocasia, <i>amla</i> and ginger in a heavy bottomed vessel. Heated it on a slow fire with continuous stirring using flat scoop. When it attained a jam like consistency added jaggery and cooked for same consistency. Added spice extract and cooked till it left the edges of the vessel. Cooled and stored in a glass bottle jar.

Table 2. Mean acceptability scores of organoleptic characteristics of *lehyams*

Sr. No.	Name of <i>lehyams</i>	Colour	Taste	Flavour	Texture	Overall acceptability
1	Cauliflower leaves <i>lehyam</i>	7	6	7	7	6.75
2	Colocasia leaves <i>lehyam</i>	8	8	7.5	8	7.88

Table 3. Nutrient composition of the *lehyams* per 100 g (as is basis)

Sr. No.	Name of <i>lehyams</i>	Protein (g)	Fat (g)	Carbo-hydrate (g)	Fibre (g)	Ash (g)	Energy (Kcal)	Calcium (mg)	Iron (mg)	Vit. C (mg)	β -carotene (μ g)
1	Cauliflower leaves <i>lehyam</i>	4.49	0.91	77.34	1.04	1.92	336	11.48	37.59	141.39	352.89
2	Colocasia leaves <i>lehyam</i>	3.25	0.50	80.42	0.92	0.48	322	164.40	32.59	79.80	1074.43

Table 4. Nutrient composition of the *Lehyams* per 100 g (dry weight basis)

Sr. No.	Name of <i>lehyams</i>	Moisture (g)	Protein (g)	Fat (g)	CHO (g)	Fiber (g)	Ash (g)	Energy (Kcal)	Calcium (mg)	Iron (mg)	Vit. C (mg)	β -Carotene (μ g)
1	Cauliflower leaves <i>lehyam</i>	14.30	5.25	1.06	90.24	1.21	2.24	392	13.40	43.87	164.99	411.78
2	Colocasia leaves <i>lehyam</i>	15.35	3.84	0.59	94.90	1.09	0.57	380	194.2	38.49	94.16	1267.82

as 80.42, 0.92, 0.48 g per 100 g and 322 Kcal, respectively. The iron content was found as 37.59 and 32.59 mg per 100 g, whereas calcium content was 11.48 and 164.40 mg per 100 g, in cauliflower leaves *lehyam* and colocasia leaves *lehyam*. The ascorbic acid and β -carotene content was observed as 141.39 mg per 100 g and 352.89 μ g per 100 g, respectively, in cauliflower leaves *lehyam* and 79.80 mg per 100g and 1074.43 μ g per 100 g, respectively, in colocasia leaves *lehyam*. While AICRP (HSc.) Food and Nutrition component of ANGRAU, Hyderabad centre reported the protein, fat, fiber ash

content of *lehyam* prepared by using cauliflower leaves as 7.92, 0.54, 7.68, 2.38 g per 100g, respectively and calcium, iron, vitamin C, and β -carotene as 136.02, 18.27, 10.81 mg per 100 and 103.92 μ g per 100 g, respectively (Annual Report 2010).

The nutritional composition of the *lehyams* on dry matter basis is presented in the Table 4. The results showed that the moisture content was found 14.30 and 15.35 g per 100 g, protein content was observed as 5.25 and 3.84 g per 100 g, whereas, fat content was 1.06 and 0.59g per 100g.

Carbohydrates, fiber, ash and energy content were observed as 90.24 g, 1.21g, 2.24 g and 392 Kcal per 100 g in cauliflower leaves *lehyam* and 94.90 g, 1.09 g and 380 Kcal per 100 g in colocasia leaves *lehyam*, respectively. Iron content was found as 43.87 and 38.49 mg per 100 g, calcium content as 13.40 and 194.2 mg per 100 g, ascorbic acid as 164.99 and 94.16 mg per 100 g and β -carotene content as 411.78 and 1267.82 μ g per 100 g in cauliflower leaves *lehyam* and Colocasia leaves *lehyam*, respectively.

As per the requirement of important nutrients especially iron, the consumption of *lehyam* can be

administered as an iron source to supplement the iron intake in the daily dietaries of the affected population

Conclusion

On the basis of results as mentioned above, it may be concluded that *lehyam* is one of the good sources of iron and can be easily prepared at home with minimum cost. It contains good amount of iron, ascorbic acid and β -carotene. Thus the developed iron rich products sufficient in essential nutrients consumed in required amount would prove to be useful to combat iron deficiency in the growing children.

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