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Estimation of Micronutrients in Fresh Kulekhara Leaves (Hygrophilla auriculata)

Chitralekha Mukherjee [1], Santa Datta (De)[2]

[1]Research Scholar, Department of Home Science, Food and Nutrition Division, University of Calcutta, Kolkata-700027,India

[2]Professor, Department of Home Science, Food and Nutrition Division, University of Calcutta, Kolkata- 700027, India

Abstract: ***In India, the micronutrient deficiency is a major and serious concern, among them iron deficiency anemia is one of the most important health hazards during reproductive age group of women. In the present study, micro elements (Na, K, Ca) and trace elements (Fe, Zn, Ni, Cu) content of fresh Kulekhara leaves are examined. Kulekhara leaves are widely grown, neglected, nutritious green leafy vegetable which is not consumed due to lack of knowledge by common people. It can be investigated to improve nutritional scenario of our country. Quantitative estimation of micro-nutrients has showed that 100gm fresh kulekhara leaves contain 56.1mg of sodium, 266mg of potassium, 27.93 mg of calcium, o.44 mg of zinc, 4.37 mg of copper, 7.03 mg of iron, 50.08 mg of vitamin-c, 102 microgram of vitamin-B2 (riboflavin),1microgram of folic acid, 2.5mg of β - carotene.***

Keywords: Hygrophilla spinosa, iron, vitamin-c, potassium, copper, sodium, trace elements

1. Introduction

India, being blessed with a variety of natural surroundings and varying climates and seasons, has a number of edible green leafy vegetables (GLV) some of which are locally grown and utilized. GLV are rich sources of vitamins such as β-carotene, ascorbic acid, riboflavin and folic acid as well as minerals such as iron, calcium and phosphorous. They are also recognized for their characteristic colour, flavour and therapeutic values. Some of the commonly consumed leafy vegetables are amaranth, spinach, ipomoea, bottle gourd leaf, etc., the nutritive value of which has been reported in the book of "The Nutritive Value of Indian Food" by C. Gopalan. [1] Apart from these, there are various types of less utilized leafy vegetables, which are not seasonal and easily available throughout the year. Among these non unutilized green leafy vegetables, Kulekhara leaves are such type of leafy vegetable which has no nutritional and anti-nutritional information available in the above said book..

Kulekhara or, Hygrophila auriculata belongs to Acathaceae family. Hygrophilla auriculata has several common name in different language. In Bengali it is called kulekhara, In Sanskrit Ikshugandha, Kokilaksha and in Hindi Talimakhana. The root contains alkaloid , Phytosterol, Potassium Salt of Oxalic Acid, Diastase, Protease, Essential Oil [2]

It is a spiny bush and is common throughout India. Though whole plant has been used medicinally but root & leaves are used more. Anciently it has been found effective in skin diseases, dropsy and sleeplessness. It is found effective in renal stones too, where in lower potencies have been proved more beneficial. The plant is used as demulcent, aphrodisiac, diuretic, urinary tonic and hepato protective substance. The aerial parts and the roots are used in herbal preparations.[3]

The people in India believes in use of different types of plants as medicine to prevent different types of diseases since early stage of life. There is a myth that use of Kulekhara Leaves can prevent aneamia successfully. Micronutrient malnutrition is of major and serious concern for many tropical developing countries[4,5].Micronutrient deficiency affects over two billion people worldwide, resulting in poor health, low worker productivity, high rate of mortality and morbidity [6] Iron deficiency anemia, for example, is one of the important worldwide health problems affecting nearly thirty percent of the world's population [7].The prevalence of anaemia in all the groups is higher in India as compared to other developing countries [8]. In India, anaemia affects an estimated 50% of the population and among them women are severely affected than men. It is estimated that about 20%-40% of maternal deaths in India are due to anaemia and one in every two Indian women (56%) suffers from any form of anaemia [9]. National Nutrition Monitoring Bureau (NNMB) Indian Council of Medical Research (ICMR) [10] and District Level Household Survey (DLHS) [11] have shown that prevalence of anaemia is very high (ranging between 80->90%) in preschool children, pregnant and lactating women and adolescent girls.[12]

A.Gomes et all. studied the effect of ethanolic extract of kukekhara leaves on male albino rats. The result of this study showed the significantly increased of heamoglobin, haematocrit, RBC and total WBC counts and the Total Iron Binding Capacity in male albino anaemic rats. [13]

As because there is no nutritional information available and very less scientifically proved medicinal properties are present regarding kulekhara leaves, people are unaware about this leaves. In spite of easy availability and less cost, people are very much reluctant to purchase it.

So in our research work we tried to focus on this underutilized kukelkhara leaves which were believed to be nutritious and might help in achieving nutritional security, specially in the prevention of micronutrient deficiency.

2. Materials and Methods

The sample were prepared to analysis the nutrient by the following steps-

2.1 Collection of Sample

Kulekhara leaves ware purchased from the local vegetable market.

2.2 Cleaning of sample

After purchasing the kulekhara leaves, those were thoroughly washed under the running tap water until all the dirt and other unwanted foreign material was depart.

2.3 Preparation of Sample

- Kulekhara leaves, after completion of thorough wash was spread over the bloating paper and in the well airy space to absorb extra water from the leaves.
- Leaves were tap dry by using cotton towel to wipe out all the moisture.
- Each Leaf was then cut off from the steam.
- Leaves were kept in a zip lock air tight plastic bag in fresh condition and brought to laboratory for analysis in fresh condition.

2.4 Quantitative estimation of vitamins and Minerals from fresh leaves

The sample extraction was prepared for the quantitative estimation of vitamin by AOAC method. [14] Extracting solvent was used for riboflavin- 0.1ml hydrochloric acid, 6 ml sodium hydroxide and standard solution of riboflavin [15]. Extracting solvent used for folic acid- Acetonitrile, Glacial acetic acid, Standard solution of folic acid. [16]Quantitative estimation of folic acid and riboflavin were done by high performance liquid chromatography after extraction of sample with extracting solvent. Vitamin –c was analyzed by using reagent metaphosphoric acid, acetic acid, 2,6-dichloroindophenol Na salt, sulphuric acid. The instrument was used uv-vis-spectrophotometer-Lamda 25 Perkin Elmer. [17]

For the β- carotene estimation Pigments were extracted from the fresh leaves and then separated. Reagent was used for quantitative estimation - beta carotene standard, potassium hydroxide, methanol, silica gel, magnessium oxide, Sodium sulphate, then determined under uv-vis spectrophotometer - Lamda 25 Perkin Elmer and expressed as beta-carotene. [18]

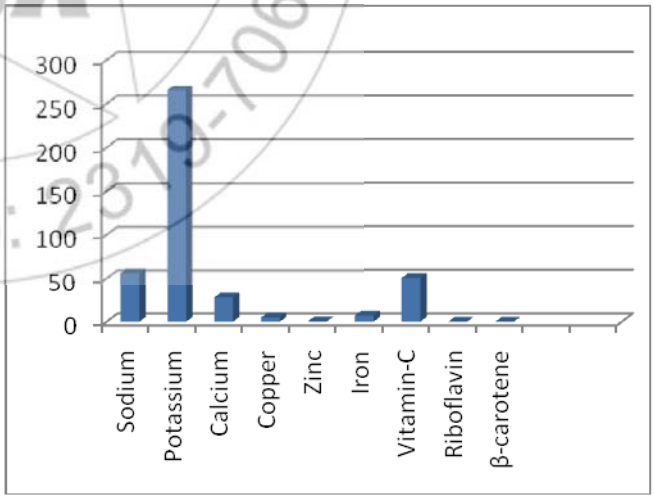
2.5 Analysis of mineral content in kulekhara leaves

The working solution was prepared for the measuring following minerals sodium, potassium, iron, zinc, nickel and copper using AOAC method. [19] The instrument used for mineral estimation was Atomic absorption spectrophotometer - Varian 240 and Muffle furnace.

3. Result and Discussion

Table 1: Vitamin & Mineral content of fresh kulekhra leaves

S No	Parameter assessed	Units	Result
1	Sodium	mg/100gm	56.1
2	Potassium	mg/100gm	266
3	Calcium	mg/100gm	27.93
4	Copper	mg/100gm	4.87
5	Zinc	mg/100gm	0.44
6	Iron	mg/100gm	7.03
7	Nickel	mg/100gm	-
8	Vitamin-c	mg/100gm	50.o8
9	Riboflavin	Microgram (µg)/100gm	102
10	Folic acid	µg /100gm	<1.0
11	β -carotene	µg/100gm	2.5



Graphical Representation of Micronutrient Content of kulekhara leaves

Table 2: Comparison of mineral content of some Other conventional green leafy vegetables [20] with fresh kulekhra leaves

Green leafy vegetables	*Sodium mg/100gm*	*Potassium mg/100gm*	*Calcium mg/100gm*	*Copper mg/100gm*	*Iron mg/100gm*	*Vitamin-c mg/100gm*	*Riboflavin mg/100gm*	*β carotene µg/100gm*
Spinach	*58.5*	*206*	*73*	*0.10*	*1.14*	*28*	*0.26*	*5,580*
Amaranth leaf	-	-	*200*	-	-	-	-	-
Ipomoea	-	-	*110*	-	*3.9*	*37*	*0.13*	*1.980*
Bottle gourd leaf	-	-	*80*	-	-	-	-	-
Kulekhara leaf	*56.1*	*266*	*27.93*	*4.87*	*7.03*	*50.08*	*0.10*	*2500*

Table-2 shows that the fresh kulekhara leaves are an excellent source of vitamin –c, iron, sodium and potassium as compared to other popular vegetables like spinach, ipomoea, bottle gourd and amaranth leaf. From this it can be said that fresh kulekhara leaves are very rich source of vitamin –c, iron, sodium and potassium. Other nutrients like β- carotene, riboflavin, copper and calcium are also present in considerable amount in fresh kulekhara leaves.

Spinach has achieved its importance due to its many proved nutritional information available to the common people. So people are used to prepare and have different types dish with spinach. But spinach contains less iron, vitamin-c, potassium and copper than fresh kulekhara leaf. Fresh kulekhra leaf contain **50.08 mg of vitamin-c** which is much higher than vitamin-c present in spinach i.e **28mg/100gm**. Spinach is also very poor source of iron as compare to fresh kulekhara leaves. Only **1.14 mg of iron** is present in 100gm of spinach where as **7.03 mg of iron** is present in fresh kulekhara leaves. Iron absorption is enhanced by the co-ingestion of vitamin-C because ascorbic acid helps to reduce the ferric (Fe3+) to ferrous (Fe2+)form of iron and it also binds or chelates the ferrous form, which allows iron to be absorbed at the intestinal brush border[21]. Vitamin-c and iron both are present in sufficient amount in fresh kulekhara leaf . From this fact we can easily establish that kulekhara leaves are much more beneficial to treat iron deficiency aneamia which is highly prevalent in Indian woman. Amaranth and bottle gourd leaves both are familiar and frequently consumed by common people but there is no report regarding vitamin-c, riboflavin, β- carotene, sodium and potassium content. Ipomoea leaves are also another easily available leafy vegetable and frequently used by people. It has very little amount of iron that is **3.9 mg/100gm** where as fresh kulekhara leaves contain **7.03mg/100gm** of iron. But there is also no report regarding sodium, potassium and copper content in ipomoea leaves. Kulekhara leaves are a very cheap as compared to above mentioned leafy vegetable and easily available in local market throughout the year. This research proves that it is a nutritious green leafy vegetable specially rich in micronutrients and also economically within the reach of the common people. Though the availability of kulekhara leaves are profound but it is not purchased by common people due to the lack of knowledge regarding this leaves.

4. Conclusion

Quantitative estimation of micronutrients in domestically processed fresh kulekhara leaves indicates that it is rich in vitamin-c, iron, potassium, sodium and copper and good source of riboflavin, β-carotene and calcium compared to other conventional green leafy vegetables. Kulekhara leaves, which are generally not consumed, can be utilized to improve the iron status of the Indian populations.

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Author Profile

Chitralekha Mukherjee received her B.Sc. and M.Sc. degrees in Food and Nutrition from University of Calcutta (C.U.) in 2005and 2007 respectively. Currently, she is a Registered Research Scholar in the Department of Home Science, University of Calcutta, Kolkata, India. She is interested in identifying the importance of locally available, unconventional, neglected food and study their effects on experimental animals.

Prof. Santa Datta (De) obtained her B.Sc. and M.Sc. degrees in Food and Nutrition from University of Calcutta (C.U.). She was ranked 1st in merit list (gold medallist) in both the examinations. She was awarded Ph.D. in 1991 from University of Calcutta, and now she is serving University of Calcutta as Professor (Department of Home Science, University of Calcutta) and Dean (Faculty Council for PG Studies in Fine Arts, Music and Home Science). She has been working in the field of developing new supplementary foods and other food products from locally available, unconventional, thrown away and neglected food by products for a long time.