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Mineral Contents in Some Wild Neglected Leafy Vegetables

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ABSTRACT

Most of the iron for our body requirements can be obtained from green leafy vegetables and nutritional anemia can be easily cured by green leafy vegetables. The iron in the ash solution was determined colorimetrically by first converting the iron into ferric form using oxidizing agent potassium persulphate and the converting the ferric into red ferric thiocynate complex $[Fe(SCN)_6]^{3-}$ exhibiting λ_{max} at 480 nm by treatment with potassium thiocynate reagent. The calcium is essential for strong bones and teeth while iron which along with above vegetables also present in sufficient quantity in carrot, bitter gourd, onions and tomatoes is essential constituent of hemoglobin which helps to carry oxygen to cell in various parts of the body. Calcium was determined by oxalate precipitation method, and then titrated in hot condition against 0.01 M $KMnO_4$ solution till permanent pink colour is obtained.

Keywords: Iron, Thiocynate complex, colorimetrically, Calcium, Oxalate precipitation, $KMnO_4$

1. INTRODUCTION

The chemical constituent of food which performs different functions of the body is referred as nutrients. These nutrients which perform various body processes which promote the growth and repair of tissues impart energy and involve in regulation of body processes. The vegetables such as Indian gooseberry, bitter gourd, tomatoes, leafy vegetables like spinach, cabbage and drumstick leaves in fresh condition contain vitamin 'C' in good amount which is essential for normal growth maintenance of body tissues, joints, bones, teeth and gums and for protection against infection. Its deficiency can lead to scurvy, tooth decay, bleeding of gums anemia and premature aging.

The vegetables are rich sources of highly soluble minerals like calcium, phosphorous, iron, magnetism, copper and potassium which not only maintain the acid base balance of the hydrogen concentration of the body tissue but also help complete absorption of vitamins, proteins, fats and carbohydrates in the food[17]. These minerals which are present in vegetables like potato, beans, spinach, radish, turnip and brinjal help the body to eliminate excess of liquid and salt and helpful in ailments such as oedema or swellings, kidney and heart conditions.

The mineral calcium and iron which are obtained in plenty from leafy vegetables like spinach, fenugreek leaves are the two important minerals which are especially usefully for our body. The calcium is essential for strong bones and teeth while iron which along with above vegetables also present in sufficient quantity in carrot, bitter gourd, onions and tomatoes is essential constituent of hemoglobin which helps to carry oxygen to cell in various parts of the body.

In the vegetable class also a neglected leafy vegetable grown in the form of weed along

with prominent kharif and rabbi crops is the *sonchus arvensis* vegetable locally known as "*Patrachi Bhaji.*" It is a poor man's salad vegetable having its own characteristic taste and is believed to have medicinal values. This leafy vegetable which develops yellowish red colouration at the plucked portion is also used for making curries. This is a crop normally as weed along with main crop. However, it is sometimes deliberately allowed to grow because it features a prominent characteristic that is favored among certain groups. The leafy vegetable *sonchus arvensis* along with *portulaca oleraceae* which is referred as "*Gareebki dal*" (poor man's food) are left untouched by many workers.

The Leafy vegetables Sonchus arvensis and Portulaca oleraceae is widely taken in the season. When the leaf of Sonchus arvensis is cutoff its pedicel it shows red spot, which shows rich iron content.

In Maharashtra research work has been done on fenugreek, spinach and coriander.

After having felt the lack of scientific knowledge about the composition and nutrient profile of the above neglected vegetables found in this region and elsewhere, it is through worthwhile to study the nutritional value of some wild neglected leafy vegetables grown in this region.

With this aim in view, the present study deals with the study of nutritional value of some neglected leafy vegetables grown in Latur district.

The research work involves the determination of ash, iron and calcium in neglected leafy vegetables.

2. Experimental Techniques:

2.1 Experimental procedure for Determination of Iron:

The iron in the ash solution was determined colorimetricaly by first converting the iron into ferric form using oxidizing agent potassium persulphate and the converting the ferric into red ferric thiocynate complex $[Fe(SCN)_6]^{3-}$ exhibiting λ_{max} at 480 nm by treatment with potassium thiocynate reagent.

A 5 mL aliquot of the above obtained ash solution, an aliquot of standard iron solution (1.0 mL = 0.1 mg of Fe) and 5 mL of distilled water as blank were taken in separated three big test tubes. The solution in each test tube was then treated with 0.5 mL of conc. H_2SO_4 , 1.0 mL of Saturated potassium persulphate solution and 2.0 mL of 3N potassium thiocynate solution and the solution in each tube was then made up to the volume of 15 mL by using distilled water as shown in table. After proper equilibrium the optical density of each solution was measured at 480 nm wavelength by setting the blank at 100% transmission.

The amount of iron (mg/100g) in the fruit and vegetable was then calculated by applying the formula given below:

1. **Formula:**

$$\text{Iron mg/100g} = \frac{\text{O.D. of sample} \times 0.1 \times \text{total volume of ash solution} \times 100}{\text{O.D. of standard} \times 5 \times \text{Wt. of Sample Taken for Ashing}}$$

2.2 Experimental procedure for Determination of Calcium:

100 gm of ammonium oxalate was dissolved in a 200 mL of glass distilled water and stirred, such that the undissolved ammonium oxalate is deposited at the bottom of ammonium oxalate solution in a beaker. 0-5 gm of methyl red was dissolved in 100 mL of 95% alcohol. 50 mL of concentrated acetic acid was mixed with 200 mL of glass distilled water. 10 mL concentrated ammonia solution was mixed with 40 mL distilled water. 100 mL concentrated Sulphuric acid was added slowly with constant stirring to 400 mL of glass distilled water and cooled. An accurately weighted 0.36 gm of potassium

permanganate was dissolved in small potion f glass distilled water in a beaker then diluted up to a mark of 100 mL using glass distilled water 100 mL standard flask. A 0.01 N potassium permanganate solution was then prepared by diluting 100 mL of 0.1 N Potassium permanganate solutions to one liter in a standard flask.

A 25 ml aliquot of the obtained ash solution was taken in a 250 mL beaker to which around 25 to 50 mL distilled water and two drops of methyl orange were added. The solution was then made slightly alkaline by the addition of dilute ammonia and then slightly acidic with the help of few drops of acetic acid until the colour is faint pink.(pH 5.0) The solution was then boiled for few minutes and precipitate of calcium oxalate (CaC_2O_4) was digested by just allowing to stand at room temperature for 5 hrs. The precipitate was then filtered through a Wattaman filter paper No. 42 and subsequently washed with small portions of distilled water till the filtrate is free from oxalate ion which is tested by use of very dilute acidic $KMnO_4/CaCl_2$ solution. The filtrate was also made free from chloride ion which is tested by $AgNO_3$ solution.[6] The larger part of the precipitate in the filter funnel was taken into a 500 mL beaker through the hole made at the bottom of the filter funnel by glass rod using hot dilute H_2SO_4 (1:4). The filter was washed 2-3 times with small portion of hot water and washing were collected in the same beaker thereby the residual precipitate was collected together.

The contents of the beaker containing filtrate with oxalic acid was then heated to 70-80 ^{0}C and then titrated in hot condition against 0.01 M $KMnO_4$ solution till permanent pink colour is obtained. The filter paper in the filter funnel was then transfer to the beaker and titration was continued to obtain the same permanent pink coloured end point.

The amount of calcium (mg/100g) in the fruit was then calculated by applying the formula given below.

Formula:

$$\text{Calcium mg/100g} = \frac{\text{titer} \times 0.2 \times \text{Total volume of Ash solution} \times 100}{\text{Volume taken for Estimation} \times \text{Weight of Sample Taken for Ashing}}$$

3. RESULT AND DISCUSSION

Arora C.L.et al evaluated N, P, Ca, Mg, S, Zn, Cu, Fe, Mn and B nutrient status of soils and plants in forty three peach orchards of Punjab. They arrived at the conclusion that the soil was generally alkaline in reaction, non-saline, low in organic matter and loamy sand to loam in texture while the leaf analysis of peach plant revealed the prevalence of the deficiency of N, K and S in 24,21and 24 percent sample respectively[6].

Barbier M.Thibault J.F. has been given in detail an account of pectic substances of cherry fruits. Similar studies on pectic contents of some fruit and plant parts have also been carried out by Liaquat Ali S.K. and Muzumdar B.C.[7]

Guha et. al. have attempted to determine vitamin C contents of different layers of fruits.[8]

Mazumdar K. and Mazumdar B.C. have estimated protein, fat and carbohydrate concentration in the mature seeds of jack fruits (Artocarpus hetrophyllus Lamk). [10]

In present work iron content in Sonchus arvensis was found to be 8.56, which is higher than iron found 1.52 mg/100gm in Portulaca oleraceae.

Deeekasha Sharma has given nutritive value of Amaranth as 4.00 g protein, 397 g calcium, 25.5 mg iron, 552.0 mg carotene 0.03 mg

thiamine, 0.3 mg riboflarin and 99.0 mg other vitamins per 100 gm of the vegetables.[12]

The vegetable Sonchus arvensis exhibited highest level of calcium content of 232 mg/100g. And the vegetable Portulaca oleracesae found to contain 76.90 mg/ 100g of Calcium.

The calcium content of Sonchus arvensis and portulaca oleraceae was determined by oxlate precipitation followed by permanganate titrimetric method in the present research work.

4. CONCLUSION

In present work iron content in Sonchus arvensis was found to be 8.56, which is higher than iron found 1.52 mg/100gm in Portulaca oleraceae.

The vegetable Sonchus arvensis exhibited highest level of calcium content of 232 mg/100g. And the vegetable Portulaca oleracesae found to contain 76.90 mg/ 100g of Calcium.

Table 1: Analytical data for Iron content of rare fruits:

Sr. No.	Name of Neglected Vegetable (Local)	Botnical name	Observation Table							
				Volume taken (mL)	Conc-entration (mg/mL)	Volume of conc. H_2SO_4 (mL)	Volume of $K_2S_2O_8$ (mL)	Volume of 3N KSCN (mL)	Finial Solution (mL)	optical density at 480 nm	Amount of iron (mg/ 100g)
1	Patrachi Bhaji	Sonchus arvensis	Standard iron solution	1.0	0.1	0.5	1.0	2.0	15	0.95	8.56
			Sample ash solution	5.0	-	0.5	1.0	2.0	15	1.83	
			Blank solution	-	-	0.5	1.0	2.0	15	0.5	
2	Mothi Ghol	Portulaca oleraceae	Standard iron solution	1.0	0.1	0.5	1.0	2.0	15	0.95	1.52
			Sample ash solution	5.0	-	0.5	1.0	2.0	15	1.08	
			Blank solution	-	-	0.5	1.0	2.0	15	0.57	

Table 2: Analytical Data for Calcium Content of Neglected Vegetables

Sr No.	Name of Neglected Vegetables (Local)	Botanical Name	Weight of Vegetable Taken for Ashing (g)	Weight of Ash obtained (g)	Weight of Ash taken for Analysis (g)	Total volume of Ash solution (mL)	Volume of Ash solution taken for Ash analysis (mL)	Volume of 0.01N $KMnO_4$ Consumed (mL)	Amount of Calcium (mg/100g)
1	Patrachi Bhaji	Sonchus arvensis	90	2.5	2.5	200	25	130.5	232.0
2	Mothi Gothi	Portulaca oleraceae	150	3.7	2.0	100	25	144.2	76.90

Declaration by Authors

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