Evaluation of Iron in Some Commonly Used Vegetables From Four Districts of Marathwada Region

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Abstract : A study was conducted to determine the level of iron in four selected vegetables such as Spinach (Spinacia Oleraceae), Country Sar (Rumex Vesicarius L), Horse Gram Leaf (Cicer) and Garden Purslave (Portulaca Oleraceae L) from Latur, Nanded, Beed & Osmanabad districts of Marathwada region. The results showed, the iron concentration ranged from 4.400 to 4.440 mg in Spinach, 3.898 to 4.118 mg in Country Sar, 0.998 to 1.110 mg in Horse Gram Leaf and 2.170 to 2.715 mg in Garden Purslave. Garden Purslave collected from Latur & Beed was rich in iron than same collected from Nanded & Osmanabad.

Keywards : Iron, Vegetable, Marathwada region.

I. INTRODUCTION

Vegetables are essential for the normal growth of human beings. Vegetables provide various necessary nutrients such as vitamins, minerals (Fe, Ca, Na, K, Mg, Mn, P, S, Cu etc), antioxidants, carbohydrates, fats, proteins, fibers etc.[1] Many people are undernourished, mainly children, pregnant and lactating woman's. Deficiency of one or more of these nutrients causes specific disease. Deficiency of iron develops a disease called Anemia. Iron deficiency is common in children below five years, pregnant and lactating woman's and old age people. Overcoming iron deficiency among such people remain a challenging problem in many developing countries.[2]

Traditional/ indigenous green leafy vegetables are valuable sources of iron.[3] In Latur, Beed, Nanded and Osmanabad districts of marathwada region, people use Spinach (Spinacia Oleraceae), Country Sar (Rumex Vesicarius L), Horse Gram Leaf (Cicer) and Garden Purslave (Portulaca Oleraceae L) as main vegetables in their diet. Hence, we decided to evaluate the iron content of these vegetables arising from these four different districts of marathwada region.

II. EXPERIMENTAL:

Procedure for the determination of iron:

The iron present in unique leafy vegetables and fruits was determined by redox titrimetric method employing potassium dichromate solution as titrant and sodium diphynyl amine sulphonate as indicater.

For this, the ash obtained from a known quantity of fruits and vegetables sample was used for preparation of definite volume of ash solution by acid treatment method of dissolution. An aliquot of the ash solution was the used for determination of iron after removal of undissolved SiO_2 in the ash solution.

Preparation of ash solution:

A 100 gm of each of unique leafy vegetables and fruits was accurately weighed in pre- weight china dish/ silica crucible after cleaning properly in fresh water and choppering the vegetables and fruits sample with a knife in to a fine mass. The fruits and vegetables samples were then converted in to ash properly by dry ashing method as described above in the method for determination of ash.

An accurately weighed quantity of ash of unique leafy vegetables and fruits was obtained as above in the range 1.415 gm to 4.50 gm in case of vegetables and in the range 0.495 gm to 1,325 gm in case of fruits was taken in a clean dry beaker. The ash was then moistened with little distilled water. It was then treated with 5ml of 1:1 dilute HCl. The content of the beaker were heated slowely with constant stirring by means of a glass rod on a Bunsen burner till the ash is completely dissolved. The residual undissolved ash is further treated with5-10 ml of concentrate HCl. For second and third time entire ash get completely dissolved.

The undissolved SiO2 particles in the solution were then separated and removal by filtering the content of beaker under hot condition through whattmann filter paper No.

41. The content of the beaker with SiO2 particles were then washed with small portion of hot distilled water for two to three times till the yellow colour completely disappear and the washing were then transferred to filter funnel.

The filtrate and washing were then collected in the clean dry 100ml standard flask. The unwanted SiO2 residue on the filter funnel was rejected and kept aside. The in the solution in the standard flask containing iron in Fe^{+3} states was then diluted to 100 ml mark using distilled water. The flask was then stoppered and the solution properly shaken.

Determination of iron:

An 10 ml of aliquot of the ash solution as obtained above containing iron in Fe^{+3} state was taken by means of pipette in a clean dry 500 ml conical flask and around 15 ml distilled water was added to it.

The solution of Fe (III) which was around 25 ml is made acidic to 5-6 M with respect to hydrochloric acid by adding 12- 15 ml of conc. HCL. The content were heated nearly to boiling (70-90 . ^{0}C). To the hot solution, an acidic solution of tin (II) chloride by prepared by dissolving 3 gm of salt in mixture of 10 ml each of conc. HCL and water, was added drop by drop with vigorous shaking until the yellow colour just disappear. Then 1-2 drop of it were added in excess. The conents cooled rapidly under tap water to 20 ^{0}C. The excess tin (II) chloride added was distroyed by adding 10 ml of 5% aqueous mercuric chloride. solution immediately in one lot, with vigourous mixing when a small silky white precipitate from indicating complete reduction of $Fe^{+3} \rightarrow Fe^{+2}$. *Then 200 ml of*
2.5 % sulphuric acid and 5 ml of 85 % phosphoric acid were added.

The addition of sulphuric acid were maintained prper acidic condition required for titration while phosphoric acid combines with yellow Fe (III) to form [Fe (HPO4)]+, thus renders the end point more cleare4ly vegible sand also lower the reduction potential of the system Fe(III) - Fe (II) by complexation and increases the reducing power of Fe (II). Then 8 drop of 0.2% aquos solution of sodium diphynyl amine sulphonate were added.

The Fe (II) obtained was titrated slowly while shaking constantly against 0.001 N potassium dichromate solution until the solution assumes a gray- blue tin near the end point. The titration was continued until the addition of one drop causes the formation of intense purple/ violate blue colouration which remain permanent after shaking and is unaffected by further addition of titrant.

The procedure was repeated for two more times. The means of three such burette reading was used to calculate the percentage of Fe (III) in the sample fruits and vegetables by employing the conversion factor given below.

[1 ml of 0.0001N $K_2Cr_2O_7$ *= 0.05585 mg of Fe (III)]. Or = 0.00005585 gm of Fe (III)]*

From the means of the three burette readings for each sample solution, the amount of iron in each fruits and vegetables in milligram per 100 gm was calculated by using the formula given below.

Formula:

$$\text{Amount of Fe (mg/100gm)} = \frac{\text{Volume of } K_2Cr_2O_7 \times \text{Conversion Factor} \times \text{Multiple} \times \text{Weights of vegetables} \times 1000 \times \text{Ratio Factor} \times \text{Weight of Ash}}{\text{Weight of vegetables corresponding to ash taken for analysis} \times \text{Total weight of ash obtained}}$$

III. Result & Discussion:

Ash of different vegetables collected from four different districts such as Latur, Nanded, Beed and Osmanabad of Marathwada region was evaluated for Iron content and the results are summarized in the **table 1**. This result depicts that the content of Iron was almost constant in Spinach. Iron content was found in a greater extent in Country Sar collected from Latur & Nanded than from Beed and Osmanabad. Horse Gram leaf was found to be almost equally rich in Iron in vegetable collected from all four districts. Garden Purslave was found to be rich in Iron in vegetable collected from Latur and Osmanabad than vegetable collected from Nanded and Beed district.

Table 1: *Iron content in four vegetables*

Name of Vegetable	*Latur*			*Nanded*			*Beed*			*Osmanabad*		
	Wt. of Ash obtained	*Wt. of ash taken*	*Amount of Fe (mg/100 g)*	*Wt. of Ash obtained*	*Wt. of ash taken*	*Amount of Fe (mg/100 g)*	*Wt. of Ash obtained*	*Wt. of ash taken*	*Amount of Fe (mg/100 g)*	*Wt. of Ash obtained*	*Wt. of ash taken*	*Amount of Fe (mg/100 g)*
Spinach	*1.964 g*	*0.5 g*	*4.399*	*1.975 g*	*0.5 g*	*4.400*	*1.876 g*	*0.5 g*	*4.211*	*1.975 g*	*0.5 g*	*4.119*
Country Sar	*1.495 g*	*0.5 g*	*4.018*	*1.391 g*	*0.5 g*	*4.118*	*1.415 g*	*0.5 g*	*3.918*	*1.391 g*	*0.5 g*	*3.898*
Horse Gram Leaf	*4.5 g*	*0.5 g*	*1.008*	*4.61 g*	*0.5 g*	*1.110*	*4.370 g*	*0.5 g*	*0.998*	*4.60 g*	*0.5 g*	*1.001*

Garden Purslave	*1.706 g*	*0.5 g*	*2.675*	*1.716 g*	*0.5 g*	*2.17*	*1.605 g*	*0.5 g*	*2.715*	*1.690 g*	*0.5 g*	*2.598*

IV. **CONCLUSION:** These studies have shown that Iron rich Spinach was present in Latur & Nanded district than the vegetable from other two districts. Country Sar and Horse Gram Leaf were found to be equally rich in Iron in samples collected from all four districts. Garden Purslave collected from Latur & Beed district was found to be rich in Iron than the same vegetable collected from Nanded & Osmanabad districts.

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