NUTRITIONAL ANALYSIS OF INDIGENOUS VEGETABLE GROWN IN MARATHWADA REGION OF MAHARASHTRA, INDIA

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ABSTRACT

The total ash and iron and calcium content of common vegetable grown seasonally in marathwada were determined by potassium dichromate titrimetric method. For this study those vegetables are selected which are commonly grown and easily available in market and used frequently in diet. The result of analysis of vegetable shows different variation in ash, calcium and iron content. Ash is the inorganic residue remaining after the water and organic matter have been removed by heating in the presence of oxidizing agents, which provides a measure of the total amount of minerals within a food. From the above data analysis it concludes that which vegetables are having more amounts of Fe and Ca with ash. From the results it concludes that fenugreek and amaranth contain high amount of Fe and Ca than other vegetables. From these results in future we can design the balanced diet for better health.

Keywords: Minerals, Composition, Vegetable, Analysis of nutrient, Fe, Ca content.

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Introduction

Vegetables are the edible parts of plant that are consumed wholly or in parts, raw or cooked as part of main dish or salad. A vegetable includes leaves, stems, roots, flowers, seed, fruits, bulbs, tubers and fungi (Barrett, et al., 2011). Vegetables are good sources of oil, carbohydrates, minerals and vitamins depending on the vegetable consumed Ihekoronye & Ngoddy, 1985, reported that vegetable fats and oil lower blood lipids thereby reducing the occurrence of disease associated with damage of coronary artery.

Normally, all plants are vegetables. The term vegetable applies to edible part of the plant that stores food in roots, stems, or leaves. Vegetables are green and leafy- like in appearance bearing edible stems or leaves and roots of plants (Sharma, 2004) the food value of vegetable is low owing to the large amount of water present (79–96%). The nutritive value of vegetable is increased greatly because of the presence of mineral salts and vitamins; they also serve as roughages that help in digestion (Sharma, 2004). Vegetables constitute essential diet components by contributing proteins, vitamins, iron, calcium, and other nutrients that are in short supply. Vegetables also contain both essential and toxic elements over a wide range of concentrations. Metals in vegetables may pose a direct threat to human health, plants or vegetables take up elements by absorbing them from contaminated soils and waste water used for irrigating them as well as from deposits on different parts of the vegetables exposed to the air from polluted environment (Funtua et al, 2008).

It is important that iron is an essential mineral and a vital component of proteins involved in oxygen transport and metabolism. Iron is also an essential cofactor in the synthesis of neurotransmitters such as dopamine, or epinephrine, and serotonin. About 15% of the body's iron is stored for future needs and mobilized when dietary intake is inadequate. (Aberoumand and Deokule, 2008). Epidemiological studies suggest that regular or increased consumption of fruits and vegetables may reduce the risk of chronic diseases and these health benefits are thought to be mainly attributable to their natural antioxidant and dietary fibers content. Calcium, needed for strong bones, is found in dark green leafy vegetables, tofu made with calcium sulfate, calcium-fortified soy milk and orange juice, and many other foods commonly eaten by humans. Although lower animal protein intake may reduce calcium losses, there is currently not enough evidence to suggest that humans have lower calcium needs. Humans should eat foods that are high in calcium and/or use a calcium supplement (Tang, et al., 2007).

The work aimed at determining few nutritionally important minerals like calcium, iron vegetables widely consumed. The objective of the present work was to examine the variability in the mineral content. Plant foods have almost all of the mineral and organic nutrients established as essential for human nutrition. Traditional vegetables contain a number of organic photochemical that have been linked to the promotion of good health. Vegetables hold an important position in well-balanced diets. Green leafy vegetables are believed to occupy a modest place as a source of trace elements due to their high water content (Gibson 1994). Nutritional information is used increasingly by public agencies and agricultural industries to promote fresh product. People are looking for variety in their diets and are aware of the health benefits of fresh fruits and vegetables. They have special interest in food sources rich in antioxidant vitamins (vitamins C, A, and E), calcium (Ca), magnesium (Mg), and potassium (K) and fiber. Most of these nutrient requirements can be solved by increasing the consumption of fresh vegetables. In addition to meeting nutrient intake levels, better consumption of fruits and vegetables is associated with reduced risk of cardiovascular disease and stroke (Gillman 1995).

This study was carried out to evaluate the chemical constituents of vegetables. Proximate analysis was carried out to determine the nutrient content of these vegetables under investigation.

Material and methods:

For the study the vegetable samples were collected from domestic market, and the study is carried out as follow. The vegetables selected for study are Spinach, Carrot, Garlic, Ginger, Tomato, Amaranths and Fenugreek.

A) Chemical Analysis

The major elements, comprising calcium, phosphorus, potassium and magnesium, and trace elements like iron were determined by different methods. The ash content was determined by combusting the plant materials (AOAC 1990). The ash, thus prepared, was used for estimation of Ca and K by flame photometry method (Baruah and Borah 1998).

a) Determination of Ash content:

90 g of Daucus Corota L (corrot) and 120 g of Lycopersicon Esculentum (Tomato) weighed accurately in a clean sillica dish were first heated over a low Bunsen burner flame to volatilize larger part of organic matter and them transferred to a temperature controlled muffle furnace

maintained at 300^0 C. The dry ashing is continued till carbon in it has ceased to glow and then the temperature was raised 450^0 C and the ignition was continued for 5 to 7 hours. The ash residue so obtained was then cooled in desiccators and weighted. From the weight of ash residue the percentage of ash was calculated by the formula given below:

$$\textbf{Percentage of Ash vegetable sample (\%)} = \frac{\textbf{Weight of Dry ash residue (g)}}{\textbf{Weight of fruit Sample (g)}} \times 100$$

b) Determination of Iron Content:

100 g of each vegetables were accurately weighted in a titrate dish and after dry ashing 0.5 to 1 g of ash residues were transferred with watch glass the ash residues were moistened 40 to 50 ml of dilute Hydrochloric acid (dil HCl) was added. The contents to heat over hot water bath for 30 min subsequently removing the cover and contents to dehydrate titrate (sio2) followed by addition of another 10 ml dil HCl and distilled water to dissolve soluble salts. The undissolved titrate (sio2) transferred to the 100ml standard flask. The residual titrate particles adhering to breaker were transferred completely to filter funnel. The titrate residue in the filter funnel was washed for two to three times with hot distilled water and all the wash used filtrate collected in the standard flask were diluted up to mark of 100ml using distilled water.

A 25ml of aliquot of above ash solution in the standard flask was titrating out into a clean dry conical flask. The solution was then treated with 1-2 ml of concentrated nitric acid oxidiz Fe +1 to Fe +3 and made 5 to 6 l with respect to hydrochloric acid by adding 10 to 50 ml concentrated hydrochloric acid. The content were heated strongly to 70 to 90 ^{0} c i.e. nearly to boiling and to the hot solution the concentrated tin (II) chloride solution was added drop by drop constant stirring titrate yellow colour of the solution just disappeared ascertaining complete reduction of Fe+3 to Fe+2. Then 1 to 2 drop of tin (II) chloride was added in excess. The content was cooled rapidly under tap water to 20^0 C. and excess of tin (II) chloride added was destroyed mercuric chloride solution immediately with vigorous mixing.

Then 200 ml of 2.5 % sulphuric acid followed by 5 ml of 85 % phosphoric acid and few drop of 0.2% aqueous solution of sodium Diphenyl amine sulphonate indicator were added. The Fe+2 solutions were then titrated titrate 0.01 N potassium dichromate solution till color assumes bluish green indicating the nearness of the end point. The titration was continued further by adding drop by drop of titrate maintain an interval of few seconds between each titration until addition of one drop caused the formation of intense purple coloration which permanent indicating the end point of titration. Absorbance readings were measured for each including the standard solutions at 579 nm using UV- Visible spectrophotometer, (Vogel 1983).

c) **Determination of calcium content:**

100 g of each vegetable were accurately weighed in a silica dish and after dry ashing were 0.5 to 1gm of ash residue transferred to a clean beaker. After covering beaker with watch glass the ash residue moistened with little distilled water. The beaker was covered with watch glass and added 40 to 50 ml of dil HCl with the help of pipette and content were further heated for 30 minutes at low flame after adding 10ml of hydrochloric acid to dehydrate silica and then little water was added to dissolve soluble salts filtered in hot condition through whatmann filter paper No. 41 and then washing were collecting along with filtrate into 100ml standard flask. The silica residue was rejected and filtrate along with washing collected in the 100 ml standard flask was then diluted up to mark of 100ml using distilled water and solution made homogeneous.

A 25ml aliquot of above solution of each fruit was transferred to a small beaker heated to boil and 5 to 1 gm solid Ammonium chloride was added and heating few minutes. Then to hot solution 1:1 ammonia was added slowly with constant stirring so as to precipitate Fe+3 and Al+3 ions as hydroxide. The hydroxide was digested 5 to 10 minute over a low flame and filtered the calcium oxalate monohydrate filtered through a Whatmann filter paper 41 precipitate was then washed with cold distilled water for 3 to 4 times cold distilled water till free chloride ions.

The precipitate along with the filter paper was transferred to beaker and then calcium oxalate monohydrate precipitate (CaC2 O4, H2O) was dissolved in minimum volume of dil H2 SO4 and transferred to clean dry conical flask. The solution was neutralized by adding 8 M Solution of potassium hydroxide (Tested by PH paper) Around 25 ml of distilled water 4ml of 8 M potassium hydroxide solution were added and allowed to stand for 3 to 5 minutes with occasional stirring them 30mg of hydroxyl ammonium chloride added and 50 mg of slide Patton and readers indicator was then and calcium ion in the solution was titrated against 0.01N EDTA till the color changes from red to blue. The volume of EDTA consumed was recorded. Both the standard solutions and samples solutions were aspirated into a flame photometer one after the other and absorbance readings were obtained and the concentrations of calcium in the samples were obtained by extrapolation from standard calibration plot, (Vogel, 1983).

RESULTS AND DISCUSSION

The results of the percentage ash content and mineral content of the various samples analyzed are presented in Table 1. The results of ash, Ca2+ and Fe2+ concentrations in the samples analyzed is presented in Fig 1, found that fenugreek is the highest source of ca followed by amaranths carrot, spinach, ginger etc. Amaranths is having highest percentage iron followed by fenugreek, spinach, carrot, ginger, garlic and tomato. Calcium is not known to be toxic because it is an essential element for bone development and maintenance and also for reduction of cholesterol level in humans (Ibrahim, 2008). The variation in the nutritional content in this may be due to a number of factors that influence the concentration of mineral elements on and within plants, these factors include climate , atmospheric deposition , nature of soil on which the plant is grown , irrigation with waste water, these observations were made by Anyawu et al,(2004) and Khairah et al, (2004).

Table 1. Nutritional content of selected vegetables.

Sr no.	**Name of common vegetables** (Local)	**Botanical name**	**Actual weight of sample taken for Analysis (g)**	**Weight of ash obtained (g)**	**Ash content (mg/100mg)**	**Iron content (mg/100mg)**	**Calcium content (mg/100mg)**
1	Spinach	*Spinacia olerecea*	100	1.100	1.100	7.884	45.76
2	Carrot	*Daucus carota*	90	0.925	1.027	1.841	78.93
3	Fenugreek	*Trigonella foenum*	80	0.925	1.156	14.504	384.80
4	Tomato	*Lycopersicon esculentum*	120	0.610	0.508	0.455	40.34
5	Amaranth	*Amaranthus tricolour L.*	75	1.810	2.410	25.407	377.32
6	Ginger	*Zingiber officinales*	100	1.210	1.210	2.439	19.36
7	Garlic	*Allium sativum*	120	1.125	0.937	1.260	27.00
8	Cucumber	*Cucumis sativus*	150	0.510	0.340	2.370	16.02

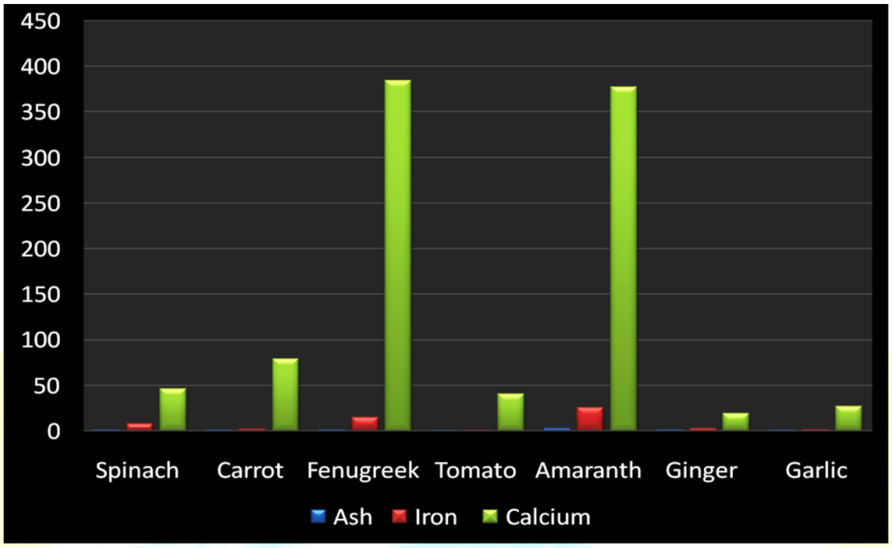

Fig.1 Comparison between nutritional content of mentioned vegetables

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