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Research Article

Analysis of Neutraceuticals from Spinach

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Abstract

Green leafy vegetables are the major source of vitamin A. These vegetables contribute protein, vitamin, minerals fibers and enzymes to the human diet. The Carotenoids present in these vegetables especially β-carotene is essential for normal growth and development of immune system function. Vitamin A also functions as antioxidant. The studies on the effect of different drying techniques on the stability of nutrients from spinach leaves were undertaken. Fresh samples of spinach leaves were collected, sorted and dried using three different methods via; Sun drying, oven-drying, and shade-drying. Proximate analysis was carried out on fresh and dried samples for β-Carotene, Calcium, Phosphorus, Nitrogen and Protein content. From the result it was revealed that stability of nutrients β-Carotene was increased by treating spinach leaves. Shade drying is more effective method than sun drying and oven drying to retain the nutritional factors.

INTRODUCTION

Spinach (*Spinacia oleracea*) is one of the most important vegetable with high nutritive value. Spinach is an edible vegetable belongs to family Amaranthaceae, is the most widely cultivated herb as a fresh or dried powdered plant material, (Sangwan *et al.,* 2011). The Spinach is a succulent dark green leafy vegetable that is consumed cooked. It is a good source of Vitamin A, C, minerals and fiber. Indian spinach is one of the widest cultivated vegetable (Oladele and Aborisade, 2009).Vegetables occupies an important place in the vegetarian diets in India. The body needs dietary fats to absorb carotene and vitamins present in leafy vegetables. Spinach has a unique place among vegetables because of their colour, flavor, and health benefits. It is easily and quickly cooked and served as rich source of β-carotene, Ascorbic acid, Folic acid, Chlorophyll, Calcium, Iron, Phosphorus, Nitrogen, Zink, protein and dietary fiber. The vegetables are known as very good sources of Antioxidants. (Sundaram *et al.,* 2012).

Drying of vegetables removes moisture. The common methods for drying are; sun drying, shade drying and oven drying. In first method leafy vegetables are exposed to direct Sun rays. Oven-drying requires the use of oven set and at certain temperature. Shade drying requires air current**.** Green leafy vegetables (GLVs) occupy an important place in Indian dietaries as they provide variety, blend in different preparations, cheap and they are easily available. GLVs are rich sources of vitamins and minerals, but fair sources of protein, which gets concentrated on dehydration (Anieke *et al.,* 2016). The present study was undertaken to evaluate the effect of three drying methods on the nutritional quality of spinach leaves.

MATERIALS AND METHODS

a) Sample collection: Fresh samples of vegetables such as *Spinacia oleracea* (Spinach) were purchased from a local market in Aurangabad.

b) **Sample preparation**: These samples were thoroughly washed with running tap water. These samples were dried in shade, Oven and Sun and finely fine powder was prepared which was used for further analysis.

1. **Sun Drying**:- 200 gm of each vegetable sample was used for the experiment. The fresh leafy vegetable was washed and evenly spread on a tray and allowed to dry in the sun for at least seven hours per day for four days until the vegetables were brittle and considered to be dry.

2. **Oven drying**:- 200 gm of each sample was washed in ordinary tap water. The leafy vegetable was oven dried at 65°c until properly dried.

3. **Shade drying**:- 200gm of each sample was washed in tap water. Shade drying in enclosed Cabinet drier which protect the drying vegetables from the direct sunlight is also practiced.

4. **Physico-chemical Analysis**:- The parameters studied were B-carotene, Calcium, phosphorus, Nitrogen and protein.

C. **Extraction of β-carotene**:- The B-carotene from the samples was separated by Holden's method. After extraction the reading was measured on single beam spectrophotometer (systronics) at the wavelength of 450nm.

D. Calcium (Ca): For determination of calcium (Ca), acid soluble ash fraction of the plant materials was utilized. In present method Ca in an aliquot is precipitated as calcium oxalate. This precipitates dissolved in acid and the content of oxalate ions determined by titrating with Potassium Permanganate (KMnO4). The amount of calcium was calculated by using an equation:1 ml of KMnO4 = 0.2004 mg of Ca

E. Phosphorus (P): In the present method, acid soluble portion of ash was diluted and treated with molybdate solution. It forms phosphomolybdic acid, was then reduced by the addition of 1,2, 4 - Aminonaphthol sulfonic acid (ANSA) reagent, which produces blue colour. The intensity of the colour was measured, which is proportional to the amount of phosphorus present.

F. Nitrogen (N): During the estimation of nitrogen dry sample was digested with concentrated Sulphuric acid (H_2SO_4) in the presence of catalyst. Nitrogen from the sample was precipitated in the form of ammonium sulphate ($(NH_4)_2\ SO_4$). Then it was allowed to react with strongly alkaline with sodium hydroxide (NaOH) solution, it released ammonia (NH3) was distilled into boric acid (H_3BO_3) solution. The ammonium tetra borate was formed, titrated against 0.035N hydrochloric acid for the determination of nitrogen (N).

G. Protein: On an average, most of the proteins have 16 % nitrogen in their composition. The amount of nitrogen content, when multiplied by 6.25, gives the protein (p) content of the sample.

RESULTS AND DISCUSSION

Effect of drying methods on β -Carotene and content of leafy vegetable sample i.e. Spinach (*Spinacia oleracea*) were studied using different drying methods.

To study the effect of storage condition by treating the vegetables with preservative using various methods of drying i.e. Shade, oven, sun drying, the level of β- carotene in Spinach was estimated. The amount of β-carotene (in µg/gm) recorded was 3.981 with shade drying. In case of oven drying the estimated carotene was 3.641 µg/gm and in sun drying it was 2.382 µg/gm. The amount of calcium estimated was (mg/100 ml) 26.05, 17.31 and 24.02 at various drying conditions. The observed phosphorus (mg/100 ml) value reported here from oven, shade, sun dried were 0.67, 0.57 and 0.51 mg/100 ml respectively. From dried samples Nitrogen content recorded was 2.66, 1.93, and 1.91. Protein content recorded was 16.62, 12.06, and 10.68. From the above observations it could be concluded that, variation in reading is due to location where vegetables grow, variety, soil type and temperature at which the leaves were dried. The highest value observed was from the sample which was shade dried.

Table: Effect of drying technique on Nutritional quality of Spinach

Methods of drying	Dry weight recorded	β-carotene µg/gm	Calcium (mg/100ml)	Phosphorus (mg/100 ml)	Nitrogen %	Protein %
Shade dry	24.98	3.981	26.05	0.67	2.66	16.62
Oven dry	13.59	3.641	17.31	0.57	1.93	12.06
Sundry	21.19	2.382	24.02	0.51	1.91	10.68

Preservation techniques such as drying methods are helpful to retain the nutrients from leafy vegetables. During present investigation among the three drying techniques studied, shade drying was most effective in increasing the B-Carotene content, Calcium, Nitrogen, and Protein from the vegetables. This method retains more dry weight along with neutraceuticals. The Dry matter and ash content of the Shade dried vegetable was recorded high compared to oven dried and sun dried samples. On the other hand they have beneficial effect on human health if more nutrients could retain. Leaf vegetables are widely used in human diet; as they are low in calories and fat and on the other hand high in dietary fibers, content of minerals, Carotenoids and Vitamins.

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