

Nutrient Analysis of Sweet Potato and Its Health Benefits

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ABSTRACT

Sweet potato (*Ipomea batatas* L.) is a dicotyledonous plant that belongs to the family convolvulacea. It is a short seasonal crop which reliably provides food on marginal and degraded land with little labor and few or no input outside the farm. The present study revealed that, sweet potato products are good sources of nutrients. Sweet potato chips, flakes and biscuits were prepared by using standard methods. Organoleptic evaluation was conducted. Results revealed that, SC-3 (sweet potato chips), SPF-3 (value added sweet potato flakes) and SB-2 (sweet potato biscuits) scored higher in all the sensory attributes. The nutrient composition of the products contained a good amount of protein, fat, energy, carbohydrate, ash, crude fibre, β -carotene and vitamin-C and also it contains better amount of minerals (potassium, magnesium, zinc, iron, copper, manganese and sodium). Shelf life study was carried out and the products were packed in an aluminium foil bags and kept for initial, 10th, 20th and 30th days of the interval. Results revealed that, the sensory scores for stored products were found to be significantly decreased, and found that, increased the microbial population in all the products, as the number of days increased. Consumer acceptance was conducted for 50 under graduate students of the University which were randomly selected. Results revealed that, the chips, flakes and biscuits were accepted by the consumers respectively. It can be concluded that, the sweet potato products contain appreciable amount of nutrients which can be developed into different products

Keywords: Sweet potato, Minerals, Chips, Flakes, Biscuits

INTRODUCTION

Sweet potato is not only a source of energy; it also supplies important nutrients mainly, vitamin A (beta carotene), Vitamin B₆, Vitamin C and Vitamin E as well as dietary fiber and they are low in fat and cholesterol. It serves as an important protein source for many world populations and is an important source

of starch and other carbohydrates. The carbohydrate content stored in roots varies from 25 per cent to 30 per cent, while the rest is composed of water (58 %-72 %). Sweet potato also contains some essential minerals and trace elements such as iron, potassium, calcium, zinc, sodium, magnesium and manganese (Srivastava et al., 2012).

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In addition to the nutritional values of sweet potatoes, it has been rediscovered as a functional food, containing high levels of various phytochemical which might have various health benefits (Hue et al., 2015).

The nutritionists in several developing countries compelled the evidence, lack of adequate essential vitamins and minerals in the diet of many children and adults. In India, about 40,000 children are affected every year by blindness mainly due to the deficiency of vitamin A and nearly half of the world's micronutrient deficiency may be found in the country. Various international efforts are being made since long back for alleviating vitamin A deficiency and thereby combating night blindness. From different approaches, mainly supplementation programme, distribution of vitamin capsules; fortification of common foods with micronutrients and the improvement of dietary quality through diversification of foods, and food based approach in achieving and maintaining adequate intake of micronutrient-rich foods. (WHO,1996).

MATERIALS AND METHODS

The present research study on “nutritional analysis of sweet potato (*Ipomea batatas* (L.)” was carried out in the department of Food Science and Nutrition, University of Agricultural Sciences, Bengaluru, during the year 2015-2016. Details of the experimental material used and methods adopted for the above research study are presented.

Procurement, packaging and storage of sample

Sweet potatoes were procured from the local market of Bangalore, which have good quality of uniform size and shape of the samples. The samples were immediately packed in Aluminum foil bags and were stored in refrigerator for subsequent analysis.

Dehydration of the samples

Sweet potato were cleaned and washed them made into slices and spread in hot air oven trays and allowed to dry at 60 ± 5 °C. Drying was continued till the sweet potato became crisp later made into powder and packed in an aluminum foil bag. Samples were weighed to calculate the per cent of dry matter with the formula, (Ranganna, 1986).

Weight of dehydrated sample

$$\text{Per cent Drymatter} = \frac{\text{Weight of dehydrated sample}}{\text{Weight of fresh sample}} \times 100$$

Weight of fresh sample

Chemical analysis of sweet potato and its products:

Chemical analysis of the products was carried out by using AOAC standard methods.

Estimation of moisture (AOAC, 1980)

Samples weighing 100g were taken and dried in oven at 60°C. Then the dried samples were weighed and this value was subtracted from the fresh weight of the sample to obtain moisture content.

Weight of the sample Before drying (g) - after drying (g)

$$\text{Percent Moisture} = \frac{\text{Weight of the sample Before drying (g) - after drying (g)}}{\text{Weight of the sample (g)}} \times 100$$

Weight of the sample (g)

Estimation of Protein (AOAC, 1980)

The protein content of the dried samples was estimated as per cent total nitrogen by

the Kjeldahl procedure. Protein per cent was calculated by multiplying the per cent nitrogen by the factor 6.25

$$\text{Per cent nitrogen (\% N)} = (V_a - V_b) 0.0014 \frac{V_1}{V_2} \frac{100}{W}$$

Estimation of fat (AOAC, 1980)

Fat was estimated as crude ether extract using moisture free sample. The solvent was

removed by evaporation and the residue of fat was weighed

$$\text{Fat content (g /100g)} = \frac{\text{Weight of ether extract}}{\text{Weight of sample taken}} \times 100$$

Estimation of crude fibre (AOAC, 1980)

Crude fiber of the sample was estimated by using moisture and fat free samples and expressed as g/100g of the sample

$$\text{Per cent of crude fiber (g/100g)} = \frac{\text{Loss in weight on ignition}}{\text{Weight of the sample used (g)}} \times 100$$

$$\frac{(W_2 - W_1) - (W_3 - W_1)}{\text{Weight of the sample used (g)}} \times 100$$

Preparation of mineral solution

The mineral solution was prepared by dissolving the ash obtained after ashing the sample in a muffle furnace and ash was mixed with dilute hydrochloric acid

Estimation of ash (AOAC,1980)

Total ash was estimated by taking about 5g of the sample into a crucible (which has previously been heated to about 600°C and

cooled). The crucible was placed on a clay pipe triangle and heated first over a low flame till all the material was completely charred followed by heating in a muffle furnace for about 4 to 5 hours at about 600°C. It was then cooled and weighed. This was repeated till two consecutive weights were same and the ash was almost white or grayish white in color.

$$\text{Ash content (g/100g sample)} = \frac{\text{Weight of the ash}}{\text{Weight of the sample}} \times 100$$

Estimation of Iron (AOAC, 1980)

The iron content of the sample was estimated by using atomic absorption spectrophotometer and the results were expressed in mg per 100grams of the sample

Estimation of Zinc (AOAC, 1980)

The zinc content of the sample was estimated by using atomic absorption spectrophotometer and the results were expressed in mg per 100 grams of the sample

Estimation of copper (AOAC, 1980)

The copper content of the sample was estimated by using atomic absorption spectrophotometer and the results were expressed in mg per 100 grams of the sample

Estimation of magnesium, (AOAC, 1980)

The magnesium content of the sample was estimated by using atomic absorption spectrophotometer and the results were expressed in mg per 100 grams of the sample

Estimation of potassium, (AOAC, 1980)

The potassium content of the sample was estimated by using atomic absorption spectrophotometer and the results were expressed in mg per 100 grams of the sample

Estimation of manganese, (AOAC, 1980)

The manganese content of the sample was estimated by using atomic absorption spectrophotometer and the results were expressed in mg per 100 grams of the sample

Estimation of Vitamin-C (Sadasivam and Manickam, 1991)

Ascorbic acid was determined colorimetrically. Ascorbic acid first dehydrogenated by bromination. The dehydroascorbic acid was then reacted with 2,4-dinitrophenyl hydrazine to form osazone

$$= \frac{0.5\text{mg}}{V_1\text{ml}} \times \frac{V_2}{5\text{ml}} \times \frac{100\text{ml}}{\text{Weight of the sample}} \times 100$$

Computation of carbohydrate (AOAC, 1980)

Carbohydrate content was calculated by differential method.

Carbohydrate (g/100 g) = 100 – [Protein (g) + Fat (g) + Ash (g) + Moisture (%)].

Computation of energy (AOAC, 1980)

Energy was calculated by differential method

Energy (kcal) = Protein(g)x4+Fat(g)x9+Carbohydrate (g)x4

and dissolved in sulphuric acid to give an orange-red colour solution which was measured at 540nm.

Ascorbic acid content was calculated as follows: Amount of ascorbic acid mg/100g of sample

The present study was carried out to know the chemical and nutritional composition of the sweet potato and its health benefits.

1 Chemical composition of sweet potato

Table-1 depicts the chemical composition of sweet potato. 100 g of sweet potato contained 62.20 per cent of moisture, 0.89g of protein, 0.20 g of fat, 148 K.cal of energy, 35.71 g of carbohydrate, 0.70g of crude fibre, 4.99 µg of β-carotene and 17.29 mg of Vitamin-C content.

RESULTS AND DISCUSSION**Table 1: Chemical composition of sweet potato per 100 g**

Nutrients	Sweet potato
Moisture (%)	62.20
Protein (g)	0.89
Fat (g)	0.20
Crude fibre (g)	0.70
Carbohydrate (g)	35.71
Energy(K cal)	148
β -Carotene (µg)	4.99
Vitamin – C(mg)	17.29
Ash (g)	1.20

Sweet potato contained 62.20 per cent of moisture, 0.89 g of protein, 0.20 g of fat content. The amount of energy contained 148 K.cal and 35.71 g of carbohydrate. The content of the crude fibre was found that, 0.70 g, 4.99 µg of β-carotene and 17.29 mg of Vitamin-C content. Antiaet *al.*, 2006 , reported that, sweet potato contain 24.85 per cent of crude protein, 4.90 per cent, 7.20 per cent of crude fibre,

11.01 per cent of ash, 51.95 per cent of carbohydrate, 82.20 per cent of moisture and 351.40K. Cal of energy content.

Mineral composition of the sweet potato

Mineral composition of the sweet potato presented in the table-5. Sweet potato contain potassium (300.02 mg), magnesium (19.09 mg), Zinc (0.11 mg), Iron (0.25 mg), manganese (0.22 mg) and sodium (2.60 mg).

Table 5: Mineral composition of sweet potato per 100g

Minerals	Sweet potato (mg/100g)
Potassium	300.02
Magnesium	19.09
Zinc	0.11
Iron	0.25
Manganese	0.22
Sodium	2.60

Sweet potato contain potassium (300.02 mg), magnesium (19.09 mg), Zinc (0.11 mg), Iron (0.25 mg), manganese (0.22 mg) and sodium (2.6 mg). Antia et al. (2006) reported that, sweet potato contain zinc (0.08 mg) and sodium (4.23 mg). Picha (2006) reported that, mineral content of sweet potato ranged from, potassium 245-403 mg/100g, magnesium 13-22 mg/100g and calcium 20-41 mg/100g.

CONCLUSION

The present research study was on “chemical and nutritional composition of sweet potato”. chemical composition of the sweet potato; chemical components. The results of the sweet potato were revealed that, 62.20 percent of moisture, 0.89 g of protein, 0.20 g of fat, 0.70 g of crude fibre, 4.99 µg of β-carotene, 17.29 mg of Vitamin-C, 35.71 g of carbohydrate, 148 K.cal of energy and 1.20 g of ash content. Mineral content was found in SPF2 potassium (152.1mg), magnesium (53.90mg), Zinc (1.08mg), Iron (8.62mg),copper (0.40mg), manganese (0.31mg) and sodium (11.67mg). SPF3 contain potassium (176 mg), magnesium (49.08 mg), Zinc (1.09 mg), Iron (7.04 mg), copper (0.33 mg), manganese (0.33 mg) and sodium (11.48mg).

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