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Studies on physical, chemical and microbial properties of sweet potato chips (*Ipomoea batatas* L.)

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Abstract

The present investigation was carried out to study physicochemical composition of Sweet Potato Chips. The different physicochemical properties of Sweet Potato Chips viz., moisture, fat, protein, carbohydrates, ash and were determined. Result obtained for proximate composition of Sweet Potato Chips revealed that moisture content was 4.0%, fat 27.5%, protein 4.3%, carbohydrates 57.3%, crude fibre 4.85%, and ash 3.0%. Physical composition shown that the shape was circular, colour was golden yellow to light brown, diameter 4.2 cm, thickness 0.1cm, weight 0.16 gm, circumference 13.29 cm and hardness measured was 20 N. The nutritional value of Sweet Potato Chips can have better suitability in value addition of food products. Sweet potatoes are rich in dietary fibre, vitamins, minerals, and antioxidants, making them a healthier choice for consumers seeking both taste and nutrition.

Keywords: Sweet potato chips, moisture, fat, protein, carbohydrates, ash, total plate count

Introduction

Sweet potato (*Ipomoea batatas* L.) is a tuber crop belonging to the family *Convolvulaceae*, widely cultivated in tropical and subtropical regions of the world such as India, China, and several parts of Africa and America (Woolfe, 1992) [13]. It is an important root vegetable valued for its high nutritional and economic significance. Sweet potato tubers are rich in carbohydrates, dietary fibre, vitamins (A, C, and B6), minerals such as calcium and iron, and natural antioxidants (Burri, 2011) [1]. The presence of beta-carotene provides the characteristic orange or yellow color and contributes to its role in improving vision and enhancing immunity (Laurie *et al.*, 2012) [4].

In India, sweet potato is grown mainly in the states of Odisha, Uttar Pradesh, Bihar, and Maharashtra (Nedunchezhiyan *et al.*, 2012) [5]. Traditionally, it is consumed in boiled, roasted, or baked form, but in recent years, there has been increasing interest in developing value-added products to enhance its utilization and market potential. Among these, sweet potato chips have emerged as a promising snack product due to their unique natural sweetness, crisp texture, and high nutritional content (Shah *et al.*, 2016) [9].

Sweet potato chips serve as a healthier alternative to conventional potato chips as they are rich in fibre, vitamins, and antioxidants, and contain relatively low fat when prepared under optimized frying or baking conditions (Ellong *et al.*, 2014) [2]. Moreover, the use of sweet potato in snack production helps in diversifying food products and reducing post-harvest losses of the crop (Padmaja, 2009) [7]. The growing demand for nutritious and convenient snack foods provides a strong basis for the development and commercialization of sweet potato chips as a functional and appealing product for health-conscious consumers (Singh *et al.*, 2015) [10].

Materials and Methods

The study was conducted in the Department of Food Plant Operation, Food Chemistry and Nutrition, Food Microbiology at K. K. Wagh College of Food Technology, affiliated with Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra.

The research focused on the development of a novel ready-to-eat snack, sweet potato chips, prepared using sweet potato, sunflower, spices seasoning.

All raw materials were purchased from local market of Nashik and were analysed for the nutrients namely moisture, protein, fat, ash, crude fibre carbohydrate content.

Fresh, mature sweet potatoes (*Ipomoea batatas* L.) of uniform size and good quality were bought from the local market (Nedunchezhiyan *et al.*, 2012) [5]. The tubers were washed properly under clean running water to remove dirt and soil. They were then peeled using a stainless-steel knife and sliced into thin, even pieces about 2-3 mm thick with the help of a slicer (Padmaja, 2009) [7].

Proximate Analysis

Different chemical properties of samples were analysed for moisture content, ash, fat, protein and total carbohydrate. All the determinations were done in triplicate and the results were expressed as the average value. (Talpad *et al.*, 2018) [11].

Moisture Content

Moisture content was determined adopting (AOAC, 2005) method as following:

$$\% \text{ Moisture Content} = \frac{\text{Loss in Weight}}{\text{Weight of Sample}} \times 100$$

Fat

(AOAC, 2005) Method using Soxhlet apparatus was used to determined crude fat content of the sample. The percent of crude fat was expressed as follows:

$$\% \text{ Crude Fat} = \frac{\text{Weight of Dried Either Soluble Material}}{\text{Weight of Sample}} \times 100$$

Protein: Protein content was determined using (AOAC, 2005) method. Percentage of nitrogen and protein calculated by the following equation:

$$\% \text{ Nitrogen} = \frac{\text{TS} - \text{TB} \times \text{Normality of acid} \times 0.014}{\text{Weight of Sample}} \times 100$$

Where,

Ts = Titre volume of the sample (ml),

TB = Titre volume of Blank (ml), 0.014= M eq. of N₂.

% Protein = Nitrogen × 6.25

Total carbohydrate

Total carbohydrate content of the samples were determined as total carbohydrate by difference, that is by subtracting the measured protein, fat, ash and moisture from 100 phenol sulphuric acid method as given by (AOAC, 2005).

Ash

Drying the sample at 100⁰ C and churned over an electric heater. It was then ashes in muffle furnace at 550⁰ C for 5 hrs. It was calculated using the following formula:

$$\% \text{ Ash Content} = \frac{\text{AW}}{\text{IW}} \times 100$$

Where, AW = Weight of Ash and IW= Initial weight of dry matter

Results and Discussion

Physical properties of Sweet Potato Chips

Various physical properties of Sweet Potato Chips were determined and results obtained are presented in Table 1.

Table 1: Physical Parameters of Sweet Potato Chips

Parameters	Result	Method
Shape & Size	Circular	Visual Observation
Color	Light yellow to orange Thin brownish skin	Visual Observation
Weight	0.5 g per slice	Digital Weighing Balance
Diameter	5.4 cm	Vernier Caliper
Slice Thickness	0.2 cm	Vernier Caliper
Circumference	16.96 cm	Circumference = $\pi \times \text{Diameter}$

*Each value represents the average of three determinations

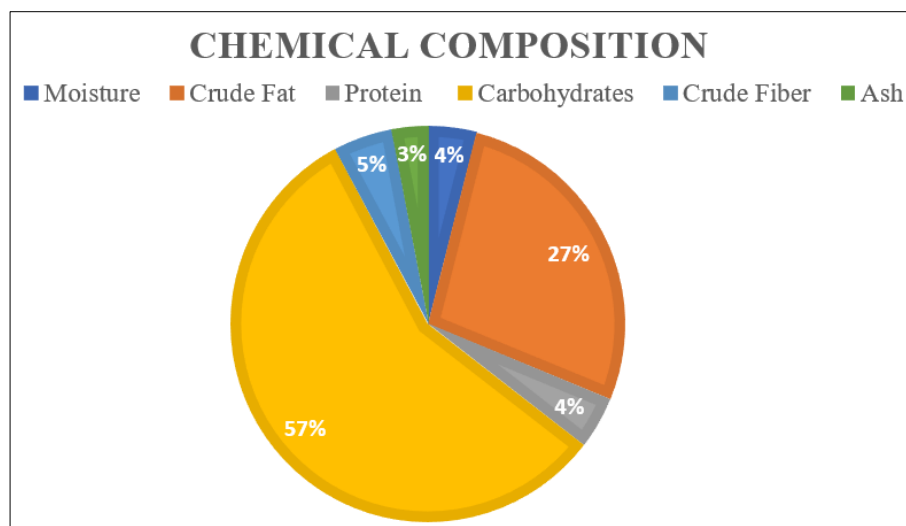
The data given in Table 1 shows the different physical characteristics of sweet potato chips. Colour plays an important role in deciding how appealing a product looks. The colour of sweet potato chips was observed to be light yellow to orange with a thin brownish skin and circular in

shape. Each chip slice weighed around 0.5 g, with an average diameter of 5.4 cm, circumference of 16.96 cm, and a slice thickness of 0.2 cm. These results were quite similar to those reported by Falade and Omojola (2010) [3] and Shittu *et al.* (2015) for sweet potato chips.

Table 2: Proximate composition of Sweet Potato Chips

Parameters	Mean Values*	SE± @5%	CD± @5%	Method Reference
Moisture	4.0%	0.058	0.25	AOAC (2000), IS:1155
Crude Fat	27.5%	0.058	0.25	AOAC (2000), IS:1011
Protein	4.3%	0.058	0.25	AOAC (2000), IS:7219
Carbohydrates	57.3%	0.058	0.25	AOAC (2000), IS:1656
Crude Fibre	4.85%	0.058	0.25	AOAC (2000), IS:10226
Ash Content	3.0%	0.058	0.25	AOAC (2000), IS:13654

*Each value represents the average of three determinations.



Graph 1: Graphical Representation of Proximate analysis

The chemical composition of the sample was analysed for major nutritional constituents, including moisture, fat, protein, carbohydrates, ash, and crude fibre. Revealed the moisture content was 4.0%, fat 27.5%, protein 4.3%, carbohydrates 57.3%, crude fibre 48.5%, and ash 3.0%.

Table 3: Microbial analysis of sweet potato chips

Storage Days	TPC (CFU/g)	Desirable Limits**
1	3.1×10^2	TPC 5.0×10^4 CFU/g
4	3.5×10^2	
8	3.9×10^2	
12	4.5×10^2	
16	5.1×10^2	
20	5.9×10^2	
24	7.0×10^2	

Conclusion

The present study on sweet potato chips revealed that the product possesses desirable physical, chemical, and sensory qualities, making it a promising value-added snack. The chips were found to have an appealing light yellow to orange colour with a crisp texture and pleasant taste. Proximate analysis showed a good balance of nutrients, with moderate fat and carbohydrate content, along with appreciable amounts of protein and fibre. The microbial analysis indicated that the chips were within safe consumption limits during the storage period. These results suggest that sweet potato chips can serve as a nutritious and convenient snack alternative to conventional potato chips. Hence, the development and promotion of such products can enhance the utilization of sweet potatoes and contribute to food diversification and nutritional security.

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