



# NUTRIENT ANALYSIS OF *IPOMOEA* *BATATAS* FLOUR AND SENSORY PROPERTY OF THE FORMULATED PRODUCT

**Dr. J. Gracia<sup>1</sup>, D. Anitha<sup>2</sup> and M. Jayalakshmi<sup>2</sup>**

Assistant Professor<sup>1</sup>, Student<sup>2</sup>,

Department of Food Science and Nutrition,  
The American College, Madurai, Tamil Nadu, India

**Abstract :** *Ipomoea batatas* (L.) Lam, commonly known as sweet potato belonging to the family Convolvulaceae, is an important root vegetable. It is a popular staple food of the tropical and subtropical areas with a nutritional benefit evidenced by the increase in its cultivation and consumption. The objectives of the study are to oven-dry the sample, to evaluate the nutrient content of the oven-dried dehydrated sample, to formulate the value-added product cake, and to find out the acceptability of cake by organoleptic evaluation. The samples used in the study were the *Ipomoea batatas*. The *Ipomoea batatas* sample used in this study was obtained from the local market, processed using Hot Air Oven Drying method. The nutrient content of *Ipomoea batatas* Such as carbohydrates, Protein, Fibre, Iron, Calcium, Sodium, Potassium, Phosphorous, Vitamin A, and Vitamin B1 were assessed. The Cake was prepared using the standard procedure. There were three different formulations as Standard cake (V1), 20gm oven-dried *Ipomoea batatas* incorporated cake (V1), and 25gm oven-dried *Ipomoea batatas* incorporated cake (V2). Sensory assessments were formulated based on the quality descriptions ie) appearance, color, flavor, taste, and texture. The sensory evaluation was carried out for the developed cake. Products were evaluated by a panel of 10 semi-trained judges. The results were expressed as mean  $\pm$  standard deviation (SD). The result revealed that the nutrient content of the oven-dried *Ipomea batatas* indicates the Carbohydrate 80.3g, Protein 3.50g, Fibre 46.4g, Iron 2.7mg, Calcium 145mg, Sodium 410mg, Potassium 746mg, Phosphorous 95mg, Vitamin A 121mcg, and Vitamin B1 0.10mg respectively. There are three different cake prepared in various proportions such as Standard Cake (V0), 20gm Oven-dried *Ipomea batatas* incorporated cake (V1), 25gm Oven-dried *Ipomea batatas* incorporated cake (V2). It helps to enhance the nutrient content of the product. The appearance of the Cake followed by V2 compared to V0 and V1. Based on the color of the product both V0 and V2 show the best compared to V1. The flavor of the product V1 shows the best compared to V0. Both V0 and V1 variations show the best for the taste of the product compared to the taste of V2. Thus the result shows that both V0 and V1 cake ie) Standard cookie and 20g of oven-dried *Ipomea batatas* shows the best compared to the others. Thus the present study concludes that according to the sensory evaluation chart the best variation among the three developed products is V2 cake ie) 25gm oven-dried *Ipomea batatas* powder incorporated cake. In the present study, we incorporate oven-dried *Ipomea batatas* powder as a base to avoid maida in a cake for health reasons.

**Keywords:** *Ipomoea batatas*, oven-dried, incorporated, formulated

## 1. INTRODUCTION

*Ipomoea batatas* (L.) Lam, commonly known as sweet potato belonging to the family Convolvulaceae, is an important root vegetable that is large, starchy, and sweet-tasting (Woolfe, 1992). Sweet potato is increasingly recognized as a health food, due to several of its nutraceutical components viz., dietary fiber, vitamin A, vitamin C, anthocyanins, xanthophylls, etc. The roots are considered as a highly functional, low-calorie food, with anti-diabetic effects (Kusano *et al.*, 2000). *Ipomoea batatas* (L.) Lam, are rich in antioxidants that have been studied for cancer prevention and treatment. Purple sweet potatoes, in particular, are high in anthocyanins which appear to promote apoptosis of cancer cells. Beta carotene, which is essential for eye health, is abundant in

sweet potatoes. Additionally, the fiber in any vegetable is known to reduce cholesterol, while the high potassium levels of sweet potatoes keep blood pressure down (NIHODS, 2020). The anthocyanins in sweet potatoes are also associated with anti-inflammatory effects that reduce the risk of heart disease. Certain pro-inflammatory cytokines appear to be suppressed in response to purple sweet potato extract (Sugata *et al.*, 2015).

*Ipomoea batatas* (L.) Lam, is a source of carbohydrate, rich in vitamin A and C (especially in yellow and orange flesh cultivars, but orange cultivars are much higher than yellow flesh cultivars), minerals, especially iron (Fe), phosphorus (P), and calcium (Ca). Sweet potato also contains proteins and fats in low concentrations in the tubers, while the leaves are rich in protein, vitamins, and minerals (Woolfe, 1992). It contains a significant amount of vitamins, most of which have powerful anti-inflammatory properties. Studies carried out on the purple sweet potato have conclusively shown that the extracts from the vegetable variant had the capability of inhibiting the production of active inflammatory components in the body. Studies have also shown that the purple-fleshed sweet potato is especially effective in the fight against cancer (Marcelia Sugata *et al.*, 2015).

*Ipomoea batatas* (L.) Lam contain soluble and fermentable fiber that increases satiety and offers the body a natural, self-sustaining mechanism for body weight regulation (Clare L Adam *et al.*, 2015). Sweet potatoes can help in controlling blood pressure because they are rich in both magnesium and potassium. Studies have shown that a higher intake of potassium results in a decrease in blood pressure, which then significantly reduces the chance of an individual developing a stroke or a coronary problem (Connie M Weaver, 2013).

*Ipomoea batatas* (L.) Lam, flour has become a key solution for the production of new products in the current global habitation. It has a high-energy, low-protein, and has been reported to be of good biological value (Hal *et al.*, 2000). Sweet potato (*Ipomea batatas*) is now considered a valuable source of unique natural products, including some that can be used in the development of medicines against various diseases and in making industrial products. It is an important food crop, which is widely grown in tropical, subtropical, and warm temperate regions (Remya Mohanraj, 2014). *Ipomoea batatas* (L.) Lam, tubers have anti-diabetic, anti-oxidant and anti-proliferative properties due to the presence of valuable nutritional and mineral components (Abubakar *et al.*, 2010). Sweet potato is a nutritious food for humans and animals (Woolfe, 1992).

The **objectives of the study** are to oven-dry the sample, to evaluate the nutrient content of the oven-dried dehydrated sample, to formulate the value-added product cake, and to find out the acceptability of cake by organoleptic evaluation.

## 2. MATERIALS AND METHODS

The samples used in the study were the *Ipomoea batatas*. The *Ipomoea batatas* sample used in this study was obtained from the local market in Simmakal in Madurai, Tamilnadu. The experiment was conducted in a laboratory at the Department of Food Science and Nutrition, The American College, Madurai, Tamilnadu.



### 2.1 Processing of *Ipomoea batatas*

The selected samples were cleaned with tap water to make the sample free from foreign materials.

#### Flowchart for processing of *Ipomoea batatas*



The *Ipomoea batatas* were collected freshly and it was weighed before and after washing and cut into small pieces. The technique used in this present study for dehydration was Hot Air Oven Drying. The sliced *Ipomoea batatas* were placed in an oven tray. Then the tray was placed inside the Hot air oven for about 3 to 4 hours at 65°C to 70°C. It was turned occasionally to ensure even drying. It was kept in original quality. They were stored in room temperature until use.

### 2.2 Nutrient content of *Ipomoea batatas*

The nutrient content of *Ipomoea batatas* Such as Carbohydrate, Protein, Fibre, Iron, Calcium, Sodium, Potassium, Phosphorous, Vitamin A and Vitamin B1 were assessed.

**2.3 Formulation of Cake**

The Cake was prepared using the standard procedure. The ingredient such as wheat flour 100gm, sugar 100gm, butter 100gm, egg 2 nos, salt, milk 15ml, baking powder were used for the preparation of cake. Preheat the oven at 180 degree Celsius for 10 minutes. Beat the butter and powdered sugar together in a large bowl with a electric beater until it attain the fluffy & pale white colour, and add eggs one by one and beat for 1minute. Mix the dry ingredients - the wheat flour, baking powder, salt & sweet potato flour together & sieve it well. Add the flour mixture together with the cream mixture and mix it well together until it just been combined. The cake batter is ready. Pour the cake batter in a greased cake mould. And Bake it at 180 degree Celsius for 30 to 35 minutes. Bake until the cakes are lightly golden on top. After that transfer to racks and let it cool for 10 minutes. And now the cake is ready to serve.

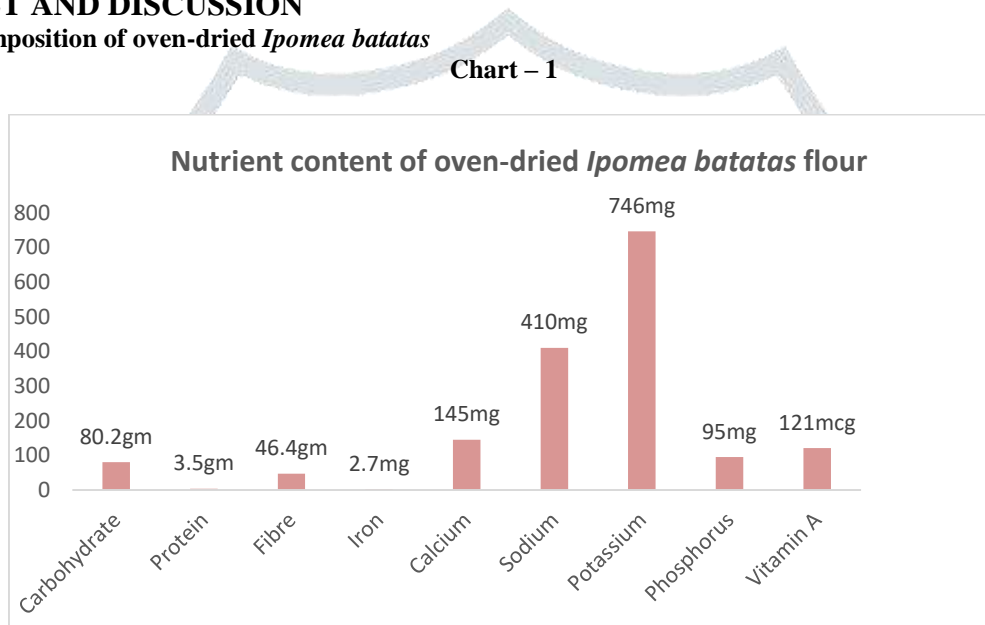
There were three different formulations such as Standard cake (V1), 20gm oven-dried *Ipomoea batatas* incorporated cake (V1) and 25gm oven-dried *Ipomoea batatas* incorporated cake (V2).

**2.3.1 Sensory Evaluation for the formulated products**

Sensory assessments were formulated based on the quality descriptions ie) appearance, colour, flavor, taste and texture. The sensory evaluation was carried out for the developed cake. Products were evaluated by a panel of 10 semi trained judges from the Department of Food Science and Nutrition, The American College, Madurai. A 9-point Hedonic scale ranging from 1 to 9, were used to evaluate the acceptability off the sample. Data analyzed are mean values of each determination ± standard deviation (SD). Data were analyzed using the statistical software of SPSS. The results were expressed as mean ± standard deviation (SD).

**3. RESULT AND DISCUSSION**

**3.1 Nutrient Composition of oven-dried *Ipomoea batatas***



The nutrient content of the oven dried *Ipomoea batatas* indicate the Carbohydrate 80.3g, Protein 3.50g, Fibre 46.4g, Iron 2.7mg, Calcium 145mg, Sodium 410mg, Potassium 746mg, Phosphorous 95mg, Vitamin A 121mcg and Vitamin B1 0.10mg respectively.

Nia Kurnianingsih *et al.*, 2011 revealed the potential candidate of nutrition from purple sweet potatoes of West Java and Central Java cultivar, both cultivars were assumed as excellent source of energy and amino acids compound.

The results of Claudia *et al.*, (2011).states that the physicochemical composition highlight the formulations with higher moisture contents; higher ash contents, and with lower fat contents.

**3.2 Formulation and Sensory Evaluation of cake**

There are three different cake prepared in various proportions such as Standard Cake (V0), 20gm Oven dried *Ipomoea batatas* incorporated cake (V1), 25gm Oven dried *Ipomoea batatas* incorporated cake (V2). It helps to enhance the nutrient content of the product.

**Table – 1**  
**Mean and standard deviation for the developed Cake**

	Appearance	Color	Flavour	Taste	Texture
<b>V0</b>	1.60 ± 1.07	1.7 ± 0.82	2.0 ± 1.15	1.9 ± 0.99	1.2 ± 0.42
<b>V1</b>	1.60 ± 0.69	1.4 ± 0.69	2.1 ± 0.99	1.9 ± 0.73	1.1 ± 0.31
<b>V2</b>	2.0 ± 1.24	1.7 ± 0.94	1.7 ± 1.05	1.5 ± 0.70	1.1 ± 0.31

V0 - Standard cake

V1 - 20 g of Oven dried *Ipomoea batatas* incorporated cake

V2 - 25g of Oven dried *Ipomoea batatas* incorporated cake

The above table shows the mean and standard deviation of the developed Cake. The appearance of the Cake followed by V2 compared to V0 and V1. Based on the colour of the product both V0 and V2 shows the best compared to V1. The flavour of the product V1 shows the best compared to V0. Both V0 and V1 variation shows the best for the taste of the product compared to the taste of V2. Thus the result shows that both V0 and V1 cake ie) Standard cookie and 20g of oven dried *Ipomea batatas* shows the best compared to the others.

Claudia et al., (2011) Formulations had the highest acceptability index, and could be an alternative for industrial processing of sweet potato for possible commercialization. The overall liking of sweet potatoes was driven by flavor liking followed by texture liking. The lack of blindfold positively impacted consumer acceptance for two samples that were distinct in color (orange and yellow) with high and low color liking scores, respectively. This suggests that color liking may not be a major driver of overall acceptance (Leksrisompong, 2011).

## Conclusion

The sample *Ipomea batatas* are analyzed in the present study by their medicinal properties and health benefits. The nutrient content of the oven-dried sample was evaluated and the cake was formulated. According to the sensory evaluation chart the best variation among the three developed products is V2 cake ie) 25gm oven-dried *Ipomea batatas* powder incorporated cake. We incorporate oven-dried *Ipomea batatas* powder as a base to avoid maida in a cake for health reasons. Thus, this study will be a key to future research.

## REFERENCES

- [1] Abubakar HN, Olayiwola IO, Sanni SA, Idowu M. A. 2010. Chemical composition of sweet potato (*Ipomoea batatas* Lam) dishes as consumed Marczak *et al* Page 177 in Kwara state, Nigeria. *International Food Research Journal* 17, 411–416.
- [2] Clare L Adam, Patricia A Williams, Karen E Garden, Lynn M Thomson, Alexander W Ross, 2015. Dose-dependent effects of soluble dietary fiber (pectin) on food intake, adiposity, gut hypertrophy and gut satiety hormone secretion in rats
- [3] Claudia Denise De Paula, Yenis Ibeth Pastrana-Puche, Karen Margarita Viloria-Benítez, Jose Antonio Rubio-Arrieta, Monica Simanca-Sotelo, Beatriz Alvarez-Badel, Yomar Avilez-Montes, 2021. Physicochemical and sensory evaluation of sweet potato (*Ipomoea batatas* L.) restructured products produced in the Sinu Valley, Colombia. *Heliyon* 7 (e07691).
- [4] Connie M Weaver, 2013, Potassium and health, PMID: **23674806** PMC3650509 DOI: 10.3945/an.112.003533
- [5] Hal, M. V. A. N. Quality Of Sweet potato Flour During Processing And Storage. *Food Rev. Int.* 2000, 16(1), 37–41.
- [6] Indonesia Nia Kurnianingsih, Retty Ratnawati, Tommy Alfandy Nazwar, Mulyohadi Ali, Fatchiyah Fatchiyah, 2011. A Comparative Study on Nutritional Value of Purple Sweet Potatoes from West Java and Central Java, *Journal of Physics: Conference Series* 1665 (2020) 012011 IOP Publishing doi:10.1088/1742-6596/1665/1/012011 1
- [7] Kusano, S. and Abe, H. 2000. Anti-diabetic activity of white-skinned sweet potato (*Ipomoea batatas* L. in obese Zucker fatty rats. *Biol. Pharm. Bull.* 23 (1): 23–26.
- [8] Leksrisompong, M.E. Whitson, V.D. Truong and M.A, 2011. Drake sensory attributes and consumer acceptance of sweet potato cultivars with varying flesh colors, *Journal of Sensory Studies*, joss\_367 59.69 P.P. ISSN 0887-8250.
- [9] Marcelia Sugata, Chien-Yih Lin, and Yang-Chia Shih - 05 OCT 2015, Anti-Inflammatory and Anticancer Activities of Taiwanese Purple-Fleshed Sweet Potatoes (*Ipomoea batatas* L. Lam) Extracts
- [10] National Institutes of Health Office of Dietary Supplements. Potassium fact sheet for health professionals. Updated June 3, 2020.
- [11] Remya Mohanraj, Subha Sivasankar, 2014. Sweet Potato (*Ipomoea batatas* [L.] Lam) - A Valuable Medicinal Food: A Review. *Journal of medicinal food*, 17 (7), 733–741.
- [12] Sugata M, Lin CY, Shih YC. Anti-Inflammatory and anticancer activities of Taiwanese purple-fleshed sweet potatoes (*Ipomoea batatas* L. Lam) extracts. *Biomed Res Int.* 2015; 2015:768093. doi:10.1155/2015/768093
- [13] Woolfe JA, 1992, Sweet Potato Past and Present. In: *Sweet Potato: An Untapped Food Resource*, Cambridge University Press, Cambridge, 1992, pp. 15–40.