# Health Benefits of Sweet potato (*Ipomoea batatas* Linn.)

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## Abstract

This research deals with preliminary phytochemical investigation, determination of nutrient values and extraction of protein from two types of sweet potato (*Ipomoea batatas* Linn.) (yellow and purple). In both samples, alkaloids, α-amino acids, carbohydrates, flavonoids, glycosides, organic acids, phenolic compounds, reducing sugars, saponins, starch, tannins, terpenoids and steroids were found to be present according to preliminary phytochemical tests. Nutritional values analyses showed that fresh yellow and purple sweet potato samples contained 7.91 % and 8.65 % of moisture, 1.10 % and 1.51 % of fat, 5.23 % and 5.88 % of fiber, 3.31 % and 3.31 % of ash, 0.88% and 1.75 % of protein, 81.57 % and 78.90 % of carbohydrate and 340.5 kcal/100 g and 336.19 kcal/100 g of energy value (based on dried sample) respectively. Where as in the boiled yellow and purple sweet potato samples 7.67 % and 7.86 % of moisture, 0.92 % and 0.62 % of fat, 4.62 % and 5.15 % of fiber, 2.91 % and 1.86 % of ash, 0.88 % and 1.75 % of protein, 83.0 % and 82.76 % of carbohydrate and 343.8 kcal/100 g and 343.62 kcal/100 g of energy value were respectively observed (based on dry samples). The yield percent of crude protein and protein contents were determined (2.66 %) and (22.65 %) of yellow sweet potato fresh, (2.82 %) and (23.35 %) in yellow sweet potato boiled, (1.93 %) and (22.42 %) of purple sweet potato fresh and (1.72 %) and (21.85 %) of purple sweet potato boiled were also determined respectively.


***Keywords*:** *Ipomoea batatas* Linn., (sweet potato), phytochemical constituents, nutritional values, extraction of protein

## Introduction

Sweet potato (*Ipomoea babatas* Linn.) is one of the world's important food crops and it is a major food crop in developing countries. Sweet potato ranks as the world's seventh most important food crop after wheat, rice, maize, potato, barley, and cassava. Sweet potato is mainly produced in marginal soils in low-input subsistence farming systems of developing countries where it is a large quantity (Woolfe, 1992).

The tuber crop also comes to mind because of its nutrient composition which helps to elevate the nutritional problems midst us. Sweet potato, nutritional composition of the tuber crop must be known by the people. It roots are excellent source of carotenoids, potassium, iron and calcium. Their roots are tubers and vary in shape, size and color, depending on the cultivar and the environment in which they are produced (Clark, 1988)

(a) the tuber of purple sweet potato (b) the tuber of yellow sweet potato

Figure 1 Photographs of the two typesof sweet potatoes (*Ipomoea batatas* Linn.)

## Uses of Sweet Potatoes

*Ipomoea batatas*Linn. used to treat wounds include debridement, irrigation, use as antiseptics, antibiotic and corticosteroid therapy, and tissue grafts. However, these methods are

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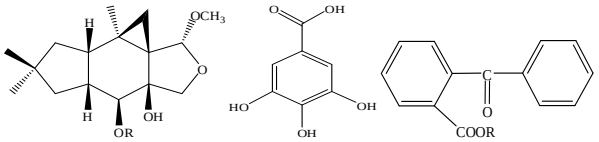
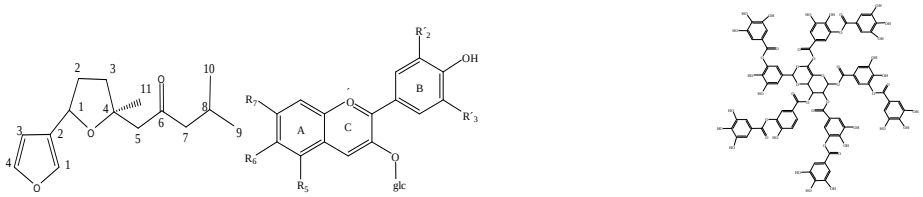
associated with unwanted side effects such as potential for bacterial resistance, bleeding, tissue damage, contact dermatitis and delay in wound healing(Mrityunjog, 2007).



Sesquiterpene Phenolic acid Phenolic ester



Ipomeamarone Anthocyanin Polyphenol

Figure 2 Structure of some chemical compounds of sweet potato

## Materials and Methods

### Sample Collection and Preparation of *Ipomoea batatas*Linn. (Sweet potato)

Two types of sweet potatoes yellow and purple (*Ipomoea batatas* Linn.) shown in Figure1 were purchased from Letpadan Township, Bago Region in August 2012. Peal and foreign impurities fresh sweet potatoes and boiled sweet potatoes removed. These samples were ground into powder in an electric blender and stored in airtight container.

### Preliminary Phytochemical Test on *Ipomoea batatas* Linn. (Sweet potato)

Preliminary phytochemical examination was carried out on dried powder of sweet potato with a view to determine the presence or absence of alkaloids, α-amino acids, carbohydrates, flavonoids, glycosides, organic acids, phenolic compounds, reducing sugars, saponins, starch, tannins, steroids and terpenoids according to the standard procedures. (Trease and Evans).

### Determination of Nutritional Value of *Ipomoea batatas* Linn. (Sweet potato)by AOAC Method

The moisture content of Sweet potato was determined by oven drying method. The nitrogen content was determined by Kjedahl digestion method and protein content was calculatedby multiplying percent nitrogen by the factor 6.25. Fibre was determined by acid, alkali treatment (Pearson, 1982).The fat content was determined by Soxlet extraction method using petroleum ether (b.p 60-80ºC) run for 8 hours. The ash content was determined by placing sample in preweighed crucible and placed in in a muffle furnace at 500 ºC for 6 hours. Percent carbohydrate was determined by calculation (Mark and Stewart, 1975, Pearson, 1981, Joslyn, 1973, AOAC, 2000, Anderson, 1984, Atwater and Woods, 1970).

### Extraction of Protein

### General Procedure

A suspension of defatted samples in water was stirred for 1 min. The pH was then adjusted to the desired value by adding drops of 20 % sodium hydroxide solution. Stirring was continued for 30 minutes, while the pH was checked every 10min and readjusted, if necessary. After centrifugation, the supernatant was filtered to remove floating particles. The residue was re-suspended in water and the same procedure was repeated twice. Combined aliquot of the supernatant was acidified to pH – 4.5 by adding drops of 20 % HCl. After standing at room temperature for 1hr, the protein precipitate was filtered under suction and washed thoroughly

with water. Then, it was left to dry in air to get a constant weight and kept in air tight container.

## Results and Discussion

### Sample Collection of two Types of Sweet Potatoes

Samples of two sweet potatoes (yellow and purple) were purchased from Letpadan Township, Bago Region in August 2012. The samples were air dried about one week to reduce its moisture content and hence to minimize spoilage during storage. The purified and dried samples were stored in air tight container.

### Phytochemical Investigation of Sweet Potato Samples

Phytochemical investigation was carried out to know the types of phytoorganic constituents present in selected two sweet potatoes samples (*Ipomoea batatas* L.). According to these results, alkaloids, α-amino acids, carbohydrates, flavonoids, glycosides, organic acids, phenolic compounds, reducing sugars, saponins, starch, tannins, terpenoids and steroids were present in two sweet potato samples.

### Investigation of Nutritional Values of two Types of Sweet Potatoes

Composition and nutrient contents (moisture, fat, fiber, ash, protein, carbohydrate and energy) of sweet potatoes were investigated by standard methods. The energy values were obtained by calculation using the Atwater general factor system (Atwater and Woods, 1896).

The moisture contents of fresh sweet potatoes of yellow and purple were found to be 7.91 % and 8.65 % respectively. The moisture contents of boiled sweet potatoes were also determined. The values of moisture contents of boiled sweet potatoes of yellow and purple were 7.67 % and 7.86 % respectively. In literature, the amount of sweet potatoes of moisture content in fresh and boiled were usually reported as 9.67-11.81 % and 24.92 ± .29 % respectively (Odebunmi, 2007 and Abubakar, 210).

The fat contents in fresh sweet potatoes of yellow and purple were found to be 1.10 % and 1.51 % respectively. The fat contents of boiled sweet potatoes were also determined 0.92 % and 0.62% respectively. In literature, the amounts of fat in fresh and boiled sweet potatoes were usually reported 0.94 – 1.32 % and 0.30 ± 0.02 % respectively (Odebunmi, 2007 and Abubakar, 2010). Fat serves various purposes in the diet. It provides a high value of energy carrier essential fatty acids and fat soluble vitamins (Heinemann, 1980).

Fiber content of fresh sweet potatoes in yellow and purple was observed to be 5.23 % and 5.88 % respectively. The fiber contents of boiled sweet potatoes were also determined. The fiber contents in yellow and purple boiled sweet potatoes were 4.62% and 5.15 % respectively. In literature, the fiber contents of fresh and boiled sweet potatoes are reported as 1.90 – 3.00 % and 0.84 ± 0.06 % respectively (Odebunmi, 2007 and Abubakar, 2010).

The ash content of fresh sweet potatoes yellow and purple were found to be the same, 3.31 %. The ash content of boiled sweet potatoes was also determined. The ash contents boiled sweet potatoes of yellow and purple were observed to be 2.91 % and 1.86 % respectively. In literature, the amount of sweet potatoes of ash contents in fresh and boiled were usually reported by 1.26 – 2.33 % and 0.84 ± 0.06 % respectively (Odebunmi, 2007 and Abubakar, 2010).

The value of protein contents in fresh sweet potatoes (yellow and purple) were 0.88 % and 1.75 % respectively. The protein contents boiled sweet potatoes of yellow and purple were observed to be 0.88 % and 1.75 % respectively. In literature, the protein contents sweet potatoes in fresh and boiled were usually reported as 1.31 – 3.72 % and 2.27 ± 0.2.25 %

(Odebunmi, 2007 and Abubakar, 2010). The result of the proximate analysis have revealed that sweet potato samples were rather low in protein contents as compared to recommended daily requirement of 45 – 50 g of protein a day for a healthy person. Protein content (nitrogen content × 6.25) was measured by Macro Kjedahl Method (AOAC, 2000). The main work of protein is to build the body and to provide the requirements to the body.The high crude protein content of sweet potatoes may encourage its use as high proteinsources in some food formulation (Ruth, 1977).

The carbohydrate contents of the diet were calculated by difference. The carbohydrates in our diet are over most of our energy requirement. Two extraction parameters including yellow and purple of fresh sweet potatoes were determined 81.75 % and 78.90 % respectively. The another extraction parameters including yellow and purple of boiled sweet potatoes were also determined 83.0 % and 82.76% respectively. In literature, the carbohydrate content of fresh sweet potatoes was usually found 70.09 – 83 .19 % (Odbunmi, 2007). Another carbohydrate contents were found in boiled sweet potatoes 70.54 ± 0.55 % (Abubakar, 2010).

Table 1 Some Nutritional Values of *Ipomoea batatas* L. (Sweet Potato) Samples

| No. | Parameters | Content ( % ) | | | | Literature* (Fresh) | Literature** (Boiled) |
|---|---|---|---|---|---|---|---|
| | | Yellow (Fresh) | Yellow (Boiled) | Purple (Fresh) | Purple (Boiled) | | |
| 1. | Moisture (%) | 7.91 | 7.67 | 8.65 | 7.86 | 9.67 – 11.81 | 24.92 ± 0.29 |
| 2. | Fat (%) | 1.10 | 0.92 | 1.51 | 0.62 | 0.94 –1.32 | 0.30 ± 0.02 |
| 3. | Fiber (%) | 5.23 | 4.62 | 5.88 | 5.15 | 1.90 –3.00 | 0.84 ± 0.06 |
| 4. | Ash (%) | 3.31 | 2.91 | 3.31 | 1.86 | 1.26–2.33 | 1.13 ± 0.10 |
| 5. | Protein (%) | 0.88 | 0.88 | 1.75 | 1.75 | 1.31 – 3.72 | 2.27 ± 2.25 |
| 6. | Carbohydrate (%) | 81.57 | 83.0 | 78.90 | 82.76 | 70.09 – 83.19 | 70.54 ± 0.55 |
| 7. | Energy value (kcal/100 g) | 340.5 | 343.8 | 336.19 | 343.62 | 294.06 – 359.52 | 293.94 ±11.38 |

* Odebunmi, 2007, **Abubakar, 2010

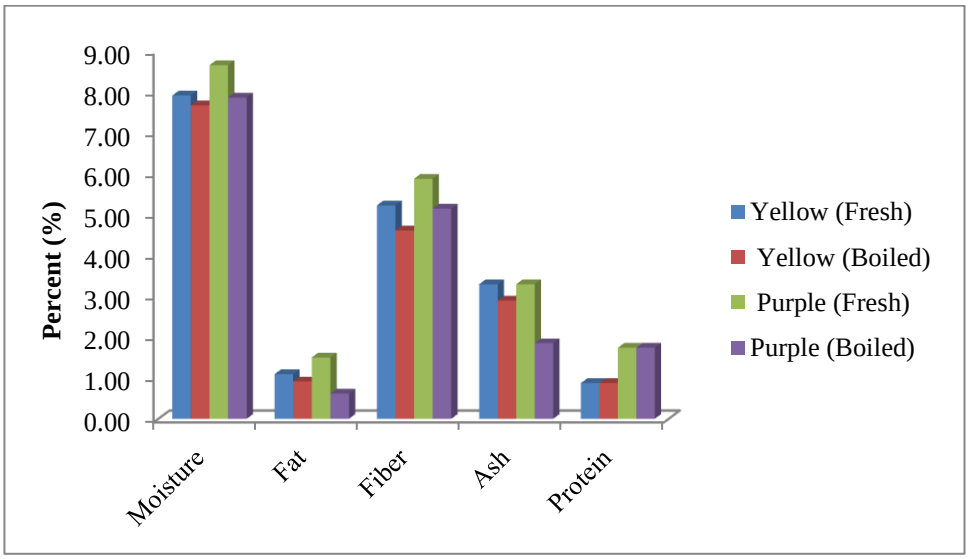



Figure 3 Diagram for moisture, fat, fiber, ash and protein of fresh (yellow and purple) and boiled (yellow and purple) of sweet potato samples

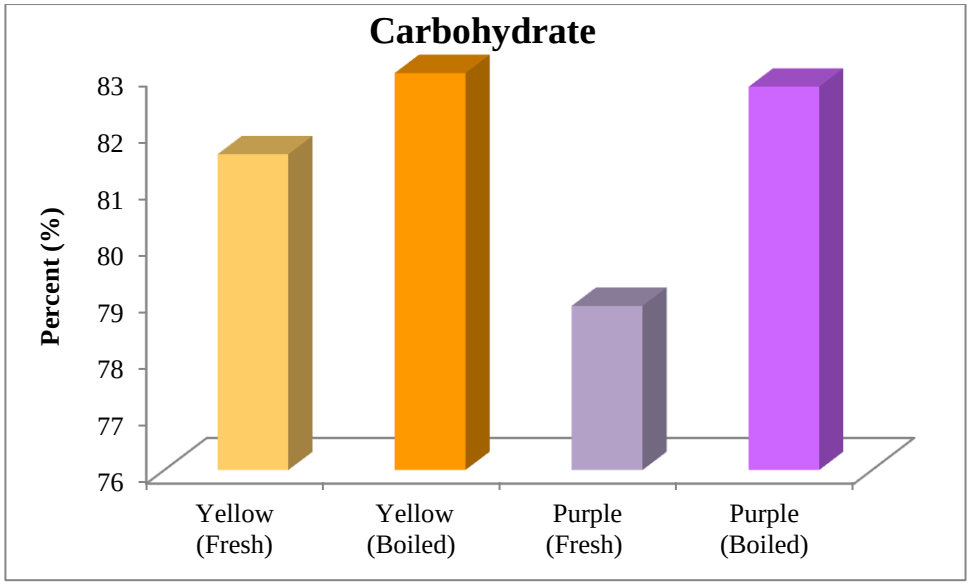



Figure 4 Diagram for carbohydrate contents of fresh (yellow and purple) and boiled (yellow and purple) of sweet potato samples

Food energy of fresh sweet potatoes samples were determined in yellow and purple (340.5 kcal/100g and 336.19 kcal/100g) respectively. Food energy of boiled sweet potatoes were also determined in yellow and purple (343.80 kcal / 100 g and 343.62 kcal / 100 g), respectively.

In terms of food energy, one calorie expresses to quantity of heat needed to raise the temperature of 1 kg (1 L) of water 1 ºC (specifically, from 14.5 to 15.5 ºC). Samples were in good agreement with those reported data in literature. In addition, sweet potato is grown in Myanmar, is an abundant and inexpensive source of protein readily available (Antonio and Kurozawa, 2006).

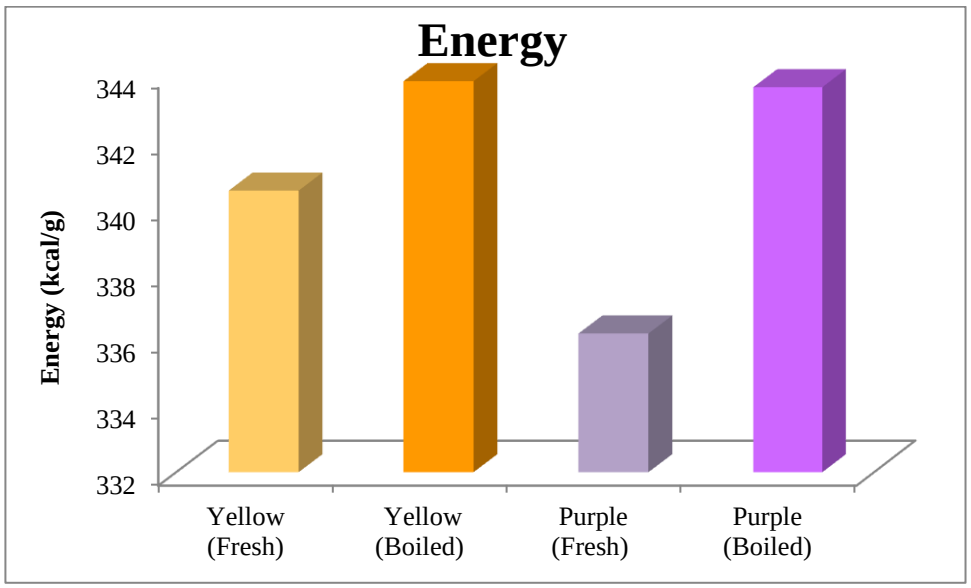



Figure 5 Diagram for energy values of fresh (yellow and purple) and boiled (yellow and purple) of sweet potato samples

Table 2 Yield Percent of Crude Proteins and Protein Contents in Crude Protein Extract from Sweet potato Samples

| Sr No. | Samples | Yield (%) | Protein contents (%) | |
|---|---|---|---|---|
| | | | Experimental | FIDSL |
| 1. | YSPFCP | 2.66 | 22.65 | 24.31 |
| 2. | YSPBCP | 2.82 | 23.35 | 25.89 |
| 3. | PSPFCP | 1.93 | 22.42 | 24.13 |
| 4. | PSPBCP | 1.72 | 21.85 | 23.35 |

YSPFCP = Yellow Sweet Potato Fresh Crude Protein

YSPBCP = Yellow Sweet Potato Boiled Crude Protein

PSPFCP = Purple Sweet Potato Fresh Crude Protein

PSPBCP = Purple Sweet Potato Boiled Crude Protein

FIDSL = Food Industry Development Supporting Laboratory

## Conclusion

In the present research work, the protein content in the selected two types of sweet potatoes (*Ipomoea batatas* Linn.) (yellow and purple) were chosen for investigation of some chemical constituents.

Preliminary phytochemical investigation of both samples indicated the presence of alkaloids, α-amino acids, carbohydrates, flavonoids, glycosides, organic acids, phenolic compounds, reducing sugars, tannins, saponins, starch, terpenoids and steroids.

Nutritional values analyses showed that fresh yellow and purple sweet potato samples were found to contain 7.91 % and 8.65 % of moisture, 1.10 % and 1.51 % of fat, 5.23 % and 5.88 % of fiber 3.31 % and 3.31 % of ash, 0.88 % and 1.75 % of protein, 81.57 % and 78.90 % of carbohydrate (based on dried sample) respectively. The boiled yellow and purple sweet potato samples were found to contain 7.67 % and 7.86 % of moisture, 0.92 % and 0.62 % of fat, 4.62 % and 5.15 % of fiber, 2.91 % and 1.86 % of ash, 0.88 % and 1.75 % of protein, 83.0 % and 82.76 % of carbohydrate (based on dried samples).The energy of fresh sweet potato sample of yellow and purple were calculated (340.5 kcal/100g and 336.19 kcal/100 g). The energy values of boiled sweet potatoes of yellow and purple were also calculated (343.8 kcal/100 g and 343.62 kcal/100 g), respectively.

The yield percent of crude protein and protein contents were determined (2.66%) and (22.65 %) in fresh yellow sweet potato, (2.82 %) and (23.35 %) in boiled yellow sweet potato, (1.93 %) and (22.42 %) in fresh purple sweet potato and (1.72 %) and (21.85 %) in boiled purple sweet potato.

Boiled sweet potato samples were found to be greater than fresh sweet potato in energy value. Yellow sweet potato samples were found to be greater in energy value than purple sweet potato. So we can get more energy values by eating the yellow sweet potato than purple sweet potato.

This study revealed that consumption of sweet potato can give high nutritional values but low fat. Moreover the appreciable protein and crude fiber in the sweet potato sample gives it an added value for its consumption to be encouraged.Sweet potato, grown in Myanmar, can be used functional ingredients in processed foods. It is an abundant and inexpensive source of protein readily available.

## Acknowledgements

I would like to express my gratitude to Rector, Dr Tin Maung Hla, Yangon University of Distance Education, for his generous permission to do this research paper.Thanks also go to Pro-rectors, Dr Mar Lar Aung, and Dr Khin Thant Zin,Yangon University of Distance Education, for sharing their thoughtful ideas. I would like to thank Dr Thazin Lwin, Professor and Head of Department of Chemistry, Yangon University of Distance Education, for her kind help and close guidance. I also thanks to Rector, Dr Winn Naing, Dagon University to allow to participate in this Research Journal.

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