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An Experimental Approach on the Study of Purple Sweet Potato (Myanmar Origin): Proximate Composition and Phytochemical Analysis

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Abstract: Fresh purple sweet potato (PSP) contains moisture 66.40%, crude protein 1.26%, crude fat 0.08%, ash 1.08%, crude fibre 1.10%, and total carbohydrate 30.08%. The biologically active compounds present in PSP sample (phytochemicals) are found in the screening test as; carbohydrate, glycoside, phenolic compound, anthocyanin, amino acid, saponin, flavonoid, reducing sugar and starch except alkaloid, tannin, steroid, terpenoid and cyanogenic glycoside which were totally absent in it.This paper mainly deals with the collection of PSP, the extraction of active compounds from the dried PSP powder, and qualitative analysis of phytochemicals in screening tests,as part of the research work of PSP wine production. The experimental data demonstrates that PSP present in Myanmar is one of the potential plant(tuber) for therapeutic use and provide health benefits for human.

Keywords: PSP, phytochemicals, cyanogenic glycoside

1. INTRODUCTION

Sweet potato (*Ipomoea batatas* (L.) Lam), a fairly drought-tolerant crop is widely grown throughout the world, primarily in the tropics and subtropics. In addition, it has various skin and flesh colour from white to yellow, orange, light purple to deep purple. Sweet potato ranks the sixth most important crops after rice, wheat, potatoes, maize and cassava. Globally, the annual sweet potato production accounts up to more than 105 million metric tons[1].

Purple sweet potato contains carbohydrates, minerals, vitamins, anthocyanins, dietary fiber and has a Glycemic Index(GI) is low, In terms of its chemical composition, PSP potentially be used as a source of carbohydrates, vitamins, minerals and antioxidants such as phenolic acids, tocopherols, anthocyanins and β-carotene[2].

Purple sweet potato(PSP) is a special type of sweet potato, and there is high content of anthocyanin pigments in the roots of some sweet potato cultivars[3]. It contains relatively high acylated anthocyanins, with mainly cyanidin or peonidin as the aglycone. It is suggested that anthocyanins as natural pigments may provide beneficial health effects. Studies proved anthocyanin provide physiological functions such as antihyperglycemic, antiinflamatory and anticarcinogenic and antioxidant[1].

Fruits and vegetables are good dietary sources of natural antioxidants for dietary prevention of degenerative diseases. The main contribution to the antioxidant capacity of a fruit or vegetable is likely to come from a variety of phytochemicals other than vitamin C. Fruits and vegetables contain many antioxidants such as phenolics, thiols, carotenoids and tocopherols, which may protect us against chronic diseases[4].

The medicinal value of these plants lies in some chemical substances that produce a definite physiological action on the human body. The most important of these bioactive constituents of plants are alkaloids, tannins, flavonoids, and phenolic compounds[5].

Phytochemicals are the chemicals that present naturally in plants. Now-a-days these phytochemicals become more popular due to their countless medicinal uses. Phytochemicals play a vital role against number of diseases such as asthma, arthritis, cancer etc. unlike pharmaceutical chemicals these phytochemicals do not have any side effects. Since the phytochemicals cure diseases without causing any harm to human beings these can also be considered as "man-friendly medicines". This paper mainly deals with collection, extraction, qualitative analysis of phytochemicals[6].

2. MATERIALS AND METHODS

Purple sweet potato samples were selected, collected and prepared for analysis as follow.

2.1 Collection of PSP Samples

Fresh purple sweet potato (sound and healthy tubers; Thai variety) were selected and procured from Thirimingalar market.

2.2 Cleaning of PSP

After PSP collection, the collected samples have to be cleaned properly. Cleaning has to be done by hands in order to get better results.

2.3 Drying of PSP

PSP samples have to be dried immediately as soon as the collection or this will lead to spoilage of sample materials. Drying can be done either by natural process (sun drying) or by artificial process (i.e. driers).

The most common drying method was done in this work with the help of mechanical driers.

2.4 Powdering of PSP

After complete drying of PSP samples , they have to be powdered well by a grinder for further analysis.

2.5 Compositional Analysis

PSP samples were analyzed for moisture, ash, crude protein, crude fat, total carbohydrate reducing sugar, brix° and starch using AOAC methods (2000) and fiber by Filter Cup method.

2.6 Phytochemical Screening Test

Sample extracts (aqueous, ethanol and methanol as soaking solvents) are prepared for screening procedure.

2.6.1 Test for Alkaloid

5ml of the extract was added to the 2ml HCl. To this acidic medium, 1ml of Dragendroff's reagent was added. An orange or red precipitate produced immediately indicates the presence of alkaloids.

2.6.2 Test for Amino acids

1ml of the extract was treated with a few drops of Ninhydrin reagent. Appearance of the colour shows the presence of amino acids.

2.6.3 Test for Flavonoids

1ml of the extract was added with, a few drops of dilute sodium hydroxide. An intense yellow colour was produced in the plant extract, which become colourless on addition of a few drops of dilute acid indicates the presence of flavonoids.

2.6.4 Test for Glycosides
The extract was hydrolysed with HCl for a few hours on a waterbath. To the hydrolysate, 1ml of pyridine was added and a few drops of sodium nitroprusside solutions were added and then it was made alkaline with sodium hydroxide solution. Appearance of pink to red colour shows the presence of glycosides.

2.6.5 Test for Saponins
The extract was diluted with 20ml of distilled water and it was agitated in a graduated cylinder for 15 minutes. The formation of 1cm layer of foam showed the presence of saponins.

2.6.6 Test for Terpenoids
1ml of the extracts was dissolved in 10ml of choloform and equal volume of concentrated sulphuric acid was added by sides of the test tube. The upper layer turns red and sulphuric acid layer showed yellow with green fluorescence. This indicates the presence of steroids.

2.6.7 Test for Tannins
5ml of the extract was added with a few drops of 1% lead acetate. A yellow precipitate was formed, indicates the presence of tannins.

2.6.8 Test for Reducing Sugar
1g of water extract was mixed with deionized water and filtered. The resulting solution was boiled with Fehling's solution for about 5 minutes. Brick red precipitate indicates the presence of reducing sugar.

2.6.9 Test for Steroids
3g of dried sample was extracted with ethanol for 24 hours and filtered. The ethanol extract, thus obtained, was evaporated to dryness. The ethanol residue was treated with a few drops of acetic anhydride, followed by the addition of concentrated sulphuric acid with care. The test solution turned to pink indicating the presence of steroids.

2.6.10 Test for Carbohydrates
A small amount of water extract was boiled with 10ml of deionized water and filtered. A few drops of 10% α- naphthol solution were added into the filtrate that contained in test tube and shaken. This test tube was kept inclined at any position and 1ml of concentrated sulphuric acid was slowly introduced along the side of the test tube. A red ring indicated the presence of carbohydrates.

Fig1. Purple Sweet Potato Plant with Tuber (Kazun-U)

3. RESULTS AND DISCUSSION

The compositional analysis was done and the finding results are described in Table 1.

Table 1: Proximate Composition of Puple Sweet Potato Tuber Sample*

Sr. No.	Test Parameter	Test Method	Result
1.	Moisture	AOAC-2000 (934.01)	66.40 %
2.	Ash	AOAC-2000 (940.26)	1.08%
3.	Crude Protein	AOAC-2000 (920.152) (Kjeldahl Method)	1.26%
4.	Crude Fiber	AOAC-2000 (978.10) Fiber Cap Method	1.10%
5.	Crude Fat (ether extract)	AOAC (Buchi Soxhiet Method)	0.08%
6.	Total Carbohydrate	By Difference	30.08 %
7.	Energy Value (kcal/100g)	Calculation Method	125
8.	Brix°	ABBE Refractometer	7.50
9.	Starch	Lane & Eynon Titration Method	22.84 %
10.	Reducing Sugar	□	1.79%

*FIDSL Lab

In the screening test, ethanol and water mixtures are commonly used for the extraction of phenolic compound from plant materials for identification qualitatively. This is because water had its limited ability to extract oil-based components (such as phenolic compound). This is proved that some bioactive compounds were only soluble in organic solvent were not present and detected in aqueous extract in the above result. Phytochemicals commonly found in plants have some possible health benefits and functions are shown in Table 2.

Table 2: Phytochemicals and its Functional Properties

No.	Phyto chemicals	Possible Health effects/ Functions
1.	Alkaloids	Anti-inflammatory effect, Antimicrobial, Antiseptic, Anticarcinogenic
2.	Glycosides	Hypoglycemic activities
3.	Reducing sugar	Energy given
4.	Phenolic compounds	May prevent cancer, inflammation, antioxidant activity, antimicrobial, antitumor
5.	Flavonoids	May inhibit inflammation and tumor growth, may aid immunity, boost production of detoxifying enzymes in the body ; antioxidant agent

6.	Saponins	Hypocholesterolemic, anti-diabetic properties, slow cancer cell growth, bone health
7.	α- amino acid	To promote growth
8.	Carbohydrate	To give energy in the body
9.	Steroids	Anti-inflammatory effect, analgesic effect
10.	Tannin	Hypoglycemic activities
11.	Terpenoids	Decrease in blood sugar level [8]; Antimicrobial, Antidiuretic, anti-inflammatory

Source: Lee Weng Foo et al.,2015 [7]

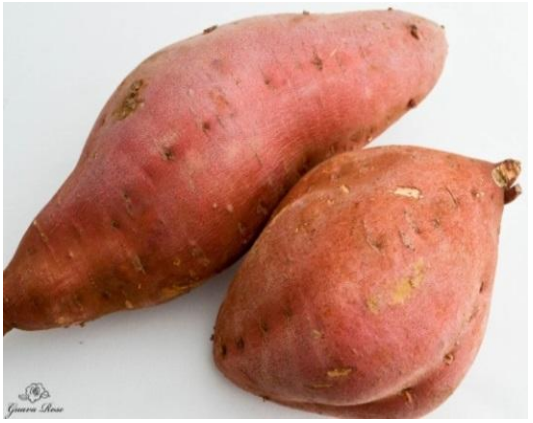

Fig 2. Purple Sweet Potato (Kazun-U)

The preliminary phytochemical test was performed with the extract of dried PSP samples. The experiments show the presence of carbohydrate, glycoside, phenol, amino acids, saponin, flavonoid, reducing sugar and starch in the given sample, as shown in Table (3).

Table 3. Phytochemical Examination of Dried PSP Sample

No.	Type of compound	Extract	Reagent used	Observation	Results
1.	Alkaloid	1%HCl	Mayer's reagent	No ppt.	-
			Wagner's reagent	No ppt.	
			Dragendorff 's reagent	No ppt.	
			Hager's reagent	No ppt.	
2.	Carbohydrate	H_2O	10% α -naphthol & H_2SO_4	red ring	+
3.	Glycoside	H_2O	10% Lead acetate solution	White ppt.	+
4.	Phenolic compounds	H_2O	5% $FeCl_3$ solution	Brownish black ppt.	+
5.	α-amino acid	H_2O	Ninhydrin reagent	Purple colour	+

6.	Saponin	H_2O	H_2O	Persistent foam	+
7.	Tannin	H_2O	1% Gelatin & 10% NaCl solution	No ppt.	-
8.	Flavonoids	70%EtOH	Mg ribbon & Conc. HCl	Red colour.	+
9.	Steriod	Petroleum ether	Acetic anhydride & Conc. H_2SO_4	-	-
10.	Terpenoids	Petroleum ether	Acetic anhydride & Conc. H_2SO_4	-	-
11.	Anthocyanin	70%EtOH	Dil HCl	Purple red	+
			Dil NaOH	Green	
			Dil HCl	Red colour reappear	
12.	Reducing sugar	H_2O	Fehling's solution	Brick red ppt.	+
13.	Starch	H_2O	Iodine solution	Deep blue ppt.	+
14.	Cyanogenic glycoside	Fresh sample	H_2O, Conc. H_2SO_4 , sodium picrate paper	No colour change	-

*DCPT Lab , (+) = presence**;** (-) = absence; EtOH = ethanol; ppt = precipitate

4. CONCLUSION

In the present study, it was found that, the preliminary phytochemical screening show the presence of carbohydrate, glycoside, phenol, α-amino acid, saponin, flavonoid, reducing sugar and starch in the extracts of PSP. It is suggested that the presence of phytochemical content in PSP have antioxidant activity or has the ability to capture free radicals so as to provide a good influence on human health ie. as a promising tool for antioxidant.

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