Academic Sciences International Journal of Pharmacy and Pharmaceutical Sciences

ISSN- 0975-1491 Vol 6, Suppl 2, 2014

Research Article

TOTAL GLUCOSE AND CRUDE FIBER IN LOCAL RED SWEET POTATO [IPOMOEA BATATAS L. (LAM)] TUBER

RAMDAN PANIGORO*, DIAH DHIANAWATY

Biochemistry Department Faculty of Medicine of Universitas Padjadjaran, Bandung, Indonesia. Email: ramdan.panigoro@unpad.ac.id

Received: 10 Aug 2013, Revised and Accepted: 06 Jan 2014

ABSTRACT

Objective: The aim of this research is to evaluate the total glucose and crude fiber in local red sweet potato (Maja village) related it as food diversification, food alternative and food security.

Methods: Total glucose was measured by Cleg-Anthrone method, and crude fiber was measured by acid – base method.

Results: The total glucose and crude fiber were 12.98 % and 2.78% respectively.

Conclusion: the local sweet potato contains 12.98% of glucose, hencemakes it as a potential of energy source. Besides that, it also contains 2.78% crude fiber that is a health benefit for the consumers. Therefore besides being a good food diversification, food alternative, and food security, the local sweet potato also promotes health.

Keywords: Carbohydrates, Fiber, Glucose, *Ipomoea Batatas* L., Red sweet potato.

INTRODUCTION

Sweet potato is popular in the Indonesia community, particularly in eastern Indonesia. Papua and West Papua use sweet potato as a staple food. In 2013 Directorate General of Food Crops, Ministry of Agriculture planned the total planted area from 10 provinces are 1,225 hectares, which are West Papua, Papua, West Java, Banten, Central Java, East Java, North Sumatra, Bali, East Nusa Tenggara, and West Nusa Tenggara. Sweet potato and the other tubers are the strategic commodities and source to increase income and welfare of farmers [1].

Red sweet potato roots is an excellent source of vitamin A (in the form of beta-carotene) [2], the other contents are ascorbic acid, thiamin, riboflavin, niacin, potassium, phosphor, iron, calcium[3].

In the human body, glucose is oxidized as follows: $C_6H_{12}O_6 \rightarrow 6CO_2 + 6H_2O$, yield energy in the form ATP [4].

Fiber has the importance role, reduce the risk of the following diseases e.g. digestive system disorder, coronary heart disease, stroke, hypertension, diabetes, obesity. Fibers have been classified in several types that have the different functions and health benefits. These are soluble fiber and insoluble fiber, e.g. cellulose, some hemicellulose were insoluble and its function reduces constipation. Wheat dextrin is a soluble fiber, aid lower cholesterol (LDL and total cholesterol), therefore decreases risk of coronary heart disease and type 2 diabetes [5-8].

The pharmacological activities of sweet potato have been published, tuber has many activities, methanolic extract of tuber in doses 400 and 800 mg/kg-bw of rat was suggested active as anti-ulcer which were induced with aspirin and cold stress [9], beside that the methanolic extract of the peel and peel bandage which were made as gel (3.0%, 6.0% and 10.0% (w/w) had activity to promote the wound healing process [10]. Anti-oxidant activity by DPPH method was 4.89 mg/ml [2].

The pharmacological activities of leaves have been published, in-*vitro* evaluation of the cytotoxic activity by tryptophan blue dye exclusion methods (DLA cell lines) and anti-oxidant activity by DPPH method of the methanolic extract of dried leaves showed potent activity with EC_{50} 305µg/ml and EC_{50} 36.5 µg/ml respectively [11].

Results of the evaluation of the capacity of total anti-oxidant by phosphor molybdenum complex method was 42.94% as compared to ascorbic acid and the antimicrobial activity by agar disk and agar well diffusion tests had no effect on *Streptococcus mutans*, *S. mitis*, *Staphylococcus aureus*, and *Candida albicans* [12].

The sweet potato greens extract had anti-proliferative activity in both *in vitro* and *in vivo* test, which it caused "perturbed cell cycle progression, reduced clonogenic survival, modulated cell cycle and apoptosis regulatory molecules and induced apoptosis in human prostate cancer PC-3 cells both *in vitro* and *in vivo* [13]. The other one of the family convolvulaceae *Ipomoea staphylina* was tested its anti-inflammatory activity in rodents. The extract and its ethyl acetate and n-butanol fractions (200 mg/kg, p.o.) had anti-inflammatory activity which induced by carrageenan, and by cotton-pellet [14].

MATERIAL AND METHODS

Plant material: Red sweet potato cultivated at Maja village (Majalengka Regency, West Java Provence), was harvested in March, 2013. It has a length of 12–15 cm; diameter 5–6 cm.

Reagent Anthron (E. Merck – 8.01461.0025), sulfuric acid, perchloric acid (E.Merck), distilled water

Equipment Spectrophotometer: Eppendorf Biospectrometer Basic AG 22331 Hamburg seri: 6135BJ (German), Balance: Sartorius 2442 (USA) and Furnace: Barnstead Thermolyne (USA)

Procedure

Measurement of total glucose with Anthron method [15]

A. Sample preparation

"2.5g of the wet sample was weighed with its available carbohydrate concentration not more than 60 – 300 mg. Then it was transferred to the 100 ml conical flask, and was mixed with 10 ml water. 13 ml of 52% perchloric acid ($HOClO_3$) was added and was mixed for 20 minutes.

The solution was filtered and then diluted, made up to 250 ml, was mixed thoroughly and then was processed for carbohydrate".

B. Measurement of the sample

"10 ml of the filtrate was diluted to 100 ml. Pipette 1 ml of filtrate, 1 ml of water, and 1 ml of standard glucose solution into 3 seperate test tubes. 5 ml Anthron reagent was added to each test tube respectively, homogenized and boiled in waterbath at 100^0C for 12 minutes, early cooling and the absorbance was measured at wavelength 630 nm".

C. Calculation

Total sugar concentration was calculated with the following equation

$$\text{Sugar concentration} = \frac{\text{concentration on the spectrophotometer} \times \text{dilutionfactor}}{\text{the origin concentration}}$$

Total available carbohydrate (% Glucose) =

$$\frac{25 \times \text{absorbance of sample}}{\text{absorbance of standrad glucose} \times \text{weight of sample}}$$

Measurement of total fiber [16]

"The sample was weighed at approximately 4 grams (W).

Fat was extracted by ether from sample by Soxhlet method. The sample is dried in an oven. It was then put into round bottom flask 500ml. 50 ml of 1.25% sulfuric acid was added to the round bottom flask, then reflux for 30 minutes. After that filtered and wash with boiling water until the washings are no longer acid.

Then 50 ml of 1.25% sodium hydroxide was added and reflux for a further 30 minutes. Then it was filtered by a Buchner funnel and vacuum pump with Whatman filter (ash-less), which Whatman paper have been dried and had constant weight. The residue was washed repeatedly with hot water and 96% of ethanol.

The residue with the filter paper was put into a weighing bottle which had constant weight. It is then dried at 105^{0}C. It was let to cool and weighed again.

The procedure is repeated until a constant weight is achieved (W_1). Then the sample was ashed at 300^{0}C, cooled in a dessicator and reweighed (W_2)."

Calculate the weight of crude fiber.

$$\text{The total weight of crude fiber} = \frac{W_1 - W_2}{W} \times 100\%$$

Note:

W = weight of sample in gram.

W_1 = weight of residue in gram.

W_2 = weight of ash in gram.

RESULTS

Total percentage of glucose

Table 1: Total available carbohydrates as total glucose percentage from fresh Ipomoea batatas(L) Lam.

S. No.	Sample (2.5 g)	Absorbance			Total available carbohydrate (% Glucose)
		1	2	Average	
1	1	0,518	0,516	0,5170	12,1504
2	2	0,546	0,542	0,5440	12,7850
3	3	0,545	0,548	0,5465	12,8437
4	4	0,602	0,603	0,6025	14,1598
5	Standard	0,417	0,434	0,4255	
Average					**12.9847**

Total available carbohydrate (% glucose) in 100 g sweet potato = 12.98 %.

Total percentage of crude fiber

Table 2: Total percentage of crude fiber in fresh *Ipomoea batatas* (L) Lam. tuber

No.	Weight of Sample (g)	Weight of Total Fiber	
		(g)	(%)
1.	4	0.1106	2.765
2.	4	0.1108	2.777
3.	4	0.1109	2.777
4.	4	0.1115	2.788
5.	4	0.1120	2.800
Average			**2.7814**

Total percentage of crude fiber in local sweet potato (cultivated at Maja village) = 2.78 %

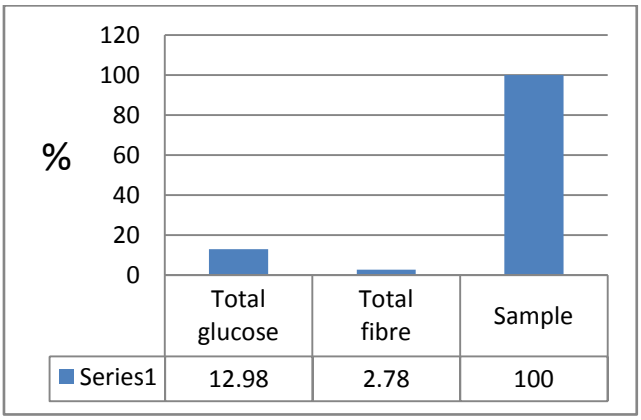

Fig. 1L The total percentage of glucose and crude fiber in fresh *Ipomoea batatas* (L) Lam. tuber

DISCUSSION

Carbohydrate in 100 g of local sweet potato (cultivated at Maja village) which measured as % glucose content was 12.98%.

Carbohydrates which can be digested by enzyme will be digested to produce glucose and glucose is then oxidized to produce energy in the form ATP. Therefore local sweet potato can be a source of carbohydrates or energy, and this makes the local sweet potato as a potential of energy source for the locals in particular, and for Indonesia in general.

The percentage content of crude fiber in local sweet potato was 2.78 %. Insoluble fiber has positive effect for human health, e.g. it makes stools heavier and speeds their passage through the gut, helping to eliminate feces and relieve constipation or prevent bowel problems. Therefore local sweet potato can help to maintain of health of the consumers.

CONCLUSION

The local sweet potato contains high level of carbohydrate (12.9847%) and fiber (2.7814%). Both make the sweet potato a potential energy source and also can maintain of health. Therefore besides being a food diversification, food alternative, and food security, the local sweet potato also promotes health.

REFERENCES

1. Directorate General of Food Crops. Production management technical Guidelines. Ministry of Agriculture; 2013.
2. Dhianawaty D, Panigoro P. Antioxidant activity and total weight of carotenoids in red sweet potato (*Ipomoea batatas* L.) tuber. Int J. Res Phytochem Pharmacol 2013; 3(1):70–73.
3. Zuraida N. Sweet potato as an alternative food supplement during rice shortage. J. of Research and Development of Agriculture 2003; 22 (4):150-155.
4. Elliot WH, Elliot DC. Biochemistry and molecular biology. 3rd ed. Oxford University Press; 2005. p.184-186.
5. Anderson JW, Baird P, Davis RH Jr, Ferreri S, Knudtson M, Koraym A, et al. Health benefits of dietary fiber. Nutrition Reviews 2009; 67(4):188–205.
6. Slavin JL, Lloyd B. Health benefits of fruits and vegetables. Adv. Nutr 2012; 3:506–516.
7. Johnson K. Types of fiber and their health benefits. Web MD Medical Reference 2012.
8. Mitra S. Nutritional status of orange-fleshed sweet potatoes in alleviating vitamin A malnutrition through a food-based approach. J. Nutr Food Sci 2012, 2 (8):160
9. Panda V, Sonkamble M. Anti-ulcer activity of *Ipomoea batatas*tubers (sweet potato). Functional Foods in Health and Disease 2012;2(3):48-61.
10. Panda V, Sonkamble M, Patil S.Wound healing activity of *Ipomoea batatas*tubers (sweet potato). Functional Foods in Health and Disease 2011; 10:403-415.
11. Prasanth NV, Dilip C, SanalDev KT, Augustine L, Saraswathi R. Evaluation of *in vitro* cytotoxic and antioxidant activities of *Ipomoea batatas*. Int J. Pharm Pharm Sci. 2010;2(3): 91-92.
12. Pochapski MT, Fosquiera EC, Esmerino LA, Santos EBd, Farago PV, Santos FA, et al. Phytochemical screening, antioxidant, and antimicrobial activities of the crude leaves' extract from *Ipomoea batatas* (L.) Lam. Phcogn Mag 2011; 7(26):165–170.
13. Karna P, Gundala SR, Gupta MV, Shamsi SA, Pace RD, Yates C, et al. Polyphenol-rich sweet potato greens extract inhibits proliferation and induces apoptosis in prostate cancer cells *in vitro* and *in vivo*. Carcinogenesis 2011; 32 (12):1872-1880.
14. Firdous SM, Koneri R. *In vivo* and *in vitro* anti-inflammatory activity of leaves of *Ipomoea staphylina*. Int J. Pharm Pharm Sci 2012; 4 (Suppl 5):339-343.
15. Apriyantono A, Fardiez D, Puspitasari NL, Sedarnawati, Budiyanto S. Laboratory guide for food analysis. Inter-university Center of Foodand Nutrition, Bogor Institute of Agricultural; 1989. p. 48-50.
16. Indonesian National Standard (SNI) 01-2891-1992. Food and beverage quality control. Centre of Industry Standardization, Industrial Department; 1992. p. 23-24.