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Production and quality assessment of dehydrated flour for two varieties of sweet Potatoes.

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Abstract

Dehydrated flours of different varieties of sweet Potatoes were produced and evaluated in this study. Two varieties of sweet potato tubers "*Ipomoea batatas*" used in this study namely (Salih), obtained from Shambat Horticultural Station- Agricultural Research Corporation and a local cultivar obtained from the local market. The peeled tubers were diced into cubes, treated with 0.15% Ascorbic acid prior to drying for 5 days under moving fans. Triplicates trails has been processed. The flesh component, peeling loss, Over-all drying ratios and draying ratio were estimated. Physiochemical properties of produced flour of two varieties such as Moisture content, crude protein, fiber, ash and fat content were determined as well as Titerable Acidity, Ascorbic acid, Total and reducing sugars. It was finding that the local variety had a higher percentage of flesh. The overall drying ratio and drying ratio of Salih was higher than the local variety. With respect to the moisture protein, fiber and ash contents, Salih variety reveals higher amount than the local variety.

Keywords: Dehydrated flours, Potatoes, Physiochemical properties,

1. Introduction

Sweet potato ranks the seventh most important food crop in the world and fourth in tropical countries (FAO STAT, 2004). Nutritionally, orange-fleshed sweet potatoes are an excellent source of vitamin A and good sources of potassium and vitamin C, B6, riboflavin, copper, pantothenic acid and folic acids (Low and Jaarsveld, 2008). Sweet potato roots can be processed into dehydrated forms such as dried chips and flour for storage and uses in food preparations (Peters and Wheatley, 1997). Van Hal (2000) estimated that sweet potato flour (SPF) could contribute 0-100%, 20 %, 20-40 %, 17 % and 10 % of daily nutrients need {based on the recommended daily allowance (RDA) for the β-carotene, thiamin, iron, vitamin C and protein, respectively, and also provided 14–28 %,20–39 % of the dietary reference intake (DRI) for magnesium and for potassium (Van Hal, 2000). This research ultimately aims to: 1/ production of flour from two varieties of sweet potatoes for different nutritional purposes 2/ Assessment of the physiochemical properties of produced flour.

2. Materials and Methods

2.1Materials:

-Two varieties of swee tpotato tubers "*Ipomoea batatas*" used in this study are of the orange-fleshed sweet potato (high β-carotene) namely (Salih), obtained from Shambat Horticultural Station-Agricultural Research Corporation and a local cultivar with low β-carotene content obtained from the local market.

- Chemicals and Reagents: Chemicals and reagents used were obtained from stores of National Food Research Center (NFRC).

2.1.1Preparation of sweet potato: The tubers were washed with filtered tap water and peeled using sharp stainless steel knives. The peels was cut into cubes using (Electronic Dicer Machine), and then immediately dipped into 0.15% (w/v) ascorbic acid solution for 45 minutes. Drained cubes spread on stainless trays (62.5 × 45.5cm^2) under moving fans for 5 days. The dried cubes were milled into fine flour using Hummer mill and packed into sanitized polyethylene bags, then stored under - 18^{o}C till use.

2.2 Methods

Analytical methods: All chemical components were calculated on dry weight basis according to the following equation:

$$\frac{\text{Weight of component}}{100 - \text{Moisture content of the sample}} \times 100$$

Peeling loss (%),Drying ratio was described by Ranganna (1979). Over - all drying ratios were estimated according to USDA (2000). Moisture content, crude protein, fiber and ash were determined according to the A.O.A.C method (1984). Titrable Acidity content and fat content described according to the A.O.A.C. (1990).Total sugars determined by Yem and Wills (1954), reducing sugars described by (Nelson,1944) and Somogyi 1952).Ascorbic acid determined according to the method described by Ruck (1963).

Statistical Analysis: Data generated was subjected to Statistical Package for Social Sciences (SPSS) software version 16.0. Means were separated using Duncan's Multiple Range Test (DMRT) according to Mead and Gurnow (1981).

3. Results and Discussion

3.1 Physio-chemical characteristics of fresh sweet potatoes:

Table (1) shows that the Salih was composed of (19.3%) peel and (80.7%) flesh ,while the local variety of (16.3%)peel and (83.7%) flesh which reveals that the local variety had a higher percentage of flesh. The overall drying ratio of Salih was (6.9: 1) which was higher than that of the local variety (4.4: 1).The drying ratio was (4.97: 1) and (3.7: 1)` for Salih and the local variety, respectively. Table (2) depicts that the moisture contents of Salih and the local variety was (77.9%) and (72.3%) respectively, which is found to be within the range of(74.8 to 86.4%) reported by Anon (1981). The variation between the varieties could be due to many factors as cultivar, location, day length, soil (Woolfe, 1992).With respect to the protein, fiber and ash content, Salih variety reveals higher amount (12.2%),(3.2%)and (3.5%) than the local variety(10.7%)(3.0%)and(2.1%) respectively .This result is similar to the result of Huang *et al. (*1999),who reported that the total dietary fiber content of orange sweet potato ranged from 2.0 to 3.2g(fwb).

Table (1): Some physical properties of Salih and Local sweet potato varieties.

Sweet potato variety	Peel %	Flesh %	Over-all drying ratio	Drying ratio
Salih	19.3	80.7	6.9: 1	5.4: 1
Local	16.3	83.7	4.4: 1	3.8: 1

3.2 Chemical properties:

From table (2) both varieties obtained within the range of protein content (3.1 to 13.1%) that reported by Collins and Walter (1982).The result of ash content was 3.5% for Salih, this result was within the range of Woolfe (1992),who reported that it ranges between 3 to 4%,while it was higher than the value of 2.1% gained by local variety. As shown the total sugar was 50.1% for Salih; higher than the value of the local variety (31.6%). This result of the local variety conforms to the findings of Truong *et al*. (1986), while total sugars of Salih variety was far higher than the result obtained by the same author. It was mentioned by Hamilton *et al.*(1986) that there is a positive correlation between color intensity on the flesh and the total sugars, thus the white-fleshed sweet potatoes show lower total sugars. Regarding the reducing sugars and ascorbic acid, it reveals that Salih contained (29.3%) and (23.8%), higher than the local variety (20.2%) and (18.2%). This result is similar to the result founded by Jaarsveld et al. (2005) who reported that ascorbic acid of orange sweet potato as (25%).on another hand, titerable acidity was lower on the Salih variety (0.49%) compare to local variety (0.28%).Table (3) shows that the moisture content of the (Salih cultivar) flour and local variety flours was

(2.1%) and (2.0%) respectively. They were all found to be within the recommended level of the moisture content of food powders which should be below (3%) according to Yuh-Maa *et al.* (1998). The protein content of Salih flour was (5.3%) which is lower than the value of (6.6%) that was obtained by Grabowski *et al.* (2008),It was higher than that of the local variety (2.2%) which was in accordance with the value (2.3%) obtained by Singh et al. (2008).It reveals that the fat content of Salih cultivar flour was 0.86% and the local variety flour was (0.8%). Both results were near to that of Grabowski et al. (2008), who reported 1.0%. The fiber content for Salih and the local variety was (3.3%) and (3.2%) respectively. The results were within the range of (0.4 to 13.8%)reported by Van Hal (2000). Furthermore the ash content of the Salih, local flour recorded (2.9 %)and (1.8%)respectively. They were higher than the results reported by Singh *et al*. (2008) as (1.56%).The total sugars content of Salih flour was (12.9%) which was higher than the content of local flour (10.9%). The results were comparable to the value (11.4%) that was obtained by Singh *et al*. (2008). Regarding the reducing sugars and ascorbic acid there were highest amount in Salih flour (15.8%), (28.9%) followed by the local flour (11.0%) and 21.7% respectively. The lowest acidity value was shown in Salihflour (0.38%), while the local flour had a value of 0.83%.

Table (2): Physio-chemical composition of orange fleshed sweet potato, local fleshed sweet potato:

Sample	Moisture %	Protein %	Fat %	Fiber %	Ash %	Total sugar %	Reducing sugars %	Ascorbic acid %	Acidity %
Orange fleshed sweet potato	77.9 ±3.7	12.2 ±0.7	2.7 ±.45	14.9 ±0.17	3.5 ±0.07	50.1 ±0.19	29.3 ±0.2	23.8 ±0.01	0.49 ±0.00
Local fleshed sweet potato	72.3 ±0.5	10.7 ±0.00	3.0 ±0.03	14.2 ±0.23	2.1 ±0.00	31.6 ±0.00	20.2 ±0.07	18.2 ±0.03	0.83 ±0.02

Table (3): Chemical properties of sweet potatoes flour:

Sample	**Moisture %**	**Protein %**	**Fat %**	**Fiber %**	**Ash %**	**Total Sugar %**	**Reducing Sugars %**	**Ascorbic Acid %**	**Acidity %**
Orange-fleshed sweet potato flour	2.1 ±0.05	5.3 ±0.1	0.86 ±0.1	3.3 ±0.07	2.9 ±0.00	12.9 ±2.5	15.8 ±0.07	28.9 ±0.03	0.38 ±0.00
Local sweet potato flour	2.0 ±0.03	2.2 ±0.26	0.8 ±0.00	3.2 ±0.07	1.8 ±0.07	10.9 ±0.77	11.0 ±1.2	21.7 ±0.07	0.83 ±0.02

Conclusion

It was concluded that sweet potato tubers can be dried with the simplest means to produce flour with good chemical and physical properties, with perfect value of moisture content as dried material, moreover the possibility of storing it for subsequent uses. The quality attributes differ according to the variety of sweet potato type and its characteristics. on other hand, simplicity of applicable technique that used to produced nutritious sweet potatoes through this study may consider as the key for further future studies on drying and utilization of tuber crops, in addition to minimizing material losses and lowering cost.

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