

Full Length Research Paper

Physicochemical composition and antioxidant properties of a sweetpotato variety (*Ipomoea batatas* L) commercially sold in South Eastern Nigeria

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The physicochemical composition, functional properties, inhibitory actions and energy value of the flour of a cream fleshed sweetpotato variety (TIS/87/0087) that is high yielding and commercially sold in South Eastern Nigeria were investigated using standard techniques. The flour was observed to have good functional properties with a pH of 5.32 ± 0.01 , high percentage moisture content, indicative of poor shelf life characteristics and high chances of being attacked by microbes, low percentage dry matter, lipid, crude fibre and ash contents but a promising source of starch ($20.78 \pm 0.02\%$), carotene ($5.0 \pm 0.04 \mu\text{g/g}$), protein ($2.67 \pm 0.59\%$), carbohydrate ($40.77 \pm 3.05\%$), energy ($179.61 \pm 20.97 \text{ kcal/100 g}$), polyphenols, in addition to containing significant quantities of reducing sugar ($1.58 \pm 0.53\%$). In addition, the methanolic extract of the flour possessed higher scavenging activities on 2,2 diphenyl-1-picrylhydrazyl (DPPH) radical than standard quercetin. Results show that this sweet potato variety has potentials of biological properties and could have wide utility in food, alcohol and sugar industries. In addition, it could serve as a promising source of protein and its consumption could be utilized in the management of diseases that implicate free radicals. Finally, it could also be useful as a drug binder and disintegrant in pharmaceutical industries.

Key words: Sweetpotato flour, functional property, physicochemical, foods.

INTRODUCTION

Sweetpotato (*Ipomea batatas* L) is an important food crop in many parts of the world, being cultivated in more than 100 countries. Survey reports placed Nigeria as the number one producer of sweetpotato in Africa with annual production output of 3.56 million metric tones, making it the second world producer with China taking the lead (FAO, 2003). It is highly nutritious, easily digestible (Akpapunam and Abiante, 1991) and grown in most parts of the world, especially in the tropics where the bulk of the crop is cultivated and consumed which

confers nutritional advantage to people living in these regions. In many food-deficit countries, the need to fully utilize all existing foodstuffs with a view to alleviating poverty and hunger is now receiving considerable attention. One way of minimizing post-harvest losses and increasing the utilization of sweetpotato is through processing it into flour, which is a more stable intermediate product.

The flour can be used as a starting material for production of juice, bread, candy, noodles, snacks, fufu (dough), alcohol, etc. The suitability of the flour for use as food or other purposes will however depend on its composition and functional properties. The consumption of fruits and vegetables is strongly and inversely correlated with the incidence of cancer, cardiovascular,

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cerebro-vascular and neuro-degenerative diseases (Bazzano et al., 2003; Liu, 2003; Riboli and Norat, 2003). This is because fruits and vegetables are rich sources of phytochemicals such as carotenoids, polyphenolic compounds, etc. Studies have shown that these phytochemicals, especially the polyphenols, have high free-radical scavenging activities which play key roles in reducing the risk of cardiovascular diseases, cancer, HIV, etc. The use of synthetic antioxidant such as butylated hydroxytoluene, tannic acid and propyl gallate has been reported to be harmful to human health (Pourmorad et al., 2006). Hence, strong restrictions have been placed on their application and the trend now is to substitute them with naturally occurring antioxidants. The World Health Organization (1980) recommended that the consumption of fruits and vegetables should be encouraged especially in places where access to conventional treatment is not adequate. This has therefore led to the wide screening of plants for antioxidant potentials. Although the polyphenolic and antioxidant activities of sweetpotato have been reported (Choong et al., 2007; Hamouz et al., 2011), there are indications that location and climatic conditions could affect the distribution of these parameters in sweetpotato.

In the light of the above, the objective of this work was to provide information on the physico-chemical composition, antioxidant activity and energy value of the flour of a new sweetpotato variety that is found in the field of farmers and commercially sold in South Eastern Nigeria.

MATERIALS AND METHODS

Sample preparation

It was properly washed, peeled, sliced, oven dried (Gallenkamp) at a temperature of 65°C for 24 h and finally processed to flour using a food processor.

Chemical analysis

The protein, moisture, lipid and crude fibre contents of the flour were determined (fresh wet basis) using the methods of AOAC (1990). Ash content was determined using the method of AOAC (2005). Triplicate samples were incinerated in a muffle furnace (Thermodyn Type 1400 Furnace, Dubuoue, USA) at 600°C until a constant weight was obtained. The energy value of the sample was calculated from the Atwater Formula of 4, 9 and 4 as reported by Onyeike and Oguike (2003). Here, the total carbohydrate content was multiplied by 4, percentage lipid by 9 and percentage protein by 4. The carbohydrate content was determined by difference (AOAC, 1990). The percentage dry matter content of the sweetpotato flour was calculated as 100- moisture contents (Onwuka, 2005). The carotenoid content of the sweetpotato variety (fresh weight basis) was determined using the spectrophotometric method of Rodriguez-Amaya and Kimura (2004). The reducing sugar content of the flour (fresh wet basis) was determined using the Dinitrosalicylic Acid Reagent (DNS Reagent) method (Miller, 1972).

Preparation of the extract for polyphenolic assays

Six grams of the sample were soaked in 60 ml of water and left overnight. The mixture was filtered (Whatman No 1) and centrifuged at 3000x g for 10 min for the assay of the phenolic and flavonoid contents of the flour.

Assay of phenols

The Folin-ciocalteu reagent method (Singleton and Rossi, 1965) was used with modifications. Briefly, to 0.1 ml of the aqueous extract was added, 50 µl of Folin-Ciocalteu reagent and the setup was shaken for thorough mixing. After 3 min, 0.3 ml of 20% Na₂CO₃ was added and the absorbance was read with a UV spectrophotometer (Genesys 10 VIS Thermo Electron Corporation) against the reagent blank. Gallic acid was used as the standard for this assay.

Assay of flavonoids

The method of Meda et al. (2005) was used with modifications. To 0.5 ml of the aqueous extract were added 0.5 ml of methanol, 50 µl of 10% AlCl₃ (in ethanol), 50 µl of 1Mol/L of potassium acetate and 1.4 ml of water. The mixture was incubated at room temperature for 30 min and the absorbance was read using a UV Spectrophotometer at 420 nm (instead of 415 nm) against the reagent blank.

2,2-Diphenyl-1-picrylhydrazyl (DPPH) radical scavenging assay

The method of Blois (1985) was used with modifications. A measured amount (0.5 g) of the flour was dissolved in 200 ml of methanol (instead of ethanol) to give a concentration of 2.5 mg/ml and the mixture was filtered with Whatman No 1 filter paper and centrifuged to get a clear supernatant. Then, 0.1, 0.2, 0.3, 0.4 and 0.5 ml of each supernatant was further diluted with methanol to give final concentrations of 125, 250, 375, 500 and 625 µg/ml respectively. Finally, 0.1 ml of 0.3 mM DPPH in methanol was added to each of the reaction mixtures and the setup was well shaken and left in the dark for 30 min before the absorbance was read spectrophotometrically at 517 nm against the DPPH control that contained 1ml of methanol. The same procedure was followed for standard quercetin (2.5 mg/ml in methanol) which was diluted to the concentrations: 125, 250, 375, 500 and 625 µg/ml respectively. The percentage scavenging activity was calculated as:

$$\% \text{ Scavenging activity} = \frac{[(\text{Absorbance of control} - \text{Absorbance of sample}) / \text{Absorbance of control}] \times 100}{1}$$

Starch extraction

One hundred grams of the freshly harvested sweetpotato tuber were thoroughly washed, sliced into chips of 2 to 3 mm thickness and homogenized using a Warring blender. The mixture was filtered with a triple-layered cheese cloth and the starch washed thoroughly with distilled water in three labeled pre-weighed beakers. The granules were allowed to sediment for 4 to 5 h. Thereafter, the water was decanted and the wet cakes were oven dried at 65 to 70°C until a constant weight was obtained.

Determination of starch content

The starch content of the sample was calculated as:

$$\frac{W_2 - W_1}{W_0} \times 100$$

Where W_0 = Weight of sample

W_1 = Weight of empty beaker

W_2 = Weight of beaker + sample after drying

Analysis of the functional properties of the flour/sample

Bulk density

Bulk density was determined using the method of Okezie and Bello (1988). A (10 ml) graduated cylinder, previously tarred, was gently filled with the sample. The bottom of the cylinder was gently tapped on a laboratory bench several times until there was no further diminution of the sample level after filling to the 10 ml mark. The bulk density of the sample (g/ml) was calculated as weight of the sample per unit volume of sample.

pH

The pH was measured by making a 10% (w/v) suspension of the sample in distilled water. The suspension was mixed thoroughly in a warring blender and the pH was measured with a Hanna pH meter (Model HI1270).

Water absorption capacity (WAC)

The WAC of the sample was determined using the method of Onwuka (2005). A measured quantity (1g) of the sample was dispersed in 10 ml of distilled water in a conical graduated centrifuge tube. The sample was thoroughly mixed for 30 s and allowed to stand at room temperature for 30 min before being centrifuged at 5,000 x g for another 30 min. The volume of the supernatant was measured directly from the graduated centrifuge tube. The amount of the absorbed water was multiplied by the density of water (1 g/ml) and results were expressed as g/100 g.

Gelatinization temperature

A 10% (in water) suspension of the flour was prepared in a test tube. The solution was heated in a boiling water bath with continuous stirring. The temperature at which gelatinization was noticed was recorded as the gelatinization temperature after 30 seconds (Onwuka, 2005).

Oil absorption

Oil absorption capacity of the flour was determined using the centrifugal method of Beuchat (1977) as modified by Adepeju et al. (2011). One gram of sample was mixed with 10 ml of pure canola oil for 60 seconds. The mixture was allowed to stand for 10 min at room temperature, centrifuged at 4000 x g for 30 min and the oil that separated was carefully decanted. The tubes were allowed to drain at an angle of 45° for 10 min and then weighed. Oil absorption was expressed as percentage increase of the sample weight.

Statistical analysis

Data was subjected to analysis of variance using the "Statistical Package for Social Sciences" (SPSS) version 15.0. Results are presented as means ± standard deviations of triplicate experiments.

Table 1. Functional properties of the flour of a sweet potato variety TIS/87/0087.

Physical property	Value
Water absorption capacity (g/100 g)	125±0.35
Bulk density (g/ml)	0.92±0.01
Gelatinization temperature (°C)	90.75±1.77
Oil absorption capacity (%)	175±0.08
pH	5.32±0.01

Values in the table are the means ± standard deviations (n = 3 replicates).

RESULTS AND DISCUSSION

Functional properties are those properties that determine the behavior of nutrients in food during processing, storage and preparation because they affect the general quality of foods as well as their acceptability. The important, usually assayed, functional properties include: water absorption capacity, bulk density, gelatinization temperature, viscosity, swelling capacity, foam stability, etc. Water absorption capacity (WAC) measures the ability of flour to absorb water and swell for improved consistency in food. It is a property desirable in food systems to improve yield, consistency and give body to the food (Osundahunsi et al., 2003). The use of any flour as food ingredient depends on the interaction between the water and flour and this also determines the rehydration of flour (Ndie et al., 2010). The major chemical compositions that enhance the water absorption capacities of flours are proteins and carbohydrates since these constituents contain hydrophilic parts such as polar or charged side chains (Guy, 2012).

Water absorption capacity ranging from 149.1 to 471.5% is considered critical in viscous foods such as soups and gravies (Aletor et al., 2002). Judging from the value that was obtained from this sweetpotato variety (125±0.35 g/100 g) (Table 1), it may not be found useful in soups or gravies. "Bulk density is a function of particle size". The higher the particle size, the lower the bulk density. Increase in bulk density is desirable because it offers greater packaging advantage, as a greater quantity may be packed within a constant volume (Fagbemi, 1999). Thus, the high bulk density of the flour of this sweet potato variety (0.92±0.01g/ml) as shown in Table 1 indicates its heaviness, suggesting its suitability as a drug binder and disintegrant in pharmaceuticals (Zaku et al., 2009).

Gelatinization involves the formation of a continuous network which exhibits certain degree of order. Gels are characterized by relatively high viscosity, plasticity and elasticity. Gelation is one of the important factors that determine starch behaviour in various food and industrial applications. It affects the quality of starch-based

Table 2. Physico-chemical composition of the flour of sweet potato variety TIS/87/0087 (fresh wet basis).

Physico-chemical property	Value
Dry matter (%)	44.24±1.54
Moisture content (%)	55.76±1.54
Ash (%)	1.15±0.00
Protein (%)	2.67± 0.59
Fat (%)	0.65±0.03
Carbohydrate (%)	40.77±3.05
Crude fibre (%)	0.12±0.02
Energy value (Kcal/100 g)	173.81±8.50
Carotenoid (µg/g)	5.00±0.04
Starch (%)	20.78±0.02
Reducing sugar (g/100 g)	1.58±0.53%

Values in the table represent the means ± standard deviations (n = 3 replicates).

products such as: texture, stability and digestibility (Tsakama et al., 2010). The most important parameter in the gelatinization study is the temperature. Gelatinization temperature is the temperature at which starch molecules in a food substance lose their structure and leach out from the granules as swollen amylose. Gelatinization temperature affects the time required for the cooking of food substances. Results shown in Table 1 indicate that TIS/87/0087 had a gelatinization temperature of 90.75±1.77°C.

Fat absorption is an important property in food formulations because fats improve the flavour and mouth feel of foods (Odoemelam, 2005). Results shown in Table 1 indicate that this sweetpotato variety contained had considerable levels of oil absorption capacity.

The pH of a flour suspension is important since some functional properties such as solubility, emulsifying activity and foaming properties are affected by it. High pH starches have been reported to have increased solubility because of increased hydrophilic characters of the starch at these pH values (Tsakama et al., 2010). pH values ranging from 5 and 7 have been reported to stimulate retrogradation and this is attributed to the absence of monovalent ions and cations that have been found to retard retrogradation (Chen et al., 2003). The pH of the flour of this sweetpotato variety investigated as shown in Table 1 indicates that it will be readily but easily retrograde.

Dry matter content relates to good cooking qualities and extended storage lives (Vuylsteke et al., 1997). Results shown in Table 2 indicate that the flour had moderate amount of dry matter (44.24±1.54%). In addition, the dry matter content of the flour of this sweetpotato variety fell within the range of 13.6 to 48.2% that was reported for dry matter content in sweetpotato (Tsakama et al., 2010).

The moisture content of the flour (fresh wet basis) as shown in Table 2 was observed to be high (55.76±1.54%). This indicates poor shelf life characteristics for this variety of sweetpotato and high chances of deterioration from microbes. This study shows that this variety of sweetpotato cannot possibly be stored for a long time to avoid spoilage. However, where there is need for storage, it has to be processed to flour and dried properly. The analysis of the ash content of the flour of the studied sweetpotato variety (which is an indication of the total inorganic mineral contents) shows that it had a low mineral content (1.6±0.00%) (Table 2).

The high amount of percentage crude protein that was observed in the flour of this sweetpotato variety investigated as shown in Table 2 is a major finding in this study. The recommended daily allowance of proteins for an infant is 9.1-13.5 g/day, children (13-19 g/day), adult women (34-46 g/day) and adult men (45 -50 g/day) (Dashak et al., 2001). The value that was obtained for crude protein in this variety of sweetpotato as shown in Table 2 (2.67±0.59% on fresh wet basis or approximately 6.00% on dry basis) was higher than the 1.5% (fwb) or 5% (dwb) that was reported as the crude protein content of sweetpotato (Bradbury and Holloway, 1988; Woolfe, 1992). Result shows that TIS/87/0087 could be a promising source of plant protein and its consumption could contribute to the formation of hormones which control a variety of body functions such as growth, repair and maintenance of body. The importance of lipids in food substances cannot be over-emphasized as it contributes significantly to the energy value of foods. The assay of the lipid content of the flour showed that it had a low total lipid content (0.65±0.03%) (Table 2) and this could be of benefit to those that suffer from atherosclerosis or related problems.

Analysis of the percentage carbohydrate content of the flour of this sweetpotato variety investigated as shown in Table 2 showed that it contained significant quantities of carbohydrates which confer on it, significant roles to human health. In addition, these carbohydrates may serve as substrates for the production of aromatic amino acids and phenolic compounds through the Shikimic acid pathway.

Dietary fiber serves as a useful tool in the control of oxidative processes in food products and as functional food ingredient (Mandalari et al., 2010). In addition, dietary fiber decreases the absorption of cholesterol from the gut in addition to delaying the digestion and conversion of starch to simple sugars, an important factor in the management of diabetes (Cust et al., 2009). Dietary fiber also functions in the protection against cardiovascular disease, colorectal cancer and obesity. Results shown in Table 2 indicate that this sweetpotato variety had low fibre content (0.12±0.02%).

The analysis of the energy value of the flour which was calculated from its proximate composition indicates it had

Table 3. Antioxidant parameters of sweetpotato variety TIS/87/0087 (fresh weight basis).

Physical property	Value
Phenols (g GAE/100 g)	0.945±0.03
Flavonoids (mg QE/100 g)	50.77±0.05
DPPH scavenging activity (%)*	85.28±1.65

Values in the table represent the means ± standard deviations (n = 3 replicates). GAE = Gallic acid equivalence; QE = quercetin equivalence. *DPPH scavenging activity (%) for quercetin is 83.64±9.65.

considerable energy value. In addition, consumption of 1.5 kg of this flour will provide approximately 2517 to 2697.3 kilocalories of energy which is within the range of 2500 to 3000 kilocalories that was reported as the daily calorie requirement for adults (Onyeike and Oguike, 2003) (Table 2).

Carotenoids are compounds found in plants that can enhance the human health immune response and reduce the risk of degenerative diseases such as: cancer, cataracts, cardiovascular diseases, etc (Eleazu and Eleazu, 2012) and these biological properties of carotenoids have been attributed to their antioxidant properties, specifically their ability to quench singlet oxygen and interact with free radicals. β -carotene which is found in vegetables and foods still remains the major source of vitamin A for most people in developing countries as it makes up about 70 to 90% of their dietary vitamin A intake. In recent times, there has been a great need for the supply of foods that contain significant quantities of carotenoids especially for young children or the fortification of existing foods. This is because there are reports that nearly 50% of pre-school children living in developing countries are vitamin A deficient (Donald and Martin, 2001). The sweetpotato variety that was studied, was observed to contain considerable amount of carotenoid (5.00±0.04 μ g/g fresh weight or approximately 11.32 μ g/g on dry weight basis) (Table 2).

In addition, consumption of one kilogram of the flour of this sweetpotato variety will yield approximately 7,911 μ g of carotene (assuming that 30% of the carotene was lost during processing) (Hagenimana and Low, 2000) which could be sufficient to supply the day's requirement of β -carotene in humans (750-1000 μ g or 2500-3333.3 international unit (IU) (Vasundev, 2003). In the age of a global energy crisis caused by the depletion of fossil fuel resources, as well as the increase in environmental pollution, interest in various agricultural crops such as cereals (maize, wheat, triticale, barley, rye, sugar cane, sweet sorghum, millet etc) and some tubers (sugar beet, potato, Jerusalem artichoke, cassava, sweet potato etc.), as renewable and biodegradable feed stocks for biofuel production are growing (Semencenko et al., 2012). Alcohol, one of the many found substitute energy

resources is especially attractive because starch or sugary biomass can produce it. Starch on its own, also has a wide application in both food and sugar industries where it is widely used as a thickener, water binder, emulsion stabilizer and gelling agent. The percentage starch content of this sweetpotato variety (20.78±0.02%) (fresh wet basis) as shown in Table 2 is comparable to the values we reported as the starch contents of different varieties of cassava on fresh weight basis (16.43-29.15%) (Eleazu et al., 2011) and also within the range of 5.3 to 28.4(%) that was reported for sweetpotato on fresh weight basis (fwb) (Woolfe, 1992). Results show that this variety of sweetpotato may possess wide utility in both food industries and alcohol production. In addition, cassava is known to be low in protein contents unlike this variety of sweetpotato studied. In general, this confers nutritional advantage on this sweetpotato variety over cassava. Reducing sugar refers to any sugar that has an aldehyde group or is capable of forming one in solution through isomerisation (Anderson and Sefa-Dedeh, 2001). Reducing sugars can easily react with lipids and proteins (non-enzymatic glycation reaction), increasing the production of reactive oxygen species (ROS). The flour of the studied sweetpotato variety was observed to contain significant quantities of reducing sugar (1.58±0.53%) (Table 2).

Polyphenolic compounds are divided into two major subgroups: phenolic acids and the flavonoids. Phenolics are one of the most numerous groups of compounds in plants ranging from simple molecules, such as phenolic acids to complex compounds such as flavonoids, flavonols, proanthocyanidins. These phenolic compounds which are derived from secondary metabolism of plants (Figure 1), have been reported to possess considerable levels of antioxidant properties (Fang et al., 2004) which are attributed to their redox properties (Zheng and Wang, 2001). Besides acting as antioxidants, phenolic compounds and carotenoids are also responsible for the distinctive flesh colours of sweet potatoes. The high degree of correlation between the simple spectrophotometric assay for total phenolic compounds and antioxidant activity of the sweetpotato extracts, as determined by radical quenching assays, shows that the assay for total phenolics would be a useful technique for rapid evaluation of antioxidant activity in sweet potatoes (Choong et al., 2007). Results shown in Table 3 indicate that the phenolic content of this sweetpotato variety (0.945±0.03 g GAE/100 g) on fresh weight basis (calculated as approximately 2.14 g/100 g GAE on dry weight basis (dwb) was higher than the range of 0.14 to 0.51 mg CAE/g fwb (calculated as approximately 0.063 to 0.227 mg GAE) that was previously reported by other authors (Choong et al., 2007; Walter et al., 1979; Yoshimoto et al., 1999) on fresh weight basis and this is a significant finding in this present study as results obtained were considerably high for a cream fleshed

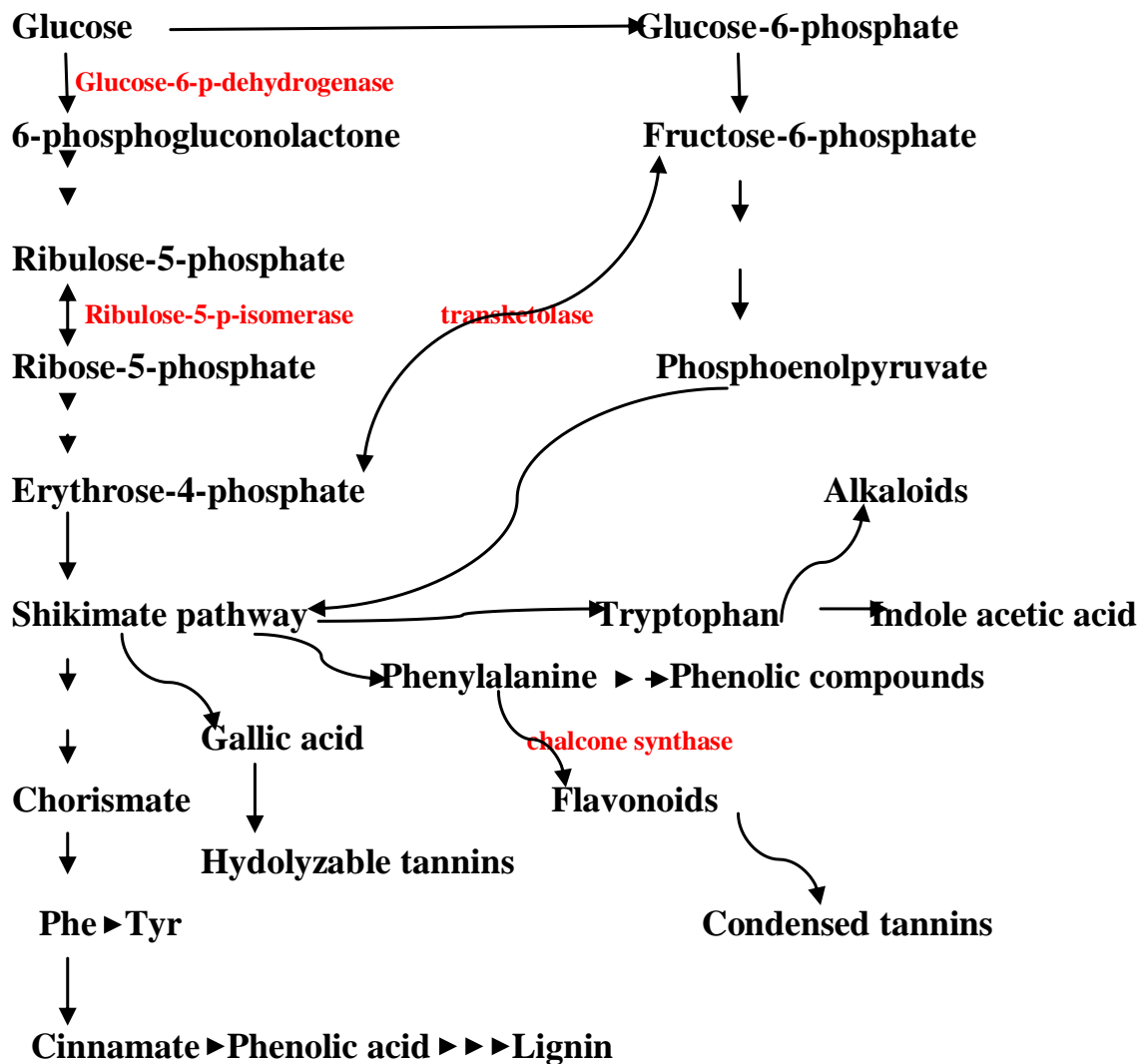


Figure 1. Biosynthesis of phenolic phytochemicals (Source: Ali and Hawa, 2012 with modifications). Red colour = enzymes.

sweetpotato variety, indicating possibilities of high antioxidant potentials for this sweetpotato variety.

Flavonoids are the major polyphenolic components of foods. The basic structure of flavonoids consists of 15 carbon atoms, two benzene rings joined by a linear three-carbon chain. There are six classes of flavonoids: flavonols, flavones, flavonones, catechins, isoflavones, and anthocyanins. Flavonols and flavones are the most widely distributed in plants compared with the other classes of flavonoids. Flavonoids attracted attention in the past few years as it was discovered that they have protective roles for human health. Kaempferol, quercetin, myricetin, and isorhamnetin (flavonols), apigenin and luteolin (flavones) are the most common in plants. Flavonols and flavones are of particular importance

because they possess antioxidant and free radical scavenging activity in foods (Rice-Evans et al., 1997). Flavonols like quercetin have been reported to inhibit the proliferation of a wide variety of cancer cell lines (Huang et al., 1999). The mechanism of action of flavonoids are through scavenging or chelating process (Cook and Samman, 1996; Kessler et al., 2003; Pourmorad et al., 2006). Results shown in Table 3 indicate that this sweetpotato variety contained large amount of flavonoids.

The presence of these different antioxidant components in plants makes it relatively difficult to measure each component separately (Kaur and Kapoor, 2002). This therefore led to the development of several methods such as: oxygen radical absorbance capacity (ORAC), 2,2-diphenyl-1-picrylhydrazyl (DPPH) and 2,2'-

azinobis(3-ethyl-benzothiazoline-6-sulfonic acid) (ABTS) radical assays to evaluate the antioxidant activities of biological samples.

The ORAC method is based on the inhibition of the peroxy-radical induced oxidation initiated by the thermal decomposition of azo-compounds, such as 2,2'-azobis (2-amidino propane) dihydrochloride. This method uses biologically relevant free radicals and it is adaptable to a high-throughput assay system. It is also advantageous as it measures both hydrophilic and lipophilic antioxidants, which gives a better estimate of the total antioxidant activity. On the other hand, the ABTS assay is based on hydrogen transfer reaction, while the DPPH assay is based on electron transfer (Prior et al., 2005). The ABTS method can be used over a wide pH range (Prior et al., 2005), whereas the DPPH method is limited to neutral and higher pH applications. Additionally, the ABTS assay is much faster than the DPPH assay and not affected by colour interference.

Although the DPPH assay suffers from colour interference in samples that contain anthocyanins, leading to possible under-estimation of antioxidant activity, this interference is minimal in sweetpotatoes since at the pH of the DPPH assay medium (pH = 6.9), the coloured flavylium ion of anthocyanins is converted to a carbinol pseudo-base and chalcone which are colourless (Wrolstad, 2000). Moreover, Choong et al. (2007) reported a highly significant correlation between the ABTS, ORAC and DPPH suggesting that any of the three methods has similar predictive capacity for antioxidant activities of sweetpotatoes. This therefore informed the assay of the DPPH scavenging activity of this sweetpotato variety as a measure of its total antioxidant activity. As observed in Table 3, the sweetpotato variety investigated, possessed higher scavenging activity on DPPH radical than standard quercetin.

This is attributed to the presence of large amounts of polyphenolic antioxidant compounds (phenols and flavonoids) in this sweetpotato variety and the hydrogen donating ability of the OH groups of the phenolic compounds. The extent of scavenging activity of this sweetpotato variety on DPPH radical compared with standard quercetin is another significant finding in this present study as it confers very high biological/pharmacological properties on this sweetpotato variety. This study thus shows that TIS87/0087 possesses a hydrogen donating ability.

Conclusion

The sweetpotato variety that was studied was observed to possess good functional properties together with considerable energy value and carotene contents. In addition, it was found to be a rich source of protein but

low in minerals, fat and fibre. The high moisture content of the flour indicates high prevalence to microbial attack unless properly dried. Finally, this variety of sweetpotato could have wide utility in food, alcohol and sugar industries.

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