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Determination of Polyphenol, Antioxidant Activity, and Individual Phenolic Compounds in Tubers of Sweet Potato Varieties Grown in South Carolina

Nazimuddin Mohammed[1,*], James B Stukes[1], Gianna Wright[1]
[1]1890 Research & Extension, and The Department of Biological and Physical Sciences, South Carolina State University, Orangeburg, S.C. 29117.
* Correspondence: nmohamme@scsu.edu

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Abstract: *The effect of varieties of sweet potato (Purple, Burgundy, Beaureguard and Porto Rico) grown in South Carolina on the antioxidant activity, polyphenol content, and individual phenolic compounds were tested. The sweet potato tuber shapes being studied consisted of an irregular, oval and elliptical while flesh color was purple for Purple, orange for Burgundy and Beaureguard, and light yellow for Porto Rico. The dry matter (DM) content was 30-37%. The Porto Rico cultivar showed the lowest polyphenol content of 57.5 mg gallic acid equivalent (GAE)/100g DM, and antioxidant activity 37.2 mg Trolox equivalent (TE)/100g DM. The highest polyphenol content, 382.7 mg GAE/100g DM and antioxidant activity 222.2 mg TE/100g of DM were found in purple cultivar. High performance liquid chromatography data showed the gallic acid, catechin, chlorogenic acid, caffeic acid, p-coumaric acid, ferulic acid, m-coumaric acid, rosmarinic acid in tubers, and the predominant ones were chlorogenic acids 11.4 mg/g of DM in Purple cultivar.*

Keywords: Sweet potato, antioxidant, nutrients, phytochemicals, phenolic compounds

INTRODUCTION

The sweet potato, *Ipomoea batatas* L. (Lam.), is a dicotyledonous plant belonging to Convolvulaceae family. It is classified as the seventh most important food crop after rice, wheat, potatoes, maize, Spaghetti squash and cassava [1-2]. Sweet potato is a crop with easy adaptability to a wide range of agro-ecological conditions (e.g. high temperature, drought,

low soil fertility). It is a suitable and attractive crop for agriculture with limited resources [3-4], which leads to its increased production [5]. It originates in Central and South America and is grown mainly in tropical and warm-temperate climatic areas, mainly due to its tuberous roots [4, 6-7] but is currently an important crop grown in more than 100 countries all over the world [8]. The cultivation of the sweet potato in Europe began in the 16th century and later spread to Asia [9]. In many countries of Asia and Africa, sweet potato is an important agricultural crop [10-11], which is reflected in their high production compared to other countries worldwide.

Sweet potatoes are a crop with high nutritional value that contain large amounts of carbohydrates, fiber, vitamins, and minerals [12]. The main components of sweet potato are carbohydrates representing from 80 to 90% dry weight [1]. Starch share constitutes up to 65 – 70% of dry weight, (amylose content ranges from 200 to 330 g per kg solids) [6]. Glucose (6.0 – 72), fructose (3.0 – 66), sucrose (21 – 77) and maltose (11 – 43 g per kg solids) are included in it as single sugars [13]. Sweet potato tubers are also a richer source of minerals and vitamins than potatoes [14]. Minerals in sweet potatoes are represented mainly by K, P, Ca, and Mg and minor amounts of Na and other minerals such as Fe, Zn, etc. [6, 15]. Sweet potato is also a rich source of phytochemical compounds, which have always been an important source of several clinically useful biomolecules, such as phenolic compounds, carotenoids, and anthocyanins [16]. These substances contribute to various health benefits of sweet potatoes, including antimutagenic, antioxidant, antimicrobial, anticarcinogenic, hepatoprotective, cardioprotective, and anti-inflammatory properties [8, 9, 17, 18]. Polyphenols in sweet potatoes are represented by two major groups, namely phenolic acids and flavonoids [19], which are also the most important groups of phenolic compounds in food [20]. They are characterized as derivatives of benzoic and cinnamic acid and occur naturally in foods of plant origin, mostly in bound form as esters or glycosides [21]. The phenolic compounds in sweet potatoes have been found to inhibit leukemia and the growth of cancer cells in the stomach and colon, and to help treat diabetes. The content of phenols, anthocyanins, and carotenoids in sweet potatoes is related to their antioxidant activity [22]. Authors of numerous studies refer to their antioxidant, anticarcinogenic, anti-hyperglycemic and chemoprotective properties [23-24].

Consumer demand for healthy foods is growing worldwide, so the nutritional value and content of biologically active substances in sweet potatoes have been attracting the attention of researchers for several years [8]. Bioactive compounds are present in food, especially in fruits, vegetables, and whole grains, and provide health benefits beyond primary nutritional value [25]. Epidemiological studies have suggested a positive effect of consumption of foods rich in bioactive substances with antioxidant activity, especially phenolic compounds, on human health. They may reduce the risk of many diseases such as cancer, heart disease, stroke, diabetes, Alzheimer's disease, and others [17, 25]. Sweet potato tubers and leaves have been reported to contain high level of bioactive phytochemicals such as anthocyanins

and phenolic acids which may provide numerous health-promoting and make them superior to other commercial vegetables [27]. Orange flesh and purple sweet potato varieties are known to have higher levels of phytochemicals such as flavonoids, phenolics and anthocyanins [22]. Anthocyanins are a group of water-soluble natural pigments which are found as the basic monomers of cyanidin, peonidin, and pelargonidin. Sweet potatoes have numerous health benefits, such as anti-mutagenic, anti-diabetic, and hepato- and cardioprotective effects, attributable to their phytochemical content [28]. Phytochemicals with high free-radical-scavenging activity may play important roles in reducing the risk of heart disease, common cancers, and other degenerative diseases. Therefore, it is important to consume a diet high in antioxidants to reduce the harmful effects of oxidative stress. Due to their preventive effects against chronic diseases, they are considered as indispensable components in a variety of nutraceutical, pharmaceutical, medicinal and cosmetic applications [29].

According to several authors, the climate conditions during vegetation determine the intensity of abiotic stress factors (UV radiation, temperature, precipitation), which are the main factors influencing the synthesis of secondary metabolites, whose level depends on the vegetative parts of the plant and its growth stage [30-31]. Research showed that another factor differentiating the antioxidant activity is the genetic variability of cultivars [32-33].

The sweet potato has been reported to have numerous health benefits including antimutagenic, antioxidant, hepato-protective, cardio-protective, and antidiabetic effects, which have been attributed to the sweet potato's phytochemical constituents [34]. However, the level of bioactive ingredients depends on the climate conditions and the intensity of abiotic stress factors such as UV radiation, temperature, precipitation during vegetation and genetic variability of cultivars [32]. Research to identify valuable compounds present in these plants is necessary for the food and breeding industries, as considerable attention has been paid to edible plants rich in bioactive compounds with antioxidant activities and other beneficial physicochemical properties. Qualitative variations in the nutrients and phytochemical profiles of sweet potatoes could contribute to differences in health-promoting properties.

The nutritional values of crop species need to be improved to fulfil the human desire for the maintenance of optimal health. Accordingly, global scientific research is targeted at gathering knowledge of the nutritional qualities of food crops and improving their values. A lack of information in recognizing the possible nutritional values of sweet potato waste will result in its underutilization. The information available on the nutritional value of this species of sweet potato is limited and fragmented. Knowledge of the nutritional content of this cultivar and its waste will affect the way it is consumed and reduce the wastage of sweet potato. Hence, it is essential to exploit the nutrients available in the sweet potato to improve its nutritional implications. Therefore, the aim of this paper was to determine the influence

of environmental conditions of sweet potato cultivar genotype on the content of phenolic acids, antioxidant activity and anthocyanin content of three sweet potato cultivars grown in Eutawville, South Carolina. Subsequently, this study aims to evaluate the presence of phytochemical, total phenolic contents, antioxidant activity and individual phenolic content in the sweet potato tuber.

MATERIALS AND METHODS

Plant Material

Four varieties of sweet potato with different flesh and peel color—Beauregard (orange), Burgundy (orange), Porto Rico (white), and purple (purple) were collected from a local farm in South Carolina.

Sample Preparation

Sweet potato tuber samples (about 2kg of each variety) were randomly selected for each variety, packaged in Kraft paper bags, and transported to the laboratory. Seven roots were washed with tap water, blot dried and diced into about 0.5 cm cubes. Approximately 200 g of clean sweet potato roots of each variety were weighed and frozen at −20°C for at least 12 hours and freeze dried (Harvest right, Utah, USA). Freeze-dried samples were ground using a warring laboratory electric blender into powder and stored at −20°C until analysis. The freeze-dried material was weighed, and the dry matter content was estimated by difference in weight.

Moisture Content

Two grams (accurate to ±0.0001 g) of sliced sweet potato tuber was weighed in the aluminum case and dried in a 105 °C oven for 4 h. The samples were then removed from the dryer, cooled to room temperature, and weighed. The drying process was repeated until the weights differed by ≤2 mg, which was considered to indicate a constant weight. The moisture content was calculated as follows:

$$\text{Moisture content (\%)} = 100 \times (m_1 - m_2)/(m_1 - m_3)$$

where m_1 is the total mass of the aluminum case and sample (g), m_2 is the total mass of the aluminum case and sample after drying (g), and m_3 is the mass of the aluminum case (g).

Extraction of Phenolics from Sweet Potato

The extraction process was carried out using 1.25 g of the freeze-dried root powder, were placed into 15-mL centrifuge vials. Eight milliliters of 80% methanol:20% H_2O (1% acetic acid) were added, and the mixture was vortexed for 1 min, and shaken on a mechanical shaker (Thermo Scientific SWB 25, USA) at 8×*g* at room temperature for 12 hours. The mixture was then centrifuged at 5000 rpm for 10 min (Thermo Scientific Sorvall Biofuge

Primo, USA), and the resulting supernatant was collected into a 25 mL volumetric flask. The extraction of the pellet was repeated two more times, and the combined extracts were brought to a final volume of 25 mL with the extraction solvent. This solution was filtered by using Whatman filter paper, ashless, grade 40 circles. The combined filtrates will be concentrated by an evaporator (RapidVap N_2 system, Labconco) and the final volume will be adjusted to 5 ml. This solution was analyzed for phenolic measurements and antioxidant activity by the DPPH assay.

Chemicals

Authentic standards of gallic acid (Thermo Fisher Scientific, USA), catechin (Acros, Organics), chlorogenic acid (Thermo Fisher Scientific, USA), caffeic acid (TCI), *p*-coumaric acid (MP Biomedicals, LLC), ferulic acid (MP Biomedicals, LLC), *m*-coumaric acid (TCI, Tokyo Chemical Industries Ltd), rosmarinic acid (MP Biomedicals, LLC) and quercetin (Acros, Organics), (purity ≥95.0%), methanol (gradient HPLC grade) and Folin-Ciocalteu reagents (MP Biomedicals, LLC) and HPLC grade water (Thermo Fisher Scientific, USA) were purchased.

Determination of Antioxidant Activity

The antioxidant activity (AA) was determined by the method of DPPH radical scavenging assay as described by Teow et al. (2007) [35].

DPPH Radical Scavenging Activity

Determination of Total Antioxidant Capacity. By 2,2-Diphenyl-1- Picrylhydrazyl (DPPH))

The antioxidant activity was calculated using a standard curve with known concentrations of Trolox and expressed in terms of µmole of Trolox equivalents per gram dry weight. DPPH stock solution: 0.025 g of DPPH was diluted to 100 mL with methanol (99.8%) and kept in a cold and dark place. Immediately before the analysis, a 1:10 dilution of the stock was made with methanol. Samples from the purple sweet potato were diluted 10 times with 80% methanol, while the two other genotype extracts were used undiluted. An aliquot (100 µL) of each sample was pipetted into 3.9 mL of DPPH solution to initiate the reaction. After a reaction time of 2 h at an ambient temperature the reaction had reached completion. The decrease in absorbance of DPPH free radicals was read at 515 nm against ethanol as a blank using a Genesys UV-Vis spectrophotometer. Trolox (0, 100, 200, 300, 400, and 500 µM) was used as a standard antioxidant compound. The antioxidant activity was calculated and expressed as µmols of Trolox equivalents per gram of dry weight (µmol TE g−1 DW). All measurements were repeated four times, and the results were expressed as average ± SD for four replicates.

Determination of Total Polyphenols Content

The total polyphenols content (TPC) was determined using the colorimetric Folin–Ciocalteu reagent [36] by spectrophotometric analysis (Genesys UV-Vis spectrophotometer). The content of total polyphenols in the sample was expressed as the content of mg gallic acid per 100g dry weight (mg GAE/100g DW). The aliquot portion of extract (0.1 mL) was pipetted into a 50 mL flask. The 2.5 mL of Folin–Ciocalteu reagent was added. After 3 minutes, 5 mL of 20% sodium carbonate aqueous was added and distilled water was added to mark. A blank with distilled water was prepared by the same procedure. The calibration curve was prepared with standard solutions of gallic acid 15.625, 31.25, 62.5, 125, 250 and 500 mg/L. The mixture was shaken and kept in the dark for 2 hours before being measured spectrophotometrically at 750 nm. All measurements were repeated four times, and the results were expressed as average ± SD for four replicates.

Quantification of Phenolic Compounds by High Performance Liquid Chromatography

The analyses were performed on a high-performance liquid chromatograph (HPLC Shimadzu, LC- 6AD, Kyoto, Japan), equipped with two high pressure pumps (LC-20AD), a diode array (DAD), a detector (SPD-M20A) and an automatic sampler (SIL-M20A). Separations were performed using a packed Shim-pack VP-ODS column (250 mm 4.6 mm) with spherical particles of 5 mm connected to a Shim-pack VP-ODS pre-column (5.0 cm 4.0 mm 5 mm - Shimadzu). Samples were eluted using two mobile phases: the first (A) consisted of water and acetic acid (1%) and the second (B) comprised methanol and water 70:30 v/v, respectively. Samples were eluted under the following gradient: 0–25 min (0–40%B); 25 to 43 min (40–45%B); 43–50 min (45–80%B); 50–55 min (80–0%B); and 55–65 min (0%B). The absorbance was measured at 280 nm, the flow rate was 1 mL.min−1 at a temperature of 35°C, and the injected volume was 20 µL. The standards used for the chromatographic analysis were gallic acid, catechin, chlorogenic acid, caffeic acid, *p*-coumaric acid, ferulic acid, *m*-coumaric acid, rosmarinic acid.

RESULTS & DISCUSSION

Morphological Characters of Sweet Potato Genotypes

The observed morphological characters of sweet potato genotypes like tuber color and flesh color were recorded and the information is presented in Table 1. In nature, sweet potatoes have a wide range of variability tuber skin color, flesh color, and tuber which can be exploited to determine the similarity and differences in morphological characters of sweet potato genotypes. The knowledge of morphological characteristics is a basis for identification and development of desirable genotypes. Sweet potato has great genetic polymorphism and high diversity in morphological traits [37-39]. The sweet potato genotypes showed ovate, irregular and elliptical for tuber shape based on their physical appearances of tuber. Ritschel and Huaman (2002) [40] also studied tuber shape and classified into long elliptic, irregular and none of the accessions belong to oval shape. Sweet

potato genotypes showed diverse variations for tuber skin color red purple, pink and brown color. Similarly, scientists have observed the tuber skin color reported the pink and cream and white color, respectively [41]. Sweet potato genotypes showed significant variations for flesh color orange, deep orange and white colored flesh. Among the genotypes studied for the flesh color observed predominance of cream color in germplasm assessed genotypes [40-41]. Dry matter content in tuber of sweet potato varieties ranging from 30-37% (Table 2)

Table 1. Basic morphological characteristics of tubers in tested sweet potato cultivars.

Parameter	Purple	Burgendy	Porto Rico
Shape	Irregular	Ovate	Ovate
Skin color	Red purple	Deep red skin	Light colored skin with a pink cast
Flesh	Orange	Deep orange flesh	White colored flesh that may have some yellow tint

Table 2. Dry matter content in tuber of sweet potato varieties.

Variety	Dry matter content (%)
Purple	30.35±2.88
Burgundy	32.86 ± 3.22
Porto Rico	37.54 ± 4.15

Our purple-fleshed (purple sweet potato cultivar) showed total phenol content (TPC) of 382.74±17.4 mg gallic acid equivalent (GAE)/100g of dry matter (DM) (Table 3). Orange-fleshed (Burgundy and Beauregard sweet potato cultivar) also showed 175.86±7.2 and 141.32±6.8 mg of GAE/100g of DM, respectively while white-fleshed (Porto Rico sweet potato cultivar) showed 57.5±5.5 mg GAE/100g of DM, (Table 3). For this study, we have proved the higher level of phenolic content in purple-fleshed sweet potato compared to other tested sweet potatoes samples, yellow, orange and white-fleshed sweet potato. In the study of Musilová et al. (2017) [42], TPC in sweet potatoes was 116.1 mg GAE/100g of DM (white cultivar), 980 mg GAE/100g of DM (purple cultivar) and 118.6 mg GAE/100g of DM in Beauregard. Alam et al. (2016) [43] determined TPC in nine sweet potato cultivars with orange flesh color in Bangladesh with higher content ranging from 349.9 – 481.9 mg GAE/100g of DM. Similarly to previous studies, Grace et al. (2014) [18] also found significantly higher TPC in purple-flesh sweet potato cultivar 3992 mg of chlorogenic acid equivalent (ChAE)/100g of DM compared to cultivars with orange (287 mg ChAE/100g of DM), yellow (283 mg ChAE/ 100g of DM) and light-yellow (278 mg ChAE/100g of DM) flesh color.

Table 3. Total phenol content (in dry weight basis) in tuber of sweet potato varieties.

Variety	Phenolics (mg GAE/100g DW)
Purple	382.74 ± 17.4
Burgundy	175.86 ± 7.2
Porto Rico	57.5 ± 5.5

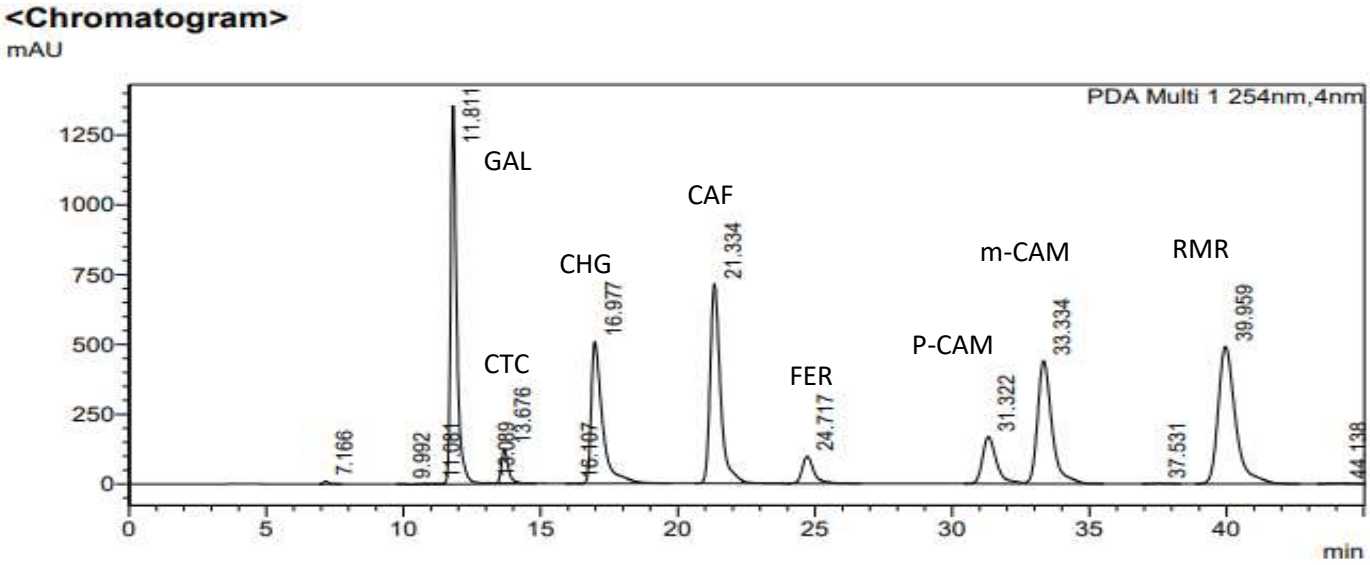
As we assumed, the antioxidant capacity (DPPH method) of purple sweet potato 222.25±12.1 mg of trolox equivalent (TE)/100g of DM was due to its highest phenolic content among sweet potato samples we tested. The antioxidant activity of Burgundy, Porto Rico and Beauregard were 73.68±7.6, 37.24.25±2.1 and 131.95±5.9 mg of TE/100g of DM, respectively (Table 4). In one study, Hana Frankova et al., 2022 [44] found AA ranged from 7.61 (O'Henry) to 44 mg of TE/100g of DM (Beauregard) for the DPPH method while Ji et al. (2015) [45] found its highest values in cultivars with purple flesh color (81.2 mg TE/g of DM), followed by cultivars with lighter flesh color, involving white (55.2 mg TE/g of DM), red (50.4 mg TE/g of DM) and yellow (43.3 mg TE/g of DM) sweet potato cultivars. In another study, Tang et al. (2015) [12] also found (DPPH method) the highest value of sweet potatoes in purple flesh cultivars (6.4 mg TE/g of DM), followed by cultivars with orange (6.3 mg TE/g of DM), yellow (5.86 mg TE/g of DM) and white (5.83 mg TE/g of DM) flesh color. Salawu et al. (2015) [46] and Ellong et al. (2014) [14] also found more than double-fold higher TPC in purple cultivar compared to white and orange cultivars of sweet potatoes. However, interestingly, ji et al., [45] (2015) reported that Shangshu 19 variety sweet potato showed significantly higher antioxidant capacity (55.2 mg/g of DM) than that of Beijing 553 variety (43.3 mg/g of DM) despite its lower phenolic content. It might contain more antioxidant phytochemicals besides phenolic compounds. The highest antioxidant activity was found in purple cultivar, followed by orange cultivars 'Beauregard', and 'Burgundy', and white cultivar 'Porto Rico' sweet potatoes.

Results of compared studies indicate that the value of antioxidant activity is significantly increased by the content of polyphenol in sweet potato tubers. The correlation between polyphenol content and antioxidant activity value was also presented in the study of Šulc et al. (2008) [47] focused on potatoes (*Solanum tuberosum* L.). Authors found that tubers of purple potato cultivars showed about 60% higher polyphenol content and double-fold value of antioxidant activity in comparison with white potato cultivars. Values of TPC were increasing in following order: purple cultivar < orange cultivar 'Beauregard' < orange cultivar 'burgundy' < white cultivar 'Porto Rico'. Ji et al. (2015) [45] found more than double fold higher TPC in purple-fleshed sweet potato cultivar (54300 mg GAE/kg of DM) compared to cultivars with red (25700 mg GAE/kg of DM), yellow (17800 mg GAE/kg of DM) and white (9600 mg GAE/kg of DM) tuber flesh color.

Table 4. Antioxidant contents (on a dry weight basis) in tuber of sweet potato varieties.

Variety	Antioxidant (mg TE/100g DW)
Purple	222.25 ± 12.12
Burgundy	73.68±7.63
Porto Rico	37.24 ± 2.14

Identification and quantification of eight phenolic compounds by High-Performance Liquid Chromatography with Diode Array Detection (HPLC-DAD). The HPLC method for quantification of phenolic compounds in sweet potato was developed. Analyze the individual phytochemicals such as gallic acid, catechin, chlorogenic acid, caffeic acid, ferulic acid, *p*-coumaric acid, *m*-coumaric acid and rosmarinic acid in sweet potato using HPLC. The quantification of phenolic was performed by peak integration, using the external standard method and the chromatographic profile of phenolic compounds in the standard solutions are shown in Figure 3.



GAL=Gallic acid, CTC=Catechin, CHG=Chlorogenic acid, CAF=Caffeic acid, FER=Ferulic acid, *p*-CAM=*p*-Cumaric acid, *m*-CAM=*m*-Cumaric acid, RMR=Rosmarinic acid

Figure 3. A typical chromatogram of HPLC to separate 8 phenolic compounds.

The individual phenolic compounds found in Purple sweet potato tuber were shown in Table 3. In purple sweet potato, chlorogenic acid was found in highest amount (11.4 mg/g DM) while gallic acid, catechin and caffeic acid were found in considerable amounts (1.15, 0.929

and 0.811 mg/g DM, respectively). A little amount of rosmarinic acid (0.28 mg/g DM) and trace amount of ferulic acid (0.006 mg/g of DM) were also found in purple sweet potato.

Table 3. Individual phenolic contents (on dry weight) in tuber of Purple sweet potato.

Compounds	mg/g DM
Gallic acid	1.152±0.23
Catechin	0.929±0.12
Chlorogenic acid	11.448±0.38
Caffeic acid	0.811±0.09
Rosmarinic	0.277±0.04
Ferulic acid	0.372±0.009

The following table 4 shows the amount of individual phenolic compound in burgundy sweet potato. Chlorogenic acid was found in the highest amount (7.6 mg/g DM) while gallic acid, catechin and caffeic acid were found in considerable amounts (0.7, 0.55 and 0.57 mg/g DM, respectively). A little amount of rosmarinic acid (0.19 mg/g DM) and trace amount of ferulic acid (0.004 mg/ g DM) were also found in burgundy sweet potato.

Table 4. Individual phenolic contents (on dry weight basis) in tuber of Burgundy sweet potato.

Compounds	mg/g DM
Gallic acid	0.704±0.03
Catechin	0.552±0.02
Chlorogenic acid	7.564±0.08
Caffeic acid	0.571±0.05
Rosmarinic	0.191±0.04
Ferulic acid	0.004±0.0001

The following table 5 shows the amount of individual phenolic compound in Porto Rico sweet potato. In Porto Rico sweet potato, chlorogenic acid was found in highest amount (4.3 mg/g DM) but the amount was lower than that of purple sweet potato. Gallic acid, catechin, caffeic acid and rosmarinic acid were found in lower amounts than that of purple sweet potato while ferulic acid was found in higher amounts.

Table 5. Individual phenolic contents (in dry weight basis) in tuber of Porto Rico sweet potato.

Compounds	mg/g DM
Gallic acid	0.593±0.04
Catechin	0.865±0.05
Chlorogenic acid	4.311±0.09
Caffeic acid	0.325±0.03
Rosmarinic	0.189±0.03
Ferulic acid	0.002±0.0001

The individual phenolic compounds found in Beaureguard sweet potato tuber were shown in Table 6. Chlorogenic acid was found in the highest amount (9.94 mg/g DM) while gallic acid, catechin and caffeic acid were found in considerable amounts (0.95, 0.71 and 0.65 mg/g DM, respectively). A little amount of rosmarinic acid (0.19 mg/g DM) and trace amount of ferulic acid (0.034 mg/g of DM) were also found.

Table 6. Phenolic contents (on dry weight basis) in tuber of Beauregard sweet potato

Compounds (mg/g DM)	
Gallic acid	0.95±0.03
Catechin	0.71±0.02
Chlorogenic acid	9.94±0.08
Caffeic acid	0.65±0.05
Rosmarinic	0.19±0.04
Ferulic acid	0.03±0.0001

Chlorogenic acids are found in most plant species, and several studies have elucidated the beneficial pathophysiological effects of this acid, as well as the effect against hypertension and hyperglycemia, in the prevention of colon cancer, in the inhibition of cell proliferation of tumors from different origins and anti-inflammatory action [48-40]. Chlorogenic acids are the main phenolic compounds in sweet potatoes. The major acid found in sweet potatoes is chlorogenic acid [50]. The chlorogenic acid content was variety depended on and decreased in the order of purple > Beauregard > Burgundy > Porto Rico. Generally, phenolic acids are more abundant in purple sweet potato varieties than white or orange varieties. Differences between varieties may be related to genetic factors that play a significant role in secondary metabolites formation, including phenolic acids.

CONCLUSION

Significant morphological variation was observed among the four varieties of sweet potato genotypes studied. Similarly, tuber shape, tuber skin color and flesh color showed greater variability. The study reveals. that the morphological characters used in this study would effectively discriminate the different genotypes. The evaluation of morphological characters of distinct genotypes helps to identify superior genotypes for crop improvement.

All know, daily consumption of fruit and vegetables that contain phytochemicals is highly recommended in diet due to their health protection effects. Among these phytochemicals, phenolic compounds have been recognized for their health benefit. Among our tested varieties, purple-fleshed sweet potato is attracting lots of attention from people in nutrition. The strong color of purple sweet potato is contributed by phenolic compounds.

The effect of cultivar on the important quantitative and qualitative (antioxidant activity, polyphenol content) parameters of sweet potatoes grown in South Carolina farms were studied. On the contrary, this purple cultivar showed the highest antioxidant activity and total polyphenol content compared to sweet potato cultivars with orange and white flesh color. Results of this study revealed that sweet potato is expressed by good yield potential, together with its quality, in conditions of South Carolina in general. This study reports the inherent phytochemical contents in the number of sweet potato varieties collected from local farm in South Carolina. The current information is important for ration formulations and dietary recommendations utilizing sweet potato tuber.

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