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A Review of the Composition and Health Benefits of Sweet Potato

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REVIEW

Abstract
Plant-based medicine is a popular emerging field. If one follows the research of this domain, will observe that the majority of the work is focused on different herbs as medicinal plants. However, many vegetables and fruits, their juices and extracts, possess medicinal properties and have been used as such since ancient times. Sweet potato (*Ipomoea batatas*) is one of the main aliments in many countries. Although regarded as a staple food, people observed its beneficial and medicinal properties. Bioactive components such as anthocyanin, polyphenolic compounds, coumarins, calystegines and triterpenes have been indicated to stimulate immune function, reducing oxidative stress and free radical damage, reduce cardiovascular disease risk, suppress cancer cell growth, prevent and improve symptoms of diabetes and hypoglycemia, suppress HIV symptoms, act as hepatoprotective while being part of a nutritious aliment all together. A sweet potato diet can therefore supplement medication for any of the above-mentioned affections. The current article sets to review the benefits and medicinal properties of sweet potato as regarded by specialty literature. The outcome is to list the main components and the medical benefits observed, outlining the potential uses of Ipomoea batatas in the plant-based medicine field. The review sets to investigate components in all plant parts: tuberous roots, leaves and young shoots.

Keywords: antioxidant; *Ipomoea batata*; plant medicine; phytochemistry.

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INTRODUCTION
Ipomoea batatas, commonly known as sweet potato is a starchy root vegetable with a sweet taste. There are many cultivars known in the world with different skin and flesh colours. The common variety has thin, brown skin on the outside and orange coloured flesh inside. Other varieties are purple, yellow or white coloured flesh, with different skin colours. Sweet potato is one of the main aliments and a staple food crop for many tropical and subtropical countries since ancient times. In its traditional climate, sweet potato is an important economic crop. In the past decade China became the biggest producer. (Mu, 2019) In terms of production quantity, worldwide and between all crops, sweet potato ranks as the 15th crop with aproximatively 92 milion tonnes per year. This is taken into consideration it is only the 29th most cultivated crop in terms of area harvested (FAOSTAT 2017, 2018, 2019). Despite its tropical and subtropical origin, it is known as a versatile plant and has been successfully grown for centuries in temperate climates, too. In recent

years, sweet potato becomes an emerging alternative culture in Romania, especially thriving in sandy soils with warmer climate such as South Oltenia (Draghici et. al, 2018).
The tuberous roots, leaves and young shoots can be consumed as food. Sweet potato root is suitable as a food rich in fiber, starch and micronutrients. On the other hand, less popular, its leaves also provide a dietary source of nutrients valuable for people. The leaves have been shown to contain vitamins, minerals, antioxidants, fiber, and essential fatty acids. Ipomoea batatas cultivars are very well known to be rich in vitamin B, protein, calcium, iron and zinc (Islam et. al, 2003; USDA, Food Data Central, 2019). Moreover, in terms of leaves utilisation, the plant is more tolerant of diseases, pests, and high moisture than many other leafy vegetables. (Islam, 2014)
The nutrient composition of sweet potato roots varies widely, depending on the cultivar type, growing conditions and climate, maturity, storage and processing. Noted by Kays et. al (1985), Truong et. al (2018), Dovene et. al (2019) and Dyah et. al (2020) processing highly impacts nutritional values and its composition. For example, both the boiling and baking treatments resulted in a significant reduction in the β-carotene content. Generally, the treated samples had a higher dry matter content than the fresh samples. The protein content of all samples decreased significantly during baking, while it did not change during boiling. The boiling process led to a significant degradation in starch (Lim 2016).
For reference, the nutrient and phytochemistry composition is presented in the Annex 1 table, presented for raw sweet potato, as per U.S.D.A. National Nutrient Database for Standard Reference, 2019.
The current article sets to review the benefits and medicinal properties of sweet potato as regarded by specialty literature. The outcome is listing the main components and the medical benefits observed, outlining the potential uses of Ipomoea batatas in the plant-based medicine field. The review sets to investigate components in all plant parts: tuberous roots, leaves and young shoots.
The medical benefits of compounds isolated and identified from Ipomoea batatas were searched through scientific articles in various specialty journals.

MATERIALS AND METHODS

Phytochemistry and Benefits

β-carotene

β-Carotene is an organic, strongly coloured, red-orange pigment abundant in many fungi, plants, and fruits. It is more prevalent in the orange-fleshed sweet potato root. Carrots are widely popular as a source of β-Carotene, although based on U.S.D.A. data, a cup of baked sweet potato can contain nearly twice the amount of β-Carotene than cooked carrots. (USDA, Food Central, 2019)
β-carotene and carotenoids composition in sweet potatoes, is an area already studied for decades. It is an already known fact that the varieties with orange flesh are the ones with the most content of β-Carotene out of all sweet potato varieties.

A series of carotenoids with a 5,6-dihydro-5,6-dihydroxy-β-end group called hypomoeaxanthines A (1), B (2), C1 (3) and C2 (4) were isolated from the pulp of yellow sweet potato 'Benimasari' (Maoka et. al 2007). Their structures were determined to be (5R, 6S, 3'R) -5,6-dihydro-β, β-carotene-5,6,3′-triol (1), (5R, 6S, 5′R , 6′S) - 5,6,5 ′, 6′-tetrahydro-β, β-carotene- 5,6,5′6′-tetrol (2), (5R, 6S, 5′R, 8′R) -5 ′, 8′-epoxy-5,6,5 ′, 8′-tetrahydro- β, β-carotene-5,6-diol (3) and (5R, 6S, 5′R, 8′S) - 5 ', 8'-epoxy-5,6,5', 8'-tetrahydro-β, β-carotene-5,6-diol (4).
Trans-β-carotene was the main carotenoid in the roots of seven sweet potatoes with orange flesh. The average content ranged from 1.08 to 3.15 mg / 100 g dry matter (Bengtsson et. al. 2008).
The main carotenoid identified in Nigerian sweet potato varieties was carotenoid pro-vitamin A, (β-carotene), trans-cis isomers namely: all-trans, 9-cis, 13-cis and 15-cis β-carotene isomers (Ukom et al. 2011). Trans-β-carotene had the highest concentration in all four varieties, followed by 9-cis-β-carotene and 13-cis-β-carotene, respectively.
Vimala et. al (2011) studied the content of total carotenes and β-carotene in several sweet potato varieties. They have found that the total carotene composition varies between 7.5 and 15.5 mg/100 g fresh raw sweet potato. The β-carotene compositon varied from 5.9 to 13.6 mg/ 100 g fresh raw sweet potato. The varieties studied were KS-7, ST-14-1, ST-14-16, ST-14-34, ST-14-49, ST-14-53, ST-14-6, ST-14-9, SV-3-17, SV-3-22, all clones from a study program of Central Tuber Crops Research Institute in India. Tubers presented different intensity in orange colour of their flesh.

Based on a study done by Islam et. al (2016) trans-β-Carotene was found to be the major carotenoid in all of the raw potatoes, but boiling was associated with an increase in cis-β-carotene and a decrease in the trans isomer. Kamalsundari and BARI SP-5 orange-fleshed sweet potatoes.
In sweet potato leaves, β-Carotene can be found in considerable amounts, but the colour given by the chlorophyll masks this high content. (Li et. al, 2017)
As stated before, processing plays a role in the composition of nutrients in sweet potatoes. Total-trans-β-carotene retention was 78% when orange-fleshed sweet potato were boiled in water for 20 minutes. When they were steamed for 30 minutes, the retention was 77%, while the roots, fried for 10 minutes resulted in retention levels of 78%. Drying of orange-fleshed sweet potato root slices at 57 ° C in a forced air oven for 10 hours reduced the total

trans-β-carotene content by 12%. Solar drying and outdoor sun drying of sweet potato slices at a moisture content of 10% led to all-trans-β-carotene losses of 9 and 16%, respectively. The cis 13-cis-β-carotene isomer was found in visible amounts in all processed samples, but not in crude samples. (Bengtsson et. al. 2008)
In terms of benefits, simply consuming the orange-fleshed sweet potatoes increases the level of carotenes in the human body. Several studies on this aspect are summarised below.
Based on a study done by van Jaarsveld et al. (2005) on 90 primary school children aged 5–10 years, consumption of β-carotene-rich orange-fleshed sweet potato was found to improve vitamin A status. These results are valuable from a dietetic point of view, especially in developing areas where sweet potato can be used for controlling vitamin A deficiency in children.

Jamil et al. (2012) studied the benefits of sweet potato consumption on a pool of Bangladeshi women residing in a resource-poor community. They found that daily consumption of orange-fleshed sweet potato for 60 days increased plasma β-carotene concentration, but did not increase total body stores of vitamin A.
Amagloh et al. (2012) found that sweet potato based formulations or addition of sweet potato were superior to an already enriched maize-soybean blend called Weaminix (processed from dehulled maize, dehulled soybean, groundnut and fishmeal). They used a household level sweet potato based food to find higher fructose level and more than 100% vitamin A compared to the enriched maize-soybean blend. It also contains lower phytate levels which are known to suppress the absorption of several minerals. Their study suggests using the sweet potato based blend to address vitamin A deficiencies while keeping the other nutritional values as traditional formulations.

Anthocyanins

Anthocyanins are members of the flavonoid group of phytochemicals. Anthocyanins are also referred to as phenolic compounds. They are responsible for the intense colour of many fruits and vegetables (berries, cherries, black rice, red cabbage, dark colour grapes and teas). Sweet potato with purple flesh is a type that has a high content of anthocyanins, which are also responsible for its colour. In contrast to fruits and vegetables containing anthocyanins, sweet potatoes belong to staple foods. (Pervaiz et. al, 2017) Anthocyanins are used as natural food ants, but it is necessary to point out they are not only enhancing the decorative aspect of the food, but also improve its beneficial properties.

Based on different extraction methods, varieties and types of processing of the purple sweet potato, the exact Anthocyanins can be identified. Among different studies, between 12 and 17 types of anthocyanins are identified per sweet potato variety. The structure of anthocyanins varies according to the type, the number of sugar molecules and the type of acylation groups. (Li et al, 2019). However, we can divide anthocyanins into two sub-groups, peonidin and cyanidin. Peonidin is an O-methylated anthocyanidin. Peonidin showed inhibitory and apoptotic effects on cancer cells, notably metastatic human breast cancer cells in in vitro tests (Jung 2007). Most of the purple sweet potato cultivars contain more peonidin than cyanidin. One unique cultivar is the P-40, which contains over 80% cyanidin proportion of anthocyanin. (Xu et. al, 2015). P-40 is a potato cultivar developed to have an increased anthocyanin content.

As stated in a review done by Lila (2004), anthocyanins have important medicinal properties which were observed in both in vivo and in vitro studies. Anthocyanins are known to provide protection from DNA cleavage and lipid peroxidation. DNA cleavage can be a (geno-) toxic response to radiation or a chemical agent, resulting in cell death. Lipid peroxidation is a metabolic process that causes oxidative deterioration of lipids by reactive oxygen species. This process takes place naturally in the human body, but in certain conditions can propagate to degrade the lipids within the cell's membrane. This leads to cell damage and eventually, cell death. Products obtained from the lipid peroxidation reaction are useful indicators of oxidative stress in tissues and have been linked to the progression of cancer. On the same note, anthocyanins decrease capillary permeability and fragility and promote cell membrane strengthening, thus providing anti-inflammatory benefits. Having in mind all the above it is believed that anthocyanins may prevent cancer cells proliferation and inhibition of tumour formation. The capacity of anthocyanins to interfere with the process of carcinogenesis seems to also be linked to multiple potential mechanisms of action including inhibition of cyclooxygenase enzymes and potent antioxidant potential. Anthocyanins' inhibition of the growth of human cancer cells was also proved by Kamei et al. (1995).
In addition to the above, strongly linked to oxidative stress protection, anthocyanins provide cardiovascular disease protection. (Lim et. al, 2013)

In a study conducted by Lim et. al (2013) an anthocyanin-enriched purple-fleshed sweet potato clone, P40, has shown potential protection against colorectal cancer by inducing cell cycle arrest. Tests were done in both in vitro cell culture and in vivo animal model. In the in vivo experiments, a diet containing the P40 species was compared with diets made of other types of sweet potato, with significantly less composition of anthocyanins, but with similar nutritional value otherwise. The content of anthocyanins of the purple sweet potato P40 is 7.5 mg/g dry matter and was concluded to be the triggering chemical for cancer cells cycle arrest. In vitro tests showed human colonic SW480 cancer cells treatment with P40 anthocyanin extracts at 0–40 μM of peonidin-3-glucoside equivalent. The results showed a decrease in cell number proportional to the dose of anthocyanin administered.

Anthocyanins have shown protection from estrogenic activity, thus preventing the development of disease dependent on this hormone. It has been studied that anthocyanins play a role in boosting production of cytokines. Cytokines are cell signaling molecules that aid cell to cell communication in immune responses and stimulate the movement of cells towards sites of inflammation, infection and trauma. Therefore, we can say anthocyanins are boosting the immune response in the human body. (Lila, 2004)

Cho et al (2003) reported that administration of anthocyanin prepared from purple sweet potato, studied in comparison with a Cordyceps mushroom extract, show enhanced cognitive and memory enhancing performance. This was assessed by passive avoidance tests in ethanol-treated mice. Also in conjunction with the Cordyceps mushroom extract, the anthocyanin-rich, sweet potato extract effectively inhibited lipid peroxidation (initiated by $Fe2+$ and ascorbic acid) in rat brain tissues.

Konczak-Islam (2003) studied the antioxidative, antimutagenic (Salmonella-reversion assay; mutagen, Trp-P-1), and antiproliferative (human promyelocytic leukaemia cells HL-60) activities of extracts of high anthocyanin producing sweet potato. The antimutagenic activity of all extracts was found to be dose-dependent. One of the extracts obviously acts as an inhibitor of the proliferation of human promyelocytic leukemia cells, suppressing the growth of leukemia cells with 47%, in a time frame of 24h.

Similarly, Yoshimoto et al. (2001) studied the antimutagenic effect of a water extract from Ayamurasaki purple sweet potato. Results showed strong inhibition on Salmonella typhimurium. A mutated Ayamurasaki type, with a low anthocyanin content, showed weak inhibition of the bacteria mutagenicity. This is relevant to show that the effect is specifically given by anthocyanins.

Studies revealed that sweet potato leaves contained higher amounts of anthocyanins than certain other commercial vegetables, including sweet potato storage roots and potato tubers. Based on Islam et. al (2003), anthocyanin profiles of sweet potato leaves varied according to cultivars, but the status of the anthocyanin compositions was relatively similar in all the cultivars studied. The crude extract from the leaves of sweet potato contains at least fifteen anthocyanins. The anthocyanins of sweet potato leaves can be evaluated with respect to the proportion of peonidin to cyanidin.

Polyphenolic compounds

Polyphenols are a structural class of mainly natural, organic chemicals characterized by the presence of large multiples of phenol structural units. (Singla et. al, 2019) Six polyphenolic compounds were identified and quantified by NMR (Nuclear Magnetic Resonance) spectra and FAB-MS (Fast Atom Bombardment Mass Spectrometry) spectra, and reverse-phase HPLC (High Performance Liquid Cromatography) analysis procedures in sweet potato leaves of three popular Japanese sweet potato cultivars. In the genotypes studied by Islam et. al (2006), caffeic acid, 3-Ocaffeoylquinic acid, 3,4-di-O-caffeoylquinic acid, 3,5-di-O-caffeoylquinic acid, 4,5-di-Ocaffeoylquinic acid and 3,4,5-tri-O-caffeoylquinic acid were identified.

Different polyphenolic compounds have been isolated and identified by chromatography from extracts of sweet potato flour. The extracts were performed using methanol and hydromethanol solvents. The identified compounds were stated to possess impressive pharmacological properties including, but not limited to: hepatoprotective, antibacterial and antihistamine. Inhibition of HIV replication was also observed. It was also demonstrated that these polyphenols exhibit hypoglycemic, radical scavenging, and antimutagenic activities. (Mohanraj et. al, 2014).

Sweet potato leaves contain higher amounts of total polyphenols than even sweet potato roots, in the same way as anthocyanins. The polyphenolic compounds from sweet potato leaves offer many physiological functions such as: protection from diseases linked to oxidation such as cancer, allergies, aging, HIV, and cardiovascular problems, antimutagenic activity, anti-diabetes, and antibacterial activity in vitro and in vivo, which may be used for maintaining and improving people's health. Sweet potato leaves are also a physiologically functional food. Phenolic profiles of sweet potato leaves vary according to genotype, but proportions of the phenolic acids were relatively similar in the genotypes studied by Islam et. al (2006). The phenolic acids are bioactive compounds found in plant foods and beverages and have received increased attention because of their potential antioxidant activities that may exert cardioprotective effects in humans (Kinsella et al., 1993). It has also been shown that intake of these compounds is inversely related to coronary heart disease mortality (Hertog et al., 1995). Since polyphenol compounds show various physiological functions, sweet potato leaves might also be expected to have physiologically-active properties because they contain higher contents of polyphenolic compounds.

Panda et al (2012) demonstrated that the tubers of Ipomoea batatas possess a potent ulcer healing effect. The free radical scavenging activity of the phytoconstituents, and their ability to inhibit lipid peroxidative processes are believed to be responsible for these effects. On preliminary phytochemical screening, the tuber extract revealed the presence of phenolic compounds, polysaccharides, saponin glycosides and flavonoids as major compounds that might have contributed to its antioxidant activity.

Potential cancer-preventing effects were observed on baked sweet potato extracts. Four fractioned extracts were studied using chromatographic methods. Promising results such as the cytotoxicity against human myelocytic leukemia HL60 cells, the apoptosis-inducing activity in human leukemia HL-60 cells, and the scavenging capacity against DPPH radical. DPPH is stable nitrogen centered free radical which is conventionally used to determined free radical scavenging activities of antioxidants present in plant extract or synthetic compound. Two of these fractions present antitumoral activity, when tested in mouse epidermal cell line (JB6) (Rabah et al., 2004). The HL-60 cell line is a human leukemia cell line that has been used for laboratory research on blood cell formation and physiology. HL-60 proliferates continuously in suspension culture in nutrient and antibiotic chemicals. JB6 is one of several epiderman cell lines that are useful in studies of the molecular events in tumor promotion and for development of promotion assays.

Caffeic acid is present in both tubercles and leaves. It is known as an antioxidant and antimutagenic. As shown in various studies (in vivo and in vitro), caffeic acid has a variety of potential pharmacological benefits. For example, caffeic acid inhibits cancer cell proliferation as studied on the human HT1080 fibrosarcoma cell line. HT1080 is a fibrosarcoma cell line which has been used extensively in biomedical research. The effect takes place by an oxidative mechanism the acid has on the cells (Prasad et. al 2011).

Caffeic acid is also known to possess an antioxidant effect and anti-inflammatory activity. Some studies have shown that it has an inhibition effect on carcinogenesis. Caffeic acid is a Vitamin B1 antagonist, but there have been no reported ill effects in humans otherwise. (Basu et. al, 2016).

Among other polyphenolic compounds, caffeic acid is the most effective inhibitor of tumor promotion in mice skin as shown by Shimozono et. all. (1996).

Harrison et. al (2003) studied the caffeic acid composition in the storage root periderm and cortex tissues of genetically diverse sweet potato. Periderm caffeic acid content of the clones ranged from 0.008 to 7.97 mg/g dry weight, whereas the highest cortex content was 0.047 mg/g. Analysis were done using HPLC (High Performance Liquid Cromatography).

Chlorogenic acid (O-caffeoyl-quinic acid) is the ester of caffeic acid and quinic acid. Derivatives of caffeoyl-quinic acid extracted from the sweet potato leaf show the antimutagenic effect. As other components found in leaves, stated in previous sections, these derivatives are helping to prevent the proliferation of human cancer cells (stomach cancer, colon cancer) and also, the proliferation of promyelocytic leukemia cell. (Islam et. al, 2006)

3, 4-di-O-caffeoylquinic acid, 3, 5-di-Ocaffeoylquinic acid, 3-O-caffeoylquinic acid and 4, 5-di-O-caffeoylquinic acid, extracted from steamed sweet potato suppress melanogenesis (Shimozono et al., 1996). Mahmood et al. (1993) comparatively studied the 3, 4, 5-tri-O-caffeoylquinic acid which was observed to exhibit a greater selective inhibition of HIV replication than 4, 5-di-O-caffeoylquinic acid and caffeic acid. The latter has only slight anti-HIV activity.

Coumarins

Coumarin molecules can be described as a benzene molecule with two adjacent hydrogen atoms replaced by a lactone-like chain −(CH)=(CH)−(C=O)−O−, forming a second six-membered heterocycle that shares two carbons with the benzene ring.

The roots of Ipomoea batatas contain the coumarins: esculetin (Minamikawa et al., 1962), scopoletin and umbelliferone. These coumarins, as other components of sweet potatoes, have been shown to inhibit HIV replication. They were also proven to exercise anti-coagulation properties (Cambie & Ferguson, 2003).

Scopoletin (6-methoxy-7-hydroxycoumarin) is a coumarin compound with antifungal properties. Scopoletin is a major active coumarin that is widely used to treat hemiplegia, rheumatoid arthritis, swelling and pain. Scopoletin has been reported to show extensive pharmacologic actions, including anti-oxidative, anti-thyroid, anti-hyperglycemic, anti-nociceptive and anti-arthritic effects. In addition, scopoletin is a partially selective monoamine oxidase B inhibitor that increases the brain dopamine level (Zeng et al., 2017). Based on Kang et al., 1998, scopoletin acts as a hepatoprotective. Shaw et al. (2003) demonstrated antioxidant effects. Scopoletin inhibits the proliferation of human androgen-independent prostate adenocarcinoma cells (PC3) by inducing apoptosis (Liu et al., 2001).

Esculetin is a derivative of coumarin. It is a natural lactone that derives from the intramolecular cyclization of a cinnamic acid derivative. Umbelliferone (7-hydroxycoumarin) is also a natural product of the coumarin family. Both esculetin and umbelliferone are used in sunscreens and have been reported to have antioxidant properties. Other reported activities are anti-inflammatory, anti-hyperglycaemic, molluscicidal, anti-tumor activities, anticoagulant and anti-HIV (Meira et al., 2012).

Calystegines

Calystegines are plant alkaloids that are detected in several plant species. Assignment of individual structures into the sections of calystegines A, B, and C depends on the number of three to five hydroxyl groups, respectively. Calystegines were initially detected in the course of a search for opines and other nutritional mediators in plant roots (Biastoff et al., 2007).

Polyhydroxylated nortropane alkaloids calystegines A3, B1, B2 and C1 were detected in sweet potato (Asano et al. 1997). Calystegine A3, B1, B3 were isolated from sweet potato root samples from Panana (Schimming et al. 1998). From Japan, sweet potato aerial part samples calystegine B1 and B2 were found but no biogenetic precursors were determined; from Panama, sweet potato root calystegine A3 and B1 were found and biogenetic precursors found in the biosynthesis of calystegines were 3-oxotropane (tropinone), 3-β-hydroxytropane (pseudotropine) and 3-β-hydroxynortropane (norpseudotropine) (Schimming et al. 2005).

Calystegines, like other monosaccharide-mimicking alkaloids, inhibit glycosidase due to their similarity to the pyranose moieties of the natural substrates. Glycosidases are ubiquitous intracellular and extracellular enzymes responsible for the hydrolysis of glycosidic linkages. (Asano et. al, 1997)

Triterpenes

Triterpenes are a class of chemical compounds composed of three terpene units with the molecular formula $C_{30}H_{48}$. They may also be thought of as consisting of six isoprene units.

Sweet potato triterpenes with beneficial effects for humans are: friedelin and β-amyrin acetate. Friedelin demonstrates good activity against Staphylococcus aureus. A comparative study with antibiotics (ampicillin, amoxicillin) shows an improved response of friedelin. β-amyrin acetate is having strong antinociceptive properties in tests done on mice. Antinociception is the action or process of blocking the detection of a painful or injurious stimulus by sensory neurons (Mohanraj et al., 2014).

CONCLUSIONS

The present literature review demonstrates that sweet potato contains high concentrations of biologically active compounds, which may hold significant medicinal values for certain human diseases such as powerful antioxidant effect, aid in the prevention of obesity and diabetes, reducing cancer cell proliferation and inhibiting tumor formation, reduce cardiovascular disease risk, suppress cancer cell growth, prevent and improve symptoms of diabetes and hypoglycemia, suppress HIV symptoms, act as hepatoprotective while being part of a nutritious aliment all together.

Anthocyanin and phenolic compounds have attracted special attention because of evidence that they can protect the human body from oxidative stress, which has been associated with cancer, aging and cardiovascular diseases.

The antioxidative and antimutagenic components in the root and leaves of sweet potato have been researched, but the information is scarce.

Cianidine is a more prevalent anthocyanin than peonidin, although both are present in sweet potato roots.

Caffeic acid, cafeoilquinic acid and chlorogenic acid and their derivatives are the polyphenols with bioactive activity, found in sweet potatoes.

Scopoletin, esculetin and umbeliferon are also found in sweet potato, from the coumarines group of chemicals.

Calistegines and triterpenes have a smaller composition, but still play a beneficial role.

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Conflicts of Interest

The authors declare that they do not have any conflict of interest.

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ANNEX 1 – NUTRITIONAL AND PHYTOCHEMISTRY COMPOSITION OF RAW SWEET POTATO BASED ON USDA DATA

Name	Amount	Unit
Water	77.28	g
Energy	86,00	kcal
Energy	359,00	kJ
Protein	1.57	g
Total lipid (fat)	0.05	g
Ash	0.99	g
Carbohydrate, by difference	12.20	g
Fiber, total dietary	3,00	g
Sugars, total including NLEA	4.18	g
Sucrose	2.52	g
Glucose (dextrose)	0.96	g
Fructose	0.7	g
Starch	12.65	g
Calcium, Ca	30,00	mg
Iron, Fe	0.61	mg
Magnesium, Mg	25,00	mg
Phosphorus, P	47,00	mg
Potassium, K	337,00	mg
Sodium, Na	55,00	mg
Zinc, Zn	0.3	mg
Copper, Cu	0.151	mg
Manganese, Mn	0.258	mg

Selenium, Se	0.6	µg
Vitamin C, total ascorbic acid	4.20	mg
Thiamin	0.078	mg
Riboflavin	0.061	mg
Niacin	0.557	mg
Pantothenic acid	0.8	mg
Vitamin B-6	0.209	mg
Folate, total	11,00	µg
Folate, food	11,00	µg
Folate, DFE	11,00	µg
Choline, total	3.20	mg
Vitamin A, RAE	709,00	µg
Carotene, beta	8509,00	µg
Carotene, alpha	7,00	µg
Vitamin A, IU	14187,00	IU
Vitamin E (alpha-tocopherol)	0.26	mg
Tocopherol, beta	0.01	mg
Tocotrienol, alpha	0.01	mg
Vitamin K (phylloquinone)	8.20	µg
Fatty acids, total saturated	0.018	g
Fatty acids, total monounsaturated	0.001	g
Fatty acids, total polyunsaturated	0.014	g
Tryptophan	0.031	g
Threonine	0.083	g
Isoleucine	0.055	g
Leucine	0.092	g
Lysine	0.066	g
Methionine	0.029	g
Cystine	0.022	g
Phenylalanine	0.089	g
Tyrosine	0.034	g
Valine	0.086	g
Arginine	0.055	g
Histidine	0.031	g
Alanine	0.077	g
Aspartic acid	0.382	g
Glutamic acid	0.155	g
Glycine	0.063	g
Proline	0.052	g
Serine	0.088	g