



## Determination of Anti-Oxidant and Anti-Inflammatory Properties of Water Yam and Orange Fleshed Sweet Potatoes

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### ABSTRACT

This study determined the anti-oxidant and anti-inflammatory properties of water yam and orange-fleshed sweet potatoes. A basket of tubers from freshly harvested water yam and orange-fleshed sweet potatoes were purchased from Afor Oru market in Ahiazu base and other ingredients required for the processing and preparation of five dishes and cake snacks of different rations from water yam (*Dioscorea alata*) and Orange fleshed sweet potatoes. White yam serves as control for the dishes and all-purpose flour serves as control for snacks from WY and OFSP. The data obtained from the laboratory were subjected to analysis of variance (ANOVA) to determine statistical differences among means at  $p(0.005)$ . Results were expressed as Standard deviation (SD). The flour processed from WY and OFSP through 30oC – 60 C oven dry was assessed for anti-oxidant and anti-inflammatory properties. The anti-oxidant properties ascertained from water yam (Beta-carotene, vitamin C, E, K, Anthocyanins, selenosis) range from (60-75%) and Orange fleshed sweet potatoes range from (70-90%). The anti-inflammatory (alkaloids, saponin, Tannin, steroids, anythocyanin, carotene, TPC, TFC). It was revealed that both WY and OFSP possess anti-inflammatory properties but with varying levels of bioactive compounds. For bulk density, no significant difference (0.76 g/cm<sup>3</sup> for both). The findings suggest that these ingredients can be used to develop targeted therapeutic diets for elderly individuals, addressing specific health needs and promoting healthy ageing. Further research is recommended to explore their bioavailability, bioefficacy, long term effects in elderly populations.

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### INTRODUCTION

Water yams contain several compounds that have anti-inflammatory properties, including diosgenin, which is a saponin, and Dioscin, which is a glycoside (Wireko-Manu et al., 2013). Diosgenin has been shown to have anti-inflammatory and analgesic effects, while Dioscin has been shown to reduce swelling and inflammation. In addition, water yams are a good source of dietary fiber, which has been shown to reduce inflammation by supporting the growth of beneficial bacteria in the gut (Afoakwa et al., 2014). All of these compounds can help to reduce

inflammation and improve overall health in the elderly (Jenfa et al., 2024). The major constituents of water yam are allantoin, dioscorin, saponin, prosapogenin, gracillin, choline, l-arginine, polysaccharides, and proteins. Due to their immunomodulatory and antitumor effects, yam polysaccharides have attracted increasing attention in the biochemical and medical fields (Nworu et al., 2017).

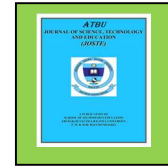
Water yams are rich in several antioxidants including vitamin C, vitamin E, and carotenoids. Vitamin C is essential for maintaining healthy skin, bones, and teeth, and it also

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supports the immune system. Vitamin E is important for protecting the body from free radicals, which can cause cell damage and disease. Carotenoids, such as beta-carotene, have antioxidant properties and can help reduce the risk of age-related diseases, such as macular degeneration and cataracts. Water yams are also a good source of dietary fiber, which is important for maintaining gut health (Ulug *et al.*, 2014).

Additionally, it has been shown to have a positive effect on wound healing. Beta-sitosterol, another compound found in water yam, has been shown to have anti-inflammatory and cholesterol-lowering effects. It can also help to regulate blood sugar levels. Alantolactone, another compound found in water yam, has been shown to have anti-bacterial (Fauziah *et al.*, 2020), anti-fungal, and anti-cancer properties. It has also been shown to protect against oxidative stress. Water yam can show down the ageing process and boost the immune system for diabetics' patients because it contains fiber, a substantial amount of antioxidants and vitamin C and helped to suppress blood sugar.

Orange-fleshed sweet potatoes (OFSP) are a rich source of vitamin A, an essential micronutrient that is critical for healthy vision, immune function, and cell growth. Vitamin A deficiency (VAD) is a significant public health problem in many low-income countries, particularly in sub-Saharan Africa, where it can lead to blindness, impaired immune function, and increased mortality. Biofortification, the process of breeding crops to be more nutritious, has been proposed as a sustainable solution to address VAD. OFSP is one such biofortified crop that has been shown to be effective in reducing VAD in various populations.

Glycoalkaloids, a class of compounds found in Orange fleshed sweet potatoes, have been shown to have anti-bacterial, anti-fungal, and anti-inflammatory properties. Additionally, they have been shown to promote wound healing and inhibit cancer cell growth. Orange fleshed sweet potatoes have also been used for their therapeutic properties. Orange fleshed sweet potatoes have been used to treat a variety of ailments (Assefa *et al.*, 2007), including

rheumatism, skin diseases, and digestive disorders. They have also been used as a sedative and to promote wound healing.

Orange fleshed sweet potatoes are also rich in a number of antioxidants that are beneficial for the elderly. Orange fleshed sweet potatoes are an excellent source of vitamin C, which has many health benefits, including supporting the immune system and reducing inflammation. They are also a good source of anthocyanins, which are a type of flavonoid that has antioxidant and anti-inflammatory properties. Other antioxidants in Orange fleshed sweet potatoes include carotenoids, phenolic acids, and flavonols. All of these compounds help to protect against the oxidative stress that can occur with aging. Orange fleshed sweet potatoes are not only a good source of antioxidants, they are also rich in other nutrients that are important for the elderly. One nutrient that is particularly beneficial for this age group is potassium. Potassium is important for maintaining normal blood pressure, and it can also help to reduce the risk of stroke and heart disease. Orange fleshed sweet potatoes are also a good source of fiber, which helps to support digestive health and can lower cholesterol level (Javanmard *et al.*, 2015).

Snacks are small portions of food that are eaten between meals. They can be sweet or savory, and they are typically less filling than a full meal. Some popular snack foods include fruits, nuts, chips, pretzels, yogurt, and granola bars. Some people view snacks as a way to tide them over until their next meal, while others view them as a treat to enjoy between meals. Snacks can be an important part of a healthy diet, as they can provide extra nutrients and energy to help people stay energized throughout the day. There are a variety of snacks that can be made from water yams and Orange fleshed sweet potatoes (Sinha *et al.*, 2015). For example, water yams can be sliced and fried into chips, or they can be mashed and formed into patties. Orange fleshed sweet potatoes can be sliced and baked into fries, or they can be mashed and formed into dumplings. Additionally, water yams and Orange fleshed sweet potatoes can be incorporated into soups, stews, and casseroles.

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The organoleptic properties of snack which is blends of cakes on different ratios from water yam and Orange fleshed sweet potatoes are well-suited for the individuals, as they are easy to eat and digest. These foods can also provide therapeutic benefits for the individuals, such as reducing inflammation and improving digestion. In overall, water yams and Orange fleshed sweet potatoes can be used to create a wide variety of food that are not only nutritious and flavorful, but also have therapeutic benefits for the individuals. Nigeria is richly blessed with a lot of underutilized foods (Oboh et al., 2019), with therapeutic properties, when properly utilized can help solve problems of malnutrition and provides solution to ailments like diabetes, ulcer (Pessu et al., 2020). The study is conceived to provide the antioxidant and anti-inflammatory properties of water yam and Orange fleshed sweet potatoes, and also help to solve the burden of malnutrition in line with the second Sustainable developmental goal (End hunger, achieve food security and improved nutrition and promote sustainable agriculture).

#### **Objective of the Study**

The broad objective of the study is to determine antioxidant and anti-inflammatory properties of water yam (*Dioscorea alata*) and orange fleshed sweet potatoes (*Ipomoea batata*). Specifically, the study sought to:

1. assess the anti-inflammatory properties of water yam and Orange fleshed sweet potatoes.
2. determine the antioxidants properties of water yam and Orange fleshed sweet potatoes.

#### **METHODOLOGY**

##### **Design of the Study:**

The Researcher used research and development as research design for this study. Research and Development (R&D) is a systematic process aimed at innovating, improving, or creating new products, services, or processes. The Researcher used this research and Development propounded by John. W. Tukey (1915-2000): A mathematician and statistician, Tukey introduced the term "research and

development" in the 1950s. He emphasized the need for iterative cycles of research, development, and testing which motivated the researcher to assess the anti-oxidant and anti-inflammatory of varieties of dishes from Water yam and orange fleshed sweet potatoes.

##### **Area of the Study:**

This study was carried in Umudike Hall in Umuohua Mpam Ekwereazu, Ahiazu Mbaise Local Government Area in Imo State.

##### **Population for the Study:**

The population of the study was 140 people from Umuohua Mpam Ekwereazu, Ahiazu Mbaise local government area of Imo State. Twenty four people were used, which serves as a focus group for the study. The focus group were trained on how to the sensory evaluation of snacks.

##### **Sample and Sampling of Techniques:**

The sample size for the study was determined using multi-stage sampling technique which involved two stages. In the first stage simple random sampling was used to select four (4) villages from Umuohua Mpam Ekwereazu town. In second stage, purposive sampling technique was used to select six (6) people. This gave a total of 24 people which constituted the sample size of the study.

##### **Procurement of Raw Material:**

Ten tubers of freshly harvested water yam and one basket of Orange fleshed sweet potatoes were purchased from Ofor-oru market in Ahiazu Mbaise and other ingredients required for the process and preparation.

##### **Data Collection Techniques:**

Based on those willing to partake in the sensory evaluation of the formulated food, questionnaire was administered, for judgement and acceptability of the product. After the sensory evaluation, the questionnaires were retrieved for data analysis.

#### **ANTIOXIDANT DETERMINATION**

##### **Determination of Total Antioxidant Capacity**

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The total antioxidant capacity was evaluated by phosphomolybdeum method as described by Nabasree and Bratai (2007). The assay was based on the reduction of Mo (vi) to Mo 9V0 by the sample and subsequent formation of a green phosphate/Mo(v) complex at acidic pH. Sample solution in ethanol (0.3ml;  $100\mu\text{g ml}^{-1}$ ) was mixed reagent solution (3 ml; 0.6 M sulphuric acid, 28mM sodium phosphate and 4 Mm ammonium molybdate). A blank composed of 3 ml of reagent solution and methanol was also prepared. All tubes were capped and incubated in boiling water bath at  $95^{\circ}\text{C}$  for 90 min. Absorbance of sample were read against blank at 695nm. The antioxidant capacity of sample were expressed as mg Ascorbic Acid Equivalent per gram of sample ( $\text{mgAAg}^{-1}$ ).

#### **Total Carotenoid Determination**

The total carotenoid content was determined by extraction method using acetone (Rodriguez-Amaya and Kimra, 2006). 5grams of the sample was placed in a mortar and 3grams of hyflosupercel (elite) were added and then ground in 50ml cold acetone and filtered with suction through a sintered glass funnel (acetone extract) then 40ml of petroleum ether were placed in a 500ml separating funnel with the flour stop-cock followed by the acetone extract distilled (water 300ml) were then added slowly letting it flow along the walls of the funnel. The two phases were left to separate and the lower phase was discarded ,washed 3-4 times with distilled water (200ml each time)to remove residue acetone.

50ml petroleum ether were collected in a volumetric flask, passed through a small funnel containing glass wool and anhydrous sodium sulphate (15g, to remove residual water .then absorbance of the sample was read at 450nm.usig uv-visible spectrophotometer.

#### **ANTI-INFLAMMATORY DETERMINATION**

##### **Determination of Alkaloids:**

Gravimetric method of Onwuka (2018) was adopted.10% of each sample was used with 50ml of 10% acetic acid solution in ethanol. The mixture was shaken and allowed to stand for four hours before it was filtered. The filtrate was

evaporated to one quarter its original volume. Concentrated  $\text{NH}_4\text{OH}$  was added drop-wise to precipitate the alkaloids. The precipitate was filtered off and washed with 1%  $\text{NH}_4\text{OH}$  solution, the filtering was done with a weighed filter paper. The precipitate in filter paper was dried in the oven at  $60^{\circ}\text{C}$  for 30mins and reweighed. By weight difference, the weight of alkaloid was determined and expressed as a percentage of the sample weighed analyzed. It was given thus:

Given that:

$W$  = weight of sample

$W_1$  = weight of empty filter paper

$W_2$  = weight of paper + precipitate.

##### **Saponin Determination**

Gravimetric method described by A.O.A.C, (2023) 5.0g of sample was weighed inside extraction thimble and transferred into the soxhlex extractor chamber fitted with a condenser and a round bottomed flask. Some quantity of acetone, enough to cause a reflux was poured into the flask, the sample was exhaustively extracted of its lipid and interfering pigments for 3 hours by licating the flask on a hot plate and the solvent distilled off. This is the first extraction. For the second extraction, a pre-weighed round flat bottomed flask is fitted unto the soxhlex apparatus (bearing the sample containing thimble) and methanol poured into the flask, the methanol should be enough to cause the reflux, the saponin is then exhaustively extracted for 3 hours by heating the flask on a hot plate after which the difference between the final and initial weights of the flask represents the weight of saponin extracted.

##### **Determination of Tannins:**

The Folin – Denis spectrophotometric method was used. The method was described by AOAC, (2023). About 1.0g of the sample was dispersed in 10ml distilled water and agitated. This was left to stand for 30mins at room temperature being shaken every 5 min. at the end of the 30mins, it was centrifuged and the extract gotten. 2-5ml of the supernatant extract was dispersed into a 50ml volumetric flask. Similarly, 2.5ml of



standard tannic acid solution was dispersed into a separate 50ml flask. A 1.0ml folin denis reagent was measured into each flask, followed by 2.5ml of saturated to mark in the flask (50ml) and incubated for 90 mins at 150m temperature the absorbance were measured at 250nm in a Genway model 6000 electronic spectrophotometer, readings were taken with the reagent blank at zero. The tannin content was given as follows,

Where; An – absorbance of test sample

As = absorbance of standard solution

C = concentration of standard solution.

W =  $\frac{\text{weight of sample used}}{\text{total volume of extract}}$

#### **Determination of Steroid Content**

Setrophotometric method described by Adia *et al.* (2016) was adopted. One gram of the sample was macerated with 20ml of ethanol. The solution was filtered with Whatman's No 1 filter paper. Two milliliters (2ml) of the filtrate was pipetted out and 2ml of cholesterol color reagent was added. The solution was left to stand for 35 min after which the absorbance of the solution was taken at 550nm.

$$\text{Concentration} = \frac{\text{Absorbance of sample}}{\text{GradientFactor}} \times DF \quad (2.5.3)$$

Where DF= Dilution Factor

#### **Determination of Total Phenol**

The total phenol content was determined according to the method of Gyesi *et al.* (2019), using gallic acid as standard. The sample extract (0.5ml) was mixed with 25ml folin-ciocalteau reagent (v/v) (previously diluted 10-fold with distilled water) and 2ml sodium bicarbonate(7.5%w/v), and the mixture was diluted to 100mL with distilled water. The solution incubated for 40min at 45°C for colour development; the absorbance was the measured at 765nm. Total phenolic content was expressed as gallic acid equivalents (the concentration of gallic acid was established from a calibration curve) in mg per g fresh weight (mg GAE/g).

#### **Determination of Total Flavonoid:**

The Total Flavonoid content of the extract was determined using a slightly modified method reported by Meda *et al.* (2005). About 0.5 ml of the sample extract was mixed with 0.5ml method, 50  $\mu$ l 10% ALCL3, 50  $\mu$ L, 1m potassium acetate and 1.4 ml water and allowed to incubate at room temperature for 30 min .the absorbance of the reaction mixture was subsequently measured at 415 nm and the total flavonoid content calculated as quercetin equivalent.

#### **Determination of Anthocyanin Content:**

The anthocyanin content in the spice extracts was determined using the pH differential method of Fuleki and Francis (2008) as described by Glusti and Wrolstad (2001), with a slight modification. The freshly prepared extract of each spice was divided into two equal parts of about 10ml each; and their pH values adjusted either to 4.5 by adding 1N HCl or to 1.0 by adding 12N HCl. The absorbance of the two samples at the pH of 4.5 and 1.0 was measured at 520 nm and 700 nm respectively, using the UV visible spectrophotometer (A. Analyst 300, Perkin Elmer, Morwalk, Conn, U.S.A). The anthocyanin content of the samples was calculated in milligrams Cyanidin-3-glucoside per gram of absolutely dry matter of the spices, using molar extinction coefficient of 26900 and molecular weight of 449.2.

#### **Statistical Analysis:**

Analyses was carried out in triplicates and data obtained were subjected to Analysis of Variance (ANOVA) to determine statistical differences among means at p <0.05. Results were expressed as Mean  $\pm$  Standard Deviation (SD).

#### **RESULTS**

The anti-oxidants properties of water yam and orange fleshed sweet potatoes.



**Table 4.1:** Antioxidant properties of water yam and orange fleshed sweet potatoes

PROPERTIES	WHITE YAM Mean ± Std	ORANGE FLESHED SWEET POTATOES Mean ± Std	F-ratio	P-value
Beta carotene	62.39±0.1222	65.77±0.0404.04	1269.378	0.001
Vitamin C	49.51±0.122	52.79 ±0.011	1312.000	0.001
Vitamin E	53.54±0.0888	56.39±0.120.1212	694.231	0.001
Vitamin K	45.84±0.0888	43.67±0.266626	118.612	0.008
Anthocyanin	59.51±0.150.155	54.36±0.0888	1689.331	0.001
Selensis	4.81±0.01101	6.67±0.188	203.506	0.005

Table 4.1 shows the antioxidant properties of water yam and orange fleshed sweet potatoes. The beta carotene content ranged from 62.39±0.12 water yam to 65.77±0.04 orange fleshed sweet potatoes. Vitamin C content ranged from 49.51±0.12 in water yam to 52.79 ±0.01 in orange fleshed sweet potatoes. Vitamin E content ranged from 53.54±0.08 water yam to 56.39±0.12 orange fleshed sweet potatoes. Vitamin K content ranged from 45.84±0.08 in

water yam to 43.67±0.26 orange fleshed sweet potatoes. Anthocyanin content ranged from 59.51±0.15 in water yam to 54.36±0.08 orange fleshed sweet potatoes. Selensis content ranged from 4.81±0.011 in water yam to 6.67±0.18 orange fleshed sweet potatoes.

The anti-inflammatory properties of water yam and orange fleshed sweet potatoes

**Table 4.2:** Anti-inflammatory properties of water yam and orange fleshed sweet potatoes

PROPERTIES	WHITE YAM Mean ± Std	ORANGE FLESHED SWEET POTATOES Mean ± Std	F-ratio	P-value
Alkaloids	1.32±0.00000	1.46±0.020.02.02	93.444	0.01
Saponin	1.68±0.00.000	1.84 ±0.01101	1089.000	0.00
Tannins	0.80±0.00000000	0.72±0.000	0	0
Steroids	0.42±0.00000	0.55±0.0000	169.000	0.00
Anthocyanin	0.56±0.00.0000	0.48±0.000.0000	0	0
Carotene	3.84±0.00000	5.78±0.033	9409.000	0.00
TPC	14.75±0.0777	12.31±0.010.01	2289.846	0.00
TFC	11.68±0.11.111	12.39±0.122	34.766	0.02

Table 4.2 shows the anti-inflammatory properties of water yam and orange fleshed sweet potatoes. The alkaloids content ranged from 1.32±0.000in water yam to 1.46±0.02 orange fleshed sweet potatoes. Saponin content ranged from 1.68±0.00.00in water yam to 1.84±0.0 orange fleshed sweet potatoes. Tannins content ranged from 0.80±0.0000in water yam to 0.72±0.01 orange fleshed sweet potatoes. Steroids content ranged from 0.42±0.000in water yam to 0.55±0.01 orange fleshed sweet potatoes. Anthocyanin content ranged from

0.56±0.00in water yam to 0.48±0.011 orange fleshed sweet potatoes. Carotene content ranged from 3.84±0.000in water yam to 5.78±0.03 orange fleshed sweet potatoes. Total Phenol content (TPC) ranged from 14.75±0.077 water yam to 12.31±0.01 orange fleshed sweet potatoes. Total flavonoid content (TFC) ranged from 11.68±0.11 in water yam to 12.39±0.12 orange fleshed sweet potatoes.

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## DISCUSSION

The antioxidant properties of water yam and orange-fleshed sweet potatoes. Beta-carotene: Higher in orange-fleshed sweet potatoes (1269.378,  $p=0.00$ ) Benefits to elderly: Beta-carotene converts to vitamin A in the body, which supports healthy vision, immune function, and skin health. Elderly individuals may experience declining vision and immune function, making beta-carotene-rich foods beneficial. Vitamin C. Higher in orange-fleshed sweet potatoes (1312.000,  $p=0.001$ ). Vitamin C supports immune function, collagen production, and iron absorption. Elderly individuals may experience decreased immune function and collagen production, making vitamin C-rich foods beneficial. Vitamin E. Higher in orange-fleshed sweet potatoes (694.231,  $p=0.001$ ).

Vitamin E supports skin health, eye health, and immune function. Elderly individuals may experience declining skin and eye health, making vitamin E-rich foods beneficial. Vitamin K. Higher in water yam (118.612,  $p=0.008$ ): Vitamin K supports bone health and blood clotting. Elderly individuals may experience declining bone density, making vitamin K-rich foods beneficial. Anthocyanin: Higher in orange-fleshed sweet potatoes (1689.331,  $p=0.001$ ). Anthocyanin has anti-inflammatory and antioxidant properties, which may support heart health and cognitive function. Elderly individuals may experience declining heart health and cognitive function, making anthocyanin-rich foods beneficial. Selenium: Higher in orange-fleshed sweet potatoes (203.506,  $p=0.005$ ). Selenium supports immune function and antioxidant defenses. Elderly individuals may experience decreased immune function, making selenium-rich foods beneficial.

Also, in line with Hunter *et al.* (2018), water yam and orange-fleshed sweet potatoes offer various antioxidant properties beneficial to elderly individuals, including supporting healthy vision, immune function, skin health, bone health, heart health, and cognitive function. These results suggest that both water yam and orange-fleshed sweet potatoes possess anti-inflammatory properties, but with varying levels of bioactive

compounds. Orange-fleshed sweet potatoes appear to have higher levels of alkaloids, saponin, steroids, and carotene, while water yam has a higher total phenolic content. These findings are consistent with previous studies that have reported the anti-inflammatory properties of orange fleshed sweet potatoes and water yams, which are attributed to their rich content of bioactive compounds such as phenolics, flavonoids, and carotenoids.

A study by Afoakwa *et al.* (2014) found that sweet potatoes had anti-inflammatory effects due to their high content of phenolic compounds, which is consistent with the high TPC found in water yam in this study. Research by Kumar *et al.* (2018) showed that sweet potatoes had anti-inflammatory properties, which were attributed to their high content of carotenoids, similar to the high carotene content found in orange-fleshed sweet potatoes in this study. A review by Amo-Awua *et al.* (2018) highlighted the anti-inflammatory potential of yams and sweet potatoes, which is supported by the findings of this study. A study by Oboh *et al.* (2019) found that boiled and roasted water yam had anti-inflammatory effects, which is consistent with the anti-inflammatory properties found in this study. These studies demonstrate the potential of water yam and orange-fleshed sweet potatoes as functional foods with anti-inflammatory properties, which could be beneficial for human health. Low *et al.* (2017) studied the carotenoid content and antioxidant activity of orange-fleshed sweet potatoes and found that they had high levels of beta-carotene and other carotenoids.

Moyo *et al.* (2020) investigated the anti-inflammatory properties of orange-fleshed sweet potatoes and found that they had high levels of phenolic compounds and antioxidant activity. Kumar *et al.* (2019) examined the nutritional and pharmacological properties of orange-fleshed sweet potatoes and found that they had high levels of vitamins A and E, as well as antioxidant and anti-inflammatory activity. These studies specifically highlight the nutritional and therapeutic properties of orange-fleshed sweet potatoes, which are consistent with the findings of your study. A study by Oboh *et al.* (2019) found that

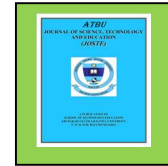
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water yam and orange fleshed sweet potatoes had high antioxidant and anti-inflammatory properties, making them suitable for use in therapeutic diets for the individuals.

## CONCLUSION

This study highlights the antioxidant and anti-inflammatory of water yam and orange fleshed sweet potatoes. The findings can inform the development of personalized therapeutic diets and food products for people, promoting healthy aging and quality of life.

## RECOMMENDATIONS

Based on the findings of this study, the following recommendations are made:

1. Healthcare professionals and dietitians should consider incorporating water yam and orange fleshed sweet potatoes into the diets of elderly individuals, particularly those with antioxidant and anti-inflammatory needs.
2. Food manufacturers should develop therapeutic food products using water yam and orange fleshed sweet potatoes, targeting the elderly population.
3. Further research should be conducted to explore the bioavailability and bioefficacy of antioxidants and anti-inflammatory compounds in water yam and orange fleshed sweet potatoes.
4. Education and awareness programs should be implemented to inform healthcare professionals, caregivers, and the elderly about the potential health benefits of water yam and orange fleshed sweet potatoes.

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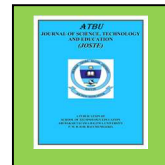
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