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Evaluation of Phytochemical and Nutritional Potential of Okra (Albelmoschus Esculentus) Leaves In Maiha Adamawa State, Nigeria

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Abstract

This work examines the phytochemicals and nutritional potentials of okra (Abelmoschs esculentus) leaves obtained from Maiha. Both the phytochemicals and nutritional potentials of okra (Abelmoschs esculentus) leaves were determined using standard method. The phytochemical composition analysis of okra leave showed the presence of alkaloid (0.22 ± 0.005 %), tannin (2.72 ± 0.005 %), saponnin (3.04 ± 0.015 %), flavonoids (1.50± 0.00 %), oxalate (2.31 ± 0.010 %) and phytate (0.354 ± 0.010 %). The proximate analysis carried out showed crude fat (6.25 ± 0.00 %), crude protein (13.56 ± 0.015 %), crude fibre (9.42 ± 0.005 %), total ash content (7.55 ± 0.00 %), moisture content (9.77 ± 0.00 %), carbohydrate (53.48 ± 0.020 %), dry matter (90.23 ± 0.00 %) and energy (254.16 ± 0.010 cal /100 g). The mineral analysis showed the leaves contains sodium (41.23 ± 0.010 mg /100 g), potassium (1142.56 ± 0.015 mg / 100 g), calcium (121.43 ± 0.005 mg / 100 g) magnesium (94.68 ± 0.00 mg / 100 g), phosphorus (65.26 ± 0.015 mg /100 g), zinc (11.32 ± 0.015 mg / 100 g), iron (9.47 ± 0.015 mg / 100 g) and manganese (25.11 ± 0.010 mg / 100 g). The result of the vitamin composition of this leave also showed beta carotene (22.43 ± 0.010 µ /100 g), B1 (0.43 ± 0.005 mg / 100 g), B2 (1.96 ± 0.010 mg / 100 g), B3(0.53 ± 0.005 mg / 100 g) B5 (0.23 ± 0.005 mg / 100 g), B6 (0.22 ± 0.005 mg /100 g), C (112.37 ± 0.015 mg / 100 g) and vitamin D (0.77 ± 0.015 mg /100 g). The proximate composition is an indication that the leave of okra can be an important nutrient to both human and livestock, the phytochemical is an indication of bioactive component that is an effect source for drugs and the mineral analysis showed that it can be used as food supplement.

Key words: okra, phytochemical, nutrients, vitamin, minerals.

Introduction

In recent years, increasing attention has been paid to the role of diet in human health (Ohr, 2004). The presence of chemical constituents in plants is important for consuming as nutrition and treatment against several diseases. The high intake of plant product is associated with reduced risk of a number of chronic, diseases such as atherosclerosis and cancer (Gosslau and Chen 2004).

These phytochemicals are essentially classified into two groups and which are primary and secondary metabolites based on the utility in plant metabolism. The primary metabolites include Carbohydrates, Amino acids, Proteins and Chlorophylls while secondary metabolites include Flavonoids, Saponins, Alkaloids, Tannins, Steroids, and etc (Dheba *et al.,* 2017). Likewise, the phytochemical components are the source for various pharmaceutical productions. These beneficial effects have been partly accredited to the compound which possesses antioxidant activity. The major antioxidants of vegetables are vitamin C and E, carotenoids and phenolic compounds especially flavonoids. These anti oxidants scavenge radical and inhibit the chain initiation or break the chain propagation (The second defense line). Vitamin E and carotids also contribute to the first defense line against oxidative stress because the quench singlet oxygen (Jeorgedisa *et al*., 2011). Flavonoids as well as vitamin C showed a protective activity to α-atocopherol in human and they can also regenerate vitamin E, from α – chromanoxy radical (Labaran *et al* .,2020a). Nutrients antioxidant may act together to reduce reactive oxygen species level more effectively than single dietary antioxidant because they can function as synergists (Rossetto *et al.,* 2002; N'guessan *et al.,* 2018).

Okra (*Albelmoschus esculentus*) is an economical important vegetable crop grown in tropical and sub-tropical parts of the World. Okra is a multipurpose crop due to its various uses of the fresh leaves, buds, flowers, pods stem and seeds. Okra immature fruits, which are consumed as vegetables, can be used in salad, soups and stews, fresh or dry, fried or boiled. It offers mucilaginous consistently after cooking. Okra mucilage has medicinal applications when used as a plasma replacement or blood volume expander (Naveed *et al.,* 2009). Okra is a power house of valuable nutrients, nearly half of which is soluble fibre in the form of gums and pectin which helps to lower serum cholesterol, reducing the risk of heart diseases. The other fraction of Okra is insoluble fibre which helps to keep the intestinal tract healthy. Okra is also abundant with several carbohydrate, minerals and vitamins which play a vital role in human diet and health. Okra is rich in phenolic compounds with important biological property like quartering and flavonol derivative, catechin oligomers and hydroxycinnamic derivative (Ohr 2004; Rakesh and Vishal 2016).

Okra is also a good source of Ca and K. Okra Pod contains thick slimy polysaccharides which used to thicken soups and stews as an egg white substitute and as a fats substitute in chocolate bar cookies and in chocolate frozen dairy dessert (Sengkhamparn *et al* ., 2009).

Okra is abundant with several vitamins, minerals and nutrients that handle the health benefits the plants provides. Here are the few of Okra health benefits: contain high fibre, which helps to stabilize blood sugar by regulating the rate at which sugar is absorbed from the intestinal tract. The fibre also helps support blood sugar level by slowing down sugar assimilation through the intestines (Ngoc *et al*, 2008). The frequent usage of okra might help avoid kidney disease. Research shows that those who consume okra every day decrease clinical indications of kidney damage a lot more than the ones that simply consumes a diabetic diet. These ties along with

diabetes, at almost 60 % of kidney disease cases are generated by diabetes (Lengsfeld *et al*., 2004; Rakesh and Vishal 2016)

Okra is used to treat digestive issues (Messing *et al.*, 2014). It is used to support colon health (Georgiadisa *et al.*, 2011). It is also use to promote healthy skin, blood and pregnancy (Nguessan *et al*., 2018). It is also use to improve good eye sight, okra is good for asthma patient (Sengkhamparn *et al* ., 2009).

Okra leaves contains trace amount of vitamins A and K. According to the office dietary supplements, vitamin A is essential for bone growth, reproduction, cell division eye health and immune system function. Vitamin K is essential to the body's ability to form blood clots in response to injury. Vitamin K is also necessary for bone strength especially in older populations. Okra leaves contains trace amount of minerals and phytonutrients such as Fe and Mg. Fe is important for the formation of protein use to make blood cell and hemoglobin, the component of the red blood cell that caries oxygen. Magnesium is important for many enzymatic activities throughout the body and contributes to health of the immune system, the central nervous system and bone (Naveed *et al.*, 2009; Tiwari *et al.*, 2016).

The World population growth has led to an increase in nutritional deficiency and disease related to lack of essential nutrient in human diet, particularly affecting vulnerability population. One of the World's greatest challenges is to cure sufficient and health food for all and to do so in an environmentally sustainable manner. In order to reduce these conditions, the attention has been increasingly focused on exploring non-conventional food sources that provide nutritional and pharmaceutical benefit. This research is aimed at evaluating the phytochemical and nutritional composition of Okra (Abelmoschus esculentus) leaves.

Materials and methods

Sample collection

The sample was randomly collected from a farm in Maiha Adamawa State, Nigeria

Sample preparation

The leaves of matured okra was collected and taken to the laboratory, the leaves were then washed with distilled water, dry and grinded in fine particle size using a mechanical grinder.

Chemicals and reagents

All Chemicals and reagents used were of analytical grade.

Quantitative determination of phytochemical composition

The extract of okra leaves were tested for the presence of phytochemicals such as alkaloids, flavonoids, saponin, tannin, phytate and oxalate and quantified using high performance liquid chromatography (HPLC) following the procedure adopted by Selvam (2007)

Proximate Analysis of the Sample

Proximate Analysis (Crude fat, Crude protein Crude fibre Ash content, moisture content, Carbohydrate, Dry matter, Energy) of the samples was carried out following the procedure described by Mbaeyi- Nwaoha and Emejulu (2013)

Determination of mineral Composition

The dried samples were weighed into crucible and placed in muffle furnace at room temperature and the temperature raise to 550^0C for 3 hours to complete ash. The ash was then dissolved in hot 10 % HNO_3, filtered and diluted to required volume in a standard flask with deionized water. This was used to determine the elemental composition by the use of atomic absorption spectrophotometer (AAS) following the standard method of AOAC (2000).

Anti-nutritional Content Analysis

The anti-nutrient contents (oxalates, phytates and tannins) were determined using high-performance liquid chromatography (HPLC) following the procedures adopted by AOAC (2000).

Statistical Analysis

All determinations were replicated three times and results were reported in mean (±) standard deviation

Results and Discussion

The result of phytochemical composition of Okra (Albelmoschus esculentus) leaves was presented in Table 1, while Table 2 shows the result of the proximate composition. Also Tables 3 and 4 shows the results of mineral and vitamin composition.

Table 1 phytochemical composition of Okra leaves (%)

Phytochemical	Values
Alkaloids	0.22 ± 0.005
Tannin	2.72 ± 0.005
Saponin	3.04 ± 0.015
Flavodoids	1.50 ± 0.000
Oxilate	2.31 ± 0.010
Phytate	0.34 ± 0.010

Table 2 proximate composition of Okar leaves (%)

Proximate	values
Crude fat	6.25 ± 0.00
Crude protein	13.56 ± 0.015
Crude fibre	9.42 ± 0.005
Ash content	7.55 ± 0.00
Moisture content	9.77 ± 0.00
Carbohydrate	53.48 ± 0.020
Dry matter	90.23 ± 0.00
Energy	254.16 ± 0.010 (cal/ 100)

Table 3 Mineral com position of okra leaves (mg / 100 g)

Element	Value
Na	41.23 ± 0.010
K	1142.56 ± 0.015
Ca	121.43 ± 0.005
Mg	94.68 ± 0.00
P	65.26 ± 0.015
Zn	11.32 ± 0.015
Fe	9.47 ± 0.015
Mn	25.11 ± 0.010

Table 4 Vitamin composition of Okra leaves (mg / 100 g)

Vitamin	Value
Beta carotene	22.43 ± 0.010 (µg /100 g)
B1	0.43 ± 0.005
B2	1.96 ± 0.010
B3	0.53 ± 0.005
B5	0.23 ± 0.005
B6	0.22 ± 0.005
C	112.37 ± 0.015
D	0.77 ± 0.015

Phytochemical

The analysis revealed the presence of saponin (3.04 ± 0.015 %) which was the highest % obtained from the leaves and flavonoids (1.50 ± 0.00 %), it was reported by Caluete *et al*. (2015) that saponin and flavonoids present in plant extract have varied uses as inflammatory. The leaves were also find to contain appreciable amount of tannin (2.72 ± 0.005 %), Alkaloid (0.22 ± 0.005%), oxalate (2.31 ± 0.010 %) and phtate (0.34 ± 0.010 %). These phytochemicals have shown effectiveness in treatment of cardiac problems, antimicrobial, anti-inflammatory, anti-diarrhea, anti-allergic and anti-cancer effect. The leaves of okra therefore, have potential sources of drugs (Emmanuel *et al.*, 2014).

Proximate composition

The proximate analysis of okra leaves revealed a very high % of carbohydrate (53.48 ± 0.020 %). The amount of carbohydrate detected showed that the leaves could be consumed as a source of carbohydrate food especially in tropic where carbohydrate contributes up to 80 % daily caloric need. Carbohydrate are utilize as major sources of biological energy (Habtamu *et al.*, 2014). Crude protein obtained from the leaves is 13.56± 0.001 %, which is an appreciable value. Consumption of protein helps in the building of essential and non-essential amino acid for protein synthesis. The average crude fibre (9.42 ± 0.005 %) obtained from the leave revealed that it can be used as a source of dietary fibre (Caluete *et al.*, 2015). The moisture content (9.77 ± 0.00 %) obtained from the leaves shows appreciable amount. The crude fat obtained was 6.25 ± 0.00 % which are universally stored forms of energy in living organism. The proximate composition obtained is higher than that obtained by Emmanuel (2014) except for the moisture content which was reported to be 82.60 %. The differences observed in the proximate composition may be due to the differences in the locality of their growth climatic conditions.

Mineral composition

The mineral composition of okra leaves revealed the presence of Na (41.23 ± 0.010mg /100 g), K (1142.56± 0.015 mg /100 g), Ca (121.43 ± 0.005mg / 100 g), Mg (94.68 ± 0.00 mg /100 g), P (65.26 ± 0.014 mg /100 g), Zn (11.32 ± 0.015 mg /100 g),Fe (9.47 ± 0.015 mg /100 g) and Mn (25.11 ± 0.010 mg /100 g). These shows that the leaves could be a good source of minerals for body building and boaster of immune system (Ojo *et al.*, 2014). Magnesium is an essential mineral involved in various metabolic reactions. The presence of Ca shows why the leaves are important in blood cloting (Uzoekwe and Mohammed 2015). The concentration of Fe is also of significance in the leave, it plays a vital role in many intercellular reactions. The leaves contain a high amount of K. Potassium is the principal intercellular cation which function as co factor in several enzmes system involve in the transmission of nerve impulse and in the regulation of heart beat (Caluete *et al.*, 2015; Labaran *et al.*, 2020b).

Vitamin composition

The leaves of okra was noted to contain high composition of vitamin C (112.37 ± 0.015 mg /100 g) also called ascorbic acid, is an antioxidant that promote healthy fit and gums. It helps the body absorbs Fe and maintains healthy tissue. It also promotes wound healing. Beta carotene (22.43 ± 0.010 µg /100 µg) was obtained from the okra leave. Beta carotene is the main safe dietary source of vitamin A, essential for normal growth and development, immune system function, healthy skin and vision. Vitamin D (0.77 ± 0.015 mg / 100 g) helps the body absorb Ca and also helps maintain proper blood level of Ca and P. Vitamin B6 (0.22 ± 0.005 mg /100 g) also called pyridoxine, help form red blood cell and maintain brain function. An appreciable amount of vitamin B2 (1.96 ± 0.010 mg /100 g) was also noted, it act as an antioxidant within the body, it is responsible for maintaining healthy blood cell, help in boasting energy level. Trace amount of vitamin B1 (0.43 ± 0.005 mg / 100 g) commonly known as thiamine possess anti trace properties in addition to this immune system. The presence of Vitamin B3 (0.53 ± 0.005 mg / 100 g) indicate that the leaves can be used to increase the levels of high density lipoprotein in the blood. Vitamin B5 (0.23 ± 0.005 mg /100 g) plays the role of breaking down fat and carbohydrate for energy and the producing of hormone for such as testosterone.

Conclusion

Based on the findings, the result of the of research work revealed that the leaves of okra contain appreciable amount of nutrient, minerals and vitamins which are daily requirement for both human and animal. These findings suggest that the plant leaves of okra could be useful as food supplements for growth and development performance. The phytochemical constituents of this plant leaves of okra revealed that the leaves could probably be a variable and cheaper substitute for conventional drugs since it is easily obtainable

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