



A Check of Phytochemistry, Proximate, Mineral and Vitamin Compositions of *Lycopersicum Esculentum* Crude Fruit Extract

Ogbonna Onyemaechi John^{1*}, Udia Pius Monday¹, Omoregha Omoaregha Agbayayo², Evuchaiwe Humble Chimaobi³, Abe Pierre Noa¹ and Anele Emmanuel Ikechi¹

¹Department of Pharmacology, Faculty of Basic Medical Sciences, University of Calabar, Calabar, Cross River State, Nigeria

²Department of Pharmacy Technology, College of Health Technology, Calabar, Cross River state, Nigeria

³Department of Anaesthesiology, Federal Medical Centre, Owerri, Imo State, Nigeria

***Corresponding Author:** Ogbonna, Onyemaechi John, Department of Pharmacology, Faculty of Basic Medical Sciences, University of Calabar, Calabar, Cross River State, Nigeria.

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Abstract

Lycopersicum esculentum is a vegetable used in many cultures to prepare soup and other delicacies, and as a medicinal plant for the prevention and treatment of many diseases. However, the basis for its therapeutic use has not been properly reviewed. Sample of the Heirloom variety of fruit extract of the vegetable were scientifically analysed, and its phytochemistry, proximate, mineral and vitamin contents were revealed. The phytochemistry showed that *L. esculentum* fruit extract contain lycopene, coumaric acid, β carotene, lutein and zeaxanthin while the proximate contains moisture, ash, protein, carbohydrate, fibre, total and saturated fats in variable amounts, and also embedded with some important vitamins and minerals. The high K (240 mg) and low Na (10 mg) contents, with the anti-oxidants (lycopene, coumaric Acid, β carotene, lutein and zeaxanthin), its vitamins (retinol, pyridoxine, ascorbic acid, nicotinic acid), high water (95%) content and little fibre (1.5g) may be the reasons behind its use in folkloric medicine in many cultures for cancer, heart disease, hypertension, stroke and arrhythmia treatment and prevention.

Keywords: *Lycopersicum esculentum*; Phytochemistry; Proximate; Mineral; Vitamin; Fruit Extract

Introduction

Lycopersicum esculentum is a common vegetable cultivated worldwide which is used for the preparation of soup and other delicacies, and in the treatment and prevention of different ailments. This has resulted in traditional medicine gaining recognition all over the world. It has also contributed to the great number of people in developing nations in the use of medicinal plants. Even individual countries have encouraged the use of its plants and plant products for the prevention and cure of many illnesses. The income it generates to individuals and nations is another great advantage. Nigeria is the second highest producer of this vegetable in Africa and the 16th in the world [1,3], with over 1.55 to 1.8 million tonnes harvested annually and used for domestic consumption with national demand of about 2 - 3 million metric tonnes annually [1,3]. However, over 50% of these are lost due to poor storage system,

poor transportation and lack of processing enterprises [2]. There are about 7500 varieties of *L. esculentum* worldwide [2].

L. esculentum is a vegetable that is widely cultivated worldwide mainly for its fruit which could be red, yellow, purple, orange, brown, and green. It is one of the few fruits that are consumed widely but its leaves stem and roots however are toxic due to alkaloids called Tropanes [1-3]. Alkaloids are nitrogenous organic substances manufactured by plants as secondary metabolites which raise physiological actions in animals even at reduced dose [2,3].

L. esculentum is a plant belonging to the family Solanaceae or Nightshade. It is a perennial and short-lived vegetable plant cultivated yearly with a height of 1 - 3m with a fragile woody stem that sprawl over other plants. The vegetable has left that measures 10 - 25 cm long, with a pinnate of 5 - 9 leaflets [2]. Each leaflet is

almost 8 cm long with serrate margin having its stem and leaves with parked glandular hairs with flowers measuring 1 - 2 cm of yellow colour. It also has 5 lobes that are pointed on the corolla [2,3].

Materials and Methods

Plant Materials

Firm ripe fruits of *Lycopersicum esculentum* were harvested from a farm in Akpet village in Biase Local Government Area of Cross River State of Nigeria during the month of May 2018. The fruits were authenticated by a Taxonomist in Botany Department of the University of Calabar, Calabar, Cross River State, Nigeria as belonging to the variety Heirloom Tomato. The fruits were deposited at the herbarium for reference with voucher specimen number 981 - AA.

Chemicals and Drugs

All chemicals used were purchased from Sigma chemical, Merck chemical supplies, SD fine and Himedia. All other chemicals used were obtained commercially and were of analytical grade.

Preparation of Extracts

The fruits were washed with tap water and then rinsed with distilled water. The outer layers were peeled and discarded while the remaining content was chopped, deseeded and dried at room temperature for two weeks. The dried pulp was crushed into powder using electric blender. The fruit extract was obtained using specific method [4,5]. 25g of the powdered fruit was extracted with 250 ml of ethanol and n-hexane using Soxhlet apparatus. The extraction lasted for six hours. The extracts obtained were concentrated by evaporation using water bath at 100°C, packaged and stored at 4°C in cold room.

Determination of Mineral Composition

The mineral composition was determined using Atomic Absorption Spectrophotometer. 10g of powdered fruits sample was weighed into a crucible and pre-washed using a heater for about 10 minutes. The appearance of a black colour was used to indicate the end of the pre-washing process. The contents were heated using Muffle furnace (Carbolite model MA450) at 500°C for about 20 hours. Nitric acid solution (1% v/v) was thereafter added to the washed sample. The diluted sample was filtered using a Whatmann filter paper. The filtrate was placed in a trace metal bottle for trace mineral analyses using a flame atomic absorption spectrophotometer (Schimadzu Model AA6800).

Determination of Vitamin Composition

The vitamin composition was determined using UV-visible spectrophotometer. 10 ml of methanol was added to 0.5g of the

powdered fruit sample. It was filtered and poured into a cuvette for analysis using UV-visible speed for various vitamins based on their standard calibration curves.

Determination of Proximate Composition

The moisture content, ash content, crude fibre content, crude lipid content, and total carbohydrate content were determined by the method of Association of Official Analytical Chemists [6], while crude protein content was by Kjeldahl method.

Determination of Phytochemical Composition

Quantitative phytochemical analysis was carried out to determine the presence of the Phytochemicals using standard methods as described earlier by [7-18].

Statistical Analysis

The results obtained were expressed as Mean \pm Standard Error of Mean (SEM). Significant differences between the control and experimental values were assessed using student's t-test and the results were considered significant at values less than 0.05 (P = 0.05). Graphical representations were designed using Microsoft Excel (2007).

Results

Phytoconstituents	Inference
Lycopene	+++
Coumaric acid	+++
β Carotene	++
Lutein	+++
Zeaxanthin	++

Table 1: Phytochemical composition of *lycopersicum esculentum* fruit extract per 100g of edible portion.

Components	Values (%)
Moisture	95.00 \pm 0.1
Ash	0.2 \pm 0.2
Protein	0.91 \pm 0.1
Carbohydrate	41.0 \pm 0.1
Fiber	1.5 \pm 0.1
Total fat	0.41 \pm 0.2
Saturated fat	0.0 \pm 0.1

Table 2: Proximate composition of fruit extract of *lycopersicum esculentum* per 100g of edible portion.

Constituents	Concentration
Retinol (Vit.A)	65 μ g \pm 0.2
Thiamine (Vit.B ₁)	0.07 \pm 0.1
Riboflavin (Vit.B ₂)	0.05 \pm 0.2
Pyridoxine (Vit.B ₆)	0.09 \pm 0.1
Ascorbic Acid (Vit.C)	21.8 \pm 0.1
Tocopherol (Vit.E)	0.5 \pm 0.2
Nicotinic Acid (Niacin)	0.92 \pm 0.1
Folate	18.1 μ g \pm 0.2

Table 3: Vitamin content of *lycopersicum esculentum* fruit extract (Mg/100g).

Components	Values (Mg)
Calcium	7.0 \pm 0.1
Phosphorous	26.1 \pm 0.1
Magnesium	15.0 \pm 0.1
Potassium	240 \pm 0.2
Zinc	0.08 \pm 0.1
Sodium	10.0 \pm 0.2
Iron	0.61 \pm 0.1

Table 4: Mineral content of fruit extract of *lycopersicum esculentum* per 100g of edible portion.

Discussion

L. esculentum fruit extract has been found to contain many phytochemicals, proximate, minerals and vitamins. The presence of these constituents has supported its use in the prevention and treatment of many illnesses like hypertension, cancer, depression, constipation and diabetes [19-23]. This fruit has high K (240 mg) and low Na (10 mg), and this has supported reasons behind its use in many parts of the globe in the treatment and prevention of arterial hypertension, stroke, arrhythmia and cancer [19]. Magnesium (Mg) - a mineral found in this fruit blocks the development of arteriosclerosis and therefore prevents heart attack and stroke [19].

L. esculentum contains lycopene - an anti-oxidant which seeks and neutralizes cancer-causing free radicals and inflammatory diseases. It also contains folate B vitamin that aids the fight of depression by preventing excess homocysteine from interfering with neurotransmitters production responsible for better mood [20]. It is also rich in pectin - a type of vegetable fibre known for its anti-cholesterol and anti-carcinogenic properties and also a natural inhibitor of prostate cancer in laboratory rats [21,22]. The presence

of vitamins A, C and E has demonstrated its use in ulcer management as they help to regenerate arterial walls, although vitamins are consumed in small quantity as a high dose may aggravate ulcer. The presence of high K and low Na has put light to its use in the treatment and prevention of cardiovascular diseases [23]. These findings were in per with [9-15, 20-23], and was ascribed to a high tryptophan and carbohydrate contents which raise the serotonin level and gives serotonin mediated natriuretic effect. The presence of folic acid has laid credence to its use in foetal nervous system development and also acts as anti - oxidants for proper functioning of the defensive system. The presence of organic acids potentiates the activity of vitamin C and helps in the elimination of toxic residues like uric acid from the body. The fruit also contain very important and highly effective anti-oxidants. The vitamin C is anti-carcinogenic, and with its carotenoids help in the prevention of ocular degeneration of the retina which causes blindness. Its folic acid helps in neural tube and red blood cell production of the child in the womb and is very beneficial to pregnant women [22].

This important fruit is also embedded with low fibre and high-water content which assist the body to manage blood sugar levels, reduce constipation, stimulates the release of stomach juice and smooth muscle movements that aid normal bowel movements thereby improving digestive health [23].

This vegetable also has coumaric acid which protects the body against carcinogens produced from cigarette smoke and therefore very useful to smokers. It also contains vitamins K and C which improve hair texture, fight against acne and prevent skin cell damage [23-25]. The vegetable also contains zeaxanthin and lutein that are found in the macula of the eye, they block blue light from reaching the underlying structures in the retina that could cause light induced oxidative damage that cause macular degeneration in the elderly [26].

Conclusion

The fruit of *L. esculentum* is utilised in various cultures of the globe in the prevention and treatment of diseases, and has gained wide acceptance, even in its use in wealth acquisition both to individuals and revenue to nations. The isolations and characterization of the active ingredients from these vegetable plant fruit fractions followed by further pharmacological and clinical research would aid in the manufacture of viable herbal drugs for the management of cancer, hypertension, cellular aging, and other cardiovascular diseases which will be readily available and cheap as an alternative therapy to the conventional medications.

Consent

Not applicable

Ethical Approval

All the authors hereby declare that principles of laboratory animal care were followed, as well as specific national laws where applicable and all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 declaration of Helsinki.

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Competing Interests

All authors have declared that no competing interests exist.

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