Original Research Article

Evaluation of Nutritional Composition of *Ocimum gratissimum* Leaf Extract

ABSTRACT

Vegetables are known to be vital sources of nutritive foods. This study evaluates the nutritional composition of *Ocimum gratissimum* leaf extract vis-a-vis proximate minerals and vitamins analyses. Fresh leaves of *Ocimum gratissimum* were purchased from a local market in Awka North Local Government Area of Anambra State, Nigeria and were washed, destalked, oven-dried at 40 ^{0}C, pulverizedand sieved through 2.0 mm mesh prior to analysis. Proximate, minerals and vitamin analyses were carried out, using standard methods. Results indicated that *Ocimum gratissimum* contained high level of carbohydrate (51.78 ± 0.50 %), protein (10.50 ± 0.04 %) and fibre (9.38 ± 0.05 %), with minute quantity of crude fat (4.94 ± 0.03 %). analysis of the mineral compositions showed that the vegetable contained considerable quantity of minerals that is sufficient to improve general well-being, while the vitamin analysis revealed that the leaves of *Ocimum gratissimum* is sufficiently rich in Vitamin E and could therefore act as antioxidant and consequently help to improve health status of its consumers.

Keywords: Green leafy vegetables, *Ocimum gratissimum*, nutrition, health,

INTRODUCTION

Green leafy vegetables are widely succulent plants parts grown in gardens and consumed as a side dish or soup with starchy staples among the tribes in Nigeria [1]. The importance of dietary components of leafy vegetables is significant in African population since they are comparatively rich in fiber, which cereals; root vegetables and other foodstuff are relatively poor sources [2]. In Nigeria, just as in most other African countries where diet is dominated by starchy staple foods, vegetables are considered the cheap source of energy. They are very rich sources of nutrients such as carotene, protein, vitamins, calcium, iron, ascorbic acid and tangible concentration of trace minerals [3].

Many species of vegetables abound in the world and they are characterized with addition of flavor, taste and color to diet which would have otherwise been monotonous. The invaluable food nutrients contained in vegetables can be used for body building, protective and regulatory material as well as sources of energy for the body.

Vegetables also contain plants secondary metabolites which act as anti-nutrients [4]. These secondary metabolites include: tannins, phytate, oxalate and cyanide; all of which have different detriments to nutrition and health [5]. A good leafy vegetable is the one that contains a great deal of these beneficial nutrients and a very minute amount of anti-nutrients. One of the promising vegetables that has been acclaimed 'good' is *Ocimum gratissimum.*

Ocimum gratissimum Linn (Lamiaceae) is an herbaceous shrub notably found in tropical countries, including Nigeria [6], where it is commonly called Clove basil, Sweet basil, tea-bush, Scent leaf or fever plant; but it is also popularly known with

different local names in Nigeria as *"Daidoya"* (hausa), *"Effirin"* (yoruba) and *"Nchuanwu"* (igbo).

Ocimum gratissimum is a widespread and commercially viable perennial herbaceous plant with a very strong aromatic smell. It is used as a natural flavouring agent, condiment, or vegetable in the preparation of fish, meat, soup, and stew.

Scientific reports have shown that *O. gratissimum* has a wide range of bio-active compounds such as flavonoids and polyphenols [7] and essential oils with several beneficial effects [8]. Since the concentrations of the nutrients vary from one leafy vegetable species to another, there is a need to investigate these varying concentrations in the vegetables. Hence, this study evaluates the nutritional composition of *Ocimum gratissimum.*

MATERIALS AND METHODS

Plant Materials

Fresh leaves of *Ocimum gratissimum* were purchased from the daily market, Mgbakwu in Awka North Local Government Area of Anambra State, Nigeria and were authenticated by a Taxonomist, Mr Iroka Finan of the Department of Botany, Nnamdi Azikiwe University, Awka, and a voucher specimen was deposited with Herbarium no NAUH 35B. The leaves were then detached from the stalk, rinsed with distilled water and were oven-dried at 40 ^{0}C. The dried samples were ground into fine powder and sieved through 2.0 mm mesh prior to analysis.

Proximate Analysis

Moisture, ash, crude fat and crude fiber were analyzed in the fresh samples in accordance with the methods described by Association of Official Analytical Chemist [9], while nitrogen was determined by the micro-Kjeldahl method (1976) and the

percentage of nitrogen was converted to crude protein by multiplying by 6.25. Carbohydrate was determined by difference [10].

Vitamin Analysis

Vitamin A and C were determined by the Futter-mayer colometric method of Kirk and Sawyer [11] while Vitamin E was determined using the Emmerie-Engel reaction for Tocopherol estimation as reported by Rosenberg [12].

Mineral Analysis

Wet ashing method was used in releasing the investigated metals in the samples from biological complexes before evaluating them with atomic absorption spectrophotometer (PinAAcle™ 900H) and flame photometer (Gulfex FP6410). The wet ashing was achieved by heating the sample with a digestion mixture containing concentrated nitric, perchloric and sulphuric acids in a Kjeldahl flask [9]. Calcium, Iron, Manganese, Magnesium, Zinc were determined by atomic absorption spectrophotometer; Sodium and Potassium by Flame photometer while Phosphorus was determined by Molybdate method using hydroquinone as a reducing agent [9].

Data Analysis

The values obtained and the significance between the treated and control group was analyzed by one-way ANOVA using the SPSS version 17 and $P< 0.05$ was considered to be statistically significant.

RESULTS AND DISCUSSION

Table 1.0 showed the result for phytochemical analysis of the leaf extract of *Ocimum gratissimum*. Result showed that the leaf extract contained high level of Steroids (81.91±14.16 ug/g), Flavol-3-ol (81.88±9.14 ug/g), Anthocyanin (67.13±6.63 ug/g) and Phenol (50.72±6.07 ug/ml), with considerable amount of Sapogenin (26.36±5.68 ug/g), Quinine (19.95±5.11 ug/g) and Lunamarin (14.64±0.15 ug/g), while

Proanthocyanin 0.42±0.03 ug/g), Naringenin (0.70±0.03 ug/g) and Epihedrine (1.55±0.51 ug/g) are found in trace quantities.

Table 1.0: Table showing average phytochemical composition of the leaf extract of *Ocimum gratissimum*

Parameters	**Quantity**
Proanthocyanin (ug/g)	0.42±0.03
Rutin (ug/g)	6.02±1.56
Ribalidine (ug/g)	4.90±0.00
Quinine (ug/g)	19.95±5.11
Flavol-3-ol (ug/g)	81.88±9.14
Anthocyanin (ug/g)	67.13±6.63
Lunamarin (ug/g)	14.64±0.15
Sapogenin (ug/g)	26.36±5.68
Epihedrine (ug/g)	1.55±0.51
Phenol (ug/ml)	50.72±6.07
Flavonones (ug/g)	6.04±1.14
Steroids (ug/g)	81.91±14.16
Epicatechin (ug/g)	21.02±3.12
Kaepferol (ug/g)	2.97±0.07
Phytate (ug/g)	1.15±0.17
Oxalate (ug/g)	5.61±0.62
Resveratol (ug/g)	5.53±0.54
Flavones (ug/g)	3.32±0.22
Naringenin (ug/g)	0.70±0.03
Tannin (ug/g)	12.39±2.85

Values are mean±*SEM*

Table 2.0 showed the result for proximate analysis of the leaf extract of *Ocimum gratissimum*. Result indicated highest content of Carbohydrate (51.78 ± 0.50%), with minimal content of crude fat (4.94 ± 0.03%).

Table 2.0: T**he percentage proximate composition of the leaf extract of *Ocimum gratissimum***

Proximate components	Percentage composition (%)
Moisture	11.92 ± 0.02
Ash	11.48 ± 0.10
Fiber	9.38 ± 0.05
Crude fat	4.94 ± 0.03
Protein	10.50 ± 0.04
Carbohydrates	51.78 ± 0.50

Values are mean±*SEM*

Table 3.0 showed the result for vitamin analysis of the leaf extract of*Ocimum gratissimum*. Result indicated that the sample is rich in vitamin E (35.85± 1.56 µg/g), with minimal content of vitamin A (1.86± 0.07µg/g).

Table 3.0: T**he vitamin composition of the leaf extract of *Ocimum gratissimum***

Vitamins	**Concentration µg/g**
A	1.86 ± 0.07
C	3.40 ± 0.00
E	35.85 ± 1.56

Values are mean±SEM

Table 4.0 showed the result for mineral composition of the leaf extract of*Ocimum gratissimum*. Result indicated that the sample contain considerable quantity of iron(1.40 ± 0.50 ppm) with minute quantity of copper (0.29 ± 0.17ppm).

Table 4.0: T**he mineral composition of the leaf extract of *Ocimum gratissimum***

Minerals	**Quantity (ppm)**
Copper (ppm)	0.29 ± 0.17
Iron (ppm)	1.40 ± 0.50
Manganese (ppm)	0.31 ± 0.08
Zinc (ppm)	0.79 ± 0.10
Selenium (ppm)	0.37 ± 0.02

Values are mean±SEM

The results of the proximate analysis of the leafy vegetable is represented in Table 2.0. Generally, the results indicate that the vegetable is a good source of carbohydrates protein, and crude fiber. Carbohydrate content was much higher (51.78 ± 0.50 %) compared to other macronutrients. The high Carbohydrate content of O*cimum gratissimum* is in accord with the reports of Hussain *et al*. [13] and Oladejo [14]. O*cimum gratissimum* meets the requirement of providing more than 12% of its calorific value from protein and can thus be considered a good source of protein according to Ajayi *et al*., [1]. The high protein content of O*cimum gratissimum* however does not present it as a good source of protein as the quality of a protein is dependent on its ability to supply all the essential amino acids in the required amount [15]. Hence, protein quality assessment is necessary to ascertain the ability of O*cimum gratissimum* to meet dietary protein need.

The microelements: copper, iron, manganese and zinc are also well represented in the vegetable. Although the Dietary Reference Intake (DRI) of 20.5 mg of iron cannot be met by the vegetable at 100g per day serving, the vegetable is nevertheless a good source of iron as supplementation with other food components will make up for the iron need. Epidemiological studies indicate that diets high in iron can help to fight infections, boost brain health and also promote systemic circulation of oxygen [14]. Manganese is an essential metal because it is required for proper immune function, regulation of blood sugar and cellular energy, reproduction, digestion, bone growth, blood coagulation, and homeostasis as well as defense against reactive oxygen species [16]. The beneficial effects of manganese are due to the incorporation of the metal into metalloproteins, thus aiding biochemical functions. The minute quantity of manganese (0.31 ± 0.08 ppm) present in this leafy vegetable indicates that it could provide the body with the minimum concentrations of manganese required for basic enzyme activities.

Similarly, the zinc concentrations of the vegetable as observed in this study were found to be comparable with previous works [1, 14]. Zinc is highly recommended in diets as it is required for proper sexual organ functioning and enzyme activity. High levels of zinc are usually associated with high-protein food stuff, whereas low levels are obtained from food rich in carbohydrates [17].

Vitamins are organic compounds that are essential to an organism in small quantities for proper metabolic function. As depicted in this study, O*cimum gratissimum* contained considerable quantity of vitamins, especially vitamins A, C and E. Vitamin A is a fat-soluble vitamin that is naturally present in many foods. It is important for normal vision, immune system, reproduction, growth and development. It has also been reported to help in the proper functioning of the heart and lungs [16]. The

vitamin A content as reported in this study is consistent with the findings of Oladejo [14] and Enemor *et al*., [17]. In the same vein, the researched vegetable is found to be rich source of vitamin E (35.85 ± 1.56 µg/g). Vitamin E is a fat-soluble vitamin that act as antioxidant and consequently help to protect the cells from damages occasioned by free radicals. By implication, consumption of this vegetable could aid the body's antioxidant defense mechanism and consequently improve health.

CONCLUSION

This study indicates that the investigated vegetable is a rich source of carbohydrate, protein, fiber and essential minerals, as well as vitamins A. C and E. O*cimum gratissimum*presented a nutritive profile capable of promoting health and well-being. The anti-nutrients in the leafy vegetable are much lower than the safe limits and the reports for other plant sourced foods, including nuts, roots, beans and berries. A serving of 100 g per day of the investigated vegetables, complemented by other nutrient sources, will provide the RDA of the essential minerals investigated. While a serving of up to 2 kg per day of the vegetables does not contribute anti-nutrients higher than the safe limits.

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