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 *O. 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, pulverized, and sieved through 2.0 mm mesh prior to analysis. Proximate, minerals, and vitamin analyses were carried out, using standard methods. Results indicated that *O. gratissimum*contained high levels of carbohydrate (51.78 ± 0.50 %), protein (10.50 ± 0.04 %), and fiber (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 *O. gratissimum* was 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, whereas cereals, root vegetables, and other food are relatively poor sources [2]. Similar to other African countries, a typical Nigerian diet is dominated by starchy staple foods, and vegetables are considered a cheap source of energy. Vegetables are major sources of nutrients such as carotene, protein, vitamins, calcium, iron, and ascorbic acid, and they also contain tangible concentration of trace minerals [3]. Many species of vegetables abound in the world, and they are utilized in addition of flavor, taste, and color to diet which would otherwise be monotonous. The invaluable food nutrients contained in vegetables can be used for body growth, protective, and regulatory roles 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 various detrimental effects to nutrition and health [5]. A good leafy vegetable is the one that contains high amount 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.*

O. gratissimum Linn (Lamiaceae) is a perennial 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. It is also popularly known with different local names in Nigeria as *"Daidoya"* (hausa), *"Effirin"* (yoruba), and

"*Nchuanwu*" (igbo). Due to its strong aromatic smell, it is used as a natural flavoring 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, polyphenols, [7] and essential oils with several beneficial effects [8]. Since the nutrient contents vary from one leafy vegetable species to another, there is a need to investigate these variationswithin the vegetables. Hence, this study aimed to evaluate the nutritional composition of *O. gratissimum*.

MATERIALS AND METHODS

Plant Materials

Fresh leaves of *O. gratissimum* were purchased from a daily market, Mgbakwu in Awka North Local Government Area of Anambra State, Nigeria and were authenticated by a Taxonomist, Mr Iroka Finan,from the Department of Botany, Nnamdi Azikiwe University, Awka.A voucherspecimen wasalso 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 and weighed (300 g). The weighed powdered sample (300 g) was then used for the extraction with a solvent combination of ethanol and water (7:3) (2500 ml) for 48 hr via maceration in an unheated medium. The mixture was decanted and filtered using sterile Whatman paper No. 1. The filtrate was there after evaporated to dryness with the aid of a rotary evaporator set at 50 ^{0}C to obtain crude ethanol extract (25.2 g) which was carefully preserved for further 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 the percentage of nitrogen was determined by the micro-Kjeldahl method

(1976) and 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 colorimetric 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 to release the investigated metals in the samples from biological complexes before evaluating them with atomic absorption spectrophotometer (PinAAcle™ 900H) and flame photometer (Gulfex FP6410). 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, and 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 mean 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 showed the result for proximate analysis of the leaf extract of *O. gratissimum.* Result indicated highest content of Carbohydrate (51.78 ± 0.50%), with minimal content of crude fat (4.94 ± 0.03%).

Table 1: Percentage proximate composition of the leaf extract of *O. 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 expressed in mean±*SEM*

Table 2 showed the result for vitamin analysis of the leaf extract of*O. gratissimum.* Result indicated that the sample was rich in vitamin E (35.85± 1.56 µg/g), with minimal content of vitamin A (1.86± 0.07µg/g).

Table 2: Vitamin composition of the leaf extract of *O. gratissimum*

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

Values are expressed in mean±*SEM*

Table 3showed the result for mineral composition of the leaf extract of*O. gratissimum*. Result indicated that the sample contained considerable quantity of iron (1.40 ± 0.50 ppm) with minute quantity of copper (0.29 ± 0.17 ppm).

Table 3: Mineral composition of the leaf extract of *O. gratissimum*

Minerals	**Quantity (ppm)**
Copper	0.29 ± 0.17

Iron	1.40 ± 0.50
Manganese	0.31 ± 0.08
Zinc	0.79 ± 0.10
Selenium	0.37 ± 0.02

Values are expressed in mean±*SEM*

The results of the proximate analysis of the leafy vegetable was represented in Table 1. Generally, the results indicated that the vegetable was 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. *gratissimum* was in accordance with the reports of Hussain *et al*. [13] and Oladejo [14].*O. gratissimum* met the requirement by providing more than 12% of its calorific value from protein and could, thus, be considered a good source of protein according to Ajayi *et al*. [1]. However, 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. gratissimum* to meet dietary protein requirements.

The microelements: copper, iron, manganese, and zinc were 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 have indicated that diets high in iron can help to fight infections, boost brain health, and 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 present in 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. 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 was consistent with the findings of Oladejo [14] and Enemor *et al*., [17]. In the same vein, the researched vegetable was 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 indicated that the investigated vegetable was a rich source of carbohydrate, protein, fiber, and essential minerals, as well as vitamins A, C, and E. *O. gratissimum*presented a nutritive profile capable of promoting health and well-being. The anti-nutrients in the leafy vegetable were 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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