



Quantitative Determination of Nutritional and Anti-Nutritional Composition of Clove (*Eugenia Caryophyllata*)



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Abstract

In Nigeria and major part of tropical Africa, the consumption of clove spice is in the kitchen. The present study revealed significant nutritional and anti-nutritional value of clove spice used widely across the world in food preparation. Results from the study revealed significant mineral composition in clove. Substantial amounts of Ca, Na, K and Mg were found, while Cu, Fe, P, Mn and Zn were present in trace amounts. Proximate analysis of *Eugenia caryophyllata* revealed the presence of 16.20 % crude lipid, 12.40 % crude protein, 17.50 % crude fibre, and 41.30 % total carbohydrate. The moisture and ash contents were determined to be 14.80 % and 12.60 % respectively of dry sample. The presence of anti-nutritional secondary metabolites; tannins, saponins, oxalates and phytates were evaluated to be 10.12 % 23.86 %, 0.71 % and 0.93 % respectively. This explains why clove is increasingly used as dietary supplement in food and pharmaceutical products, partly due to their high essential mineral content and low anti-nutritional components.

Keywords: Cloves; *Eugenia caryophyllata*; Nutritional; Anti nutritional

Introduction

Herbs and spices have been used from time immemorial for flavouring, food preservation and medicinal purposes. The awareness of the benefits of plants in food as wealthy additives poses researchers to pursue for discovering the influence of such ingredients to the health of the human beings [1]. Spices and herbs are well known food ingredients, which enhances the flavour and aroma of the supplemented foods. Botanically, spices are one class of the aromatic plants; they are mainly present in the tropical provinces. Generally, spices could be either as seeds, flowers or leaves [2]. On the other hand, herbs are fragrant and non-woody plants in which they are used in flavouring food dishes; the herbs could be leaves, stems or seeds. Nutritionally, the spices and herbs are significant in reducing the per oxidation of lipids, which are the changes (off-flavour) in the nature and the chemical composition of lipids during the processing, preservation and the final preparation of foods [3]. Generally, spices and herbs prevent the lipid oxidation process due to the presence of natural antioxidants [4]. Spices and herbs have also antimicrobial properties that can help in the preservation of foods and more recently in animal feed. Nowadays, there is more pressure by consumers in food and feed industry in replacing synthetic preservatives by natural preservatives [5]. Antimicrobial compounds in food, whether or

not processed, can increase the shelf life by reducing the growth of microorganisms or by reducing their viability [6]. The exact chemical composition of herbs and spices have been reported to be greatly influenced by many factors such as part of the plant used, its vegetative state, environmental conditions, harvesting technique, etc. [7]. It is against this background that this study aimed at characterizing the chemical and minerals composition of *Eugenia caryophyllata* (Clove buds).

Cloves are the immature unopened flower buds of the evergreen tree *Eugenia caryophyllus*, which belongs to the Myrtaceae family. Cloves are green or pink when they are picked, and need to be dried until they become brown before they can be stored and sold. They resemble tiny nails of about 1.5cm long and have a diameter of about 0.5cm. Cloves (*Eugenia caryophyllata*) are used in cuisines all over the world as well as in the food, pharmaceutical, tobacco and cosmetics industries.

Materials and Methods

About 200g of the *Eugenia caryophyllata* (Clove buds) were purchased from the local markets. It was ground to a fine powder using a laboratory mill to pass a 0.5mm sieve and kept at room temperature in plastic bags until analyzed.

Proximate analysis

Moisture, ash, proteins, fat and crude fibre contents were determined according to standard procedures outlined in [8]. Total carbohydrate was calculated by difference according to [8] procedure.

Mineral analysis

The sample was ashed and the residue dissolved in hydrochloric acid and quantitatively transferred into a volumetric flask. The volume was made up to 50ml using distilled deionised water. The concentrations of the mineral elements (Ca, Na, K, Cu, Fe, Mg, Mn and Zn) were determined using atomic absorption spectrophotometer according to the method outlined by the Williams [8]. Phosphorous was determined according to the procedure reported by Fiske and Subbarow [9].

Anti-nutritional analysis

Total tannins were determined colorimetrically as described in AOAC [10]. The method described by Day and Underwood [11] was adopted for the determination of oxalates and phytates. Whereas the gravimetric method of AOA [10] was employed to quantitatively determine saponins.

Results and Discussion

Proximate Composition

Data on the dry matter, ash, fat, protein, fibre and carbohydrates constituents in *Eugenia caryophyllata* (Cloves bud) sample are shown in Table 1. The dry matter was determined to be about 85.2%.

Table 1: Proximate Composition (%) of *Eugenia caryophyllata* (Cloves bud).

Constituents	Relative amount
Dry Matter (%)	85.2±0.40
Moisture Content (%)	14.8±0.20
Ash Content (%)	12.6±0.10
Crude Fat (%)	16.2±0.30
Crude Protein (%)	12.4±0.20
Crude Fibre (%)	17.5±0.20
Total Carbohydrate (%)	41.3±0.30

Data are mean of triplicate determinations±standard deviation the ash and fat contents were 12.6% and 16.2% respectively. The Moisture content was determined to be 14.8%, which agree with data reported previously. The protein level, Carbohydrate level and Fibre contents were determined to be 12.4%, 41.3% and 17.5% respectively. These results are comparable with those reported by Kirk and Sawyer [2].

Minerals composition

Minerals determination experiment was conducted to determine the nutritional value of *Eugenia caryophyllata* (Cloves bud). Nine minerals had been inspected, which were calcium, sodium, potassium, copper, iron, phosphorus, magnesium,

manganese and zinc. These minerals are regarded as the most significant elements of a valuable food.

Table 2: Minerals Composition (mg/100g) of *Eugenia caryophyllata* (Clove buds).

Minerals	Concentration (mg/100g)
Ca	117.5
Na	61.6±0.008
K	111.6±0.012
Cu	0.4±0.002
Fe	8.3±0.003
P	1.6±0.007
Mg	196.8±0.020
Mn	20.9±0.008
Zn	1.4±0.004

Data are mean of triplicate determinations±standard deviation Table 2, showed that *Eugenia caryophyllata* (Cloves bud) has high content of the following essential minerals; Calcium Ca, Potassium K and Magnesium Mg, with the following concentrations; 117.5mg/100g, 111.6mg/100g and 196.8 mg/100g, respectively. While relative amount of Sodium Na, about 61.6 mg/100g and Manganese Mn, about 20.9mg/100g were also found to be present in the sample. Iron Fe, Phosphorus P, Zinc Zn and Copper Cu recorded the least with the following concentrations; 8.3mg/100g, 1.6mg/100g, 1.4mg/100g and 0.4mg/100g respectively. This implies that *Eugenia caryophyllata* (Cloves bud) can be a good supplement for Calcium Ca, Potassium K and Magnesium Mg. This agrees with the study of Achinewa et al., [1] where they concluded that *Eugenia caryophyllata* is rich in some micronutrients.

Anti-nutritional composition

Table 3: Anti-nutritional Composition (%) *Eugenia caryophyllata* (Cloves bud).

Constituents	Composition (%)
Tannins	10.12±0.2
Saponins	23.86±0.4
Oxalates	0.71±0.02
Phytates	0.93±0.01

The anti-nutritional composition of *Eugenia caryophyllata* is presented in Table 3. Four factors which include tannins, saponins, oxalates and phytates were quantitatively determined.

Data are mean of triplicate determinations±standard deviation: The concentrations of tannins, saponins, oxalates and phytates in *Eugenia caryophyllata* (Cloves bud) are 10.12 %, 23.86 %, 0.71 % and 0.93 % respectively. Saponin has the highest value while oxalate has the least value. Higher value of oxalate in human diet can increase the risk of renal calcium absorption and has been implicated as a source of kidney stones (Chai and Liebman [12]). Higher value of tannin in foods interferes with protein absorption and digestive enzymes. From the results obtained in this study, the concentrations of oxalate, tannin and

phytate in *Eugenia caryophyllata* (Cloves bud) are low to cause any health risk in human being [13].

Conclusion

This Study can buttress the fact that *Eugenia caryophyllata* (Clove buds) are not only used to add flavour to a variety of dishes, but can also be used as a dietary supplement to correct some nutritional deficiencies, so as to balance our daily diets. The low concentrations of anti-nutritional factors also suggest that *Eugenia caryophyllata* (Cloves bud) is a good source of food for human and animals. To improve animal health and digestion, cloves are increasingly used in animal feeds. Even though this development is still relatively new, but can provide interesting opportunities.

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