Asian Journal of Food Research and Nutrition

Volume 3, Issue 1, Page 92-97, 2024; Article no.AJFRN.111103

Phytochemical, Mineral, and Proximate Characterization of Seed and Pod of Aligator Pepper [*Aframomum melegueta*]

Yerinbide O. [a*], Onwugbuta G. C. [a] and Tonye W. [a]

[a] Department of Biochemistry/Chemistry Technology, School of Science Laboratory Technology, University of Port Harcourt, Nigeria.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/111103

Original Research Article

Received: 09/11/2023
Accepted: 13/01/2024
Published: 07/02/2024

ABSTRACT

This study investigated the phytochemical and proximate composition of Seed and Pod methanol extract of *Aframomum melegueta*. The Seed and the pods extraction were performed by Soxhlet extraction method using methanol. Screening and quantification of total phytochemical in the seed and pod of methanolic extract of *Aframomum melegueta* was carried out using gas chromatography. The proximate composition was carried based on standard methods. The phytochemical composition of the seed revealed the presence of eight phytochemical in which flavonoid has the highest percentage 4.29%, followed by saponin (3.98%), allkaloids (3.85%), phenol (3.54%) tanin (2.35%) terpenoid (1.85%) and steroid (1.25). The phytochemical content of the pod extract was flavanoid (5.10%) which was observed to be highest in concentration, followed by saponin (1.32%), terpenoid (0.76%) steriod (0.64%), alkaloid (0.38) tannin (0.37%) while the least was phenol (0.07%). The protein content of the seed methanolic extract was 38.67± 0.02%

**Corresponding author: E-mail: ewellington@yahoo.com, ewellinton41@yahoo.com;*

which was highest in percentage followed fiber (21.71 ± 0.01%), nitrogen free extract (13.81 ± 0.0.3%), lipid (10.35 ± 0.01%), moisture (7.80 ± 0.02%), dry matter (5.20 ± 0.02%), while the least was ash (2.46 +0.02%). The dry matter of the pod was 7.80 ± 0.02%, which was highest in percentage, follow by nitrogen free extract (21.71 ± 0.01%), fibre (5.20 ± 0.02%), moisture (6.54 ± 0.02%), protein (25.30 ± 0.02%), ash, (6.40+0.02%), and lipid (5.76 ± 0.02%). The phytochemical, mineral, and proximate compositions characterized showed *Aframomum melegueta* pod and seed could have excellent nutritional values, hence justifies their consumption as vegetable in Nigeria.

Keywords: Aframomum melegueta; methanol extract; seed; pod; phytochemicals; proximate.

1. INTRODUCTION

Several medicinal plants are of great relevance in the nutrition [1] and are the cheaper and more available sources of nourishment to the body due to the presence of several beneficial minerals and proteins in them [2]. Plants are shown to contain many diver chemical compounds that of different medicinal properties which can be exploited in drug profiling, designing and production [3,4].

Uhegbu et al. [5] stated that there are over 600 million persons in under developed countries suffering from malnutrition including young growing children residing in the rural areas. Poor nutrition can be minimized through increases in the consumption of plant materials endowed with proteins, minerals and vitamins from the natural environment [2,5]. The Unavailability of profound nutritional information and improved products derived from local plant has been indicated to possess direct linkage with feeding.

In Nigeria, in-depth research on the use of natural plant products to improve nutrition and health has greatly increased over the years which, but this subject has been abandoned by the western society [5,6]. Lack of documentation regarding the nutritional properties of organic substances is the major reasons for the under-utilization of natural plant products. There are a large number of Nigerians particularly those from the Western, Southern, and Eastern parts of Nigeria who depend on plant materials for food but have no consideration for their nutritional composition [7,6].

Alligator pepper is a spice that is used in many cultures for entertainment, religious rites, food flavoring and as a part of many traditional medications [8]. Pregnant women majorly consume alligator pepper because it has been shown to keep help with morning sickness. *Aframomum melegueta* (Alligator pepper) is a spice from the ginger family [9]. It is a perennial plant native to swampy habitats along the West African coast and humid areas, chiefly Ghana and Nigeria [10]. The seeds of *Aframomum melegueta are* used as a spice in food due to the aromatic flavor and pungent taste or as ingredients of ethnomedical preparations for the treatment of snakebites, stomachache and diarrhea, hypertension, aphrodisiacs, measles and leprosy [11]. They are also taken for excessive lactation and post partem hemorrhage, and are used as a purgative, galactogogue, anthelmintic and hemostatic agent. Pharmacological investigations have demonstrated that the seeds have anti-ulcer, antimicrobial and cytoprotective effects [12]. However, there is very scanty information on the chemical, mineral, and proximate composition of the plant. The objectives of the study is to carry out phytochemical, mineral, and proximate characterization of the seed and pod of *Aframomum melegueta* (Aligator pepper).

2. MATERIALS AND METHODS

2.1 Chemical / Reagents

Chemicals used for this research were purchased from commercial industries and the manufacturers' standard methods and procedures were strictly followed with regard to this study.

2.2 Sample Collection and Preparation

The sample alligator pepper (*Aframomum melegueta*) were obtained from swali market in Yenagoa Bayelsa state in December 2021. The pods were separated from the seeds manually and they were allowed to dry further before the sample was ground using a blender (pulse Q232) to a fine powder form.

2.3 Extraction of Sample

Extracts from the seed and the pods were collected by Soxhlet extraction method using

methanol. Exactly, 100g of the two grounded sample was weighed using a balance and was placed inside a thimble, which was loaded into the main chamber of the Soxhlet extractor. The extraction solvent (methanol) was put into a distillation flask and the soxhlet extractor was placed inside the solvent, vapor traveled up the distillation and flowed into the chamber housing the thimble of solid. This cycle was allowed to repeat many times, over hours until the extraction was completed.

2.4 Phytochemical Screening and Quantification

Screening and quantification of total phytochemical in the leaf and pod of methanolic extract of *Aframomum melegueta* was carried out using gas chromatography, following standard methods and procedures.

2.5 Proximate Analysis

The moisture level was determined through evaporation in an oven to attain unchanged mass. Total ash of the plant sample was evaluated by weighing and the values was then changed into dry ash in a swaddle forge (550°C). Crude fat amount was characterized through hexane extraction by adopting a Soxhlet machine. Other analyses performed were based on [13]. Kjeldahl principle and procedure were employed in the quantification of protein concentration. Carbohydrate concentration was estimated by taking the disparity between the sums of all the proximate concentrations from 100%. Calorie readings were garnered by multiplication of the carbohydrate, protein and lipid by the Atwater conversion factors of 17, 17 and 37, respectively [14].

2.6 Minerals Analysis

Mineral contents of the plant determined based on Martin-Prevel et al. [15] method. Calcium, magnesium, potassium, Iron, manganese, copper, zinc, and phosphate (PO_4) were evaluated colorimetrically. The levels of each metallic ion in the plant's aerial parts computed on a crispy weight base.

3. RESULTS AND DISCUSSION

Medicinal plants constitute the main source of new pharmaceuticals and healthcare products [16]. Extraction and characterization of several active phytonutrients from these green factories have given birth to some high activity profile drugs [16]. It is believed that crude extract from medicinal plants are more biologically active than isolated compounds due to their synergistic effects [17,18]. Phytochemical screening of plants has revealed the presence of numerous chemicals including alkaloids, tannins, flavonoids, steroids, glycosides and saponins etc, were responsible for the antifungal and antibacterial potentials elicited by *Euphorbia heterophylla.* In this present study, phytochemical composition of the seed of *Afamomum melegueta* as shown in Table 1. The phytochemical composition of the seed extract revealed the presence of eight (8) phytochemical in which flavonoid has the highest percentage 4.29%, followed by saponin (3.98%), allkaloids (3.85%), phenol (3.54%) tanin (2.35%) terpenoid (1.85%) and steroid (1.25) (Table 2). The phytochemical content of the pod extract wereflavanoid (5.10%) which was observed to be highest in concentration, followed by saponin (1.32%), terpenoid (0.76%) steriod (0.64%), alkaloid (0.38) tannin (0.37%) while the least was phenol (0.07%). From T-test statistical analysis showed that there were significant difference in the phytochemicals of the seeds and the pod of *Aframomum melegueta*. The significant difference in the alkaloid contents between the seed was 0.023, those of tannin significant difference between the seed and pods was 1.000, terpenoids was 1.00, phenolic acid was 1.00 while that of steroid was 0.422. The phytochemical contents observed in the seed and pod of *Afamomum melegueta* could attributed to the presence of these eight phytochemicals. This result agrees with the report of Singh et al. [19] on evaluation of antioxidant potential of ethyl acetate extract/fractions of *Acacia auriculiformis*.

Table 3 shows the proximate composition of methanolic extract of the seed of *Aframomummelegueta*. The protein content of the seed methanolic extract was 38.67$\pm$ 0.02% which was highest in percentage followed fiber (21.71 $\pm$ 0.01%), nitrogen free extract (13.81 $\pm$ 0.0.3%), lipid (10.35 $\pm$ 0.01%), moisture (7.80 $\pm$ 0.02%), dry matter (5.20 $\pm$ 0.02%), while the least was ash (2.46 +0.02%) (Table 3). The dry matter of the pod was 7.80 $\pm$ 0.02%, which was highest in percentage, follow by nitrogen free extract (21.71 $\pm$ 0.01%), fibre (5.20 $\pm$ 0.02%), moisture (6.54 $\pm$ 0.02%), protein (25.30 $\pm$ 0.02%), ash, (6.40+0.02%), and lipid (5.76 $\pm$ 0.02%) as shown in Table 3. The moisture,

protein, lipid, and fibre percentage of seed were higher than those of the pod while dry matter, nitrogen free extract, and ash content were higher than those of the pod (Table 3). The moisture content of the seed and pod of *Aframomum melegueta* are suggestive that plant could be a good provenance of vegetable water for the cells of the body. However, the lipid contents of the seed and pod of are in agreement with statements made by Guyton and Hall [19] and Oyeleke et al. [20] that edibles are poor sources of lipids therefore increases in consumption of vegetables might obviously lower body lipid concentration.

Table 4 indicates the mineral composition of the seed and pod of *Aframomum melegueta.* Analysis of the seed of *Aframomum melegueta* for mineral contents indicated the nine minerals in which Na was 12.50 mg/100 which highest in concentration, followed by Mg(9.64 mg/100 g), Mn (0.66 mg/100 g), Cu (0.43 mg/100 g), Zn (0.32mg/100g) and while the least was PO_4 (0.07mg/100g) (Table 4). Analysis of the pod of *Aframomum melegueta* revealed the presence of nine minerals in which PO_4 was highest (42.54 mg/100 g), followed by K (24.45 mg/100 g), Mn (22.52 mg/100 g), Mg (15.7652mg/100g), Zn (12.8452 mg/100 g), Fe (5.2052mg/100g) and Cu (0.08 mg/100 g) (Table 4). The Na, K, Mg, and Ca levels observed in the seed and pod extract of *Aframomum melegueta* were similar to those reported by Wellington et al. [21] on proximate, mineral, vitamin and amino acid analysis of *Aframomum melegueta.*

Table 1. Phytochemical detected in the seed and pod of *Aframomum melegueta*

Sample	Akaloid	Tannin	Saponin	Flavanoid	Cardiac glycoside	Terpenoid	Phenol	Steriod
Seeds i	++	+	+	+	++	+	+	+
Ii	+	+	+	+	+	+	+	+
Iii	+	+	+	+	+	+	+	+
PODS i	+	+	+	+	+	+	+	+
Ii	+	+	+	+	+	+	+	+
Iii	+	+	+	+	+	+	+	+

Table 2. Phytochemical contents of the seed and pod of *Aframomum melegueta*

Parameter	Seeds	Pods
Alkaloid	3.85 ± 0.01	0.40±0.02
Tannin	2.35±0.02	0.39±0.02
Saponin	3.98±0.02	1.32±0.02
Flavanoid	4.29±0.01	5.10±0.02
Trapanoid	1.85±0.02	0.76±0.02
Phenol	3.54±0.02	0.07±0.02
Steriod	1.24±0.01	0.64±0.02

Value are means + standard deviation (SD). Value are in triplicate determination + SD

Table 3. Proximate composition of the seed and pod of *Aframomum melegueta*

Parameter	Seeds	Pods
Moisture	7.80 ± 0.02	6.54 ± 0.02
Protein	38.67± 0.02	25.30 ± 0.02
Lipid	10.35 ± 0.01	5.76 ± 0.02
Fibre	21.71 ± 0.01	5.84 ±0.02
Dry matter	5.20 ± 0.02	27.46 ± 0.02
Nitrogen free extract	13.81 ± 0.0.3	22.70 ± 0.05
Ash content	2.46 +0.02	6.40+0.02

Value are means + standard deviation (SD)

Table 4. Mineral composition of the seed and pod extract of *Aframomum melegueta*in mg/100 g

Parameter	Seed	Pods
Ca	3.92 ± 0.02	21.50 ± 0.02
Mg	9.64 ± 0.02	15.76 ± 0.02
Na	12.52 ± 0.02	18.36 ± 0.01
K	0.30 ± 0.02	24.45 ± 0.02
Fe	2.80 ± 0.02	5.20 ± 0.02
Mn	0.70 ± 0.02	22.52 ± 0.01
Cu	0.41 ± 0.01	0.08 ± 0.02
Zn	0.33 ± 0.01	12.84 ± 0.01
PO_4	0.07 ± 0.01	73.54 ± 0.02

Value are means + standard deviation (SD)

4. CONCLUSION

Alkaloids, tannin, flavonoids, saponins, phenols, terpenoids, steroids, and cardiac glycosides are present in the seed and pods of *Aframomummelegueta.* The high protein and nitrogen free extract observed on the seed is indicative that consumption of *Aframomum melegueta* seed could help in building and strengthening of body cells. The high content of calcium and magnesium observed in the seed is reflective that consumption of *Aframomum melegueta* pods could help in building strong bones and teeth formation. The considerable concentration of sodium and potassium ions noticed in *Aframomum melegueta* pods is suggestive that consumption of *Aframomum melegueta* pods will enhance proper cellular signaling, membrane and cardiac functioning. The high phosphate level observed in the pods indicates that *Aframomum melegueta* could enhance DNA metabolism upon consumption. The phytochemical, Proximate and mineral compositions characterized showed *Aframomum melegueta* pod and seed could have excellent nutritional values, hence justifies their consumption as vegetable in Southern and Eastern Nigeria.

NOTE

This study highlighted the effectiveness of “traditional medicine” which is an ancient tradition practiced in some parts of India. This ancient concept should be carefully investigated in the light of modern clinical science and can be adopted partially if considered appropriate.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Muhammad A, Dangoggo SM, Tsafe AI, Itodo AU, Atiku FA. Proximate, minerals and anti-nutritional factors of *Gardenia aqualla* (*Gsudendutse*) fruit pulp. Pakistan Journal of Nutrition. 2011;10(6):577-81.
2. Amaechi NC. Nutritive and anti-nutritive evaluation of wonderful kola (*Buccholzia coricea*) seeds. Pakistan Journal of Nutrition. 2009;8(8):1120-2.
3. Sofowora, A.A. (2008). Medicinal plants and traditional medicine in West Africa. 3rd Ed. John Wiley and Sons. Ltd. New York. 2008;200-3.
4. Sarwatt SV, Kakengi AMV, Kaijage JT, Salome M. Effect of *Moringa oleifera* leaf meal as a substitute for Sunflower seed meal on performance of laying hens in Zanzana. Livestock Research for Rural Development. 2002;19(8):151-73.
5. Uhegbu FO, Emeka EJ, Ijeoma K. Studies on the chemical and nutritional content of some Nigerian Spices. International J. of Nutrition and Metabolism. 2011;3(6):72-6.
6. Ejoh RA, Nkonga DV, Inocent G, Carl H, Moses M. Nutritional component of some Non – conventional leafy vegetables consumed in Cameroon. Pakistan Journal of Nutrition. 2007;6(6):712-7.
7. Oshodi AA. Comparison of proteins, minerals and vitamin C content of some dried leafy vegetables. Pakistan Journal of Science Industrial Research. 1992;35:267-9.
8. Oludare TO. *Aframomum melegueta* (grains of Paradise). Annuals of Microbiology and Infectious diseases. 2020;3(1):1-6.
9. Shah MV, Rohit MC. Novel techniques for isolation and extraction of phyto-constituents from herbal plants, Amer. J.

Phytomedicine and Clinical Therapeutics. 2013;3:338.
10. Doherty VF, Olaniran OO, Kanife UC. Antimicrobial Activities of *Aramomum melegueta* (Aligator Pepper) International Journal of Biology. 2010;2(2):126-131.
11. Kamtchouing P, Mbonge GYF, Dimo T, Watcho P, Jatsa HB, Sokeng SD. Effects of *Aframomum melegueta* and Piper guineenseon sexual behaviour of male rats, Behavioural Pharmacology. 2002;13:243–247.
12. Mbongue GYF, Kamtchouing P, Dimo T. Effects of the aqueous extract of seeds of *Afromomum melegueta* on some parameters of the reproductive function of mature male rats. Andrologia. 2011;44(1) 53-58.
13. Association of Official Analytical Chemists (AOAC). Official methods of analysis. 15th Ed. Washington, DC: AOAC. USA. 200-10.
14. Brams SJ, Kilgour DM. Winding down if preemption or escalation occurs: A game-theoretic analysis. J Confl Resolut. 1987; 31(4):547-72.
15. Martin-Prevel P, Gagnard J, Dautier P. Lanalyse Vegetale dans le Controle de L alimentation des Plantes Temperees et Tropicales. Technique documentation, Paris. Journal of Cell Biology. 1984;133: 683-93.
16. Jana S, Shekhawat GS. Phytochemical analysis and antibacterial screening of in vivo and *in vitro* extracts of Indian medicinal herb: Anethum graveolens. Res. J. Med. Plant. 2010;4:206-212.
17. Cowan MM. Plant products as antimicrobial agents. Clinical Microbiology. Rev. 1999;12:564-582.
18. Singh R, Singh S, Kumar S, Arora S. Evaluation of antioxidant potential of ethyl acetate extract/fractions of Acacia auriculiformis A. Cunn. Food Chem. Toxicol. 2007;45:1216-1223.
19. Guyton C, Hall JE. Textbook of medical physiology. Philadelphia, India: Elseveir Publisher. 2006;11:113-5.
20. Oyeleke SB, Dauda BEN, Boye OA. Antibacterial activity of *Ficus capensis*. African Journal of Biotechnology. 2008; 7(10):1414-7.
21. Wellington EO, Onyeike EN, Peters DE, Felix D, Otobo MB. Proximate, mineral, vitamin and amino acid analysis of *Leonurus cardiaca.* Asian Journal of Food Research and Nutrition. 2022;1(3):1-7.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/111103