Organic and Medicinal Chemistry
International Journal
ISSN 2474-7610

Juniper Publishers
key to the Researchers

Research Article
Volume 7 Issue 3 - August 2018
DOI: 10.19080/OMCIJ.2018.07.555720

Organic & Medicinal Chem IJ

Proximate and Antinutritional Analyses of Seed, Pulp and Peel of *Aframomum Angustifolium (Sonn) K.Schum*

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Submission: July 25, 2018; **Published:** August 07, 2018

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Abstract

The seed, pulp and peel of *Aframomum angustifolium (Sonn.) K.Schum* were analyzed for proximate composition and some anti-nutritional factors (alkaloids, oxalate and saponins). The results of the analysis indicate the moisture content of the seed, the pulp and the peel as 13.13±0.76%, 16.48±2.97% and 42.47±0.00% respectively. The % moisture content was higher in the peel and pulp than the seed. The ash content of the seed was found to be 3.55±0.08%, for the pulp as 2.09±0.20% and the peel was found to be 0.86±0.09%. These indicate that the peel has the least amount of ash as compared to the seed and pulp. The lipid content of the seed, the pulp and the peel were 2.59±0.00%, 65.30±0.00% and 41.06±0.00% respectively. Crude fibre content of the seed, the pulp and the peel of the fruit were determined as; 13.72±0.00%, 1.18±0.05% and 5.88±1.79% respectively. Whereas, the results of the crude protein for the seed was found to be 23.05±1.54%, the pulp was found to be 1.57±0.05%, and that of the peel was found to be 1.80±0.05%. The carbohydrate content of the seed, pulp and peel were observed to be 43.96±0.86, 13.38±2.77% and 7.93±1.65% respectively. The seed, pulp and peel had 10.35±0.00%, 7.25±0.00% and 15.05±0.00% amount of alkaloids respectively. Total oxalate for seed, pulp and peel was found as 3.39±0.20%. Results of soluble oxalate revealed 1.13±0.16%, 1.24±0.30% and 1.02±0.47% amounts of the respectively. In addition, the levels of saponins in the seed, pulp and peel were 7.35±0.00%, 20.20±0.35% and 7.00±0.00% respectively. However, if the plants are properly utilized, it will help as a substitute for some food nutrients that can be obtained easily.

Keywords: Aframomum Angustifolium; Proximate Composition; Malnutrition; Antinutritional Factor

Introduction

Malnutrition is a global challenge due to inadequate intake of balanced diet. However, consuming appropriate fruits can contribute significantly to balance diet. In our localities importantly, the fruits may be available but ignorance prevents the people from taking them. The consequences of these could be illness due to lack of essential nutrients which they could have gotten from taking appropriate fruits. This in turn affects our personal, family and societal well-being. Our popular adage says, health is wealth. In fact some fruits are grossly underused because their nutritional & medicinal values are not well known. Fruits are sources of vitamin A, carotenoids, ascorbic acids and many mineral as well as digestible carbohydrate and fibre [1]. The contribution of fruits and it constituent to human nutrition cannot be overstated. Nutritional science has demonstrated that there are certain foods that cannot be eliminated, such as fruits and fresh vegetables.

Fruits offer the most rapid methods of providing adequate supplies of vitamins, minerals and fibre to people living in the tropics. Most fruits and vegetables have low energy density and are recommended for weight management. In another finding, fruits contain about 85% of water, fats and protein in very small varying amounts, a fair proportion of carbohydrate present as cellulose, starch in small quantity, vitamins and sugar [2]. Fruits have high vitamin, mineral, fibre, phytochemical and antioxidant in their pulps, seeds and peels [3]. More so, many fruits are used to make beverages, such as fruit juice or alcoholic beverage such as wine, brandy or vinegar. The fibre content of fruits and vegetables has been reported to have beneficial effects on blood cholesterol and they aid in the prevention of large bowel diseases. It has also been reported that, people who consume diet rich in fruits and vegetables have significantly lower rates of many types of cancers [4].

Nutritionist have advised that eating at least five portions of fruits and vegetable a day can help people to maintain good health throughout their lives, protecting them from heart disease and cancer, Type 11 diabetes, kidney stones and they reduce stroke. Fruits are also useful as nutrient supplement

and recommended internationally as superior to processed foods [5]. Notwithstanding, some fruits are also known to have anti-nutritional factors such as phytates and tannins, which can diminish the nutrient bioavailability, if they are present at high concentrations [6]. About 15% of global disease is as a result of under-nutrition and deficiencies in micronutrients. However, not consuming enough fruits can lead to adverse health conditions such as vitamin deficiency, serious illness (like cancer, heart diseases), digestive problem, weight gain [7]. Hence there is need to explore more on fruit nutritional qualities with aim of incorporating appropriate local or wild fruits into our daily diet.

Aframomum angustifolium is a perennial herb. The genus consists of about 50 species. It is a plant with leafy stems to 1.90m high, and flowers narrow in short inflorescences, pink or carmine; of moist shady places in hill savanna. The ripe fruits appear above the soil surface and are often eaten as a snack [8]. The seeds are surrounded by masses of an agreeable, white, sweet-acid pulp inside 3 membranes. The fruit is a round to oval, tough, orange-red-black berry 7-9cm long including the calyx beak. This species has the most extensive range of any species in the genus, occurring in the Mascarenes, Madagascar, and throughout Tropical Africa from Mozambique to Sudan and Cote d'Ivoire. It also occurs across the Region from Guinea to N and S Nigeria. The plant is named as Barkonon dati, Ogbaichwo, Andra ichambolo and ijoor in Hausa, igede, Idoma and Tiv respectively. The fruits are eaten raw. The sweet, sugary pulp is frequently eaten as a snack it is particularly liked by children. The seeds are crushed and used as a spice like pepper. The stems are beaten for use as a rope in Nigeria to tie up guinea-corn. The Igede people of Nigeria use the rhizomes of this species as a spice. Seeds are chewed in the Democratic Republic of the Congo to get rid of worms. In Liberia the root-stock is given to relieve post-partum pain [9]. In addition, Aframomum angustifolium has laxative, anti-helmintic and anti-fungal properties; juice extract of its rhizomes are effective in the treatment of body odor and toothache [10]. *A. Angustifolium* can be used to treat Fever in Nigeria [11]. The botanical family of this plant is used as antiulcer, antimicrobial, antiplasmodial, hepatoprotective, anticancer as well as a tonic for sexual stimulation [12]. It is also used in treatment of diarrhea [13]. In addition, this work reports for the first time at least in this locality, the proximate composition, alkaloid, oxalate, saponin content of the wild fruits of *Aframomum angustifolium*.

Materials and Methods

Apparatus/Reagents

Crucible, dessicator, kjeldahl, markham distillation, measuring cylinder, buckner flask funnel, whatman filter paper, muffle furnace, drying oven, Soxhlet extractor, cotton wool, centrifuge, water bath, seperatory funnel. Concentrated sulpuric acid, copper sulphate, sodium sulphate, a speck of selenium tablet, distilled water, sodium hydroxide, boric acid, methyl red indicator, hydrochloric acid, petroleum ether, sodium tetraoxosulphate (vi) solution, ethanol, methanol, 10% acetic acid, NH4OH, conc. NH3 solution, 5% CaCl2 solution, 25% H2SO4, 0.05M KMnO4 solution, 20% ethanol, diethyl ether, n-butanol, 5% aqueous NaCl.

Sample Collection

The fruits of *Aframomum angustifolium (Sonn.) K.Schum* were collected from the outskirt of Gawa village in Katsina-Ala Local Government Area of Benue State in December 2017. The plant and its fruits were identified by Mr. Joshua Waya of the Department of Biological Sciences, Benue State University, Makurdi. Fresh fruits were broken to release the pulps, seeds and peels and stored in the freezer for analysis as presented in Figure 1.

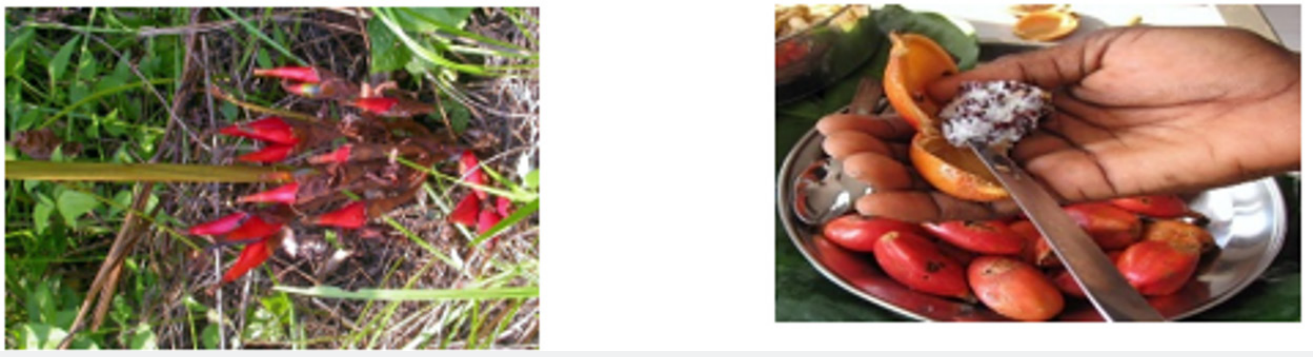

Figure 1: The plant, seed, pulp and peel of *A. angustifolium* (Sonn.) K. Schum fruit.

Determination of Proximate Composition

The moisture, ash, crude lipid, protein, carbohydrate and crude fibre contents of the sample were determined using method described by AOAC [14] and the anti-nutritional analysis were determined using method described by Onyeike [15]. Whereas, the carbohydrate was determined by mass difference.

Results and Discussion

Proximate Analysis

The proximate analysis of seed, peel and pulp of *Aframomum angustifolium* fruits is shown in the Table 1. From above Table 1, the moisture content of seed, pulp and peel were found to be

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13.13%, 16.48% and 42.47% of *A. angustifolium* respectively. The result shows that the % moisture content was higher in peel and pulp relative to the % moisture content of seed. From previous report, moisture content of the pulp and peel of fruits are found to be higher (varied from 65.8 ±3.1 to 93.3 ±0.2 g per100g) than 7% of seed analyzed [16]. It can be seen that the value of moisture content obtained from *A. angustifolium* was comparable to literature values. However, this implies that the fruits pulp have a short shelf life. From the results obtained in this study, the fruits would need to be stored in a cool condition if they are to be kept for a long period or would be needed to be processed as quickly as possible to avoid microbial spoilage. Products with lower moisture content, generally, are less subject to degradation by microorganisms and chemical changes. The high moisture content of the peel suggests that the peels require drying process for better conservation of the product [16,17]. The ash content of seed was found to be 3.55%, pulp was found to be 2.09% while peel was found to be 0.86%. The peel has the least amount of ash as compared to the seed and pulp, this shows that the seed contains more mineral than the peel and pulp. Total ash content of *A. angustifolium* obtained was 6.5%. The value compared favourably with the same fruits of *A. angustifolium* fruits performed by another researcher (6.97%). It is important to note that the ash composition is the amount of mineral elements in food [18].

Table 1: Proximate composition of the seed, pulp and peel of *A. angustifolium* fruit (%).

Parameters	Seed	Pulp	Peel
Moisture	13.13±0.76	16.48±2.97	42.47±0.00
Ash	3.55±0.00	2.09±0.20	0.86±0.09
Crude lipid	2.59±0.00	65.30±0.00	41.06±0.00
Crude fibre	13.72±0.00	1.18±0.05	5.88±1.79
Crude protein	23.05±1.54	1.57±0.05	1.80±0.05
Carbohydrate	43.96±0.86	13.38±2.77	7.93±1.65

Note: Values are recorded as mean ± SD of two determinations

The lipids content for seed, pulp and peel were found to be 2.59%, 65.30% and 41.06%. Result of the proximate analysis shows that the pulp has the highest percentage of lipids, followed by peel while seed gave the least percentage of lipids. Therefore, pulp and peel are good source of oils (65.30±0.00) and (41.06±0.00). They also contain reasonable oil deposit and may thus be a good raw material for extraction of oil for certain use(s) [19]. More so, lipids are important because they contain essential fatty acids and fat soluble vitamins. Lipids are responsible for aroma and flavor of food, source of energy and protect the body against cold [20]. Lipids values of *A. angustifolium* from literature were reported as 3.02%, which is similar to the lipid content of the seed at least in our hands.

The fibre content of seed, pulp and peel were found to be 13.72%, 1.18% and 5.88%. Crude fibre content of pulp (1.18±0.00) is relatively low in comparison to NAFDAC minimum requirement of 3 g /100 g for fibre and the EU/WHO recommended limit of 2.5 g/ 100 g. The crude fibre content of fruit pulps in the present study are also lower than those found in the peel and seed. Dietary fibre helps to maintain the health of gastrointestinal track but, in excess, may bind trace elements, leading to deficiencies of some of these micro nutrients in the body [21]. The lowest amount of crude protein was observed in pulp (1.57%) and the highest in seeds (23.05%).

The amount of protein contents in peel were found to be (1.80%). Protein values were obtained for the seeds of pawpaw and watermelon (23.30% and 22.30%) respectively, it was observed that the protein content for seed was similar to the values of protein in pawpaw and watermelon fruits [16]. Another analysis of protein contents of oranges, it was observed that the seeds protein (6.12%) were more than the peels and albedo protein (3.97% and 0.22%) respectively [21]. This result indicates that the fruit if taken will provide dietary protein need of the body. Moreover, dietary proteins derived from plant origin are generally rich in essential amino acids such as lysine and tryptophan [20]. The carbohydrate contents were determined to be 43.96% in seed, 13.38% in pulp and 7.93% in peel. Results indicate that the seed is higher in carbohydrate than the peel and pulp. Therefore, *Aframomum angustifolium* fruits can be a good source of carbohydrate.

Anti-Nutritional Analysis

The result of alkaloid, oxalate and saponin as obtained in the seed, peel and pulp are as presented in Table 2. Anti-nutritive factors limit the use of many plants or food due to occurrence as natural products in plants or foods. However, these natural compounds are capable of eliciting deleterious effects in man and animals. The curative properties of fruits and spices are perhaps due to the presence of various secondary metabolites which are the non-nutritive plant compounds. The range of the percentage alkaloids present in the food samples was from 7.25 - 15.05%. Among these peel has the highest value of 15.05% while pulp has the least value of 7.25%. The alkaloid found in this fruit is low compared to literature value of 55.54% in Aframomum chrysanthum [22]. The alkaloid content of the *A. angustifolium* may be responsible for its sharp taste [22]. However, alkaloids are known to have curative activity against several pathogens and therefore could suggest the use traditionally/locally and scientifically for the treatment of various illnesses [23].

Table 2: Alkaloid, oxalate and saponin composition of the seed, pulp and peel of *Aframomum angustifolium* fruit (%).

Parameters	Seed	Pulp	Peel
Alkaloid	10.35±0.00	7.25±0.00	15.05±0.00
Oxalate	1.13±0.16	1.24±0.30	1.02±0.47
Saponins	7.35±0.00	20.20±0.35	7.00±0.00

Note: Values are recorded as mean ± SD of two determinations

The total oxalate content in the analyzed sample is 1.13±0.28%. The value recorded in the peel, seed and pulp are 1.02%, 1.13% and 1.24%. The value of oxalate was found to

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be lower when compared with other fruits [20]; however, the value of oxalate are moderate; therefore people suffering from coronary heart disease are encouraged to consume moderately oxalate rich foods as it helps to reduce blood cholesterol [24]. The saponin content of seed, pulp and peel are 7.35%, 20.20% and 7.00%. The values comparable with the 23.01mg/100g as previously reported [20] in fruits. Pulp has the highest value of saponin relative to seed and pulp. High saponin content has been associated with gastro-enteritis manifested by diarrhea and dysentery. However, it was reported that saponin reduces body cholesterol by preventing its re-absorption and suppresses rumen protozoan cell membrane thereby causing it to lyse [25].

Conclusion

The seed, pulp and peel of *Aframomum angustifolium* (Sonn.) K. Schum were analysed for moisture, ash, lipids protein, carbohydrates and fibre, alkaloid, oxalate and saponin. It is found that the seed, pulp and peel of *Aframomum angustifolium* can be considered as good source of mineral (the seed especially), lipid, carbohydrate (the seed especially), protein (the seed especially), fibre and moisture, which is beneficial to human health. Therefore, people could resort to this wild fruits for supplementation of their diet. Importantly, this research has upheld the consumption and various nutritional and medical benefits of this fruit on the basis of its proximate analysis.

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