



# Food characterization and Nutritional Value of *Aframomum giganteum* and *Aframomum alboviolaceum*

ITOUA OKOUANGO Y.S.<sup>1,2,3\*</sup>, MANANGA Vital<sup>1,2,3</sup>, ELENGA Michel<sup>1,2,3</sup> and MAKAYA DANGUI C. U.<sup>2,3</sup>.

1 Multidisciplinary Research Team in Food and Nutrition (Eprancongo)

2 Laboratory of Nutrition and Human Nutrition BP: 69, Faculty of Science and Technology, Marien Nguabi University, Brazzaville, Congo.

3 Department of Masters, Course: Biological Sciences.

\* E-mail for Correspondence: yvonvasthar@gmail.com, Tel: 00 (242) 06-686-74-37

## Abstract

The objective of this study is to determine the nutritional and nutritional value of *Aframomum* marketed in Brazzaville. A consumer survey of *Aframomum* fruits was conducted among 150 consumers and chemical analyzes were performed. The results reveal that out of the 150 buyers surveyed, the representative population was between 25 years old and 29 years old (31.1%), 80.0% of fruit consumers are women compared to 20.0% of consumers are women. men ( $P < 0.001$ ). 20% of respondents have a college level against 46.7% have a high school level,  $P < 0.001$ . 86.7% of the people surveyed consume it raw, and 8.9% turn it into juice. 68.9% of the respondents consume the fruit once a week, 20.0% consume it twice a week ( $p < 0.001$ ). 53.4% of consumers associate *Aframomum* with fish, and 2.2% prefer to associate it with meat ( $p < 0.001$ ). These results reveal that this fruit has a water content of 70.33%. However, the lipids, the proteins, the carbohydrates and the ashes have respective contents of 4.60%, 5.80%, 15.49%, 4.50%. This study revealed that *Aframomum giganteum* and *Aframomum alboviolaceum* have a good nutrient content, deserve to be known and valued because their consumption could have beneficial effects on health by improving the nutritional status of the populations, because of its richness in proteins and minerals.

**Key words:** *Aframomum giganteum* and *Aframomum alboviolaceum* food value, survey, consumption, nutritional value.

## INTRODUCTION

Fruit and vegetables are a source of micronutrients (FAO / WHO, 2007), and their consumption is recognized as an indicator of healthy eating (Florence et al., 2008). It can help prevent several diet-related diseases such as obesity, cardiovascular disease, cancer and also slow down aging (Elenga et al., 2016, FAO / WHO, 2007).

In Congo Brazzaville, soaring food prices are steadily increasing due to a lack of large-scale fruit trees, a lack of agricultural policy and the lack of modernization of market gardening crops. Thus crops such as safous, mangoes, mangosteens, lychees, oranges, mandarins and pineapples become expensive (CNSEE, 2006). This price spike does not facilitate the consumption of fruits. However, the country has a very rich and diversified natural flora, with a high importance in non-lignified forest products (NTFPs), notably non-cultivated wild fruits collected by simple harvesting (FAO, 2001). Non-cultivated wild fruits are easily accessible because collected by simple picking, They have an importance in the food chain.

Congo is a country with enormous potential for wild fruits that, despite their importance, do not receive the attention they deserve. The study of the nutritional value of *Aframomum* allows to have results likely to enter the food database. The general objective of our work is to carry out a characterization of the nutritional and nutritional value of *Aframomum* marketed in Brazzaville.

## METHODOLOGY

### Framework of study

The study was conducted among the inhabitants of Brazzaville in five of these nine districts. This choice was based on the location of major markets in the city and their high population density.

Congo Brazzaville is a country of 342000 km<sup>2</sup> divided into 12 departments, the largest of which is Brazzaville, the capital. It is a highly urbanized country, the high density of the population is concentrated in Brazzaville explaining the choice of this locality for the study.

### Equipment

### Plant material

It was made of fruits of *Aframomum alboviolaceum* and *Aframomum giganteum*. These fruits were bought at the markets Executioner, Commission, Total, Kinkala, Mougali, Plateau of 15 years, Mampassi and Sukissa, then brought to the laboratory for analysis.

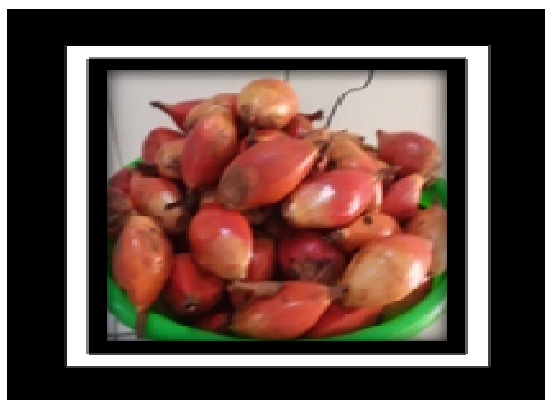


Photo 1: *Aframomum alboviolaceum*



Photo 2: *Aframomum giganteum*

### Teaching materials

The didactic material consisted of a survey sheet, focusing on consumption. The survey form consisted of open questions and closed questions that are asked of the respondent and whose answers are checked on the form by the interviewer. These questions focused on: level of education, duration of consumption, frequency of consumption, consumption patterns and organoleptic qualities.

### Methods

#### Work on the field

The fieldwork was characterized by a consumer survey of *Aframomum* fruit buyers from the Executioner, Commission, Total, Kinkala, Mougali, 15-year-old Plateau, Mampassi and Sukissa markets. The survey only concerned shoppers who shopped.

This is a cross-sectional descriptive survey because this study was conducted on part of the population and for a given period.

#### Inclusion criteria

The persons subject to the survey must meet the following criteria:

- agree to answer the questionnaires
- be a buyer of the product

- buy the fruit on the display
- consume the fruit

### **Conduct of the investigation**

The survey was conducted from 16 November 2018 to 01 December 2018, for 16 days in front of the *Aframomum giganteum* and *Aframomum alboviolaceum* fruit vendors. Each visit to the display had a duration of no more than two hours, during which time we had to wait for potential buyers and submit them to the questionnaires on the survey form. The study made it possible to inventory 150 buyers of *Aframomum* fruits on display. The buyers were interviewed according to the survey sheet, according to the language mastered by the respondent (the language lari was used frequently during the investigation at the level of the markets Total, Kinkala, Executioner, Commission)

### **Work in the laboratory**

The laboratory work consists of physicochemical analyzes of samples of *Aframomum alboviolaceum* and *Aframomum giganteum* fruits purchased in different markets.

### **Place of identification**

Samples of *Aframomum alboviolaceum* and *Aframomum giganteum* fruit were taken to the Botanical Laboratory of the Plant Resources Study Center (CERVE) of the General Delegation for Scientific and Technical Research in Brazzaville for the purpose of determining case.

### **Chemical analyzes**

The chemical analyzes in our sample focused on moisture content, dry matter content, lipid content, protein content and ash content.

### **Sample Preparation for Chemical Analyzes**

The fruits of *Aframomum* were shelled, weighed and dried in an oven at a temperature of 70 ° C until a constant mass. At the end of this drying, the fruits were crushed and the powder obtained was used for the chemical analyzes.

### **Determination of the water content**

The water content was determined by drying the *Aframomum* fruit in an oven at a temperature of 70 ° C.

### **Determination of lipid content**

The Soxhlet method was used to determine the lipid content of *Aframomum* fruits.

### **Determination of the protein content**

Protein content was determined by the method of KJELDAHL (AOAC, 1990).

### **Determination of the content of total mineral salts (ash)**

The ash content is a residue obtained after calcination of *Aframomum* fruits in the oven at 500 °C.

### **Determination of total carbohydrate content**

The sugars were extracted by their solubility in ethanol after delipidation of the crushed *Aframomum* fruit.

### **Statistical analysis of data processing**

The statistical processing of the data from the survey was carried out using Epi info 6fr, Excel and Word software. The Student or comparison test was used. It makes it possible to decide whether the difference observed between the two

**Table 1.** Sociodemographic Characteristics of *Aframomum* Consumers

Parameter	Variable	Effective	Percentage (%)	Statistical test
Sex of consumers	Male	30	20	$\chi^2 = 13,770$ P<0,001
	Female	120	80	
Age of consumers (years)	15-19	37	24,4	$\chi^2 = 10,848$ P<0,001
	20-24	20	13,3	
	25-29	47	31,1	
	30-34	20	13,3	
	35-39	10	6,7	
	45-49	10	6,7	
	50-54	6	4,4	
Mean : 27,27 ± 9,60 years				
Level of education of consumers	Primary Education	30	20	$\chi^2 = 18,44$ P<0,001
	Secondary Education I	43	28,9	
	Secondary Education II	70	46,7	
	Superior	7	4,4	

movements is attributable to a systematic cause or if it can be considered as the effect of a fluctuation due to chance. The statistical analysis of the values obtained was performed according to the student test, and the statistical significance threshold was set at 5%.

## RESULTS AND DISCUSSION

### Sociodemographic characteristics

Table 1 presents the Sociodemographic Characteristics of *Aframomum* Fruit Consumers.

The results reveal that out of the 150 buyers surveyed, that 80.0% of buyers of the fruit are women compared to men account for 20.0% of buyers (P <0.001).

The age ranges from 15 years to 54 years with an average age of 27.27 ± 9.60 years. The representative population was 25 to 29 years of age (31.1%), 15 years to 19 years (24.4%). the least represented age group is 50 years old at age 54 (4.4%). the statistical test is revealing a very significant difference, P <0.001.

With regard to the level of education of the respondents, these results reveal that 20% of buyers have a primary level, 28.9% have a college level while 46.7% have a high school level and only 4.4% have a high school level. University level, P <0.001.

### Consumption and consumption patterns of *Aframomum*

Information on whether or not *Aframomum* has been consumed by buyers and how they are consumed is presented in Table 2.

The results reveal that all buyers consume *Aframomum giganteum* and *Aframomum albviolaceum*. The consumption modality; 86.7% of the people surveyed consume it raw, while 4.4% consume it in compote and 8.9% turn it into juice (p <0.001). Regarding the frequency of consumption, 68.9% of the respondents consume the fruit once a week, 20.0% consume it twice a week against 11.1% consume the fruit more than three times a week (p <0.001).

Regarding the duration of consumption, 77.8% consume the fruit for more than one year against 22.2% consume the fruit for less than a year, of which p <0.001.

### Product taste and utility according to consumers

Table 3 collects the taste of *Aframomum* according to the buyers. This table shows that two distinct flavors have been reported: 73.3% of consumers perceive the acid flavor while 26.7% say the sweet flavor, with p <0.001.

**Table 2.** Distribution of buyers according to consumption patterns, frequency and duration of consumption

Parameter	Variable	Effective	Percentage(%)	Statistical test
Consumption	yes	45	100%	
	No	0		
Modality of consumption	Cru	39	86,7%	$\chi^2 = 13,692$ P<0,001
	In compote	2	4,4%	
	Transformed into juice	4	8,9%	
Frequency of consumption	Once a week	31	68,9%	$\chi^2 = 13,817$ P< 0,001
	Twice a week	9	20,0%	
	More than three a week	5	11,1%	
Duration of consumption	Less than a year	10	22,2%	$\chi^2 = 28,365$ P<0,001
	Plus d'une année	35	77,8%	

**Table 3.** Distribution of consumers according to the taste and usefulness of the fruit

Parameter	Variable	Effective	Percentage(%)	Statistical test
Fruit taste	Sour (acidic)	110	73,3%	$\chi^2 = 34,000$ P< 0,001
	sugar	40	26,7%	
	Bitter	0		
Usefulness of the fruit	Food usefulness	150	100 %	
	Medicinal usefulness	0		

### Association with a food, and consumption with staple

Table 4 presents the information relating to the association of *Aframomum* with another food and the possible use of staple foods in consumption.

These results indicate that 53.4% of consumers associate *Aframomum* with fish, and 2.2% prefer to associate it with meat (p <0.001).

In addition, the 55.6% who associate *afmomum* with another food accompanies it with cassava as a staple (P <0.001). On the other hand, bread, rice and bananas are not used as staple foods for consumption of *Aframomum*.

### Terms of conservation, shelf life and different impacts on the fruit

Table 5 summarizes the conservation methods, the shelf life of the fruit and the different impacts that the fruit presents in case of petrification.

The survey reveals that all the respondents keep their fruits in a ventilated place to allow a good conservation. 60.7% of sellers say that after one week the fruit deteriorates and 39.3% say that their fruit deteriorates in less than a week (p <0.001).

In addition, 78.6% of the respondents say that the deterioration is manifested by a change in the taste of the fruit and the color of the shell; 17, 9% claim that the deterioration is manifested by a change in color of the shell and 3.6% of consumers say that the deterioration is manifested by a change in fruit taste (p <0.001).

### Nutritional values of *Aframomum giganteum*

The nutritional composition of *Aframomum giganteum* and *Aframomum alboviolaceum* is shown in Table 6

These results reveal that this fruit of *Aframomum giganteum* has a water content of 65.29%. However, lipids, proteins,

**Table 4.** Distribution of consumers by whether they combine other foods and use a staple or not

Parameter	Variable	Effective	percentage(%)	Statistical test
Association with other foods	Fish (salted, smoked, roasted)	80	53,4%	$\chi^2= 10,407$ P< 0,001
	Meat	3	2,2%	
	Poultry	0		
Base Use of staple foods	No	67	44,4%	$\chi^2=19,282$ P<0,001
	yes	83	55,6%	
Types of staple foods	no	67	44,4%	
	Cassava	150	100 %	
	bread	0		
	rice	0		
	Banana	0		

**Table 5.** Distribution according to the shelf life of the fruit

Parameter	Variable	Effective	percentage(%)	Statistical test
Conservation place	Airy place	150	100%	
	Wet place	0		
	Outdoors	0		
	Dark place	0		
The duration of the conversation	Less than a week	59	39,3%	$\chi^2= 17,099$ P<0,001
	One week	91	60,7%	
	More than a week	0		
Existence of impact	yes	150	100%	
	no	0		
Type of impact	Color change of the hull	27	17,9%	$\chi^2= 24,285$ p< 0,001
	Change of taste	5	3,5%	
	Change of hull and taste	118	78,6%	

**Table 6.** Chemical composition of *Aframomum*

	<i>Aframomum giganteum</i>	<i>Aframomum alboviolaceum</i>
<b>Overall composition</b>	<b>Values</b>	
Humidity (g / 100g of fresh matter)	65,29±0.11	70,33± 0.07
Lipides (g/100g of dry matter)	11,42±0.06	4,60± 0.11
Protéines (g/100g of dry matter)	4,81±0.15	5,08± 0.10
Glucides (g/100g of dry matter)	12,47± 0.05	15,49± 0.06
Cendres (g/100g of dry matter)	6,01±0.1	4,50± 0.04

carbohydrates and ashes have respective contents of 11.42%, 4.81%, 12.47%, 6.01%.

As for *Aframomum alboviolaceum*, this fruit has a water content of 70.33%. While lipids, proteins, carbohydrates and ashes have respective contents of 4.60%, 5.80%, 15.49%, 4.50%.

## DISCUSSION

Our study found that 80% of *Aframomum* fruit consumers are female, which is consistent with the results of Probst (2008) who said that women are empowered in food-related activities.

The age of the consumers varies between 15 years and 54 years with an average age of  $27.27 \pm 9.60$  years. The most representative population was aged 25 to 29 (31.1%), 15 to 19 (24.4%), 20 to 24, and 30 to 34 (13.3%). These results show that the consumer population consists mainly of young people. Our results differ from those obtained by Volatier (2000) in France in the individual and national study on food consumption, which reveals a marked increase in fruit and vegetable consumption with age in adults. In the same vein, Henderson and Kelly (2005), in the United Kingdom during the national food consumption survey, show a lower consumption of fruits and vegetables among young adults aged 19-24 and higher consumption among 50-64 years old.

This difference could be explained by the demographic context of Congo Brazzaville, which consists of a population aged less than 15 years representing 42.5% against 4.3% for people aged 65 and over (FAO, 2007). The survey reveals that 46.7% of consumers have a high school level, 28.9% a college level, 20.0% a primary level and 4.4% a university level. This high proportion of education is related to the literacy rate in Congo. Indeed, Congo is characterized by a high rate of schooling (84.2%) and a high rate of adult literacy, 78% for women and 90% for men (CNSEE, 2006). In addition, Roos (2001) reveals that consumers with a high level of education consume more fruits and vegetables than those with a low level of education. In the same vein, Stewart and Harris (2005) observe a positive relationship between the level of higher education and the quantities consumed or the variety of fruits consumed. For example, those with long-type and short-type tertiary education eat significantly more fruit (129 g / day and 122 g / day respectively) than those with lower levels of education (87 g / day). These results are consistent with those of Paalanen et al. (2011) in Russia, who reported that the low level of education was associated with inadequate consumption of fruits and vegetables. These results could be explained by the fact that those in school would have a better knowledge of nutrition as a result of formal education.

The study reveals that all respondents consume *Aframomum giganteum* and *Aframomum alboviolaceum*. In particular, 86.7% consume it raw, on the other hand 4.4% consume it in compote and 8.9% turn it into juice. With a consumption frequency of once a week for 68.9% against 11.1% consuming it more than three times a week. Traoré (2005) in a study of fruits in general, corroborate our results and specify that, more and more fruits are stabilized through their transformation into juices and jams. Thus, this transformation into juice or compotes not only allow the consumption of the fruit but also its conservation for prolonged use. The frequency of fruit consumption is related to the socio-economic level, fruit consumption is positively associated with the level of education and income reported by Vandevijvere et al., (2004).

During the study, two flavors stood out: acid (73.3%) and sweet (26.7%). Nevertheless *Aframomum alboviolaceum* has a sweeter flavor, so it is called "the sweet maniguette".

The results reveal that all buyers consume *Aframomum* for food, in addition 53.4% of respondents associate *Aframomum* with fish, and 2.2% prefer to associate it with meat. Also, the preferred staple food is cassava for all consumers associating the fruit with other foods. The preference of the fish could be just linked to the accessibility considering the purchase price more favorable compared to the meat. Mialoundama. (2004) during this work, states that in the Congo, cassava remains the first staple food.

This study noted that the conservation of *Aframomum* fruits was done in a ventilated place with a shelf life of less than a week evoked by 39.3% of consumers against 60.7% estimating it to one week. The product after this shelf life had impacts. The work of Kengue (2002) states that the water content of fruits is an element making them very fragile to putrefaction. Conservation is a critical element influencing the availability, price and quality of the product.

### Chemical characteristics

The study noted that *Aframomum alboviolaceum* is composed of 70.33% water, 15.49% carbohydrate, 4.60% fat, 5.80% protein and 4.50% in ashes. By contrast *Aframomum giganteum* contains 65.29% water, 12.47% of carbohydrates, 11.42% of lipids, 4.81% of proteins and 6.01% of ash.

These two non-cultivable fruits contain an almost identical water content (70.33% for *Aframomum alboviolaceum* and 65.29% for *Aframomum giganteum*). This high water content explains the difficulties of conservation of these products causing their rapid deterioration, observed by Kengue (2002). The total sugar content is almost identical in both fruits. Nevertheless, it is higher in *Aframomum alboviolaceum* (15.49%) than in *Aframomum giganteum* (12.47%). These levels are close to the most commercial fruits described by

Tossou (2003) as: mango (14.3), mandarin (10.4%) but higher than those of orange (8.8%) and lawyer (0.8%). The lipid content is higher in *Aframomum giganteum* (11.42%) than in the *Aframomum alboviolaceum* (4.60 g / 100g dry matter). These values are higher than those of *Detarium senegalense* harvested in five localities of Senegal where the

levels are between 1.79 and 2, 46g / 100g of dry matter (Diop et al., 2010). However, they are lower than that obtained by Ngakegni (2013) in the *Aframomum giganteum* (16%). The quality of soil in which these fruits grow is a determining factor in their physicochemical characterization, which could explain the difference in lipid content of these fruits.

The average protein and ash contents of two fruits are low and substantially identical ( $5.3 \pm 0.5\%$ ). This value is higher than those obtained by Diop et al. (2010) on the fruit pulp of *Senegalese deuterium* where the average protein and ash contents are respectively between 1.59 and 2.06% of dry matter; 1.21 and 2, 34% dry matter. *Aframomum alboviolaceum* and *Aframomum giganteum* could therefore be a significant source of protein and ash compared to other fruits that are already valued or overexploited.

## CONCLUSION

The objective of this work was to evaluate the consumption of *Aframomum* marketed in Brazzaville and to determine certain chemical characteristics. Survey results indicate that *Aframomum giganteum* and *Aframomum alboviolaceum* are seasonal non-cultivated wild fruits. The consumption of *Aframomum giganteum* and *Aframomum alboviolaceum* is part of the eating habits of the population of Brazzaville.

This study revealed that *Aframomum giganteum* and *Aframomum alboviolaceum* have a good nutrient content, deserve to be known and valued because their consumption could have beneficial effects on health by improving the nutritional status of the populations, because of its richness in proteins, lipids and minerals.

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