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Full Length Research Paper

Study of some biochemical parameters of the seeds of the fruit of the sweet Maniguette (*Aframomum alboviolaceum* (ridl.) k. Schum.) harvested in the Republic of the Congo

Jean Paul Latran Ossoko

Laboratory of Processing and Quality of Foods, ENSAF, National School of Agronomy and Forestry (Research) Brazzaville, Congo.

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***Aframomum alboviolaceum* is a plant that belongs to the family of Zingiberaceae, genus Aframomum and species of *A. alboviolaceum*. It is wide spread across tropical Africa and represented about 50 species. Proximate analysis is usually done to determine the values of macronutrients present in plant or food sample; it gives the composition of the biomass in terms of gross components. Proximate analysis includes determination of: Ash (sodium, potassium, iron, calcium, phosphorus) and other dietary minerals; moisture, proteins, fats, carbohydrate (dietary fibre, sugars, sugar alcohol, e.t.c). *A. alboviolaceum* (ridl.) k. schum) harvested in Republic of the Congo proximate analysis revealed the presence of lipids (10.58%); humidity (30.68%); protein (5.19%); carbohydrate (52.37% with 3.86% of dietary fibre); ash (1.18%) (Phosphorus=0.14%, Calcium=0.72%, Magnesium=0.29%, Iron=0.00%). The calculated energy value is 325.46 Kcal / 100 g.**

Key words: *Aframomum alboviolaceum* (Ridl.) K. Schum., fruit, seeds, physico-chemical.

INTRODUCTION

The Congo, like other countries of Central Africa has significant agricultural potential thanks to its climate, which unfortunately are insufficiently exploited and makes the country dependent on food imports. In recent years, there is a renewed interest in non-conventional crops with both potential assets for the development of populations at the local level as the industry (Silou et al., 2004). That is why seventy oil species in the basin of the Congo, from 35 botanical families were studied; their oil content and their fatty acid compositions were determined. Very numerous works have been published on this topic (Binaki et al., 2013; Kapseu, 2009; Loumouamou, 2012; Womeni et al., 2011; Attibayeba et al., 2010; Silou, 2014). Despite all this work of valorization of oilseeds in the Congo basin, much of our fruit seeds have never been subjected to scientific studies in this area.

The sweet *A. alboviolaceum* (Ridl.) K. Schum., of African origin, is known for its aromatic seeds fruit and plays an important role in native medicine or as spice or flavouring agents (Ngakegni, 2012). It is consumed fresh

E-mail: jplatran@yahoo.fr. Tel: +242 06 631 42 91, +242 05 526 86 98.

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Figure 1. Fruit ripe integers *of A. alboviolaceum* (Ridl.) Lenaerts Schum.

and also used as raw material in the manufacture of juice first. The purpose of this study is to characterize the seeds of the sweet *A. alboviolaceum* (Ridl.) Lenaerts Schum.

This study is on the valorization of the seeds of *A. alboviolaceum* (Ridl.) Lenaerts Schum) and the determination of their nutritional potential.

MATERIALS AND METHODS

Plant material

The plant material of this study consists of seeds of the fruits of *A. alboviolaceum* (Ridl.) Lenaerts Schum, harvested in most of the savannas of the Republic of the Congo. Figures 1 to 4 show the fruits and seeds *of A. alboviolaceum* (Ridl.) Lenaerts Schum.

Methods

Determination of moisture (H)

The humidity level was determined according to the *AOAC* method (AOAC, 2005). 2 g of crushed obtained after grinding the seeds was placed in a previously weighed capsule and put in oven (Memmert, Germany) at 70°C until the mass became constant.

Determination of the rate of ash and major mineral

2g of crushed seeds meal was used for the determination of the rate of ashes by the gravimetric method (AOAC, 2005). Incineration of the samples was performed in an oven mitten at 550°C for 6 h. The rate of ash after incineration was calculated.

The mineral elements contents are measured by atomic absorption spectrophotometry (Perkin-Elmer-1100) on ash obtained after mineralization. Prior to dosing, the ashes are diluted in a solution containing 10% as corrector of interactions lanthanum chloride (concentration: 116 LaCl3 g in 1 l of HCl concentrated diluted to one-quarter).

Determination of the rate of fat (MG)

The lipids in 5 g of the dried and crushed seeds were extracted using Soxhlet (NF ISO 82 62 - 3, 2006) by 200 mL of hexane for 6 h. The excess of solvent is evaporated to the rotavapor (IKA HB 10 basic).

Determination of the rate of protein (P)

About 0.1 g of crushed seeds is used to determine the rate of the crude protein from the dosage of total by the method of Kjeldhal nitrogen (AOAC, 2005). Protein was obtained by multiplying the total nitrogen by a convention factor, 6.25.

Determination of the rate of total carbohydrate (G) and dietary fibre (FB)

Carbohydrate (G) was estimated by the difference method. According to this method (AOAC, 2005), it was calculated by subtracting the sum of moisture (H), of the fat (MG), protein (P) and (C) ash content in the sample of 100.

Raw samples fiber levels are determined by the method of Weende (Wolff, 1968). To do this, 1 g of the crushed seeds (M) is boiled in 50 ml of sulfuric acid (0.25 N) and then 50 ml of soda (0.31 N) for 1 h. The resulting residue is dried at 105°C for 8 h and then cremated at 550°C for 3 h.

Determination of the energy value (EV)

Total energy value was calculated according to the method of

Figure 2. Half- fruits of *A. alboviolaceum* (Ridl.) Lenaerts Schum showing the pulp and the seeds.

Figure 3. Dried seeds *of A. alboviolaceum* (Ridl.) Lenaerts Schum.

Manzi (1999) cited by Diallo et al. (2015)
It is determined using the formula below:

VE (kcal / 100g) = (CHO x 4) + (CL x 9) + (CP x 4) with CHO = % of carbohydrates.

Where, CL = % of lipids and CP = % protein.

RESULTS AND DISCUSSION

Moisture level

The different tests for the moisture content obtained gave an average of 30 68% on the seeds of *A. alboviolaceum* (Ridl.) K. Schum studied. This humidity is less than 56.33%, value obtained on fresh almonds *Borassus aethiopum* (Kabiru et al., 2015) and also very low compared to the *Cocos nucifera* (94.45%) (Jean et al., 2009). This allows us to conclude the fresh seeds *Aframomum alboviolaceum* (Ridl.) K. Schum studied are less hydrated than *C. nucifera* and therefore keeps a little better than the last.

So for better conservation, the seeds must be dried beforehand. This value is also high compared with those obtained by various authors on other products such as

Figure 4. Seeds dried and ground *of A. alboviolaceum* (Ridl.) Lenaerts Schum.

peanuts with: 7.48% (Ayoola and Adeyeye, 2010; Ayoola et al., 2012) on seeds (raw groundnut, sun-dried groundnut and roasted groundnut), 7.54% (Eshun et al., 2013) on the varieties sur les variétés Huitzuco 93, Rio Balsas, Ocozocuautla, Tlaxmalac Gerardo Uribe, Ranferi Diaz, A-18 and RF - 214 in Mexico; 5.55-6.05% (16) on the varieties *Sinkarzie, F - mix, JL 24, and Manipintar*; 4.12-4.75% (Mora-Escobedo et al., 2015; Brintha et al., 2014) on a variety of peanut in Sri Lanka after treatments of organic fertilizers; 7.18% (Adegoke et al., 2014) on a variety of peanut in Nigeria. It is however slightly less than those of fresh almonds of the Hyphaeneguineensis which is 37.32%. This water content is not normal for a good preservation of seeds (the conservation of seed water content ranges from 10 and 14%).

Rate of fats

The seeds of *A. alboviolaceum* Soxhlet extraction (Ridl.) K. Schum give an average fat content of 10.58%. This lipid content in seeds of the sweet *A. alboviolaceum* (Ridl.) K. Schum (10.58% is close to 8-10% on the same product (Ngakegni, 2012). On the other hand, this value is very low compared to that of the kernels of *C. nucifera*, which is 60% more (www.information nutritionnelle.fr) but very high compared to 0.01% value obtained from *B. aethiopum* (Kabiru et al., 2015). These seeds are poor in oil compared to walnuts *Juglans regia* L. (58.3-65.2%) (Tapia et al., 2013).This content is very low compared to 46, 10% (Ayoola et al., 2012), 40 to 42% (Mustapha et al., 2015); about 46% (Olayinka et al., 2015) and 39.30% (Adegoke et al., 2014). Some authors, by studying the physicochemical properties of eight varieties of peanuts grown in the Mexico, got the oil content in seeds ranging from 37.9 to 56.3% (Mora-Escobedo et al., 2015). This value of 10.58% is very low compared to 67.5% (Balla and Baragé, 2008) value obtained from the kernels of the fruit of the tree of Cayor (*Neocarya macrophylla* Sabine).

The seeds of *A. alboviolaceum* (Ridl.) K. Schum oil extract can be used directly in food or feed as the source of carbohydrate.

Rate of proteins

The average protein content has been determined from 6 tests. So we got a 5.19%, low value compared to the almonds of coconut palm (*C. nucifera*) which have a protein content of 13% (www.information nutritionnelle.fr) and the almond tree, which has a protein levels ranging from 18.1 to 21.2%. This value of 5.19% is slightly less than 6.9% (Kabiru et al., 2015) value obtained from *Borassus aethiopum*. The protein content of the seeds of *A. alboviolaceum* (Ridl.) K. Schum studied is 5.19%. This value is very low compared with the seeds of *Parkia biglobosa* (Jacq.) (24.33-33.70%) (Koura et al., 2014); very low compared to the values obtained by some authors working on some varieties of peanuts: 19.81% (Ayoola and Adeyeye, 2010) 27.54-32.85% 23.62-28.88% (Eshun et al., 2013; Mora-Escobedo et al., 2015) 32.64% (Ossoko, 2017). It can thus be said that *A. alboviolaceum* (Ridl.) K. Schum is no protein. The seeds of *A. alboviolaceum* (Ridl.) K. Schum are not a good source of protein.

The seeds of *A. alboviolaceum* (Ridl.) K. Schum are less rich in protein than seeds of *Voandzou* (*Vigna subterranea* (l.) grown in Côte d'Ivoire with a rate ranging

from 14.61 to 20.74% (Diallo et al., 2015)).

Rate of ash and minerals

Different tests for the analysis of the rate of ash gave an average value of 1.18%, lower value than almonds of *C. nucifera*; it hovers around 2.5% (www.fao.org) and to the almond trees which is 2.65%. This indicates that the seeds of *A. alboviolaceum* (Ridl.) Lenaerts Schum) contain less minerals than *C. nucifera* and almond trees, but remain a significant source of minerals. This value is roughly equal to 1.17% (Eshun et al., 2013), value obtained from *Borassus aethiopum*. It is however lower than 4.08%, value obtained from the melon seeds (*Cucumis melo* l. *Inodorus*) (Bouazzaoui et al., 2016) and those ranging from 1.38 to 1.48% from the seeds of peanut (Ayoola and Adeyeye, 2010; Ayoola et al., 2012). It is also lower than those obtained from peanuts by some authors (values ranging from 2.45 to 2.96%) (16). Peanut '*Manga"* has a rate of 5.68% ash (Ossoko, 2017), very high value than that of the seeds studied here. *A. alboviolaceum* (Ridl.) Lenaerts Schum contains less minerals ions (ash 1.18% rate) as *B. aethiopum* (1.60%). Phosphorus, iron, calcium and magnesium were obtained from the ash and the result obtained is as follows: phosphorus: 0.14%; iron: 0.00%; Calcium: 0.72% and Magnesium: 0.29%. This result shows that there are still a lot of minerals to determine in these ashes. These identified minerals are essential for the proper functioning of the body.

Rate of total carbohydrates and dietary fibre

The value of 52.37% obtained is low compared to 81% value obtained from *B. aethiopum* (Kabiru et al., 2015). The levels of carbohydrates of some varieties of peanut: 17.41% (Ayoola and Adeyeye, 2010; Ayoola et al., 2012). 11, 54-19.65% (Eshun et al., 2013) and 17.56% (Ossoko, 2017), are lower than that of *A. alboviolaceum* (Ridl.) K. Schum, which is 52.37%. The seeds of *A. alboviolaceum* (Ridl.) K. Schum are a good source of carbohydrates.

The rate of fiber was 3.86%; very low value compared to 11.2% value obtained from the Palm (*Borassus aethiopum*) (Kabiru et al., 2015). The seeds of *A. alboviolaceum* (Ridl.) Lenaerts Schum) are not a good source of fiber from the *B. aethiopum*.

Energy value (EV)

The energy value obtained is 325.46 Kcal / 100 g. This value is less than those obtained from the seeds of seven cultivars of voandzou (*Vigna subterranea* (l) Verdc. Fabaceae) grown in Côte d'Ivoire, values ranging from 370.02 to 388.8 Kcal / 100 g (Diallo et al., 2015). This value of 325.46 Kcal / 100 g is slightly higher than the *B. aethiopum* (308.87 Kcal / 100 g); seeds of *A. alboviolaceum* (Ridl.) Lenaerts Schum are a good source of energy.

Conclusion

As part of the development of seeds, *A. alboviolaceum* (Ridl.) Lenaerts Schum) which has been the subject of our study is one of many varieties of fruit that exist in our country; there has never been a comprehensive scientific study on it. This study enabled us to achieve this goal by determining the physico-chemical composition of the seeds of the maniguette (*A. alboviolaceum* (Ridl) K Schum) whose results are as follows: water (30.68%), lipids (10.58%), proteins (5.19%); carbohydrates (52.37%); ash (1.18%) and the fibers (3.86%). The values obtained show that these fruits contain significant health nutrients and can be recycled in the industrial production of human foods. The study of food quality oil is to continue the determination of the composition in fatty acids, glycerides, phospholipids, ceramides, and sphingomyelin, the position of fatty acids on triglycerides and phospholipids and the composition of the unsaponifiable. This work should be completed by making a thorough study of the protein fraction of these seeds. Thus, it would enhance oil extract cake of these seeds in food meals and feed manufacturing.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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