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Research Article

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Chemical and Biochemical compounds from two tropical fruits- *Anisophyllea quangensis* and *Gambea africana*

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ABSTRACTS

The seeds of Anisophyllae quangensis and Gambea Africana were studied for proximate, mineral, qualitative and quantitative phytochemical compositions in order to assess their nutritive and medicinal value. Phytochemical screening of solvent extracts showed the presence of alkaloids, flavonoids, glycosides, saponins, steroids, tannins and anthocyanins. Quantitative analysis revealed high alkaloid (12.00±3.10 &31.30±18.30%) and flavonoi d contents (24.60±0.20 &12.80±0.32%) for A. quangensi s and G. Africana respectively followed by pectins (06.00±0.46 & 02.67±00.31%). However carothenoids a nd anthocyanins were found in lower concentrations (00.40±0.20-00.60±0.28%). Proximate analysis of the seeds showed high moisture, carbohydrate, and energy content values in the ranges of 39.88-41.13%, 36.73-41.66%, and 958.69-1067.91 Kj/100g respectively. The results showed moderately high protein (except for A.quangensis) and fat values for both fruits studied and the low ash contents for all the samples (05.55- 04.64%. The mineral analysis revealed that potassium and phosphorus were the most abundant minerals (02.60 and 0.60% respectively) present in the plant parts. Calcium, magnesium and sodium were detected in lower quantities (0.10-0.14%) whereas iron was detected in trace amounts (0.01-0.02%). The seeds were found to be important in nutrition since they contained nutrients and non-nutrients needed for the human's physiology and medicinally to protect the body against various diseases.

Key words: Composition, fruit, chemical, phytochemical.

INTRODUCTION

Many fruits and leaves have been used in folk medicine to treat various diseases and illnesses. Most of these natural products are also consumed in nutrition and represent the lesser known field for scientists. These products required further research to justify their ethnomedicinal uses and pharmacological activities. Among these plants used in nutrition there are:

Anisophyllea quangensis , anisophylleaceae rhizophoraceae family, is a rhizomatous ,usually many stemmed undershrub or shrub that grows to 20-60 cm in height. *A. quanguesis* is a common plant found in dry savanna, on arid soil, grassland and sandy soils. It is also found in tropical Africa: Gabon, Angola and in Zambia. The edible fruits are available throughout the year and used for oil production [1],[2]

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Gambea Africana, sapotaceae family, is a medium size tree up to 25-35 meters tall.The plant occurs throughout the tropics and is found in Tropical America,Continental Africa,in the rain forests of Cameroun,Gabon and Congo,Madagascar,Tropical Asia and Australia[3],[4]. The fruits are used to treat diarrhea and vomiting. Root barks

are used in treatment of hearing afflictions and trunk barks are used to treat hemorrhoids and also vaginal inflammation. The bark latex and young fruit is used as biording. A bark infusion is used as stomachic and carminative. Root decoctions through steam bathing are used to treat rheumatism, arthritis and renal afflictions. Crushed bark is used as an unguent. The wood is suitable for construction [3-5].

No literature were found on the phytochemical profile of the fruits .The aim of this work was to evaluate the nutritive and medicinal potentials of these seeds consumed in Congo in order to determine their nutritional and medicinal importance.

EXPERIMENTAL SECTION

Collection and processing of plant materials:

The fresh fruits of A *quangensis* and *G.africana* were collected from April to May 2010 at Texaco market, Kibeliba-Tsieme, in the North area of Brazzaville (Congo). The plants were identified and authenticated by Nkouka Saminou from the herbarium of the Vegetal Research Centre (CERVE, ex/OROSTOM-Congo) where voucher specimens had been deposited. The fruits were washed and air-dried at room temperature for a few hours. They were slit open and the seeds discarded from the pulp. The pulp were dried in an oven (70-90°C) and ground with a mechanical grinder. The powder material was stored under cool and dry conditions. Proximate analysis and mineral composition analysis were carried out on the dried powder. The defatted powder was used for phytochemical analysis.

Chemical analysis

Proximate analysis:

The moisture content of the seeds was determined by drying them at 105°C in an oven, until a constant weight was reached. For total ash determination, the plant samples were weighed and converted to dry ash in a muffle furnace at 450 and at 550°C for incineration. The crude fat content was determined by extraction with dichloromethane, using a Soxhlet apparatus. All these determinations were carried out according to AOAC[6].

The Kjeldahl method was used for crude protein determination. Carbohydrate content was determined by calculating the difference between the sum of all the proximate compositions from 100%. Energy values were obtained by multiplying the carbohydrate, protein and fat by the Atwater conversion factors of 17, 17 and 37, respectively [7].

Mineral analysis:

Mineral analyses of the plant sample were carried out by using the methods of Martin-Prevel [13]. Elemental analyses were carried out using an atomic absorption spectrophotometer and a flame photometer to determine calcium, sodium, potassium and magnesium content. Aluminum, iron and phosphorus were determined calorimetrically. The concentration of each element in the sample was calculated on a dry matter basis.

Qualitative phytochemical evaluation

Preparation of the fat free sample

The dried powder of the fruits of *A.quagensis* and *G.africana* was soaked in diethyl ether for 48 h at room temperature to remove lipids. After filtration the lipid fraction was discarded.The residue was air-dried to evaporate the remaining solvent, and left in dry conditions for phytochemical screening.

Extraction procedure

The plant powders were extracted with ethanol (90%) using the percolation method. Thus 20g of the samples was percolated with 150ml of solvent at room temperature for 72h. The mixtures were then filtered. The filtrates were concentrated to one quarter and subjected to phytochemical screening.

Phytochemical screening

Qualitative analysis of plant seeds was carried out according to the standard methods [9-13] to determine the alkaloids, flavonoids, glycosides, steroids, saponins, tannins and anthocyanins.

Quantitative phytochemical analysis

Quantitative phytochemical analysis of the fruits was performed by using the described methods[14-17].The phytochemicals determined included alkaloids, flavonoids , anthocyanins,carotenoids and pectins.

Statistical analysis

Data were reported as means±SD of triplicate determination.

RESULTS AND DISCUSSION

Proximate Composition

The results of proximate composition (Table1) showed that all the studied fruits had high moisture content values , *G. africana* with the value of 43.13%, and *A. quangensis* with the 39.88%.

Table1: *Proximate composition of the fruits*

Parameters	Percentage composition(%)	
	A.quangensis	*G.africana*
Moisture	39.88	41.13
Crude proteins	11.31	06.50
Carbohydrates	41.66	36.73
Total fat	01.60	09.00
Total ash	05.55	04.64
Energy(Kj/100g)	958.69	1067.91

The moisture contents recorded in the present study were in line with the values of 37.00 and 42.80% reported for fermented locust beans seeds[18]. These values were much higher than the range of 5.04 to 6.54% recorded for some medicinal plants [19]. The high moisture content recorded in the present study would favor the micro-organisms growth and the seed deterioration .

The results of the present study revealed that *A. quagensis* contained the highest protein content values (11.31%) when compared with that recorded for *G.africana* (6.50%). The moderately high protein concentration of A. *quagensis* were favorably compared to the value recorded for *M.paradisiaca* (11.47%) [20] but lower that the 33.69% recorded for *Terminate catappa* seeds[21].

The protein values recorded in the present study suggested that the seeds could be used in diet supplementation for people with nutritional deficiency.

The results also showed high carbohydrate concentrations of the fruits of *A.quangensis* (41.66%), and *G. Africana* (36.73%) when compared to the values recorded for others plants. Nyam et al. [22] reported the 2.85% in black olive and also the 24.40% recorded in raw locust bean seeds [18]. However these content values were found to be lower than the 57.82 % [23] and the range of 50,08 to 56.16% [19] reported for *A.sativum* and some medicinal plants respectively. This make these fruits good sources of energy, since carbohydrates are known as a source of energy for body metabolism.

The highest fat concentration was recorded for the fruits of *G.africana* (09.00%) and that for A. *quagensis* was the lowest(01.66%). These values were lower than the 17.30 % for *P.guineense*[24] and the range of 31.52 to 37-31% for *D.eludis* [25].

The low fat values of these fruits suggested that they could not be considered as useful sources of oil**.**

The ash content of 5.00[21], [24] and the 6.7% [26] reported for *T. catappa*, *B.eurycoma* and some plant foods respectively were found to be within the range recorded in this study. The lower ash content of the studied samples correlated with the results of mineral analysis.

The calculated energy values of the samples, which varied in the range of 958.69 to 1067.91Kj/100g, were very high and favorably compared with that recorded for *H.miryantha* [27]. These values were found to be very high when compared with the 534.20 Kcal/100g [21] and 400.68-450.59 Kcal/100g [25] reported for *T.catappa* seeds and *D.eludis* fruits. This means that these fruits are good sources of energy and thus, may be important for insertion into the food system for children and adults.

The study suggested that these fruits contained appreciable amount of nutrients, thus their consumption may be important and would be recommended in food supplementation.

Mineral composition of the fruits

The results of mineral analysis of the plants (Table 2) showed that the minerals analyzed were present in all the samples but in very lower quantities. Potassium and phosphorus were the most abundant minerals detected in the plant (0.10-02.60 & 0.10-0.65%). These values were found to be lower than those reported for others species by Fagbohun et al. [19] (31.51-47.01 for potassium and 27.40-68.31mg/100g for phosphorus) .

The results also showed that calcium, magnesium and sodium were recorded in lower quantities ranging from 0.10-0.54; 0.10-0.35 and 0.10% respectively. This trend was also observed when analyzing the results obtained *for B.eurycoma* and *P.guineense* [24]. It was noticed that iron was detected as a trace element in all the studied samples.

The K/Na ratio of the plant samples recorded in the present study were 26.00 and 01.00(For *A.quangensis&G.africana* respectively). According to CIHFI [28] natural foods with a higher potassium concentration than sodium have a K/Na ratio of 4 or more. The high K/Na ratio of *A. quangensis* indicated that the fruits may be considered as good and their consumption may help in health care.

The Ca/P ratio of the studied plant samples had the values of 0.22 and 1.10 (For *A.quangensis & G.africana* respectively). Food with a Ca/P ratio over 1 is considered as good [29] and poor if this value is < 0.5 [30].

Table 2: ***Mineral composition of the fruits***

Element	Content value (%)	
	A.quangensis	*G.africana*
Calcium	0.14	0.11
Magnesium	0.12	0.10
Sodium	0.10	0.10
Potassium	02.60	0.10
Phosphorus	0.65	0.10
Iron	0.01	0.02
K/Na	26.00	01.00
Ca/P	0.22	01.10

The Ca/P ratio found in this study was less than 0.5 for *A .quangensis* indicated that these fruits are poor sources of minerals and over 1 for *G.africana* indicating that they serve a good plant food and would help in consumption.

Besides the presence of potassium in slightly high quantities, the results showed lower mineral levels (0.01-1.79%) for all the studied fruits.

Although these elements were found at lower levels, consumption of these fruits may be important for body health care. For instance Potassium is known to be an important mineral that help in maintaining electrolyte balance in humans [31]. Phosphorus is known to play a role in bones mineralization as well as in the structure of cellular membranes, nucleic acids and nucleotides, including adenosine triphosphate [32].

Qualitative phytochemical analysis

Table 3 : ***Results of phytochemical sceening of the fruits***

Phytochemical	Plant species	
	A.quangensis	*G.africana*
Alcaloids	+++	+++
Flavonoids	+++	++
Glycosides	+++	+
Saponins	–	++
Steroids	+	++
Tannins	+++	+++
Anthocyanins	++	+++

+ = present; - = absent

The results of qualitative analysis (Table3) revealed the presence of alkaloids, flavonoids, glycosides, steroids, saponins, tannins and anthocyanins in all the screened plants. Saponins were detected in *G.africana*, but absent in *A.quangengis*. Sivasankari [33] reported their absence in solvent extracts of *C.pulcherrima* and *C.bondus.* Contrarily to the previous work [27] anthocyanins were detected in all the plant samples studied. All the screened compounds were present in *G.africana* while alkaloids and tannins were the most present of the tested phytochemicals with the high concentrations. Alkaloids were reported to be highly present in polar solvent extracts [34]. Steroids were the less present of all the tested compounds. Flavonoids and glycosides were hightly present in A quangensis contrarily to anthocyanins. The results of qualitative analysis of *A.quangengis* and *G.africana* showed the high presence of phytochemicals**.**

Quantitative phytochemical analysis

Table 4: Results of quantitative analysis of the fruits

Phytochemical	Amount(%)	
	A.quangensis	*G.africana*
Alcaloids	12±3.10	31.30±18.30
Flavonoids	24.60±0.20	12.80±0.32
Anthocyanins	0.50±0.28	0.6±0.28
Pectins	6.00±0.46	2.67±0.31
Carotenoids	0.60±0.12	0.40±0.20

Quantitative analysis of the fruits revealed the highest concentrations of alkaloids (31.30±18.30%) and flavonoids(24.60±0.20%) and the moderate amounts of these compounds (12.80±0.32 and 12±3.10 % in G.*africana* and *A.quangensis* respectively) .

The content values recorded in this study for these compounds were very higher than the 0.05 & 0.46% reported by Oyeyemi et al. [35] (for alkaloids and flavonoids respectively). However the moderate amounts of alkaloids found in *A.quangensis* were in line with the 12.07% recorded in sundrying leaf [36] , the 13.44 and 11.21% in ginger and pepper respectively[37].

The presence of alkaloids and flavonoids in high levels in this study indicated that consumption of these fruits would be beneficial due to the wide range of biological properties of these compounds [38-39].

The results showed that anthocyanins and carotenoids contents were the lowest (0.50±0.25-0.6±0.28 and 0.40±0.20-0.60±0.12% respectively. Netherless anthocyanins are known for their antioxidant activities [40] and their inhibition effect on lipid oxidation [41] . Thus they can help in protecting body organism at chronic diseases.

The study showed various phytochemical levels for the fruits of *G.africana* and *A.quangensis*, their consumption may be a necessity for women since the presence of these compounds are known to provide protector effect and wellness due to their biological properties .This determined the medicinal value of the plants.

CONCLUSION

The study showed that the fruits contained appreciable amounts of nutrients and non-nutrients .It indicated that they could be recommended in nutrition and also serve in diet supplementation due to their various properties to prevent or to cure chronic diseases and also to ameliorate many functional properties of body organism.

These new knowledge can be used as a basis for further studies to be carried out in order to assess the structure of new compounds, which may lead to new treatments for incurable diseases or new roads for researchers.

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