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Nutritional characterization of neglected and unexploited seed (oil) from Klainedoxa gabonesis (Shrew African bush mango): A novel study

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INTRODUCTION & AIM

With the high rate of poverty and food crises across the globe coupled with growing world population; there is a growing need for adequate nutrition especially in children and pregnant mothers. Also not left out of these crises is the developing world. Therefore it is imperative that alternative and affordable sources of nutrition be sought for in order to curb the growing menace. The consumption of fruit species, including their seeds or by-products, is widely recommended for promoting human health and preventing diseases due to their nutritional properties (Liu, 2013; Ros & Hu, 2013; Pem & Jeewon, 2015). Plants have developed the capacity to produce numerous metabolites with diverse biological activities. Because fruit species have nutritional qualities, it is often advised to consume them, including their seeds or by-products, to improve human health and avoid sickness (Liu, 2013; Ros & Hu, 2013; Pem & Jeewon, 2015). These benefits are often attributed to their ability to scavenge free radicals, chelate metals, and quench singlet oxygen (Chukwuma et al., 2023).

Klainedoxa gabonensis is a large tropical African tree of the family Irvingiaceae growing to 40m in height. Its straight trunk is buttressed and up to 25m long, while its spreading evergreen crown makes it one of the largest trees of the rainforest. Two species of the genus Klainedoxa (K. gabonensis and K. grandifolia Engl.) are found in Cameroon while *K. gabonesis* is found in Nigeria; it is one of the three genera in the Irvingiaceae family (Aubreville, 1962). Common name of *Klainedoxa gabonensis* in Enugu-Ezike is Ujiri Nkakwu translated in English as Shrew African bush mango.

In folk medicine, *Klaindoxa gabonensis* has been utilized for its purported effectiveness in managing arthritis. The traditional practice involves grinding the plant's parts, particularly the bark, into a fine powder. This powder is then mixed with clay and water to form a paste that is topically applied to the affected joints for rubbing. In Nigeria particularly in Enugu-Ezike, the aqueous extract of the leaves is used for treatment of malaria and management of enteric fever.

Several studies have investigated the phytochemical composition of *Klaindoxa gabonensis* seed and seed oil, revealing the presence of various bioactive compounds (Wansi et al., 2010; Dongo et al., 2009). In spite of these desirable features of the plant, the seeds which would be a rich source of food are abandoned on the ground of superstitious beliefs about seed's toxic nature and have put the plant in danger of going extinct in Enugu State, Nigeria. In this study we intend to develop a nutritional additives and vegetable oil from the seeds to be used in food preparation, by investigating nutritional composition of the seed and seed oil.

METHOD

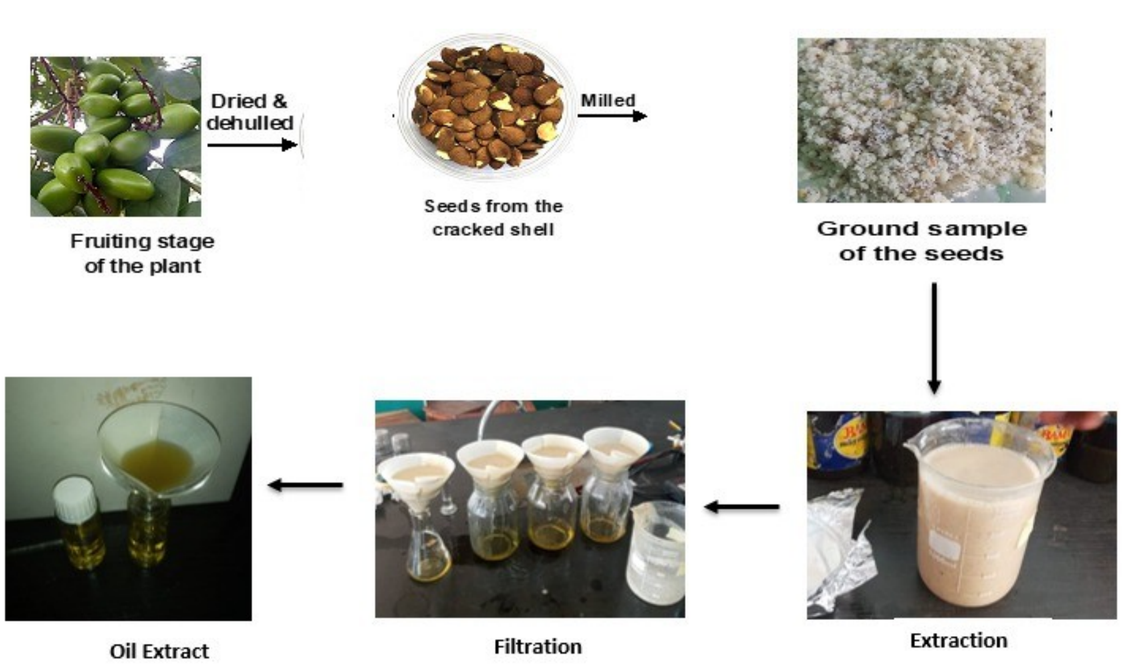
Sample preparation

Klaindoxa gabonensis seeds were collected from its tree in Onicha Enugu-Ezike, in Igbo Eze North Local Government Area, Enugu State Nigeria. The seeds were taken to University of Nigeria, Nsukka for autentfication at the Department of Plant science and Technology. The good seeds were selected in the laboratory after cracking the nut and were allowed to air-dry. The seeds were ground using electric blender (Excella mixer). The ground sample was screw-capped in an air-tight plastic container and stored in a refrigerator at 4° C for analysis.

Preparation of extract

The seed were air-dried, powdered and extracted with ethyl acetate. The extract was prepared using 300g of dry-grinded sample (*Klainedoxa gabonensis* seed) and 500ml of absolute ethyl acetate solution of analytical grade (Sigma Aldrich) by cold maceration at room temperature for 48 hours. The mixture was shaken intermittently at every 4 hours using vortex mixer. The solution was filtered through Whatman filter paper number 1 (pore size 11m). The final extract (oil) was concentrated on a rotary evaporator at 45 °C and placed in a refrigerator at 4 °C till needed.

The proximate and amino acid profiles of the seed, fatty acid, tocopherol and sterol component of the extracted oil were carried out using standard methods. The analysis were carried out in triplicate and the values were analysed statistically using SPSS version 21.



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https://scholar.google.com/citations?user=GVf3eSoAAAAJ&hl=en&oi=ao

RESULTS & DISCUSSION

Table 1. Proximate composition of *Klainedoxa gabonesis* seed

Proximate parameters %	Values mean ± SD
Moisture	3.01±0.01
Ash	2.63±1.09
Fibre	14.68±0.60
Fats	49.22±0.01
Proteins	18.96±2.01
Carbohydrates	11.60±0.40
Calorific Value Kj/100g	2364.39±10.30

Values are expressed as mean ± SEM.

Table 2. The content of free amino acids in of *Klainedoxa gabonesis* seed

	Peak ID	Ret Time	Height	Area	Conc (mg/100g)
1	Alanine	0.240	225.889	1634.600	0.2250
2	Glycine	1.040	14137.729	487327.406	67.0779
3	Leucine	1.640	6274.447	219963.328	30.2767
4	Isoleucine	2.907	486.518	5716.621	0.7869
5	Threonine	3.182	153.388	1019.865	0.1404
6	Aspartic acid	3.482	62.085	232.923	0.0321
7	Methionine	3.698	35.324	91.456	0.0126
8	Hydroxylproline	5.048	186.704	4053.000	0.5579
9	Phenylalanine	5.482	190.711	844.463	0.1162
10	Glutamine	5.582	179.132	3074.240	0.4232
11	Tryptophan	6.065	100.000	1893.897	0.2607

Table 3. Fatty acid profile of ethyl acetate extract of *Klainedoxa gabonesis*

S/N	Component	Compound name	Retention	Area	Height	External Units (µg/ml)
1	C18:3	Linolenic acid (ω−3)	0.223	8102.9098	511.271	9.3502
2	C14	Myristic acid	1.340	5601.2640	318.828	6.9538
3	C18:1	Oleic acid (ω−7)	5.340	10079.5090	570.838	17.2890
4	C12	Lauric acid	9.296	10885.7797	614.758	12.6029
5	C22:6	Cervonic acid (ω−3)	11.643	5389.7004	305.901	3.1299
6	C16	Palmitic acid	14.523	6886.0076	390.051	8.8585 ug/g
7	C20:5	Eicosapentaenoic acid (ω−3)	17.970	4893.9115	277.864	6.2931
8	C20:2	Eicosadienoic Acid	24.766	3786.7750	215.037	1.7479
9	C18	Stearic acid	30.476	7791.6220	441.962	13.3533
10	C18:2	Linoleic acid (ω−6)	39.746	7272.9038	412.648	15.1204
11	C24:5	Tetracosapentaenoic acid	43.336	10.2722	0.080	0.0127 ppm

Discussions

The study found that the ash content of *Klainedoxa gabonesis* (Ujiri Nkakwu) seed, a marker for mineral elements, was 2.63%. Since the ash content obtained in this study falls within this range, it can be used as microbiological media without the need for a mineral supplement as well as for human and animal consumption. The average value of 49.22% for the extracted *K. gabonesis* (Ujiri Nkakwu) seed oil is in close agreement with the average values of 48.1% for pumpkin seeds (Fagbemi & Oshodi, 1991). The amino acid profile of K. gabonesis (Ujiri Nkakwu) seeds examined in this study indicates that these seeds are a superior source of both non-essential and essential amino acids, particularly glycine and leucine, respectively. The ethyl acetate seed extract (EASE) of K. gabonesis exhibited a notable concentration of important fatty acids, specifically oleic acid and linoleic acid, as presented in Table 3.

CONCLUSION

This innovative research has demonstrated the significance of examining the components of unsaponifiable matter, which pertains to the small constituents of seed oils, as an essential element in the comprehensive characterisation of oils and fats. It could provide high-value fatty acids and amino acids (glycine and leucine) that are useful for the creation of novel functional food products.

FUTURE WORK / REFERENCES

We suggested that a longitudinal research be carried out to evaluate the health effects of integrating *K. gabonesis* seeds into the diets of specific populations, especially in communities experiencing nutritional deficits. Also development of food products fortified with *K. gabonesis* seed flour should be explored, emphasising its potential as functional foods that provide health advantages beyond fundamental nutrition. This will require some funding.