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Safe Use of Shea Butter in Relation to Its Fatty Acid Profile, Phytochemical and Vitamin Contents

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ABSTRACT

Vitellaria paradoxa is commonly known as the "shea tree", which is indigenous to Africa. It is one of the native African food plants found to be very useful in the cosmetic and skin care industries. Shea butter is fat, extracted from the nut of the African shea tree. This study was done to determinethe fatty acid profile, phytochemical and vitamin contents of shea butter in other to elucidate its nutritional and industrial applications, especially owing to its growing use in the food and cosmetic industries across Africa and beyond. The Shea nuts were cracked and fat extracted. Gas Chromatographic method was used in the fatty acid analysis. Phytochemical and Vitamin analyses were carried out using approved, recognized procedures and techniques. The result showed that the African shea butter, has high amount of saturated fatty acids such as Palmitic acid (22.10%), Stearic acid (18.73%),Archidic acid (12.65%) and Heptadecanoic acid (10.15%). It also contains some unsaturated fatty acids such as Oleic acid (7.74%)Arachidonic acid (7.47%) and Linoleic acid (5.49%). The result ofthe phytochemical analysis showed that it contains Phenol (16.15%), Kaempferol (12.89%), Sapogenin (12.73%), Tanin (12.68%) and Oxalate (10.68%) amongst others. It has high amounts of vitamin D (136mg/g) and vitamin K (72mg/g). Other vitamins such as vitamin A and the B-vitamins were found in trace quantities. The shea butter is thus, enriched with various fatty acid components, some of which have, antioxidant, antimicrobial and anti-inflammatory activities. However, its high amount of saturated fatty acid components, make it relatively unsafe for prolonged consumption, especially in unhealthy individuals, because of the implications of saturated fatty acids in human health. Shea butter, can find excellent application as a skin care product, because of its rich antioxidants embedded in the vitamins, phytochemicals and fatty acid contents.

Keywords: *Vitellaria paradoxa,* fatty acids, phytochemical,vitamin, antioxidant, antimicrobial, anti-inflammatory.

INTRODUCTION

Shea butter is fat gotten from the nut of Shea tree, botanically known as *Vitellariaparadoxa. Vitellariaparadoxa* belongs to the Sapotaceae family, which consists of trees, woody lianas, and shrubs. Africa contributes about 90% of world Shea nut production (Ademola*et al*., 2012). The shea tree grows in the wild and has huge economic and ecological potentials. The Sapotaceaefamily is divided into two primary sub-species, namely Nilotica and Paradoxa. It is a multipurpose tree, yielding nutritious fruit pulp and kernels with a range of other derived products with edible and medicinal applications. The kernel lipid is known as shea butter. Many of the species are characterized by sticky white latex, often found in the bark, branches, leaves, and fruits.Sapotaceae species often occur as a slow-growing species, in dry conditions.

Shea butter is consumed by rural households and sold in local market as an edible fat of great importance. It is also used as an industrial feedstock in global supply chains, serving the confectionery, cosmetic, and pharmaceutical industries.

In Nigeria, Shea butter is locally known as “Ori” in Yoruba, “Markade” in Hausa and “okwuma”in Igbo (Ololade and Ibrahim, 2020). As a medicinal plant, *Vitellaria paradoxa* has a long history of preventing and curing diseases and infections in the clinical traditional medicine in sub-Saharan Africa for many decades. Its leaves, stems, roots, barks, fruits, oils, and seeds can be utilized as medicines with different therapeutic effects (Essiet, 2015). In addition, *Vitellariaparadoxa* is also utilized commercially as a primary ingredient in confectionery, cosmetics, soaps, pharmaceuticals, and green chemistry products. In Nigeria, the seed oil decoction is used for curing cough, while the bark decoction is used for the treatment of diarrhoea and hypertension in Benin. It is reported that some traditional healers in Côte d'Ivoire utilize the bark to ease labour pain and child delivery (Olusesan*et al*., 2021).

Shea butter has been proven to be very good for the production of cosmetic and medicinal ointment.

The traditional production process of shea butter in Nigeria, involves the use of manual labour and local tools (Lovett and Hagg, 2018).

Considering the enormous health benefits of shea butter, it isof great importance to x-rayits nutritionalcontents in order to be able to apply it effectively and safely in both modern and traditional medicine.

RESEARCH METHOD

The Shea nuts were bought from Kwara State, Nigeria. They were properly identified in the botany department of Nnamdi Azikiwe University, Awka. Thereafter, theshea nuts were cracked and fat extracted using the traditional method which included De-pulping, Boiling, Washing of the shea nuts, Drying, Pounding and Crushing of the shea nuts into grit, Roasting, Milling/Grinding of the shea nuts into paste, Kneading, Filtration and Solidification.

Analysis of fatty Acid profile

Fatty acid profile was analyzed using the Gas Chromatographic method.

Phytochemical and Vitamin analyses

The phytochemical and vitamin analyses were carried out using approved standard procedures and techniques.

All chemicals, reagents and distilled water used were of analytical standard.

RESULTS AND DISCUSSION

Table 1 shows the percentage concentration of constituent fatty acids found in shea butter. It is observed that it containsmore of saturated fatty acids, with Palmitic acid having the highest concentration, followed by stearic acid.

Table 1: Percentage(%) fatty acid contents of shea butter

Common Name	Carbon Number	% Concentration	Saturation
Capricacid	C10:0	7.84	Saturated
Lauric acid	C12:0	4.32	Saturated
Palmitic acid	C16:0	22.10	Saturated
Heptadecanoic acid	C17:0	10.15	Saturated
Stearic acid	C18:0	18.73	Saturated
Archidic acid	C20:0	12.65	Saturated
Linoleic acid	C18:2	5.49	Polyunsaturated
Archidonic acid	C20:4	7.47	Polyunsaturated
Oleic acid	C18:1	7.74	Monounsaturated

Docosahexaenioc acid (DHA)	C22:6	1.49	Polyunsaturated

Table 2 shows the percentage concentration of phytochemicals found in shea butter, it contains high amount of Phenolic compounds such as Phenols, Kaempferol and Tannin amongst other phytochemicalswhich all have their medicinal values.

Table 2: Phytochemical contents of shea butter in Percentage(%) concentration

Phytochemical	**% concentration**
Kaempferol	12.89
Anthocyanin	0.11
Phenol	16.15
Oxalate	10.68
Sapogenin	12.73
Epicatechin	7.260
Flavone	4.998
Quarcetin	3.944
Alkaloid	7.365
Tannin	12.68
Phytate	6.735
Terpeniod	1.476
Resin	2.999

Table 3 shows the concentration of some vitamins in shea butter in mg/dl. Vitamins D and K were found to be very high.

Table 3:Vitamin contents of shea butter in (mg/g)

Vitamins	**Concentration (mg/g)**
Vitamin A	0.601
Vitamin C	1.83304
Vitamin D	136
Vitamin E	0.506
Vitamin k	72
Vitamin B1	0.0076
Vitamin B2	0.0092
Vitamin B3	4.379
Vitamin B5	0.628
Vitamin B6	0.740
Vitamin B7	0.067
Vitamin B9	0.923
Vitamin B12	0.035

Discussions

Shea butter isfat extracted from Shea nuts, a plant that is very common in Nigeria. It is used by various persons across different geographical regions for different purposes. The fatty acid analysis has shown that Shea butter contains predominantly saturated fatty acids, with Palmitic acid having the highest concentration in this study (table 1). Stearic acid andArachidic acid were also high in concentration when

compared to other fatty acids in the table. The work done by Saba *et al*., 2022, showed higher percentages of Stearicand Oleic fatty acids. Similarly, Ofoegbu-Chibuzo*et al*., 2022 pointed out that shea butter containsaturated fatty acids. According to Saba *et al*.,2022,the presence and percentage of the constituent fatty acids in shea butter are greatly influenced by climatic conditions, the processing conditions and the extraction methods of the shea butter. This might explain the variation in the percentage concentration of the fatty acids constituents in shea butter across various research works.Theattribute of having more of saturated fatty acids, makesShea butter a physically hard fat at normal temperature, just like margarine, except that the latter is made of processed fat.Some unsaturated fats were also found to be present, especially polyunsaturated fats such as Arachidonic and linoleic acids, but in smaller concentrations (table 1).

The presence of mainly saturated fatty acids in Shea butter, makes it fit for a lot of industrial uses, but may pose some questions about its safety for consumption.In some communities in Northern and South western Nigeria, shea butter is used for cooking, just like other fats (Sodimu*et al*., 2022). But in South eastern Nigeria, shea butter is mainly used for topical applications as an emollient, moisturizer, hair cream, body cream and for treatment of arthritis, skin and scalp diseases (Moughalu*et al*., 2016).

Various research works have implicated excessive consumption of fats rich in saturated fatty acids to the development of inflammations, insulin resistance, cardiac problems, arteriosclerosisetc. (Zhou *et al*., 2020).Shea butter contains lots of saturated fatty acids although some may have medicinal benefits. Palmitic acid for example, which is a saturated fatty acid, with the highest percentage in shea butter in this research, has multiple crucial physiological activities, including maintaining cell membrane stability and functions. It is also produced de novo in the human body and the body system has a way of maintaining its homeostatic balance, despite the food intake. However, when palmitic acid homeostatic balance is tilted, especially in people who already suffer some pathophysiological conditions, it can trigger inflammations leading to the development or worsening of inflammatory diseases, such as insulin resistance, neurodegenerative diseases, atheriosclerosis (Korbecki and Bajdak-Rusinek , 2019). Shea buttermay be good for consumption in healthy persons, only when taken in moderation, plusan intake of adequate balance of other polyunsaturated fatty acids from sardine, salmon, olive oil, avocado etc. Its consumption should be highly regulated or totally avoided in persons who already suffer from dyslipidemia or inflammatory related medical conditions such as arteriosclerosis, insulin resistance, type 2 diabetes etc.

The high concentration of saturated fatty acids in Shea butter makes it rather suitable for topical medicinal uses, cosmetic uses, as a lubricant and for other industrial and pharmaceutical applications. It may also be suitable as a substitute for margarine production, but for some class of people who are healthy. Its consumption should be regulated. Shea butter has lots of medicinal values, embedded in its phytochemical, vitamin and fatty acid contents. Some of the fatty acids in such as palmitic, stearic and oleic have antimicrobial properties (Petropoulos *et al*., 2021), making it good for the treatment of minor skin and scalp infections.

The phytochemical composition of shea butter as captured in table 2, addsmore support to the fact that the fat possesses lots of medicinal values. It contains Phenol, Epicatechinand other polyphenolic compounds such asKaempferol and tannin as well as other phytochemicals. Abubakar*et al*., 2022 also reported the presence of phenols such tannins in shea butter.

Phenols and other Polyhenolic compounds are renowned for their antioxidant(Rodrigo *et al*.,2011), anti-inflammatory(Pragasam*et al*.,2013), anti-microbial and antibacterial(Rahman*et al*., 2021) effects. These attributes of shea butter, may explain the significant role it plays when used locally for the treatment of scalp infections, skin diseases, inflammations such as boilsand as hair moisturizer (Ayanlowo*et al*., 2021). Reports have also shown that it has also been effectively used locally as a topical agent in some parts of Nigeria for the management of serious inflammations such as arthritis and rheumatism (Muoghalu*et al*., 2016). The rich phytochemical, fatty acid and vitamin contents may be largely responsible for the acclaimed effects.

Shea butter has abundant amount of vitamin D (136mg/g) table 3. Vitamin D has been shown to have a role to play in skin health, especially in treatment of hyperproliferative skin disease (psoriasis) of which the sebocytes are the responsive target cells (Brozyna*et al.,* 2022). This means that shea butter may have great potential in the treatment of acne, because of its abundant vitamin D content. The presence of vitamins C and D in addition to other vitamins will help in the treatment of skin injuries, inflammations and general improvement of skin health and appearance.

Shea butter, has lots of role to play in skin health, considering its contents as shown in tables 1-3. The fat may also help in protecting the skin fromUV-radiation -induced damage, promoting collagen synthesis and reducing oxidative stress, which can lead to premature aging and skin disorders (Malachi, 2014).

Away from diet and skin care, shea butter has also found application as a lubricant in recent times, probably because of its thick nature, consistency and Physico-chemical qualities (Joseph and Abifarin, 2025)

Considering the above results and discussions, shea butter may be more suitable as a medicinal skin care product for various indications rather than as a normal routine dietary component.

Shea butter is already being used traditionally in many West African countries including Nigeria as askin care product and as a medicinal topical agent. This can be further harnessed by careful processing and modifications of the crude product.

CONCLUSION

Shea butter is as a natural fat, well endowed with different fatty acids components, phytochemicals and vitamins. It can be carefully processed and tailored to suit various health needs as highlighted in the discussion above. It is most suitable for external uses rather than used as food. It can also be easily obtainable and abundant in nature.

Conflict of Interest

Authors report no conflicts of interest.

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