PHYTOCHEMICAL COMPOSITION OF SHEA BUTTER'S (*Vitallariaparadoxa*) SEED AND LEAF EXTRACTS

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Abstract
The study investigated the phytochemical composition of shea butter (Vitellariaparadoxa) leave s and seeds at Biochemistry Laboratory, Faculty of Basic Medical Sciences, Bayero University Kano. The leaves and seeds were collected from Tiga village, Bebeji Local Government Area, Kano, State Nigeria. Both leaves and seeds were properly dried indoors in a ventilated place, crushed into powder and stored in opaque bottles. The phytochemical composition of both the leaves and seeds were determined by using appropriate chemicals and reagents and the filtrate were used for the test. The phytochemical analysis shows that both the leaves and seeds contain flavonoid, tannin, phenolic compound, phytosterol, triterpenoid, cardiac glycoside, reducing sugar and carbohydrate. However, there isabsence of protein, amino acid and phlobatannin in leaves extracts while saponin, amino acid and phlobatanni were absent in seed extract. The results of quantitative analysis reveals that the leaves of shea butter are rich in phenolic (141.071mg/g) alkaloid (50.500mg/g), cardiac glycosides (28.150%), flavonoid (8.436mg/g), Tannin (8.370mg/g) and saponin (1.317mg/g). and also the quantitative analysis of shea butter seeds was obtained phenolic (734.643mg/g), flavonoid (183.517mg/g), tannin (39.74mg/g) and cardiac glycosides 29.726%). The results obtained seems to justify the use of shea butter tree in Africa as appreciable amount of important compounds such as cardiac glycosides, phenolic, saponin, flavonoid, alkaloid, tannin were present in leaves and seeds and their role in physiological activity of the human body is imperative. The level of utilization of shea butter tree in most African countries is low. It is necessary to publicize the use of this tree nutritionally and medicinally to other part of the African countries.

Key words: *Shea butter, phytochemicals, leaves, seeds and medicine*

Introduction

Vitellariaparadoxa commonly called Shea butter tree, it is the only species in genus *Vitellaria* of *Sapotaceae* family with deciduous leaves in the African Savannah. The average height of the tree is 15m but it can be up to 25m.The area of distribution stretches from Senegal to Sudan through Guinea Bissau, Sierra Leone, Ivory Coast, Ghana, Togo, Benin, Burkina Faso, Niger, Nigeria, Chad, Central Africa Republic and Cameroon. (Maranz*et al.,* 2004) The leaves of the tree are oblong and clustered at the ends of branches. The flowers are white and clustered at the ends of shoots. The fruits are sub-globose to ovoid in shape containing one or two shiny brown seeds. Fruiting commence 10-15 years after planting but full production occurs at 20-30 years. Medicinally, Shea butter is used for tropical medicines against rheumatic and joint pains, wounds, swellings, dermatitis, bruises, and other skin conditions. It is also useful as relief from nasal congestion and rhinitis. The leaves are used to treat stomach pain and headache, and as eye bath. Seed kernel contains fat, which is white, odorless, and it is used for cooking, pastries, and confectionery, and as an excellent substitute for cocoa butter. It is also used in cosmetic products, soap, and candles. Mature fruits are eaten fresh and bark yields reddish latex which is used as a chewing gum, or made into glue and balls as toys(Vogt, 1995).

Shea (*Vitellariaparadoxa c.f. Gaertn.*) is arguably socio-economically and environmentally the most important plant species in the semi-arid and arid zones of Africa where it is widely distributed. Apart from the economic gains in international export markets where Shea butter is valued for use in luxury cosmetic, pharmaceutical and confectionary industries, locally the fat (butter) is the main cooking oil for over 86 million inhabitants. Researches during the past decadeshas acknowledged the chemical and nutritional composition as well as the ethnobotanical uses of Shea which has resulted in its butter being used in a wide array of products. The tree regenerates well, and is traditionally favored and protected by farmers. As a result, it has played a significant role in soil and water conservation and environmental protection in semi-arid region of Africa. The husks of the seeds make a good mulch and fertilizer(International Plant Genetics Resources Institute, 2006).

Phytochemicals literally mean "plant chemicals", are non-nutritive chemicals that have protective or disease preventive properties. They are non-essential nutrients, meaning that they are not required by the human body for sustaining life. Scientist have identified thousands of different phytochemicals, found in leaves, fruits, beans, whole grains, nuts seeds or whole plant. It is well-known that plant produce these chemicals to protect themselves but recent research demonstrate that they can also protect humans against diseases. There are more than thousands known phytochemicals. Some of the well-known phytochemicals are lycopene in tomatoes,

isoflavones in soy bean and flavanoids in fruits. Phytochemicals or chemicals in plants play important role in their growth and development. They protect plants from harmful agents such as insects and microbes as well as stressful events such as ultraviolet (UV) radiation and extreme temperatures. They also attract beneficial birds and insects that promote pollination, germination, and seed dispersal. Phytochemicals provide colors to plants and array of flavors both pleasant and unpleasant when consumed. They are unique to specific plants and parts of plants, and they usually increase in abundance during stressful events. Phytochemicals also provide health benefits when consumed (Sofowara, 1995). They consist of nutrients essential for optimal health (e.g., proteins, carbohydrates, vitamins, and minerals) and other chemicals (e.g., phenolic acid, flavanoids, and other phenolics) (Baba Mousa*et al.*, 1999) with lesser known roles in health promotion or disease prevention. A number of these phytochemicals are recognized as bioactive components in traditional herbal medicines (e.g., salicylates (aspirin) found in willow bark used to reduce inflammation, quinine in cinchona bark used to treat malaria, and proanthocyanidins in cranberries used to treat urinary tract infections).

Despite the claims on shea butter to have a lot of economic values such as nutritional, medicinal and pesticidal, these claims have not been clearly justified. This research is therefore meant to investigate the claims made on this plant (leaves and seeds). It is also meant toexamine the chemical composition responsible for the medicinal and economic value of the plant (leaves and seeds).

Materials and Methods

Sample Collection and Preparation

The samples of leaves and seeds were collected from Tiga Village, Bebeji Local Government Area, Kano State in July, 2019. Both the leaves and seeds were properly dried indoors in a ventilated place, crushed into powder and stored in an opaque bottle. The fine powder obtained was sieved and then packaged in a transparent air tight glass bottles and stored at room temperature. The experiment was conducted at the Laboratory of the Department of Biochemistry, Faculty of Basic Medical Sciences, Bayero University Kano, Kano State, Nigeria

Procedure for Phytochemical Analysis

The sample of shea butter leaves' powder was weighted 50g into a bottle and 250ml of methanol was added. The bottle was covered and shaked and allowed to stand for 24hours. Then it was filtered and the extract was placed in a water bath to 12hours. The extract was weighted after complete dryness and the percentage was calculated.

70g of dried-powdered of *Vitellaria paradoxa* seeds was weighted into bottle and 200ml of petroleum ether was added to reduce the amount of fat contain in the seeds, because the fat could not allow for Phytochemicals screening. The bottle was covered and allowed to stand for 24hours.Then the extract was collected and put in a water bath and analysis yield oil of 23.8% and the residue was put in oven for 12hours and extracts was used for analysis.

Qualitative Analysis of Phytochemicals

All the phytochemicals were examined using the established procedures for the respectivephytochemicals

1. **Lead Acetate Test for Favonoids**
   0.1g each of the extracts were dissolved in ethanol and few drops of 10% lead acetate solution were added. Appearance of yellow precipitate indicated the presence of flavanoids.

2. **Foam test for Saponins**
   Small amount (0.1g) of the extracts were taken in test tubes with little quantity (1.0ml) of water and shaken vigorously. Appearance of foam persisting for 10minutes indicated presence of saponins.

3. **Ferric Chloride Test for Phenolic Compounds and Tannins**
   About 2.0ml of each extract was measured in a test tube and 0.01mol dm^3 ferric chloride solution was added drop by drop. Appearance of bluish black precipitate indicated presence of phenolic compounds and tannins.

4. **Salkowski Reaction Test for Phytosterols**
   Up to 0.5ml each of the extracts was added in a test tube then 1.0ml of concentrated H_2SO_4(conc.) from the sides of the test tube and then 1.0ml chloroform. Appearance of reddish brown colour in chloroform layer indicates the presence of phytosterols.

Quantitative Analysis of Photochemicals of *Vitellariaparadoxa*

1. **Determination of Total Alkaloid Content**: The total alkaloid content was determined according to UV-spectrophotometer method. This method is based on the reaction between alkaloid and bromocresol green. The part of the plant extract was dissolved in 2NHCL and then filtered. 1ml of this solution was transferred to separatory funnel and then washed with 10ml chloroform the PH of phosphate buffer solution was

adjusted to neutral with 0.1N NaOH. One ml of this solution was transferred to a separatory funnel and then 5ml of bromocresol solution along 5ml of phosphate buffer were added. The mixture was shaken and the complex formed was fractioned with chloroform by vigorous shaking. The fractions were collected in a 10ml volumetric flask and diluted to volume with chloroform. The absorbance of the complex in chloroform was measured at 470nm.

2. **Total Flavanoids Content**: The total flavanoids content was estimated using the procedure described by Jia*et al.,* (1999).A total of 1ml of the leave or seed extracts each were diluted with 200µL of distilled water separately followed by the addition of 150uL of sodium nitrite (5%) solution to each. This mixture was then incubated for 5 minutes and 150uL of aluminum chloride (10%) solution was added to each and allowed to stand for 6 minutes. Then, 2ml of sodium hydroxide (4%) solution was added to each and made up to 5ml with distilled water. The mixture was shaken well and left for 15 minutes at room temperature. The absorbance was measured at 510nm.

3. **Determination of Cardiac Glycosides**:10ml of purified filtered water was transferred into a clean flask of leaves and seeds extracts each.10ml of BALJET'S REAGENT was added. A blank was carried out at the same time using 10ml of distilled water instead of the purified filtered water and BALJET'S REAGENT. It was allowed to stand for one hour (time necessary for maximum color development).Each of the solution were diluted together with blank 20ml distilled water. The absorbance was measured at 495nm using spectrophotometer.

Results and Discussion

Phytochemical Screening

Qualitative Phytochemical screening of shea butter leaves extracts shown the presence of flavonoid, tannin, Saponin, phenolic compound , cardiac glycoside, alkaloid, reducing sugar, phytosterol, Triterpenoid and carbohydrates while phlobatannin, amino acid and protein were found absence as shown in the Table 1.

***Vitellariaparadoxa*'s Leaves Extracts**

S/N	Phytochemical	Status
1.	Flavonoid	+ve
2.	Saponin	+ve
3.	Phenolic compound	+ve
4.	Tannin	+ve
5.	Phytosterol	+ve
6.	Triterpenoid	+ve
7.	Glycoside	+ve
8.	Protein	-ve
9.	Alkaloid	+ve
10.	Amino acid	-ve
11.	Reducing sugar	+ve
12.	Carbohydrate	+ve
13.	Phlobatannin	-ve

Keys
Present = +ve
Absent = -ve

Qualitative Phytochemical screening of *VitellariaParadoxa*'s seed extracts indicated the presence of flavonoid, phenolic compound, Tannin, Phytosterol, Triterpenoid, Glycoside Protein, Reducing sugar and Carbohydrate while Saponin, Alkaloid, Amino acid and phlobatannin were absence as shown in the Table 2.

Table 2: Qualitative Analysis of *Vitellaria paradoxa*'s Seed Extracts

S/N.	Phytochemical	Status
1.	Flavonoid.	+ve
2.	Saponin	-ve
3.	Phenolic compound	+ve
4.	Tannin	+ve
5.	Phytosterol.	+ve
6.	Triterpenoid	+ve
7.	Glycoside	+ve
8.	Protein.	+ve
9.	Alkaloid	-ve
10.	Amino acid	-ve
11.	Reducing sugar	+ve
12.	Carbohydrate	+ve
13.	Phlobatannin	-ve

Keys
Present = +ve
Absent = -ve

Quantitative Analysis of Phytochemicals Present in Leaves and Seed Extracts of *Vitellaria Paradoxa*

The quantitative analysis were used to find out the quantity of each compound in the extract of leaves. The results shown that phenolic compound has highest crude yield of (141.071mg/g), followed by Alkaloid (50.500mg/g),Glycoside (28.150mg/g), Flavonoid (8.436mg/g),Tannin (8.370mg/g), Sponin (1.317mg/g) as shown in the Table 3.

Table 3: Quantitative Analysis of Phytochemical Found in Leaf Extracts of *Vitellariaparadoxa*

Chemicals	1st Concentration Mg/ g	2nd concentration Mg/g	Mean	stad
Saponin	1.974	0.6591	1.317	1.314
Phenolic	140	142.142	141.07	2.142
Flavonoid	9.000	7.871	8.436	1.129
Tannin	8.370	8.370	8.370	0.000
Alkaloid	52.000	49.000	50.500	3.000
Glycosides	28.1%	28.2 %	28.150%	0.100%

The quantitative analyses were used to find out the quantity of each compound in the extract of the seeds. The results show that phenolic compound has highest crude yield of (734.643mg/g), then Flavonoid (183.517mg/g),Tannin (39.741mg/g), Glycoside (29.726mg/g) as shown in the Table 4.

Table 4: Quantitative Analysis of Phytochemicals Found in Seed Extracts of *Vitellariaparadoxa*

Chemical	1st Concentration mg/ g	2nd concentration mg/ g	Mean	Std.
Flavonoid	185.452	181.581	183.517	3.871
Tannin	39.222	40.259	30.741	1.037
Phenolic	732.857	736.429	734.643	3.572
Glycosides	29.876	29.576	29.726	0.300

Discussion

The results indicated the presence of flavonoid, saponin, phenolic compound, tannin, phytosterol, triterpenoids, cardiac glycoside, alkaloid, reducing sugar and carbohydrates inthe leave extracts of shea butter. The results also indicate the presence of flavonoid, phenolic compound, tannin, phytosterol, triterpenoids, cardiac glycoside, protein, reducing sugar and carbohydrates in the seed extracts of shea butter. The plants and phytochemical compounds are used in folk medicine for the treatment of different types of diseases (Paretaet *al*., 2011). These bioactive secondary plant compounds are not only useful in the cosmetics industry but also useful in drugs making, house use, manufacture of soap and other uses.

The results of quantitative analysis reveals that the leaves of shea butter are rich in phenolic (141.071mg/g) alkaloid (50.500mg/g), cardiac glycosides (28.150%), flavonoid (8.436mg/g), Tannin (8.370mg/g) and saponin (1.317mg/g). The quantitative analysis of shea butter seeds revealed the presence of phenolic compound (734.643mg/g), flavonoid (183.517mg/g), tannin (39.74mg/g) and cardiac glycosides 29.726%). The results obtained seems to justify the use of shea tree in Africa as appreciable amount of important compounds such as cardiac glycosides, phenolic, saponin, flavonoid, alkaloid, tannin were present in leaves and seeds and their role in physiological activity of the human body is imperative. It is also possible that these plant species could have allelopathic effect on other orgnanism in their ecotype (since these bioactive substances are responsible for such actions (Omulokoli and Dihabra, 1997). Plant oils have been utilized for a variety of purposes throughout history, with their integration into foods, cosmetics and pharmaceutical products. They are now being increasingly recognized for their effects on both skin diseases and the restoration of cutaneous homeostasis. Thus, it focuses on the therapeutic benefits of these plant oils according to their anti-inflammatory and antioxidant effects on the skin, promotion of wound healing and repair of skin barrier. Most shea butter products in Africa are manufactured manually and in general, without the use of chemicals or bleaching agents (Warra*et al*., 2009a).

Conclusion

The results of this study indicated that the extracts of leaves and seeds of shea butter tree are good source of food and fodder, medicines, raw materials to industries and also included in the preparation of herbal drugs for the treatment of different diseases in Africa. The use of medicinal plants by indigenous people to treat different diseases of human being and livestock has a long history, very recently the scientific research supported nutritional and medical values of phytochemicals for the prevention and treatment of several diseases. Both the leaves and the seeds contained appreciable quantities of nutrients with health promoting benefits.

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