Greener Journal of Agricultural Sciences
Vol. 11(4), pp. 213-221, 2021
ISSN: 2276-7770

https://gjournals.org/GJAS

Formulation of Cosmetics Containing Sudanese Baobab (*Andasonia Digitata* L.) Seed Oil in Kordofan State

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ARTICLE INFO

Article No.: *102021107*
***Type*:** *Research*
Full Text: ***HTML***, ***EPUB***

Accepted: *21/10/2021*
Published: *28/11/2021*

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Keywords: *Baobab, Adansonia digitata, saponification value, seed oil, mineral*

ABSTRACT

Recently, there has been renewed search for ingredients to be used in herbal cosmetics industry. Baobab (Adansonia Digitata L.) seed oil has received high attention. This study was carried out to study Baobab oil physicochemical properties, mineral concentration for domestic consumption and industrial utilization as cosmetics products: soap, cream and shampoo. Baobab oil was extracted by cold pressing process, oil quality parameters was evaluated using standard methods of analysis. Results obtained shows that the Baobab oil is golden yellow color and its slightly acidic PH was 6.2. Baobab seed oil content, saponification value, peroxide value, iodine value and acid value were 21.75%, 189.06 mgKOH/g, 3.22 mEq/kg, 96.95 mgI2/100g and 0.43 mgKOH/g, respectively. While oil specific gravity and refractive index were determined 0.9157 g/ml and 1.4666. Baobab seed oil is a good source of macro nutrients with potassium being the most prevalent elements followed by calcium and sodium. The soap, cream and shampoo produced from Baobab seed oil reach the PH 10, 6 and 5.5. The results introduced here established the edibility of Baobab oil as well as indicator to its cosmetics and industrial products. Therefore, recommended that more and advanced research should be undertaken for this abundant source of natural nutritious oil, Baobab oil and oils of local seeds should be inserted into cosmetics and other industries purpose.

INTRODUCTION

Baobab *(Adansonia digitata L.),* is a tree specie commonly found in Africa. Genus Adansonia have numerous source plants which are widely distributed throughout sub-Saharan Africa, western Madagascar and Asia (Ayaz, et al., 2014). Baobab is one of the biggest and oldest living creatures attributed with supernatural powers and spirits, it called different name in many language ; Arabic (amaraya, hamao, gungole (fruit), tabaldi, tebeldi), English (upside-down tree, baobab, monkey bread tree, lemonade tree, sour gourd) (Warra et al., 2015). In Sudan especially, western people depended on the pulp of Baobab for treatment of dysentery, diarrhoea, gastro enteritis and colic. Seeds are used for treatment of kidney inflammation by boiling seed till color becomes brow, drinking it for many days. Seeds oil are particularly essential sources of vitamins, which were founded in Baobab oil, including vitamins A, D, E and K. Vitamin E, Linoleic acid were found in Baobab oil which are useful for protection of skin production and miniaturization, it can help with decreasing inflammation and promote the reform of the cells and tissue generation (Kamatu et al., 2011). Increase in the demand for Baobab seed oil worldwide by the cosmetic industries has been reported in recent years thereby increasing the commercial value and importance of this coveted African tree. Baobab seed oil, is one such ingredient, which has rapidly become popular on global markets (Venter, 2012). Herbal Cosmetics, referred as products are formulated using various permissible cosmetic ingredients to form the base in which one or more herbal ingredients are used to provide defined cosmetic benefits (Gediya et al., 2011). The demand of herbal cosmetics is increasing rapidly due to their lack of side effects. This study was carried out to study Baobab seed oil physicochemical properties, mineral concentration, for domestic consumption and industrial utilization as cosmetics products: soap, cream and shampoo.

MATERIAL AND METHODS

Kordofan state Location and Agro climate

Kordofan state is one of the central state of Sudan, it occupies the center part although trends to be a little western, between longitude 16,30 - 30,9^{o,} North 32,35 - 40,36^{o,}East, it bordered to the north by Northern state, from the north-east by Khartoum state, from the east by White Nile state, from the west by Darfur state and from south by South Sudan. Kordofan state occupies a land area of 240,974 km2. The climate of Kordofan is hot and semi-arid with mean annual rainfall varying from 300 mm in the north to over 900 mm in the south, rainfall is concentrated in a single short season which increases in reliability and length from May to October (Alabadi, 1975).

Vegetation of the Study Area

The natural vegetation in Kordofan state follows the rainfall pattern, Kordofan state is characterized by three regions of rain, dry region in the north, semi-dry in the middle and wet in the south. It is represented in the trees of the acacia family, Balanites and Baobab trees. The most important characteristic of these trees is their long term drought tolerance which lasts for six months, (Food and Agriculture Organization, 1960).

Land Use in Study Area

The region depends on rain fed agriculture. Kordofan lands are known to be agricultural, and offers the most important product Arabic gum, peanuts, sesame, Baobab, hibiscus and it is at the forefront in the export of watermelon, cotton, millet and corn.

Sample Collection

The Baobab seeds sample were collected on November 2019 from Kordofan state (El-Nuhud city), Sudan, which is located in western part of Kordofan state. Sampling was collected randomly without consideration of tree fruit amount, fruit size or tree height. It characterized 3-7 trees from each source, and from each Baobab tree, a compound shell fruit (that included pulp and seeds) totaling consist 5-10 fruit from the same tree.

Sample Preparation

Fruit shell was manually cracked using hammer. Seeds were soaked in water for about one hour, washed by hand to remove residual of pulp and fiber, then seeds were diffuses on the drying trays mantled with an absorbent (paper towels) and left overnight on the laboratory bench to lose moisture gained during seeds washing. Seeds were put on the dryer 70^{o}C for 1 hr, then packed in polyethylene bag. Dried seeds were crushed and milled into fine powder using the electrical crusher. The Baobab powder was pressed with the hydraulic extractor (Cold Pressing Machine), powder was poured into the bridge of press manually screwed and pressed to obtain oil with phytoconstituents intact.

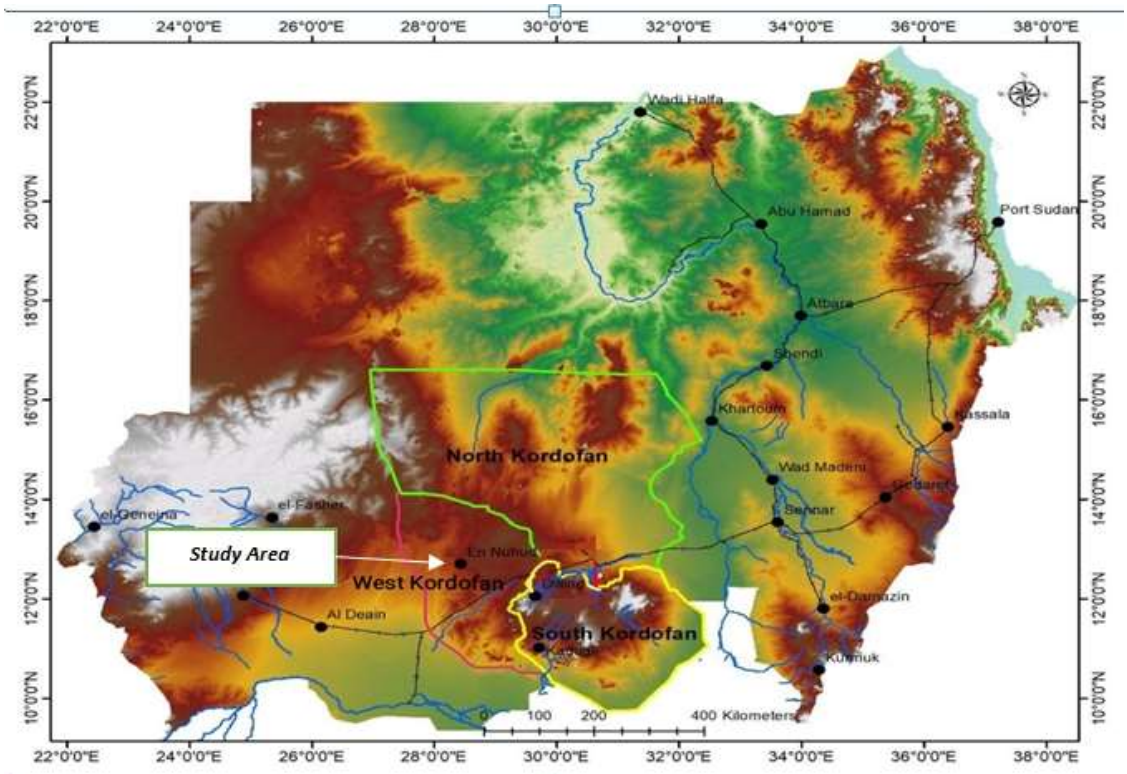

Fig 1. Sudan Map showing North, South and West states of Kordofan and Study Area.

Physicochemical Analysis

Determination of Density (ρ)

The density of the oil was determined by the dry pycnometer filled with the prepared sample in such a manner to prevent trap of air bubbles after removing the cap of the side arm. The stopper was inserted in pycnometer and immersed immediately in water bath 30.0±0.2, it was held for 30 minutes. Any oil came that off the capillary opening for the pycnometer stopper was wiped out carefully. The bottle was removed from the bath, cleaned and dried thoroughly. The cap of the side arm was removed and the bottle was weighed to ensure the temperature did not fall below 25°C (AOAC, 1990).

$$\rho(g/ml) = \frac{W2 - W1\ (g)}{V\ (ml)}$$

Where W2, bottle weight with oil, ***W1*** weight of empty bottle and ***V*** volume of oil.

Baobab Oil Color

The color intensity was measured using a Lovibond colormeter, units of red, yellow and blue color were recorded. Samples were filtered through a filter paper before testing. Appropriate cell (2 inches cell) was filled with oil and placed in the colorimeter, the colorimeter was then placed near the window for light. The instrument was switched on and looked upon through the eye, slides were adjusted until color match was obtained. The readings of the filter, used to make the match (red, yellow and blue) were recorded (AOAC, 1990).

Determination of Refractive Index

The refractive index of oil was determined by method of (AOAC, 1990). The refract meter was first adjusted to 1.3330 at 25^{o}C with pure distilled water as a blank reading. A drop of the oil was placed in the instrument and telescope was adjusted so that the cross hairs were distinct and in focus. The adjustment of the knob was rotated until the lower part of the field was dark and the upper part was light and a clear definite boundary appeared. The coarse adjustment knob was moved first and then the fine adjustment knob until the boundary line coincided with the intersection of the cross hair in the telescope, the instrument was read when temperature was stable. The refractive index value was read directly from refract meter.

Determination of PH Value

The method described by (AOAC, 1990), was adopted. 2g of the sample was poured into a clean dry 250 ml beaker and 13 ml of hot distilled water was added to the sample in the beaker and stirred slowly. It was then cooled in a water bath to 25^{o}C. The PH electrode was standardized with buffer solution of known PH. The

electrode was then inserted into the sample and the PH was read and recorded.

Determination of Oil Content

Lipid was determined according to the method of (AOAC, 1990) using Soxhlet apparatus as follows: An empty clean and dry exhaustion flask was weighed. About 2 were used in the extraction and expressed in percentage. Extraction continued for eight hours with petroleum ether. The heat was regulated to obtain at least fifteen siphoning per hour. The residual ether was dried by evaporation. The flask was placed in an oven at 105°C till it dried completely and then cooled in a desiccator and was weighed.

$$\textbf{Oil } \% \frac{\textbf{Oil Weight (g)}}{\textbf{Seed Sample Weight (g)}} * \textbf{100}$$

Determination of Crude Protein (CP)

Crude protein of the sample was determined by method according to (AOAC, 1990) as:

1. Digestion: 0.2 gram of sample was weighed and placed in small digestion flask (50 ml). About 0.4 gram catalyst mixture (96% anhydrous sodium sulphate and 3.5% copper sulphate) was added, 3.5 ml of approximately 98% of H_2SO_4 was added. The contents of the flask were then heated on an electrical heater for 2 hours till the colour changed to blue-green. The tubes were then removed from digester and allowed to cool.

2. Distillation: The digested sample was transferred to the distillation unit and 20 ml of NaOH (40%) were added. The ammonia was received in 100 ml conical flask containing10 ml of 2% boric acid plus 3-4 drops of methyl red indicator. The distillation was continued until the volume reached 50 ml.

3. Titration: The content of the flask was titrated against (0.02 M) HCL, then titration reading was recorded.

$$\textbf{CP}\% = \frac{[\textbf{T} - \textbf{B (ml)}] * \textbf{N HCl} * \textbf{100} * \textbf{6.25}}{\textbf{Ws (g)} * \textbf{1000}}$$

Where, T Titration Reading, ***B*** Blank Reading, ***N HCl*** Normality of HCl and ***Ws,*** sample weight.

Determination of Crude Fiber (CF)

Crude fiber was determined according to (AOAC, 1990). 2 g of defatted sample were treated successively with boiling solution of H_2SO_4 and KOH (0.26 N and 0.23 N, respectively). The residue was then separated by filtration, washed and transferred into a crucible then placed into an oven adjusted to 105°C for 18 – 24 hours. Then the crucible with the sample was weighed and ached in a muffle furnace at 500°C and weighed.

$$\textbf{CF}\% = \frac{\textbf{W1} - \textbf{W2}}{\textbf{Ws (g)}} * \textbf{100}$$

Where **W1** weight of pot before ash, **W2** weight of pot after ash and ***Ws,*** sample weight.

Determination of Ash Content (AC)

Ash content of the sample was determined according to the method of (AOAC, 1990) as follows: 2 g of sample were placed in a clean dry pre-weighed crucible, and then the crucible with its content was ignited in a muffle furnace at about 550^{o}C for 3 hours or more until light grey ash was obtained. The crucible was removed from the furnace to desiccators to cool and then weighed. The crucible was reignited in the furnace and allowed to cool until a constant weight was obtained.

$$\textbf{AC}\% = \frac{[\textbf{W1 (g)} - \textbf{W2 (g)}]}{\textbf{Ws (g)}} \textbf{ ×100}$$

Where, W1 weight of pot with ash, ***W2*** weight of empty pot and ***Ws,*** sample weight.

Determination of Saponification Value (SV)

The saponification value was determined using a method presented by (AOAC, 1990); 2 g of the oil was weighed in a 25 ml conical flask to which 5 ml of 0.5 N alcohol and 20 ml of 0.5 N alcoholic KOH solution were added. Also 5 ml of 0.5 alcoholic KOH solution were added, then the flask and content was refluxed for one hour. Then the condenser was connected and the content heated gently, but steadily for one hr. After the condenser and the flask has cooled. Then a few drops of phenolphthalein solution were added to the flask and the sample was titrated with hydrogen chloride, HCl (0.5N) until the pink color disappeared. The difference in titre between that of the blank and the sample solution is equivalent to the fatty acid present.

$$\textbf{SV} = \frac{\textbf{56.1} \times \textbf{N(HCl) (M)} * [\textbf{V0} - \textbf{V1 (ml)}]}{\textbf{Ws (g)}}$$

Where, ***V0*** , ***V1,*** are the volume of hydrogen chloride required by blank and sample, respectively, ***N*** is the concentration conversion coefficient of hydrogen chloride and ***Ws,*** sample weight.

Determination of Iodine Value (IV)

To 300 ml conical flask with ground in stopper, 0.1g sample was added. 20 ml of carbon tetrachloride was added and the flask was sealed. 25 ml Hanus solution was also added and the flask also sealed. The flask content was shaken for 1 minute. And kept sealed and left in a dark room (about 20^{o}C) for 30 min with continuous shaking every 5 minutes. 10 M of 15% potassium iodide and 100ml of water were added, and

the flask was sealed and shaken for 30 seconds. The flask content titrated with 0.1mol/L sodium thiosulphate to obtain iodine value. Likewise, blank test was performed to obtain blank level (AOAC, 1990).

$$\mathbf{IV}=\frac{1.269\times[\mathbf{T}-\mathbf{sample\ (ml)}]\times\mathbf{M}}{\mathbf{Ws\ (g)}}$$

Where T, Titration of blank***, M*** Molarity of stander and ***Ws,*** sample weight.

Determination of Acid Value (AV)

Acid value was determined by standard methods (AOAC, 1990). The oil was mixed thoroughly before weighing. About 5 of cooled oil samples was accurately weighed in a 250 ml conical flask and 50 ml of it was added to 100 ml of freshly neutralized hot ethyl alcohol and about one ml of phenolphthalein indicator solution. The mixture was boiled for about five minutes and titrated while hot against standard sodium hydroxide while shaking vigorously during the titration. The weight of the oil was taken for estimation and the strength of the alkali used for titration against standardized potassium hydroxide (0.24 M), therefore, the titration does not exceed 10 ml.

$$\mathbf{AV}=\frac{56.1\times\mathbf{T\ (ml)}\times\mathbf{M}}{\mathbf{Ws\ (g)}}$$

Where T Titration of stander, ***M*** Molarity of stander and ***Ws,*** sample weight.

Determination of Peroxide Value

According to the method described by (AOAC, 1990), 5 g of sample was delivered into a conical flask with stopper. About 25 ml of solvent (15 ml acetic acid+10 ml chloroform) was added (0.11 M) and gently shaken to dissolve the sample completely. The air inside the flask was gently replaced with nitrogen to remove remaining oxygen. One ml of saturated potassium iodide was added and immediately the flask was sealed and gently shaken it for one minute. The flask was left at room temperature 15 to 20^{o}C in a dark room. 30 ml of water was added, and the flask was sealed and stirred. Titration with 0.01mol/L sodium thiosulphate was performed to measure peroxide value.

$$\mathbf{PV}=\frac{[\mathbf{T\ (ml)}\times\mathbf{M}\times\mathbf{100}}{\mathbf{Ws\ (g)}}$$

Where T, Titration of stander***, M*** Molarity of stander and ***Ws,*** sample weight.

Determination of Mineral

Sodium, Calcium and Potassium were measured using a flame photometer, equipped with air-acetylene flame. All glass wares were washed with detergent and water. After being rinsed with water for several times, they were soaked in 20% HNO_3 (v/v) for 25 hr, and then were soaked again in 20% HNO_3 (v/v) for 24 hr, then the glassware was rinsed several times with deionized water and dried. The oil sample was brought into clear solution to eliminate the organic part of oil for analyses, for this reason, oil sample was first digested with chemicals where the organic matrix of oil was destroy and leaving the element as a clear solution. Wet digestion method (i.e. digestion with nitric and sulphuric acids) was used. Known volume of oil (100 ml) was evaporate to dryness, about 1 g sample was transferred into a 125 ml conical flask. A 10 ml HCl-H_2O_2 [1+1] mixture was added to it, and the flask was covered with a watch glass. The sample was heated on a hot plate at 100°C for about 2 hr, bringing it to a gentle boil. The digested solution was filtered into a 100 ml volumetric flask through 125 mm filter paper, and diluted with deionized water. The samples were incinerated at 450°C for 12 hr in a muffle furnace and acid digest was prepared by oxidizing each sub-sample with a nitric/per-chloric acid (2:1) mixture. The samples were quantified against standard solutions of known concentration that were analysed concurrently (AOAC, 1990).

Preparation of Baobab Oil Cosmetics

Baobab Oil Soap

The method by (Warra, 2012) was applied to Baobab oil, for saponification procedure: 20 g of sodium hydroxide pellets was dissolved in a 100 cm^3 volumetric flask and the volume was made to the mark with distill water. The required quantity of alkali solution was mixed with Canary melon seed oil (ratio 1:1 v/v). The oils was warmed gently and poured into the beaker followed by the alkali solution to form an intimate mix and then stirred frequently using stirring rod until the reaction reach equilibrium, this took 5 minutes. The saponification mixture was then poured into mould and allowed to dry (cure) for 24 hours.

PH of Soap: 2 g of soaps were added into 20 ml distilled water and shaken and the soap suspensions were allowed to stay for at least 12 hours before the PH meter was inserted into a beaker, the readings were recorded.

Baobab Oil Cream

Procedure described by (Pratibha et al., 2016) was applied to Baobab oil, 4.76 g of Baobab oil was mixed with 2 g emulsifying wax, 1 g stearic acid and 0.7 g cetyl alcohol. The mixture was melted at 700^{o}C. A mixture of 15 ml water and 1.7 g glycerine was added with continuous stirring. After that cream was left to cool down, then 0.8 g Sodium benzoate was added to the mixture.

PH of Cream: 5 g of cream was weighed accurately in a 100 ml beaker. 45 ml of water was added and dispersed

the cream in it. PH of the suspension was determined at 27^{o}C, PH of cream was adjusted from 5-9 (Pratibha et al., 2016).

Baobab Oil Shampoo

Method prepared by (Mahendran and Haleeda, 2016) was modified and applied to Baobab oil. Shampoo was prepared by using primary emulsion method, 17 ml of castor oil, 8 ml glycerine and 10 g sodium lauryl sulphate, volume was made to 100 ml with water. PH of the solution was adjusted by adding sufficient quantity of 1% citric acid or tri ethanol amine solution, few drops of essential oil were also added to impart aroma to the prepared shampoo, and PH was adjusted from 4-7.

PH of Shampoo: PH of 10% v/v shampoo solution in distilled water was determined using PH tester at room temperature (Tarun et al., 2014).

Statistical Analysis

The Statistical analysis of Baobab oil results was done using Microsoft Excel (2007) - version 12.0.4518.1014, the results were performed in three repetitions and expressed as mean.

RESULTS AND DISSCUTION

The results showed that the obtained oil was (reddish yellow) golden yellow color, fixed and liquid at room temperature of 25°C.

Fig. 2- Baobab seed oil.

Physicochemical Properties of Baobab Oil

The physical characters were studied according to five different aspects: physical state, color, density, viscosity, PH and refractive index. Table 1 shows the physicochemical analysis of the Baobab seeds oil. Physical properties of oil: density, viscosity, refractive index and PH were 0.91570 g/cm^3, 31.53 mm^2/s, 1.4666 and 6.2 respectively. Whereas, the literature had reported Baobab oil density value ranged from 0.195 to 1.024 g/cm^3, that is within the obtained value (Singh et al., 2016).

Refractive index for Baobab seeds oil was reported to be 1.459 by (Nkafamiya et al., 2007), it was acceptable according to unsaturated fatty acids and long chain hydrocarbon. Baobab seed contains 21.75 % oil, it has high oil content indicating that is a promising source of oils, the obtained yield was agreeable with a literature stating that Baobab seed contains 22-45% oil, this value is represented in terms of lipid or fat content.

The Saponification value for the present study was 189.06 mgKOH/g of oil, this value was within that reported in literature, which found saponification value of Baobab oil was 133 to 200 mg KOH/g (Zahra'u et al., 2014), it falls within the range of fruit oil, this indicates that the oil could also be used in soap making since its saponification value falls within the range of these oils.

The iodine value was considered a factor in oil classification using the drying quality of the oil. It could be drying, semi-drying or non-drying oil through the analysis of iodine value. The obtained oil was non-drying edible oil, iodine value for Baobab seed oil was found to be 96.95 gI2/100g when compared with the standard of oil. It contains low degree of unsaturation and can therefore be classified as non-drying edible oil because it falls within the range of non-drying oils. Researchers reported IV for Baobab oil ranged from 56 to 96 gI_2/100g which is almost close to the result found in this study (Nkafamiya et al., 2007).

Acid value is used to measure the extent to which glycerides in the oil has been decomposed by lipase and other physical factors such as light and heat. Thus, the low acid value of Baobab oil was 0.43 mgKOH/g, and fell

within the range recommended for cooking oil, which is 0.00-3.00 mgKOH/g (Oderinde et al., 2009).

Peroxide value is used to measure the extent to which rancidity reactions have occurred during storage. A high peroxide value for any oil shows the fact that the oil has less resistance to lipolytic hydrolysis and oxidation while a low peroxide value shows otherwise. Peroxide value of the Baobab seed oil was 3.22 mEq/kg, this value is lower than that reported by (Ishag, 2019) which is 6.6 meq O_2/kg, quite low and indicates less susceptibility to oxidation. It is within the range of 0-10 mEq/kg stipulated for freshly prepared oil. The peroxide indicates the rancidity process, whereby the higher the peroxide value, the higher the oxidation level and the lessening of lipids. Theoretically, oil that shows a high **amount of peroxide value is more prone to undergo** rancidity that affects the total quality of the oil (Ibeto et al., 2012).

Table 1- Physiochemical properties of Baobab seed oil.

Parameter	Value
Color	Golden Yellow
Density 25°C (g/ml)	0.91570
Viscosity (cp)	31.53
Refractive index 25°C	1.4666
PH	6.2
Oil content %	21.75
Crude Protein %	18.01
Crude Fiber %	14.05
Ash content %	3.45
Saponification value (mgKOH/g)	189.06
Iodine value (gI_2/100g)	96.95
Acid Value (mgKOH/g)	0.43
Peroxide value (mEq/kg)	3.22

Baobab seed oil contain valuable amount of the mineral relative. Oil is a good source of macro nutrients with potassium being the most predominant element. It is contained significant amounts of important mineral element sodium, calcium and potassium. Potassium was the most abundant element in the Baobab seed oil, followed by calcium and sodium. These result revealed that Baobab oil may provide a sufficient amount of minerals to meet the human mineral requirement. Generally, Baobab seed oil is a cheap source of nutritive elements. The seed oil followed those of seeds with mineral element composition. Minerals are important in the diet because they serve as cofactors for many physiologic and metabolic functions and in their absence, clinical deficiencies may occur (Oyeleke et al., 2012). Sodium, potassium and calcium ratios are also of medical importance especially in blood clotting and in reducing high blood pressure.

Table 2- Mineral Composition of Baobab seed oil.

Mineral	Value (mg/g)
Sodium Na	22.50
Calcium Ca	334.03
Potassium K	360.34

Baobab Oil Cosmetics

Baobab oil was chosen for its high fat content (~21.75%). The saponification value of the oil extracted from Baobab seed was 189.06 mg/KOH/g, it was suitable for soap making. Baobab soap was prepared as a product of saponification reaction between NaOH solution and oil extracted from Baobab seed. From the results, PH of Baobab oil soap was 10, it is consistent with the normal PH range for soap 8-10.5 and 9-11 (Oyedele, 2002). This value is slightly higher than 9.38 for cotton seed oil soap (Warra et al., 2011), it can be overcome by the addition of excess fat or oil or any other super fatting agent to reduce the harshness of the soap. This indicates that, the prepared soap is not corrosive to the skin. As the salt of a weak acid (fatty acid) and strong base (NaOH), soap is alkaline (pH~10) in aqueous solution.

Fig.2- Baobab oil soap, cream and shampoo.

Baobab oil cream had normal values of hydration, it was homogeneous, smooth and consistent in nature, easily spreadable, non-greasy film on the skin surface and did not leave residue on skin surface after application. The stability studies of the various parameters like visual appearance, nature, PH of formulations showed good results. The PH of cream was found to be 6 which is suitable for topical application because PH of the skin is 5-6, which is an acidic value (Pratibha et al., 2016). The herbal shampoo was prepared by using primary emulsion method, this is for the purpose of securing stability and inhibiting discordance. The formulated shampoo was pale white color, had high viscosity, had a good odour given by components and produced good amount of foam. It also has good antioxidants content and fatty acid present in Baobab oil. The PH balance of shampoo is important as it affects the skins and surfaces as they are being used. PH of formulated shampoo was 5.5, it fell within the ideal PH range for shampoo which is between 5 and 7 (Tarn et al., 2014).

Table 3- Baobab oil soap, cream and shampoo properties.

Parameter	Soap	Cream	Shampoo
Colour	light yellow	White	Pale white
Appearance	Solid	Semi-solid	Emulsion
PH	10	6	5.5
Foam height (cm3)	10.8	-	6
Mass of Baobab oil (g)	10	4.76	17
Foam producing ability	yes	-	yes
Foam stability	Good	-	Good
Odour	Good	Characteristic	Good
Wash ability	Easily	-	Easily
Stability	Stable	Stable	Stable
Skin /eye irritation	No harmful	No harmful	No harmful

CONCLUSION

The worldwide demand for Baobab as raw material has increased dramatically for industrial products. Based on the results of the study, Baobab oil properties are interesting and promising for several applications. The overall results of this analysis show that Baobab seed contains valuable amount of oil, energy, protein and minerals. The obtained results in this study were acceptable and similar to previous studies. Baobab oil cosmetics are among quality products in terms of health benefits and with favourable medicinal properties. Industrially, the oil is useful in small, medium and large scale for soap and cosmetic making.

RECOMMENDATION

1- Advanced research should be undertaken for this abundant source of natural nutritious oil.
2- Insert Baobab oil and oils of local seeds into cosmetics and other industries purpose.
3- Investigate Baobab seed oil potency as raw materials for new industrial products and applications to increasing economic probability of future commercial farming of the tree.

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Cite this Article: Alia MAI; Kamal EEY (2021). Formulation of Cosmetics Containing Sudanese Baobab (*Andasonia Digitata* L.) Seed Oil in Kordofan State. *Greener Journal of Agricultural Sciences* 11(3): 213-221.