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Original Article

Physicochemical Analysis and Soap production from Hexane Extract of Two Varieties of Sesame Seed (*Sesamun indicum* L.) Oil

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Abstract

Oil was extracted from two varieties of sesame seed in a soxhlet apparatus using n-hexane which yielded 40.83±0.02%and 41.67± 0.01% for white and brown sesame seeds respectively. Colours of the two oils were light brown and light yellow respectively. Quality characteristics from the physico-chemical analysis revealed the following; Acid values(mgKOH/g) of 0.03± 0.01and 0.32± 0.01, Iodine values(gI_2/100g) of 129.8± 0.10and 112.8± 0.20, Saponification values of (mgKOH/g)of 203.00±0.00 and 218.52± 0.01, Saponification values (mgKOH/g) of 203.00±0.00 and 218.52± 0.01, Peroxide values (meq H_2O_2)of 3.0± 0.01 and 1.57±0.02, Relative density (g/cm^3) of 0.8183±0.00 and 0.6031±0.00, Refractive index of 1.4429±0.00 and 1.4112±0.00 respectively. Analysis of soaps produced showed colour of light cream and lighter cream , slight solubility for both, pH of 10.15 and 10.87, Foam height of 36cm^3 and 20cm^3 respectively. The quality characteristics of the oils and soaps produced indicated the potential of the two seed varieties for cosmetic utilization.

1. Introduction

Sesamum indicum L. is an annual plant of pedaliaceae family considered to be the oldest of the oilseed plants and has been under cultivation in Asia for over 5000 years.[Sesame is cultivated on 7 million ha worldwide; India and China are the world's largest producers of sesame, followed by the areas found in developing countries Myanmar, Sudan, Uganda, Ethiopia, Nigeria, Tanzania, Pakistan and Paraguay[1].It was a highly prized oil crop of Babylon and Assyria at least 4000 years ago [2]. Sesame oil, otherwise also referred to as gingelly oil, is one of the major sources of edible oil in India and is culturally associated from the Vedic period. The Sanskrit word for oil, taila is derived from the Sanskrit word for sesame tila [3]. Within 2011 – 2013 timeframe, Nigeria ranks second in the world for production and export of sesame seed [4]. Sesame is one of the most important high value oil crops in Ethiopia contributing high foreign currency [5]. Biochemical Assessment of Moroccan Sesame (*Sesamum Indicum*) Genotypes was also reported[6]. Sesame (*Sesamum indicum*) is an important oilseed crop which produces seeds with 50% oil that has a distinct flavor and contains antioxidant lignans. Because sesame lignans are known to have antioxidant and health-protecting properties, metabolic pathways for lignans have been of interest in developing sesame seeds [7].

It is called "sesame" internationally, while it is called "benniseed" in West Africa; "simsim" in East Africa and "Till" in India. Within Nigeria it is called different names in different localities. It is generally called "ridi" in the Northern States. The Igalas, Idomas and Tivs of Benue State call it "Igogo", "Ocha" and "Ishwa" respectively. The Ibos call it "isasa" and Yorubas call it "Ekuku" or "Eeku" in parts of Ogun, Ondo and Oyo states and Ilorin in Kwara State [8]. Bioactive lignans from sesame (*Sesamum indicum* L.): evaluation of their antioxidant and antibacterial effects for food applications was reported [9] Report has shown the impact of environment on the seed yield. Seed production environment and potential seed longevity of Rain-fed Sesame (*Sesamum indicum* L.) genotypes was reported [10].

The oil is used widely in the some injectable drug formulations. The lignans such as sesamin, episesamin, sesaminol and sesamolin are major constituents of sesame oil and all have chemically methylenedioxyphenyl group [11]. It ranks ninth among the top 13 oilseed crops which make up 90% of the world production of edible oil. The oil is also useful in the industrial preparation of perfumery, cosmetics (skin conditioning agents and moisturizers, hair preparations, bath oils, hand products and make-up), pharmaceuticals (vehicle for drug delivery), insecticides and paints and varnishes. Sesame seed has higher oil content (around 50%) than most of the known oil seeds. The seed has 40-60 per cent of oil with almost equal levels of oleic (range 33-50%, typically 41%) and linoleic acids (range 33-50%, typically 43%) and some palmitic acid (range 7-12%, typically 9%) and stearic acid (range 3-6%, typically 6%) [12].

Sesamum indicum L. oil can be classified in the oleic-linoleic acid group. The dominant saturated acids were palmitic (up to 8.58%) and stearic (up to 5.44%). Chemical analysis of varieties of sesame seed was reported. An analytical comparison of the biochemical composition of Black Sesame (BS) and White Sesame (WS) produced in China was carried out [13]. Some physical and chemical characteristics of oils extracted from sesame seed Grown inJigawa State – Nigeria was reported [14]. The oil is used for religious ceremonies, apart from its use in cooking, anointing, soap making, preparing antioxidants and as insecticides. Quantification of seed oil and evaluation of antioxidant properties in the wild and cultivated species of *sesamum* l. (pedaliaceae) was reported [15]. Methanolysis optimization of sesame (*Sesamum indicum*) oil to biodiesel and fuel quality characterization was reported[16] and characterization of white seed *sesamum indicum* l. oil for biodiesel production was also reported [17]. Cosmetic potential of oil extract from the seed of sesame was reviewed [18]. This research is aimed at quality characterization of oil and analysis of Soap Produced from Hexane Extract of Two Varieties of Sesame Seed (*Sesamun indicum* L.) seed oil

2. Materials and Methods

2.1 Sample Collection, Identification and Preparation

The two varieties of Sesame (*Sesamun indicum* L) white and brown L. seed were procured from sesame commercial producers at Argungu market in Argungu town of Kebbi State, Nigeria. The dried seeds were crushed into powder using mortar and pestle and were stored in a plastic container for oil extraction.

2.2 Oil Extraction Procedure

The hexane extract was obtained by complete extraction using the Soxhlet extractor (GG-17, SHUNIU). The 50 g of each powdered kernel sample was put into a porous thimble and placed in a Soxhlet extractor, using 150 cm3 of n-hexane (with boiling point of 40- 60°C) as extracting solvent for 6 hours repeatedly until required quantity was obtained. The oil was obtained after evaporation using Water bath at 70oC to remove the excess solvent from the extracted oil. The oil was then stored in refrigerator for subsequent physicochemical analysis.

2.3 Percentage Yield

The oil which was recovered by complete distilling of most of the solvent on a heating mantle was transferred to a beaker. The beaker was then placed over water bath for complete evaporation of solvent for about 2 hours and volume of the oil was recorded and expressed as oil content (%) in line with literature report [19].

2.4 Determination of Colour

The colour of the oil samples was determined by observation using several independent competent individuals. Oil colour was correlated using colour charts [20]

2.5 Determination of Relative Density

This was performed according to literature report [21]. The10ml of the oil was measured in a pre-weighed measuring cylinder. The weight of the cylinder and oil was measured; the weight of the oil was then obtained by subtracting the weight of the cylinder from the weight of the oil and cylinder. The density of the oil was obtained using equation below.

2.7 Physico-Chemical Analysis

The physico- chemical analysis of the onion seed oil was carried out using the methods reported [22; 23; 24]

2.8 Preparation and Analysis of the white and brown sesame seed oil Soap

Saponification Procedure: As reported in literature [25]. 200 grams of sodium hydroxide pellets was dissolved in1000cm3 volumetric flask and the volume made to the mark with distilled water. The required quantity of alkaline solution was mixed with onion seed oil (ratio 1:1 v/v). The oil was warmed gently and poured into the beaker followed by the alkali solution to form an intimate mix and then stirred frequently for 7 minutes using stirring rod until reaction reached equilibrium. The saponification mixture was then poured into mould and allowed to dry (cure) for 24hours.

2.9 pH Determination

The pH was determined using pH meter (827PH Metronm Model). A 5g of the soap shavings were weighed and dissolved with distilled water in a 100ml volumetric flask. The electrode of the pH meter was inserted into the solution of the soap and the pH reading was recorded [25].

2. 10 Foam Ability Test

A 2g of the soap was added to a 500 cm^3 measuring cylinder containing 100 cm^3 of distilled water. The mixture was shaken vigorously so as to generate foams. After shaking for some time, the cylinder was allowed to stand for 10minutes. The height of the foam in the solution was measured and recorded [25].

Figure 1: Sesame plant

Figure 2: White sesame seeds variety

Figure 3: Brown sesame seeds variety

Figure 4: White sesame seed oil

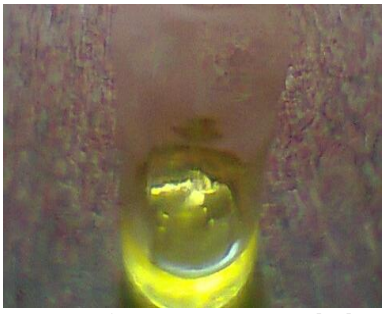

Figure 5: Brown sesame seed oil

Figure 6: White sesame seed oil soap

Figure 7: Brown sesame seed oil soap

3. Results

Table 1: Physicochemical properties of two varieties of sesame seed (*Sesamun indicum* L.) oil*.

Parameters	Values	
	WSSO**	BSSO***
Oil yield (%)	40.83±0.02	41.67± 0.01
Colour of oil	Light brown	Light yellow
Acid value mgKOH/g	0.03± 0.01	0.32± 0.01
Iodine value gI_2/100g	129.8± 0.10	112.8± 0.20
Saponification value mgKOH/g	203.00±0.00	218.52± 0.01
Peroxide value meq H_2O_2,	3.0± 0.01	1.57±0.02
Relative density (g/cm^3)	0.8183±0.00	0.6031±0.00
Refractive index	1.4429±0.00	1.4112±0.00

*Values are expressed as mean and ± standard deviation of triplicate determinations *

** WSSO = White sesame seed oil. *** BSSO = Brown sesame seed oil.

Table 2: Physicochemical characteristics of soaps produced from two varieties of sesame seed (*Sesamun indicum* L.) oil*

Parameters	Values	
	WSSO**	BSSO***
Colour	Light cream	Lighter cream
Solubility	Slightly soluble	slightly soluble
pH	10.15	10.87
Foam height	36cm^3	20cm^3

*Values are expressed as mean and ± standard deviation of triplicate determinations *

** WSSO = White sesame seed oil. *** BSSO = Brown sesame seed oil.

4. Discussion

Oil yield of 40.83±0.02% and 41.67± 0.01% for white and brown sesame seeds was recorded, the values were lower than 49.3% reported for *Neocarya macrophylla* seed oil [26], higher than 22.5% reported for Garlic oil [27] recommended for soap production. The colour of the oils were light cream and lighter cream respectively. It was reported that many consumers preferred the bright color, transparent but close to its natural color of oil [28].Acid values (mgKOH/g) were 0.03± 0.01 and 0.32± 0.01 respectively lower than 0.35± 0.01 reported for canary melon seed oil [29]. Lower acid value signifies a maximum purity and made it suitable for soap production. Iodine values (gI_2/100g) were 29.8± 0.10 and 112.8± 0.20 respectively which is within a range of semi-drying oils consisting predominately polyunsaturated fatty acids mainly oleic and linoleic fatty acids. This class of oils whose iodine value is between 100 – 150 possesses the property of absorbing oxygen on exposure to the atmosphere; though do not do so sufficiently to qualify them as drying oils. They become thicken and remain sticky but do not form a hard dry film. They are used in the production of margarine and soap [30] Saponification values (mgKOH/g) were 203.00±0.00 and 218.52± 0.01 respectively higher than 197 (0.19) reported for Ackeeoil[31] and 166.10±0.84 reported for shea nut fat [32]. Higher saponification values indicate suitability for soap production. The peroxide values (meq H_2O_2) were 3.0± 0.01 and 1.57±0.02 lower than 3.80± 0.1 and 4.10±0.153 reported for brown and yellow Cyperus esculentus tubers oil [33]. The peroxide value is used as an indicator of deterioration of oils. Fresh oils have values less than 10 mEq Kg-1. Values between 20 and 40 result to rancid taste. High values can be reduced by alkaline refining [34] Relative density (g/cm^3) values were 0.8183±0.00 and 0.6031±0.00. Refractive index values were 1.4429±0.00 and 1.4112±0.00 lower than 1.4750 and 1.4750 reported for Corn oil and Sunflower oil respectively [35]. Higher than 1.412 reported for Palm Kernel Oil [36]. Increase in refractive index values in the triacylglycerols or degree of unsaturation result in increase in chain length of fatty acids [37]. For the prepared soaps the colours were light cream and lighter cream respectively. Both soaps were slightly soluble. The pH values were 10.15 and 10.87 respectively. pH slightly or higher than skin friendly can be regulated by super fatting. Foam height values were 36cm^3 and 20cm^3 respectively.

5. Conclusion

From the results of the physico-chemical analysis and the soaps produced from the hexane extract of two varieties of sesame seeds oil indicated their potential for cosmetic utilization.

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