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Physicochemical Properties of Oil Extracts from *Sesamum Indicum* L. Seeds Grown in Jigawa State – Nigeria

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ABSTRACT: Many physical and chemical properties of fats and oils have been investigated. In this study the oil content, Iodine value, specific gravity and some chemical analyses on oil extracted from the white and red seeds of sesame seeds were determined and compared with those reported by the other workers. The white and red sesame seeds have mean percentage oil contents of 48% and 50%, mean iodine value of 103 and 116gI_2/100g and specific gravity of 0.915 and 0.923g/cm^3 respectively. The chemical analysis carried out on the oil of white and red sesam*e* seeds have the following properties: acid value of 0.5 and 0.45 mg KOH/g, saponification value of 189 and 191 mg KOH/g and peroxide value of 8 and 7.45 meq KOH/g respectively. The high oil content of the sesame seeds obtained in this study strongly indicates its prospects for commercial extraction. @ JASEM

Sesamum indica L., the annual plant reaches height of 6 feet and sprouts along leaves and seed pods. The plant requires a fairly warm growing season of four to five months and favourable condition similar to that needed to grow Soya beans (Facciola, 1990). For nearly as long as 1500BC, a variety of Sesame plants have flourished throughout the rest of Middle East and Asia, where their seeds and oils were used liberally for culinary, medicinal, health and beauty purposes. Indeed Sesame seeds often pop up in the Middle Eastern and Asian recipes, like in tasty Mannades and dipping sauces. Today Sesame seeds are still in demand the world over, cultivation in the U.S. is concentrated mostly in southern and western states, while top global producers are China, India and West Indies. Most of the Sesame seed sold in the United States is grown in Mexico, Central America and China (Dutta, 1986). Not limited to white and red, the seeds also come in more exotic forms such as the black and brown varieties. Sesame seeds are used to add texture and flavour to a variety of breads, rolls, cracker and salad dressings. Middle Eastern Muslims and Asian seasonings blends use crushed, whole and toasted seeds for flavour and texture (Facciola, 1990).

MATERIALS AND METHODS

Chemicals of analytical grade purity and distilled water were used in the preparation of reagents. All glassware used was washed with detergent solution and was rinsed with water before drying in the oven.

Sampling and Sample Preparation

Samples of white (W) and red (R) sesame seeds were collected from Gujungu of Jigawa State, Nigeria. The samples were dried in the oven at 105^{o}C, overnight. The oven dried samples were grounded to a powdered form using mortar and pestle and allowed to pass through a 0.2 mm sieve. The samples were analysed in triplicates.

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PROCEDURE

The methods for proximate analyses were the Standard procedure of AOAC (1990). Crude oil was extracted by the use of a soxhlet extractor with n – hexane at 40^{o}C for 24 hours (Das *et al.,* 2002). Analysis of saponification value, peroxide value, acid value, iodine value, specific gravity, oil content and cyanide test were carried out using the methods of AOAC (1990). The free fatty acid (FFA) was calculated from the relation: 1 unit of acid value = 0.053% FFA (Ajiwe *et al.,* 1997).

RESULTS AND DISCUSSION

Table of results shows the values of physicochemical analysis carried out on the crude oil extract of *Sesamum indica* L. seeds. The results indicate that the acid value which is an index of free fatty acid content due to enzymatic activity in the samples was found to be very low, below the minimum acceptable value of 4.0% for Sesame recommended by the Codex Alimentarius Commission for oil seeds (Abayeh *et al.,* 1998). The saponification values of the Sesame seeds were found to be within the range of 189 to 190 mg KOH/g. According to Ezeagu *et al.* (1998) a saponification value of 200 mg KOH/g indicates high proportion of fatty acids of low molecular weight. This shows that the oil does not have a potential for use in soap making industry and for the thermal stabilization of poly vinyl chloride (PVC). Peroxide value is an index of rancidity, thus the high peroxide value of oil indicates a poor resistance of the oil to peroxidation during storage. The peroxide values of Sesame seeds are little below the maximum acceptable value of 10 meq KOH/g set by the Codex Alimentarius Commission for groundnut seed oils (Abayeh *et al.,* 1998). The oils of the seeds were found to be cyanide free using the AOAC (1990) cyanide test method.

The seeds contain 50% light yellow crude oil characterized with pleasant smell. The quantity of crude oil is comparable to the values reported in seeds of lin 40%, cotton seed 24% and groundnut 46% (Abdullahi *et al.,* 1991). This indicated that *Sesamun indicum* L. seeds are good source of oil. The oils were showed to have specific gravities of 0.915 (white) and 0.923 (red) g/cm^3, which is comparable to the values reported in seeds of *Balanite aegyptiacae* 0.895, *Lophira lanceolata*, 0.8867 and *Sclereocarya birrae* 0.8975 (Eromosele and Pascal, 2003). The oil density is however closer to that of groundnut oil (0.918) and less dense than neem seed oil (0.939) (Akpan, 1999). The iodine values of the crude oils were 103 and 116gI_2/100g for white and red seeds respectively, which is high, indicating that it is semi dry oil (Fernando and Akujobi, 1987). Thus, the oil will not attract high interest in the paint and coatings industry unless it undergoes dehydration before use (Abayeh *et al.,* 1998). The values are comparable to iodine value of melon seed, 124.5 (Das *et al.,* 2002) and 121.03 for African pear, *Caryodes edulis* (Ajiwe *et al.,* 1997). On the other hand, the values obtained are higher than 53.4 to 101.5 reported as iodine values for some selected vegetable oils (cotton seed, melon seed and shea) marketed in former Sokoto State (Fernando and Akujobi, 1987) and other wild seed oil grown in Bauchi, Nigeria (Abayeh *et al.,* 1998), but lower than 178.8 reported in Palm oil (Oshinowo, 1987).

Table 1: Some physical and chemical characteristics of oils extracted from Sesame seeds*

S/N	Analysis/Physical and chemical characteristics	W	R
1	Colour	White	Red
2	Iodine value (gI_2/100g)	103	116
3	Oil content (%)	48	50
4	Specific gravity (g/cm^3)	0.915	0.923
5	Acid value (mg KOH/g)	0.5	0.45
6	Peroxide value (Meq KOH/g)	8	7.45
7	Saponification value (mg KOH/g)	189	191
8	Cyanide test	Negative	Negative

* The values are mean of three replicates

Conclusion: The results of the oil content, iodine value, specific gravity determinations and other physicochemical analysis of the oil extracted from the Sesame seeds compared favourably with those reported by other workers (Abayeh *et al.,* 1998; Ezeagu *et al.,* 1998; Das *et al.,* 2002; Fernando and Akujobi, 1987; Horwitz, 1980; Klein, 1994; Stebbins and Lance, 1980; York, 1979). The high percentage oil content of the seeds makes them viable for commercial extraction. The oil was found to be cyanide free, hence suitable for human consumption.

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