Extraction And Determination Of Physico-Chemical Properties Of Watermelon Seed Oil (*Citrullus Lanatus* L) For Relevant Uses

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ABSTRACT: Oil extract from a number of fruits, nuts and seeds are used in cooking, soap making and as ingredient in confectioneries of baked or fried foods. Seeds of many edible fruit are often thrown out as waste despite. They are important source of edible oils and potential source of high quality protein and vitamins. Dried and pulverized watermelon seed (*Citrullus lanatus* L), family Cucurbitaceae was extracted with solvent extraction method using hexane solvent at 60-70 ^{o}C. The physiochemical properties estimated for the extracted oil include Acid Value, Saponification value, Iodine value, Percentage oil content, Moisture content, Specific Gravity, Refractive Index, Viscosity and PH with values of 2.37 mgNaOH/g, 183.13 mgNaOH/g, 121.51 Wijs, 45.77%, 2.04%, 0.85, 1.47, 2.48 St and 6.40 respectively. The yield of 41.32±0.5% per 100gm of pulverised seed was appreciable and could be used domestically for commercial purposes and as complimentary vegetable oil rather than as waste where the crop is grown in abundance.

Keywords: Extraction, Physico-chemical, Pulverisation, Desolventise, Saponification

1 INTRODUCTION

The vegetable crop of family Cucurbitaceae are important horticultural crop, mostly grown for its sweet and juicy fruit in warm climates all over the world [1], [2]. The *Citrullus lanatus* L) is one of the most popular species with high water content as high as 92% of the total weight and It plays a very important role in Africa as it is used to quench thirst when there is shortage of water [3]. The crops are primarily harvested for juice and juice concentrate as an excellent source of vitamin C and vitamin A [4]. The fruits are widely eaten as snack without due regards to the seed which are discarded each year either as cheap animal feed or simply thrown away. The use of an oil is determined by many factors intrinsic of its constituents, high percentage of fatty acids in an oil had been reported to influence the tendency of such substances to foam [5] [6]. High iodine value of oil had been shown indicate high unsaturation of fats and oils [7]. These fatty acids constituents of vegetable and seed oils are used for the production of different materials and each of them offers certain distinct advantages. For instance, some monoglyceride, or fatty-ester type are most commonly used in foam production [8]. Many types of seed oil with specific gravity the range of 0.87–0.90 were recommended for oil requirement for biodiesel [9]. The present investigation was carried out to determine the available oil quantities in the seeds and some of its physico-chemical characteristics for possible future commercial uses and/ or incursion into human diets.

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2 MATERIALS AND METHODS

Samples of fresh watermelon fruits were purchased from a local market in the Epe suburb of Lagos, Nigeria. The seed were extracted from the fruits, washed and dried in an oven at 70 ^{o}C for 48 hours for easy removal of the husk. Moisture content per 100gm sample was determined directly on the seeds by oven drying at 55 ^{o}C for 12 hours until constant weight was achieved The cleaned de-husked melon seed were dry-milled and kept in a desiccators till when needed. A 100gm of pulverized sample was extracted in a thimble of the Soxhlet apparatus. The samples were extracted with hexane in a ratio of 1: 6 w/v at 60-65^{o}C. The resulting oil mixture *(miscella*) were subjected to distillation and desolventised *in vacuo* using rotary evaporator at 35 ^{o}C [10]. The extracted oil was further air-dried to remove residual solvent vapour and measured. Proximate analysis of refractive index, iodine value, saponification value, free fatty acid, peroxide and acid values were determined for each sample in triplicate in accordance with the Association of Official Analytical Chemist procedures [11]. For peroxide value (meq/kg), a known weight of watermelon seed oil was dissolved in a mixture of acetic acid / chloroform (3:2 v/v), and a saturated solution of (1 mL) potassium Iodide (KI) was then added. The liberated iodine was titrated with sodium thiosulphate solution in the presence of starch as indicator. Ester value was obtained by finding the difference between the saponification value and the acid value. The pH electrode was standardized with buffer solution and the pH value recorded from a PH meter, refractive index with Abbe Refractometer (RFM100) and the specific gravity using specific gravity bottle. The viscosity was read of a clean, dried viscometer with a flow time above 200 seconds. Other parameters were evaluated according to the equations 1.0 to 5.0:

$$\text{Extracted Oil} = \frac{W_1 - W_2}{W_2} \times 100\,\% \qquad 1.0$$

where W_1 = Weight of sample before extraction and W_2 = Weight of cake after extraction and drying to constant weight.

$$Free\ \text{fatty acid} = 2.82 * \left({}^{V_o}\!/\!_{W_o} \right) * 100 \quad \text{....2.0}$$

where V_0 is the titre value of 0.IM NaOH and W_0 = sample weight The saponification value (S.V.) was estimated using equation 3.0:

$$S.V = 56.1N \frac{(Vo - V1)}{M} \qquad 3.0$$

where V_0 = the volume of the solution used for blank test, V_I = the volume of the solution used for determination, N = Normality of the HCl and M = Mass of the sample. The iodine value (I.V) was determined according to equation 4.0:

$$\text{Iodine value} = 12.69 * C\left(\frac{V_1 - V_2}{M} \right) \qquad 4.0$$

where C = Concentration of sodium thiosulphate used

V_1 = Volume of sodium thiosulphate used for blank

V_2 = Volume of sodium thiosulphate used for determination

M = Mass of the sample.

The specific gravity was determined using equation

$$\text{Specific gravity} = \frac{W1 - W0}{W2 - W0} \qquad 5.0$$

Where W_1 is the weight of the substance, W_2 is the weight of an equal volume of water and W_o is the weight of density bottle.

3 RESULTS AND DISCUSSION

The experimental results revealed that it is possible to state that the watermelon se seeds which often are disregarded contained important quantities of natural compounds of immense values. The extracted oil was light yellow in colour and an average yield of (41.32±0.5%) per 100gm of pulverized seed was obtained. This quantity of extract is considerable and the value is commensurate with reported values for some other similar oil seeds contents such as Cucumis melo (44.85%) and pumpkin seed oil 41.59% [6], [12]. The proximate results obtained from the physico-chemical analysis are presented in Table 1.0:

Table 1.0: Average values of physic-chemical analysis of watermelon oil extract

S/N	Property	Value
1	Acid Value (MgNaOH/G)	2.37
2	Saponification value (MgNaoh/G)	183.13
3	Iodine value (Wijs)	121.51
4	Specific gravity	0.85
5	Viscosity (St)	2.48
6	Refractive index	1.47
7	Power of Hydrogen Free fatty acid content (% as oleic acid)	6.40

The watermelon seed oil had a high concentration of unsaturated fatty acids when compared with other similar oil seeds in literature. The evaluated specific gravity of 0.85 for watermelon seed oil was found to be below the range of 0.87–0.90 recommended for oil requirement for biodiesel production and so may not be fit as ingredient in biofuel production but in other areas of applications. Saponification value was used in checking the quality of the oil and found to be far greater than > 100. It indicated the presence of unsaturated fatty acid characteristics of foaming ability. Foaming is a desired characteristic of good surfactants with applications in preparation of emulsions, soaps and detergents formulation. There could also be an extension to its application into stable foam by incorporation of other ingredients. Therefore, watermelon seed oil may enjoy usage in many other industrial applications as well as a food supplement.

4 CONCLUSION

The high oil content of the watermelon seed coupled with a fairly high concentration of fatty acid make the seed suitable as food supplement. It may also enjoy applications as industrial ingredients in soap production, cosmetics, and foam ingredient. The by-products emanating from the processing could be useful in firing boilers for plants or as animal feed if properly processed.

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