
**PRODUCTION AND CHARACTERIZATION OF OIL FROM MELON SEED (*Cucumis melo*)
USING N-HEXANE**

**OTUEWU, OPEYEMI OLUMUYIWA¹; ALAWODE BAMIDELE OLAMIDE¹; AMAO
OLUWATOYIN ATILOLA²; ODUNTAN OLUWAFUNMILOLA ENIOLA¹; & DAVID PAULINA
KEHINDE¹**

¹Department of Science Laboratory Technology, School of Sciences, Abraham Adesanya Polytechnic, Ijebu-Igbo, Ogun-State, Nigeria. ²Federal college of Animal Health and production Technology, Ibadan, Oyo-State, Nigeria

Corresponding Author: opotuewu@gmail.com

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Abstract:

The up rise in request and various applications of oils promote the search for seed oils that are of high standard to meet up with the increasing rate of its needs worldwide. This research was aimed at the extraction and analyzing the physicochemical characterization of the oil from *Cucumis melo*. The seed oil of the plant was extracted using solvent (N-Hexane). Standard method was employed in extracting the seed oil of the plant. The parameters of seed oil determined include Physico-chemical properties such as; acid value 12.32 mg KOH/g, peroxide value -2 mEq/Kg, ester value 195.79 mgKOH/g, oil content 25 %, iodine value 0.46 gI₂/100g, saponification value 12.6 mgKOH/g, free fatty acid 8.46, Moisture content 0.35, Specific gravity 8.73. These make the oil suitable for use in the industry except in the ink and paint industries because of its non drying property which is due to its low iodine value content.

Key-Words: *Cucumis melo*, Extraction, Seed Oil, Physico-chemical parameters, standard methods

Introduction

Fats and oils are non-volatile substances insoluble in water, but soluble in organic solvents. Vegetable oil is a triglyceride extracted from a plant. It can be narrowly defined as referring only to plant oils that are liquid at room temperature. Vegetable oils are composed of triglycerides, as contrasted with waxes which lack glycerin in their structure. Vegetable oils are extracted from seeds, or less often, from other parts of fruits. Seed oil is a vegetable oil that is obtained from the seed (endosperm) of some plants,

rather than the fruit (pericarp). Most vegetable oils are seed oils. Some common examples are sunflower oil, canola oil, groundnut seed oil, sesame oil and melon seed oil (Aguele *et al.*, 2023). Edible oils are vital constituents of our daily diet which provide energy, essential fatty acids and serve as carriers of fat-soluble vitamins (Ameha *et al.*, 2024). Oils belong to a larger group of naturally-occurring substances called lipids. Lipids serve as a convenient means of rapid heat transfer, thus they have found increasing use in commercial frying operations. Fats of plant (vegetable) origin, with the exception of oils from coconut and palm kernel, are good sources of the essential fatty acids (kong *et al.*, 2023). Melon (*Cucumis melo*), one of the species belonging to the family of Cucurbitaceae, is an annual plant that is cultivated in regions with warm and mild climates. It is an oval or elliptical fruit with long seeds weighs between 1 and 7 kg. Melon is a pulpy and succulent vegetable with a pleasant aroma and a delicate flavor; it is generally harvested during the summer months (Sari and Orag, 2024). Egusi melon (*Cucumis melo*) seeds are a major soup ingredient and a common component of daily meals in West Africa. However, little nutritional details exist on egusi melon oil in spite of its rich content of oil in the range of 44 – 53% for seeds cultivated in different bioclimatic regions (Aliya *et al.*, 2025). It is essential to consider the fatty acid composition and quantity of vegetable oils because they are important factors for improving the oils' stability and applicability. This study was therefore designed to extract oil from melon seed and investigate the physicochemical properties of the oil.

Materials / Equipment

Smooth stones together with stainless steel and container were used, mortar & pestle were be provided then soxhlet extractor set-up, rotary shaker(Bio Techno Lab Mumbai India)and retort stand were used, water bath HHW420(B-scientific England), heating mantle, beaker, Terminalia mentaly seed and Reflux condenser were also used.

Chemical and Reagent

Distilled water, Dam's reagent together with some important reagent such as carbon tetra chloride,(May and Baker limited DangenHam England) diethyl ether (Sigma Aldrich Germany) and ethanol(JHD China) were used, then sodium hydroxide(JHD China), potassium hydroxide(JHD China), starch solution, phenolphthalein indicator (Sigma Aldrich Germany) and glacial acetic acid, Ammonia, Hydrochloric acid, N-Hexane, sulphuric acid, (E.merck, Darmstadt Germany), Boric acid(BDH Chemicals limited poole England), Iron(iii)chloride, potassium iodide, ammonium thiocyanate, orthophosphoric acid, Silver nitrate (HEZEDATONG CHEMICAL CO., LTD Sandong-China) were also be provided, sodium thiosulphate, ethanoic potassium hydroxide were also used in this research.

Sample Collection and Preparation

The fresh seeds of Cucumis melo were collected from Ijebu-North Local Government Area of Ogun state, and identified at the department of Sciences Laboratory Technology, Abraham adesanya Polytechnic (APP) Ijebu-igbo. Sample was then washed with distilled water 3 times, dried under shade and stored for further use.

Soxhlet extraction

The method described by Petal et al., 2011 and Akbar et al. (2009) with slight modification was used. The seed kernels (100 g) were grounded using a mechanical method and defatted in a soxhlet apparatus. The extraction was carried out by using organic solvents such as N-hexane. The process was continued for 6 h. Solvent will be removed by vacuum

Acid value of Oil.

1g of oil sample was weighed and 75ml of hot neutral alcohol was added with a few drops of phenolphthalein. The mixture was shaken vigorously and titrated against 0.1M NaOH solution with constant shaking until the pink coloration remained permanent, acid value was calculated using the formular.

Acid value = $V \times 5.6$ *weight of sample* (2) where V = Titration end- point

Peroxide value

2 g of oil sample was weighed into a test tube and 1 g powdered potassium iodide with 20 ml of solvent mixture (glacial acetic and Chloroform). was added, this was then placed in boiling water for 30s. The content was poured into a flask containing 200 ml of distilled water and titrated with 0.002N sodium thiosulphate solution using starch as an indicator. A blank was prepared alongside the oil sample. The Peroxide value was calculated using the formula *Peroxide value* = $2(V_1 - V_2) / \text{kg weight of}$ (3) where V_2 = Blank titre value V_1 = Sample titre value

Saponification Value

2 g of oil sample was weighed into a conical flask and 250 ml of alcoholic potassium hydroxide was added, solution was heated in boiling water for 1 hour, 1 ml of 1% of phenolphthalein was added and titrated with 0.5M Of HCL. A blank was prepared alongside the oil sample. The value was calculated by the formular: *Saponification Value* = $56.1 (A - B) / W$ (4) Where N = Normality of acid used A = Volume of HCL for Sample 56.1 = Equivalent weight of potassium hydroxide W = Weight of oil used

Iodine Value

2g of oil sample was weighted into a dry glass stopper bottle of 250 ml capacity and 10ml of carbon tetrachloride was added to the oil. About 20ml of Wij's solution was added and allowed to stand in the dark for 30 mins. 15 ml of (10%) potassium iodide and 100ml water were added and then titrated with 0.1M sodium thiosulphate solution using starch as an indicator just before the end point. A blank was also prepared alongside the oil sample. The Iodine value is calculated using the formula *Iodine value (Wij's)* = $(V2 - V1) \times 1.269$ *Weight of sample(g)* (5) Where V2 = Titre value for blank V1 = Titre value for sample

Specific Gravity

The specific gravity bottle was oven-dried to remove existing after which its mass (empty) was measured and recorded, it was then filled with 25 ml of water and its mass was measured and recorded. The specific gravity bottle was then filled individually with an equal volume of oil extract while its mass was measured and recorded, the specific gravity of the oil extract was calculated using the formula below. *Specific gravity* = $\frac{W1 - W2}{W3 - W2}$ (6) Where W1 = Mass of specific gravity bottle + Oil extract W2 = mass of empty specific gravity bottle W3 = Mass of specific gravity bottle + water

Free fatty acid

The Free fatty acid is the acid value expressed in percentage. 5 g of the oil was weighed into a flask of hot neutralized ethanol and 2 cm³ phenolphthalein indicator was added and titrated with 0.1M sodium hydroxide. *%Free fatty acid* = $\frac{\text{Titre value} \times 2.82}{\text{Weight of oil}}$ (7)

Results

Table 1: Summary of physical properties of the oil extract

Parameters	Values
Colour	Amber
Moisture %	0.35
Specific gravity L/Kg	8.73

Table 2: Summary of chemical properties of oil

Properties	Values
Oil yield (%)	25.00
Acid Value (mg KOH/g)	12.32
Peroxide Value (meq/Kg)	-2.00
Iodine Value (gI ₂ /100g)	0.46
Saponification value (mgKOH/g)	12.6
FFA (%)	8.46

Discussion

The results for the physical and chemical properties of oil extracted from Melon seed were given in tables 1 and 2. The oil is Amber in colour. It has specific gravity of 8.73L/Kg at 20 °C. The specific gravity of this study (8.73L/Kg) is higher than that of Terminalia Mantaly Seed (1.08L/Kg) (Abubakar et al., 2020), Avocado Pear Seed (Persea Americana) and African Pear Seed (Dacryodes Edulis) (0.954, 0.816) (Nelson, 2024). The percentage oil yield of the seed was 25%, higher than that of Date palm kernel seed between (3.46 % sesame seed 8.06%) (Halabi et al. 2023), And it is within the A.O.A.C 1990. This high percentage oil yield indicates its potential use in detergent/ soap making industries and edible purposes. The acid value in this study was (12.32 mgKOH/g) which is higher than the 3.48 0.06 mg KOH/g for C. albidum oil by (Yusoff et al., 2023). This value is above the AOAC Standard of < 4.0. According to Popoola & Haruna, 2024 high acid value in oil showed that the oil may not be suitable for use in cooking (edibility), but however, be useful for production of paints, liquid soap and shampoos. The peroxide value in this study was (-2 mEq/Kg) which is lower than that of melon (6.7-8.9mEq/Kg) as reported by Zhang et al., 2024, the value is fall within the AOAC 1990 standard Saeed and Shola, 2015. Peroxide value (PV) is the most common indicator of lipid oxidation. Rancid oils contain peroxide levels of 10- 20 mequiv O₂/kg oil, while the Standard Organization of Nigeria (SON) recommends peroxide values of 10 mequiv O₂/kg oil for edible oils (Edo et al., 2022). The seed oils studied have a lower peroxide value, implying that they will be stable for a long time if properly packaged and stored at a suitable temperature. The iodine value is a measurement of the unsaturation degree of fats and oils; it's expressed as the number of grams of iodine per 100 g of sample. Our results Iodine value of melon was (0.46 g I₂ /100g) which is lower compared to Date seed oil that was ranged between 48.84-60.59 g I₂/100 g oil, for the variety of Boushammi (DN6) and Bouslikhen (DN5) respectively, these values indicate that melon seed oil is classified as a highly unsaturated and a non-drying oil (Halabi et al., 2023). The Saponification value of the oil was found to be (12.6 mgKOH/g) which is lower than that of Avocado pear seed oil (210 mgKOH/g), and Africa pear seed oil (250 mgKOH/g) (Nelson, 2024), Oils with lower saponification values contains high amount of long chain fatty acids (Andualem and Gassesse, 2014).

CONCLUSION

It can be shown that from the result of the analysis, the seed of Melon (Cucumis melo) oil has higher Percentage oil content of 25%. The oil obtained in this research was analyzed for specific gravity at 20°C, viscosity at room temperature, acid value, saponification value, iodine value, peroxide value and ester value. Their respective values are 8.73 mg KOH/g, 12.32 mg KOH/g, 12.60 g I₂/100g, -2.00 meq/Kg and -0.46

mg KOH/g respectively. According to the deductions of this study, the seed of Melon (*Cucumis melo*) oil studied have the potential for a wide range of culinary and industrial applications. The concentration of iodine and peroxide values indicated that the oils have a larger saturated fatty acid content and will resist oxidative rancidity. The fatty acid composition showed that the oils are rich sources of essential fatty acids (monounsaturated and polyunsaturated) important in human health.

Further study is needed to ascertain the vegetable oils' nutritional indexes and the production process's sustainability. More tests of safety should be conducted before it is used by the factories that make food and cosmetics.

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