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***Journal of Scientific and Engineering Research*, 2019, 6(1):189-192**

Research Article

ISSN: 2394-2630
CODEN(USA): JSERBR

Physical Characterization and Elemental Analysis of Guna seed Oil (*Citrillus vulgaris*) produced in Gaanda town Gombi Local Government, Adamawa state Nigeria

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Abstract Soxhelet extraction method was used for the extraction of Guna seed oil (*Citrillus vulgaris*) which was picked from my mothers farm in Gaanda town of Gombi local Government, Adamawa state of Nigeria. Physical properties of the oil were observed to be as follows; specific gravity was found to 0.987g/cm3 at room temperature (28oc). Refractive index was observed to be 1.460, the color was observed and seen to be dark-Brown. Elemental analysis of Sodium and potassium was determined with flame photometer by serial dilution. Atomic absorption spectrophotometer (Model 21 VGP-AAS) was used for the determination of Copper, Lead and Manganese. Concentration of Zinc in the oil was found to be 2.01.

Keywords Guna seed Oil, *Citrillus vulgaris*, Elemental Analysis

Introduction

Various organic fats are essential constituents of plants and animals life. All species of plants and animals produce some quantity of fats and oil during its life cycle. Sometimes, the terms 'fat' and 'oil' are used inter changeably , but more often, the term fat referred to those fatty materials that are solid at room temperature while oil are liquid under the same condition.

The fatty acid portion of the triglyceride structure represent over 92% of the total weight, the balance consisting of the glycerol radical, such as- cholesterol, phytosteroids, phosphotides (lecithin), vitamins and water. The total amount of non glyceride components present is usually not over 3% of the weight. Oil and fats has tendency to dry or solidify on exposure to air [1].

Vegetable Oil

These are chiefly present in seeds, and nuts of plants. They are stored in seeds to serve as nourishment for the germination of the embryo. There are few seeds and nuts which are rich in fats contents, thus, Soya beans, groundnut and palm cannel, pipe or mustered sesame seed, all are important source of edible oil.

In the other hand, cotton seed, linseed, and caster seed gives a non-edible oil in various industries [10].

Hydrogenated Oils

Unsaturated vegetable fats and oil can be transformed through partial or complete hydrogenation into fats and oil of higher melting point. The hydrogenation process involves sparing the oil at high temperature and pressure with hydrogen in the presence of catalyst, typically a powdered nickel compound. As each double bond is broken, two hydrogen atom form single bond with two carbon atoms. The elimination of double bond by adding hydrogen atom is called' saturation, as the degree of saturation increases, the oil progresses towards being fully hydrogenated. Oil may be hydrogenated to increase resistance to rancidity (oxidation) or change its physical characteristics. As the degree of saturation increase, the oils melting point increase [3].

Storing and Keeping Vegetable Oil

Whether refined or *not, all oils* are sensitive to heat, light and exposure to oxygen. Rancid oil has an unpleasant aroma and acrid test, and its nutritional value is greatly diminished. To delay the development of rancid oil, a blanket of an inert gas, usually nitrogen, is applied to the vapor space in the storage container immediately after production. This is referred to as tank blanketing.

All vegetable oils should be kept in a cool, dry place. Oils may thicken, they will soon return to liquid if they stand at room temperature. To prevent negative effect of heat and light, oil should be removed from cold storage just long enough for use Extra-virgin and virgin olive oils kept at least 9 months after opening.

More refined vegetable oil tends to have higher smoking points. Smoking oil indicate ask of combustion [4].

Uses of Vegetable Oil

Vegetable fats and oils may be edible or non edible. They are *used as* lubricants, paints, cosmetics, pharmaceuticals and other industrial purposes. Oil extracted from plants has been use in many cultures since ancient time. Many vegetable oil are consumed directly, or used directly as ingredients in food. A role that they share with some animal's food include butter and glucose. They are also use in;

- Shortening:- *To* give pastry a crumbly texture
- Texture to make other ingredients stick together.

Flavor while less- flavor full oil command premium prices oil such as olive oil may be chosen specifically for the flavor they impart.

Flavor base: Oils, can also carry flavors of other ingredients, since many flavors are present in chemicals that are soluble in oil.

Oil can be heated, and used to cook other foods. Oil of this purpose should have high flashy point [5].

Fats stored in animal adipose provide insulation against cold and protect body organisms.

Fats are source of vitamin A and vitamin D as nourishment for the germinating embryo [6].

Industrial Uses of Vegetable Oil

Many vegetable oils are use in making soaps, candles, perfumes and other personal care and cosmetics products and are used in making paints and other wood treatment products.

Vegetable oil are increasingly used in the electric industry as insulators as vegetable oil are non- toxic to the environment, if spilled and have high flash and fire points

Vegetable oil is being use to produce bio-degradable hydraulic fluids and lubricants.

It is also used experimentally as a cooling agent in PCs. Vegetable *oils* like castor oil are used for medicinal purposes due to the presence of hydroxyl groups on di-fatty acid chain.

Palm oil have been increasingly in cooperated into food by the global commercial food industries because it remain stable in deep frying or in baking at very high temperature and for high level of natural antioxidants [6]

Negative Health Effects of Vegetable Oil

Heating an oil changes its characteristics. Oils that are healthy at room temperature can be unhealthy when heated above certain temperature. When choosing cooking oil, it is important to match the oils heat tolerance with the cooking method.

Polyunsaturated oils like canola, sunflower and con oil degrades easily to be toxic when heated. Prolonged consumption of burnt oils leads to arteriosclerosis, inflammatory joint diseases and development of birth effects.

Extraction of the Seed (Locally)

The matured fruits which cannot be eaten are cut into pieces and kept in a closure for some weeks. The pieces are completely rotten, became soft, watery and a bad odour. The rotten pieces are properly washed several times to remove the rotten smelly flesh; the seeds are then properly rinsed. The seed is milky in color and small in size. The seeds are dried at a moderate temperature and then stored [7-8]

Principle and Method of Soxhlet Extraction

Normally, a solid material (sample) containing the desired compound was placed inside a thimble made from thick filter paper, which is loaded into the main chamber of the soxhlet extractor, which is placed into a flask containing the extraction solvent. The soxhlet extractor is equipped with a condenser. The solvent is heated to reflux, the solvent vapour travels up a distillation arm and floats in to the chamber housing the thimble of solid (sample) the condenser ensure that all solvent vapor cools and drips back down the chamber housing the sample. The chamber, containing the sample slowly filled with warm solvent, some of the designed *compounds will* then dissolve to the warm solvent. When the soxhlet chamber is almost full, the chamber automatically, emptied by siphon side arm, with the solvent running down to the distillation flask. This cycle was allowed to repeat itself over hours during each cycle, a portion of the non- volatile compound dissolves in the solvent. After many cycles, the desired compound is concentrated in the distillation flask. After extraction the solvent is removed by means of rotary evaporator or a continuous heating on a water bath yielding the extracted compound. The non-soluble portion of the extracted solid remain in the thumble and is discarded or be used for different purpose [9].

Physical Characterization of Guna Seed Oil

Determination of Specific Gravity (relative density)

The relative density of a liquid is the mass of the liquid compared with the mass of an equal volume of water. Density bottle (specific growth) is specifically designed to measure the relative density of liquid. The main feature is a tight or fitting stopper with a fine hole through it. The bottle is first of all filled with liquid and stopper is then firmly fitted, the excess liquid through the fine hole and it is then tripped off with a cloth, in this way, the volume of liquid filling the bottle always the same [7].

Material

Oil sample, distilled water, weighing balance, density bottle.

Methods

A clean dried bottle was weight empty with the stopper; it was then filled with distilled water while the excess was wiped by a cotton wool and weighed. The bottle was emptied, dried, refilled and weighed again.

Weight of density bottle - wj = 32.30 Weight of density bottle + water -w3 = 58.70 Weight of density bottle + oil - W2 = 85.00 Weight of water = W3 –W2= 88.70-32.30 = 56.40

S.G (Relative density) = weight of substance in air Weight of equal volume of water = 0.987g / cm3 at 28° C

The experiment was performed at room temperature.

Determination of Refractive Index

Abbe's refractometer is the instrument use for the determination.

The instrument was first standardized by taking the refractive index of distilled water which was found to 1.33. After cleaning and adjustments, the refractive index of the Guna seed oil was taken. The oil sample was dropped on a transparent glass which was reflected and be viewed. The reading was taken when a cross line in the instrument intercepts when viewed through the eye piece. The reading was repeated several times in order to obtain the correct refractive index of the Guna seed oil.

The refractive index of Guna seed oil was found to be 1.460.

Determination of Colour of the Oil Extract

The oil of Guna seed was physically observed to determine the colour. The colour was found to be dark brown.

Elemental Analysis

5g of the sample was weight in a crucible and dried on heating mantle. It was further taken to a muffle furnace at 400C- 450°C until the color of the black substance turn to ash colour (whitish), and it was allowed to cool. The ash totally free from carbon was moisture with conc. H_2SO_4 and was heated on a hot plate until fumes of H_2SO_4 evolved. The crucible with sulphate ash was heated again in muffle furnace till the weight of the sample was constant.

0.5g of the ash was taken into a beaker and was dissolved in 100 ml 5% conc. HCl to obtain solution for determination of Na and K by the use of flame photometer serial dilution was done by the use of the formula C1V1 = C2V2.

Determination of Cu, Pb, Mn and Zn using Atomic Absorption Spectrometer: (Model 21 VGP - AAS)

The same sample was taken to AAS for the determination of Cu, Pb, Mn and Zn. The absorbance of the clear solution was determined and concentration was gotten from the standard calibration curve on a graph sheet.

The absorbance of Zn with Atomic, Absorption spectrometer was found to be 0.098mm, but Cu, Pb and Mn was not detected by the machine i.e. they were not determined or absent in the Guna seed oil.

From the calibration curve, it was found that die concentration of Zinc in the oil sample is 2.01.

Table 1: Physical characters of Guna Seed oil

S/N	Character	Result
1	Specific gravity (Relative density)	0.987/cm^2 at 28° C
2	Refractive index	1.46
3	Colour	Dark brown

Conclusion

Conclusively, physical properties of the oil were observed to be as follows; specific gravity was found to 0.987g/cm^3 at room temperature (28 ^oC). Refractive index was observed to be 1.460, the color was observed and seen to be dark-Brown. Elemental analysis of Sodium and potassium was determined with flame photometer by serial dilution. Atomic absorption spectrophotometer (Model 21 VGP-AAS) was used for the determination of Copper, Lead and Manganese. Concentration of Zinc in the oil was found to be 2.01.

In conclusion, the presence of Sodium (Na) and Potassium (K) as detected by spectrophotometric means in Guna seed oil proves that Guna seed oil (*Citrillus vulgaris*) is edible oil. It is highly needed by our Biological system for its healthy function.

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