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Suitability of oil from mango seed for making soap

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Abstract: *The quality of oil extracted from mango seed was studied to know if it will be suitable for making soap. This was done by measuring the physicochemical properties of the mango seed oil to ascertain if these physichochemical properties are within acceptable values that qualify mango seed oil to be used to make soap. The result from the physichochemical properties showed that the mango seed oil has a saponification value of 94.71 mgKOH/g an iodine value of 5.87 I_2/100g and an acid value of 17.84 mgKOH/g. But the saponification value and the acid value are not within an acceptable range/standard. This shows that the mango seed oil is not suitable for making soap.*

Keywards: *Mango seed oil, Soap making, Saponification value, Iodine value.*

1. INTRODUCTION:

Fats or oils are used to make soap. Oils used for making soap can be gotten from the seeds of plants while fats are usually of animal origin (Ababio, 2005). Fats or oils can react with caustic alkali (NaOH and KOH) to form soap in a chemical reaction known as saponification reaction (Ababio, 2005), this means that fats or oils are the main commodities needed for making soap. There is therefore a demand of oil which can be employed in soap making, and it is necessary to know which plant seeds has a suitable oil for making soap. Oils can be extracted from the seeds of plants and be used to make soap. Warra et, al. (2011) investigated the use of cotton seed oil to make soap in their work. Due to the presence of different plants in Nigeria, it is therefore imperative to know if the oils from the seed of these plants will be useful in soap making. Some seed of plants are just being wasted when there is a possibility of using the seed to make something economical like soap by extracting its oil. Mango seed is a seed that is being wasted because the seed is thrown away after eating the mango fruit in by Nigerians and it is necessary to know if the oil from the mango seed will be suitable for making soap. This research aims to know the suitability of mango seed oil for making soap. This is done by extracting oil from the mango seed and measuring its physicochemical properties like saponification value, iodine value and acid value so as to know if these physicochemical properties are up to the standard that can make mango seed oil suitable for making soap.

2. LITERATURE REVIEW:

A lot of research have been done to know if different oils extracted from different seeds of plants are up to the standard for making soap. Maduelosi et al. (2021) investigated the seed of tallow tree also known as allanblackia floribunta to know if its oil is good for making soap They extracted its oil and measured its physicochemical properties and concluded that the seed of allanblackia floribunta has good physicochemical properties for making soap. Maduelosi et al. (2021) went ahead to produce soap using the allanblackia floribunta seed oil that they said compared well with commercial soaps. Legesse et al. (2020) conducted a research on the potential of using Jathropha curcas L. seed oil for making soap, they even went ahead to blend the jathropha curcas L. seed oil with palm oil and measured its physicochemical properties of the oil. But the jathropha seed oil has a saponification value which can be considered low and not up to standard ; but after the blending of the jathropha seed oil and palm oil the saponification value increased to an acceptable value for making soap. They also used the jathropha curcas L. seed oil to produce soap in their research. Nchimbi (2020) conducted a research in Tanzania on oil from the seed of Trichilia emetica plant, to know its quality.

He extracted the oil from the seed of the Trichilia emetica plant and measured its physicochemical properties to knowhow suitable the oil will be if employed to make soap.

3. MATERIALS AND METHODS:

The seeds of mango fruit were collected after the mango fruits were eaten. Mango tree also known as Mangifera indica are grown in most Nigerian states. The variety of mango seeds collected and used in this research is known locally as " German mango".

The mango seeds collected were dried under the sun to remove moisture from it and to enable the easy cracking/dehulling of the outer shell so as to bring out the endosperm or main mango seed.

EXTRACTION OF MANGO SEED OIL

The dried mango seeds were dehulled and the endosperm (main mango seed) removed. The mango seeds (endosperm) removed after dehulling were dried in an oven to remove moisture and then ground in a grinder. The ground mango seed was introduced into the thimble of the soxhlet extractor. The extracting solvent (95% n-hexane) was put into the round-bottom flask. The round-bottom flask containing the n-hexane was heated, which caused the n-hexane to evaporate and condense into the thimble containing the ground mango seed. The desired oil now dissolved into the condensed n-hexane was siphoned back to the round-bottom flask. The process was continued until all the oil was extracted from the sample. The residue in the thimble was removed and the round-bottom flask containing the solvent and oil was heated till only the oil was left in the round-bottom flask.

$$\% \text{ oil content} = \frac{\text{Weight of oil obtained}}{\text{Weight of sample used}}$$

DETERMINATION OF THE PHYSICOCHEMICAL PROPERTIES OF THE OIL

The saponification value, iodine value, acid value and free fatty acid were determined using AOAC (1984) official methods of analysis.

PROCEDURE FOR THE DETERMINATION OF SAPONIFICATION VALUE

2g of the extracted mango seed oil was added into a conical flask and 25ml of alcoholic potassium hydroxide solution was added to it. The flask was added to a reflux condenser and heated for 1 hour with frequent shaking. 1mlphenolphthalein (1%) solution was added to it. The solution was titrated hot with 0.5M HCl. A blank titration was also done without any oil in the potassium hydroxide.

$$\text{Saponification value} = \frac{(b-a)\text{x } 28.05}{\text{Weight of mango seed oil used}}$$

b = Titre value for the blank titration.
a = Titre value for the titration with oil sample.
The multiplication by 28.05mg is because 1ml of 0.5M KOH contains 28.05mg of KOH.

4. RESULTS AND DISCUSSION:

The physicochemical properties of the mango seed oil were measured and used to know if the oil is of the quality that can be employed to make soap.

Saponification value shows the number of milligram of sodium hydroxide (NaOH) or potassium hydroxide (KOH) needed to saponify one gram of a fat or oil under standard conditions. It is a measure of the average molecular weight (or chain length) of all the fatty acids present in the sample in form of triglycerides. The higher the saponification value, the lower the fatty acids average length and the higher the mean molecular weight of triglycerides and vice versa. Oils with high saponification values are more suitable in making soap (Legesse, et. al., 2020). Saeed and Shola, (2015) stated that oils having a saponification value ≥180 mgKOH/g are suitable for making soap, while oils having a saponification value ≤ 180 mgKOH/g cannot be used to make soap from what they saw from a standard. The mango seed oil has a saponification value of 94.71 mgKOH/g (Table 1), which is not within the range of saponification value

≥ 180 mgKOH/g set by a standard. This shows that this low saponification value makes mango seed oil to be inappropriate for making soap.

TABLE 1. Physicochemical properties of the castor seed oil

Parameter	
Saponification value (mgKOH/g)	94.71
Iodine value (I_2/100g)	5.87
Acid value (mgKOH/g)	17.84

Iodine number or iodine value are used to know the degree of unsaturation of a fat or an oil. The higher the iodine value, the more the unsaturation of the fat or oil. Oils with iodine value less than 100 I_2/100g are known as non-drying oils. (Datti et al., 2021). Non-drying oils are useful/suitable in the manufacture of soaps (Okpala, 2021). The mango seed oil has an iodine value of 5.87 I_2/100g (Table 1), this shows that it is a non-drying oil and that the iodine value is within an acceptable range that is below I_2/100g which is recommended.

Acid value is used to know the extent in which the oil has gone through deterioration (Okpala, 2021). The higher the acid value then the higher the extent of deterioration of the oil. A standard recommended a maximum acceptable acid value of 4 mgKOH/g for making soap. The mango seed oil has an acid value of 17.84 mgKOH/g (Table 1) which is above the maximum acceptable range of 4 mgKOH/g. This shows that the mango seed oil has undergone deterioration and is not acceptable for making soap.

Oil content is used to know the amount of oil that can be gotten from a given sample. Seeds with high oil content are desirable because it will produce much oil and they are economically viable. A CODEX Commission, 1969 classified seeds with oil content greater than 17% as oil seeds (Legesse, et. al., 2020). Oil seeds has high oil content and they are desirable. The mango seed has an oil content of 31.08 % which is desirable. This oil yield of 31.08 % shows that extracting oil from the mango seed is economically viable.

5. CONCLUSION:

This study ascertained the quality of mango (mangifera indica) seed oil to know if the oil will be suitable if employed to make soap. This was done by measuring the physichochemical properties of the mango seed oil to know if they are within an acceptable range that qualifies oil from mango seeds to be employed to make soap. From the result obtained, the mango seed oil has a saponification value and an acid value which are not within the range needed for making soap. It can be concluded that the mango seed oil is inappropriate for making soap.

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