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Research Article

Proximate, Extraction and Characterization of the Oil from Tamarind (Tamarindus Indica) Seeds

Echioda, Samuel[1*], Popoola Olubunmi[2], Salisu Salisu[3], Solomon Daniel[4], Muqtad M. Adam[4], Ogbe Elizabeth[1] Echioda Emmanuel[5] and Hadiza Rita Sule[6]

[1]Chemistry Department, Federal University of Health Sciences Otukpo, Benue State.*

[2]National Centre for Agricultural Mechanization, Ilorin, Kwara State.

[3]Department of Science Laboratory Technology, Federal College of Agricultural Produce Technology, Kano, Nigeria.

[4]Department of Science Laboratory Technology, Abubakat Tatari Ali Polytechnic, Bauchi State.

[5]Physics Department, Bingham University Nassarawa State, Nigeria.

[6]Crescent International School, Kano, Nigeria.

Corresponding Author: Echioda Samuel, Chemistry Department, Federal University of Health Sciences Otukpo, Benue State.

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Abstract

The chemical analysis of not well searched and underutilized seed oils is gaining relevance as there is little or no information on their composition and uses, since most of them are yearly discarded as waste. Analysis of these underutilized tropical seed oil will help in grouping them and making the best use of them in various applications. The seeds of Tamarindus indica were evaluated for their proximate composition while the oils were subjected to chemical analysis. All the analysis was carried out using Standard Analytical method. The proximate analysis showed the presence of moisture content 6.10 ± 0.20%, ash content 4.10 ± 0.0%, lipid content 3.11 ± 0.41%, crude protein 36.65 ± 0.60%, crude fiber 4.02 ± 0.30 and carbohydrate content was the highest value which was obtained by difference as (46.02 ± 1.01). Saponification and ester values were recorded as the highest values in the physicochemical analysis on acid value as the least value obtained. The seeds are rich in carbohydrates, protein and fat which may be a very good source of food supplement to man and animals.

Keywords: Tamarind Seed, Extraction, Proximate Analysis and Characterization, Human and Animal Consumption.

1. Introduction

Tamarind seeds are underutilized by-product of the tamarind pulp. The seeds are somewhat flattened and a glossy brown. The fruit is best described as sweet and sour in taste, and is high in tartaric acid, sugar, vitamin B and usually Calcium. The seeds are consumed widely in South and Southeast Asia, usually use to prepare sauces, Marinades, chutneys, drinks and even desserts [1]. Amongst its traditional uses is the treatment for joint pain and arthritis by ingesting roasted tamarind seed powder. Early research suggests that tamarind seed does indeed reduce inflammation and oxidative stress in joints helping with pain and protecting bone and cartilage. Tamarind seeds generally come from a Tree commonly found in region of Africa and South-East Asia. These trees can reach up to 40 feet with fragrant, beautiful flowers that are red or purple. Tamarind seed usually contain arachidic acid, myristic acid and lauric acid lignoceric acid. Whole tamarind seed are rich sources of protein fats or oils carbohydrate and crude fiber [2]. Tamarind (Tamarindus indica) is a leguminous tree family fabaceae bearing edible fruits that is Indigenous to tropical Africa. The genus tamarindus is monotypic, meaning that it contains only this specie. The tamarind tree produced brown, like fruits that contain a sweet tangy taste [3]. The work is aimed at evaluating the proximate composition, extraction and characterization of the oil contents from tamarind (Tamarindus indica) seeds.

2. Material used for the Study

The following materials were made use of in this research. These include; Drying Oven, Muffle Furnace (Box – Type), Soxhlet Apparatus, Water Bath, Weighing Balance (Analytical of 0.0001g), Reflux Condenser and reagents of Analytical grades.

2.1. Methodology

The Following parameters were analyzed in this research; The seeds were obtained by removing the pulp of tamarind. One tamarind fruit contained four seed. The seeds were then obtained and controlled dried for three (3) days. After that the seeds were crushed and grinded using grinder [4-6].

The reagents that were used for the analysis are of Analar grade. Distilled water was used for all dilution throughout the study. N-hexane (250.0 ml) was used for extraction. Iodine solution was prepared by dissolving 10.00g KI in 100.0 ml of distilled water. Then slowly 5.00g of iodine crystal was added with constant shaking until a clear solution was observed. It was then filtered and stored for further analysis [7, 8]. Preparation of sodium thiosulphate; (0.002 m) m x mm v = 0.300236 was weighed and dissolved. in 100.0 cm3 of distilled water.

The proximate composition of foods which include moisture Ash, lipid, protein and carbohydrate component in this research was analyzed as method described by Babatunde et al., [4].

2.2. Extraction of the Oil from the Tamarind Seed

Before beginning the process of extraction, tamarind seed was dried to reduce the moisture content. The next step of size reduction by crushing, grinding and filtering the seed was done to form powder which increases the surface area of facilitate easier extraction. The extraction of oil from tamarind seed was achieved by using cold moist ration method. This method involves weighing 300g of the sample into a beaker and adding 500.0 cm3 of acetone to it. This was stirred continuously for 30.0 minutes. The sample was then sealed and allowed to stay overnight while undergoing extraction. Then, the mixture of acetone and the extracted oil was filtered from the sample with the aid of a filter paper into a conical flask. This was left open so as to facilitate evaporation of the acetone. The oil gotten was then sealed properly for further analysis [9].

2.3. Characterization of the Oils: The oil extracted from tamarind seed was characterized by methods described [4, 8, 5, 6].

3. Results and Discussions

Table 1: Result showing the proximate composition of the tamarind seeds

Constituents	Percentage composition (×±Sd)
Moisture (%)	6.10 ± 0.20
Ash (%)	4.10 ± 0.00
Lipid (%)	3.11 ± 0.41
Crude fiber (%)	4.02 ± 0.30
Crude protein (%)	36.65 ± 0.60
Carbohydrate (%)	46.02 ± 0.01

Values are mean ± standard deviation of triplicate determinations

4. Discussions

The proximate composition of the tamarind seeds is presented in Table 1. It shows that the moisture content was 6.10 ± 0.20 % which was similar to the work of Adewale et al., Nwosu et al., Babatunde et al., and Khanna and Zhang [11, 10, 4, 11]. Based on nutritional perspective the moisture content is said to be good for storage. The percentage of carbohydrate was found as the highest value present in tamarind seeds (46.65 ± 0.60 %) and crude protein as the second highest value (36.65 ± 0.60 %). Moisture content is the quantity of water contained in a material such as soil, food or other substances. Moisture content of food materials is very important to consider before storage and consumption. This is because moisture content affects the physical and chemical aspects of food which relates with the freshness and stability for the storage of food for a long period of time. The ash content represents the organic residue [minerals] remaining after ignition and complete oxidation of organic matter at specific high temperature.

This is based on the fact that all organic matter can be eventually be burnt to produce water and carbon [iv] oxide. The remaining inorganic constituents however remain as final white ash. This value of 4.10 % was similar to those of Murray et al., 2011 who reported ash content of 4.09 to 3.94 g/100.0 g and 4.11 % obtained by Musa and Suleiman , Siyanbola et al., and Aribido et al., [13, 14]. The ash content of the sample is relatively high which further confirms its high mineral content. Lipid are components that are soluble in organic solvents [such as ether, hexane or chloroform], but are insoluble in water. These group of substances are triglyceraldehydes, monoacyl glyceroides, free fatty acids, phospholipid, steroids, carotenoids and vitamin A and D. as shown in Table 1, the samples tamarind seed contained very low crude fat 3.11 ± 0.41 which are clearly reported previously and lower compared to that obtained by Alkofali and Atta and Adewale et al., (4.02 ± 0.41) [15, 9].

Fiber content; The consumption of fiber prevents constipation, helping undigested food components to move

smoothly through the digestive tract. It also encourages healthy gut microbiota. According to Musa and Suleiman review dietary fiber increase the bulk of stool, helps promote regular bowel movements and reduce the time that waste spends inside the intestines. The analyzed samples had an average fiber content of 4.02 % this value is compared with 4.10 % that was obtained by Stevenson et al., and Nwoso et al., [7]. Our findings were markedly lower compared to the value of 16.17g/100g earlier mentioned in the literature. This variability in crude fiber content could be explained by the variation in method of crushing of the fruit, removal of the inedible portions, pounding and sieving used.

Proteins are components that are made up of amino acids. Proteins are involved in building of the body tissue and organs. The body's protein requirement is moderate for proper metabolism. The protein content of the sampled tamarind seed was relatively high in general (above 35%). The obtained result (36.65 ± 0.60) is in agreement with that presented by Adewale et al., 2000 (36.60 %) [9]. There is some report which showed much higher protein content 40% and 42.52 %. it is clear that the total protein of tamarind seeds when eaten fresh is quite high.

Carbohydrate content; The classes of substance that form principal component of carbohydrate includes sugar with polysaccharide. The empirical formula for most carbohydrate is approximately CH2 and its between 3 and 8 carbon atoms. The result revealed that the carbohydrate content of tamarind seeds represented more than 45% of the dry matter. This falls within the range obtained by Adewale et al., Nwosu et al., Babatunde et al., and Khanna and Zhang, they reported a range of 44 to 47%[9, 10, 4, 11].

Table 2: Characterization of the oils from tamarind seeds

Parameter	Mean values (× ± Sd)
Free fatty acid (%)	2.8 ± 0.30
Saponification value (mg KOH/g)	189.80±0.20
Iodine value (g iodine /100g)	99.00±0.80
Specific gravity	0.9113±0.10
Ester value	189.30±0.01
Acid value	0.5±0.02

Values are mean ± standard deviation of triplicate determinations

Characterization of the oils of tamarind seeds, which was presented in Table 2 shows that the free fatty acid content was 2.80 ± 0.30. This value is found satisfactory and is similar to the work of Musa and Suleiman 2012, Adewale et al., 2011, Nwosu et al., 2017, Babatunde et al., 2016 and Khanna and Zhang 2011 2001 (2.85 ± 0.28). The iodine value is a measure of the unsaturation in the oils. This value was found as 97.00 ± 0.80 and is lower when compared to the work of Schwartz et al., 2001 (109.89 ± 0.72) but is in accordance with 2000 literature review (96.72 ± 0.50) The saponification value which was found as 189.80 ± 0.20 was considered safe for human consumption and is similar to the work of Adewale et al., 2006 (180.95 ± 0.19 %). A value of 0.5 ± 0.02 % was obtained as the acid content and is relatively lower when compared to the work of Murray et al., 2002 (0.9 ± 0.5 %). This value obtained is concluded as the optimum value for acid content and is considered safe for ingestion.

5. Conclusion

The sampled seeds and oils of tamarind have been evaluated for proximate and chemical composition. The results of proximate analysis revealed the presence of high amounts of protein and carbohydrate in the seeds which are good source of nutrient and essential for human health. In terms of its chemical composition, saponification was the highest value gotten and specific gravity as the lowest value. These values obtained revealed that tamarind seed oil is safe essential for human and animals' consumption and a good source of nutrient.

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