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Research Article

Preliminary Study on Physiochemical and Fatty Acids Content of *Cassia tora Seed Oil*

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ABSTRACT

In this study, physiochemical and fatty acids content of *Cassia tora* seed oil was investigated. The oil was extracted from the *Cassia tora* seed kernel using Soxhlet extractor with petroleum ether as solvent. Oils obtained from seed oil provide essential components and fatty acids in human diet, and for industrial uses. Reports on fatty acids content from some seed oils have showed good potential; therefore, focus on oil properties and fatty acids content of *Cassia tora* seed would probably make it useful to our industries, and thereby enhances its economic status. Oil yield of Cassia *tora* seed kernel was 17.76%, while its fatty acids content were: oleic acid (43.21%), stearic acid (19.37%), palmitic acid (15.83%), and other chemicals constituted 21.59%. Oils with high oleic acid content were regarded as the major healthful oils replacing *trans* fat in food processing and foodservices. In regard to this, high oleic acid in *Cassia tora* seed oil may boost its value among the high-oleic oils used by the oil industry. The oil physical parameters determined in this study include; specific gravity (0.88), refractive index (1.43), and pH (4.41) these values were within the ASTM standard specifications. In vantage of these, *Cassia tora* seed oil could be recommended suitable for industrial usage particularly in regard to its high oleic acid content.

Keywords: *Cassia tora* seed, oil, Fatty acids, physiochemical

INTRODUCTION

Vegetable oils are chemically similar to animal fats, consisting of glycerol combined with fatty acid, but are liquid at room temperature. The largest sources of vegetable oil are annual plants, which include soybean, corn, cottonseed, groundnut, sunflower, rapeseed, melon and sesame seed (1). Other sources are oil bearing perennial plants such as olive, coconut, cashew and palm. Several other oil seeds including canola, citrus seed and avocado have been identified (2).

Cassia tora is a legume in the subfamily *Caesal pinioideae*. Its name has been derived from *Sinhala* language, in which it is called *Tora*. It grows wild in most of the tropics and is considered a weed in many places; its native range is not well known but probably South Asia. It is called Sickle Wild Sensitive-plant (3).*Cassia tora* seeds are hard to beat in their quality and affordability. The seed is used as a supporting agent for calomel, kaolin and lactone. The seeds are also used as a mordant in dyeing. Literature on physiochemical properties and fatty acids content of some seed oils have showed good potential; therefore, focus on oil property and fatty acids content of *Cassia tora* seed would therefore enhance its economic status.

METHODOLOGY

Cassia tora seeds: The seeds were collected in Samaru, Zaria in February, 2012 and authenticated at the Department of Crop Science, Institute for Agricultural Research (IAR), Ahmadu Bello University Zaria.

Chemicals/Solvents: All chemical and solvents used were of analytically grade obtained from sigma Aldrich, England but were purchased in Zaria, Kaduna state.

Oil Extraction / Determination of oil yield: Oil extraction was done using AOAC method (4). The *Cassia tora* seeds were cracked and the kernels were removed, air dried before used. Fifty grams of kernel sample was packed in a Whatman's filter paper and inserted into the Soxhlet extractor. Petroleum ether was used as the extracting solvent. After six continuous hours of extraction, solvent was recovered by simple distillation and the residual oil was oven-dried at 65±2°C for one hour. The sample was cooled in desiccator's before being weighed. Oil yield in percentage was calculated using the equation below:

Percentage oil yield = (weight of extracted oil / weight of seed samples) x 100

Table 1. Chemical constituents and oil yield of *Cassia tora* seed oil

Parameters	Value (%)
Fatty acids	
Unsaturated	43. 21
Saturated	35. 20
Fatty acid esters	09. 00
Hydrocarbon	12. 59
Oil yield	58. 00

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Table 2. Fatty acids composition of *Cassia tora* seed oil

Fatty acids	Value (%)
Oleic	43. 21
Palmitic	15. 83
Stearic	19. 37

Table 3. Physical properties of *Cassia tora* seed oil

Property	Values
Specific gravity	0.88
Refractive Index at 25°C	1.43
pH at 24.1ºC	4.41
Colour	Golden brown

GC Analysis of oil /Determination of fatty acids content: Fatty acids content was analyzed by Gas Chromatography instrument (QP2010 plus) equipped with a FID Detector and a high temperature HT5 AQ (SGE), 12 m x 0.22 mm column. The Column flow was 1.80 ml/min, purge flow was 3.0ml/min and total flow was 40.8 ml/min. The injector temperature was 250ºC; the oven temperature was programmed from 70ºC to 280ºC at 10ºC/minute and was held at 250ºC for 5 minute. The fatty acids content of the oil were determined from the chromatogram.

Determination of free fatty acids of the oil: Free fatty acid was calculated using the AOCS method (5). Mixture of 1.0g of oil, 25ml of diethyl ether, 25 ml of alcohol and 1ml of phenolphthalein solution was prepared. The mixture was titrated with aqueous 0.5N NaOH, vigorously shook until a permanent faint pink colour appeared. The percentage of free fatty acid in the sample was calculated using the equation below.

$$\% \text{ free fatty acids} = \frac{\text{Titration (ml)} * 0.141 * 1000}{\text{Wt of oil sample used}}$$

Determination of refractive index: This was determined using the Abbe refractometer. The refractometer was first standardized to 1.33 using distilled water at a temperature of 25ºC. This water was cleaned off with tissue paper and replaced with about 0.5g of oil. The dark and light regions of the refractometer were adjusted to meet at an intercept of a crossbar before the readings was taken.

Determination of specific gravity: An empty pycnometer bottle was weighed, filled with water and reweighed. The oil was poured into the cleaned, dried bottle and the weight noted. The specific gravity was calculated using the equation below.

$$\text{Specific gravity} = \frac{\text{Wt of bottle and oil sample} - \text{Wt of empty bottle}}{\text{Wt of bottle and water} - \text{Wt of empty bottle}}$$

Determination of oil Ph: The pH meter was used at 24.1ºC. Two grams of oil sample were homogenized in 13ml of distilled water and pH was determined using a Hanna pH meter model no. 02895. The pH meter was standardized using a standard buffer of pH 7.01.

RESULTS AND DISCUSSION

It have been reported that oil yields of vegetable oil bearing seed, nut, kernel or fruit varies between 3% and 70% of the total weight (6,7). Oil yield of *Cassia tora* seed in our study was 17.76% (Table 1) and this falls within the range of oil yield of many vegetable oil bearing seed.

Nutritionally, oils obtained from oil seeds provide the calories, vitamins and essential fatty acids in the human diet in an easily digested form. The rate of vegetable oil consumption is increasing compared with animal fat due to its low sterol *(*8,9*).* In addition to being nutritious, vegetable oils also have industrial uses. It have been reported that oil with high oleic acid content was among the major healthful oils replacing *trans* fat in food processing and foodservices (10). High content of oleic acid in *cassia tora* seed oil as presented (Table 2) may boost its value among the high-oleic oils used by the oil industry.

Recently, efforts to reduce the level of linolenic and linoleic acids in plant seeds have been reported (10). In this vantage, absence of these polyunsaturated (linolenic and linoleic) fatty acids in *Cassia tora* seed oil may probably make it to be a good candidate for replacing *trans* fat. Free Fatty Acid (FFA) concentration of the *Cassia tora* seed oil was 2.53%, it is slightly above the maximum limit of 2.0% reported for high-grade Codex Alimentarius (11). This is actually an important variable in considering the quality of oil, it have been reported that the lower the free fatty acid the better the quality of oil (12).

Application of oil is a function of its physiochemical properties. The high concentration of unsaturated fatty acids (Table 1) of *Cassia tora* seed oil suggests its properties of unsaturated oil. Specific gravity for *Cassia tora* seed oil was 0.88 and this is very close to the values 0.89-0.92 gml^{-1} reported for good oils by Odufoye, (13). Likewise, refractive index for *Cassia tora* seed oil in this study is 1.43 this is an indicative for high degree of purity of the oil and is consistent with that of *Citrus sinensis* reported by Akinoso *et al* (14).

CONCLUSION

In conclusion, we could report that the oil property and fatty acids content of *Cassia tora* seed oil determined in this study could be suitable for industrial usage. Especially in regard to its high oleic acid content this may help to boost its economic status among the high-oleic oils used by the oil industry.

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