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# Fatty Acid Composition of Seed Oils of T. Argentea and G. Maculata Plants

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**ARTICLE DETAILS**

**Research Paper**

**ABSTRACT**

Fats and oils are obtained from plants and animals. Which contain chemical compounds called esters. Ester are combinations of glycerol with various fatty acids. Fat and oils are triglycerides of saturated and unsaturated fatty acids. Which has minor proportions of sterols, vitamins, pigments, hydrocarbons and soluble other substances. They are obtained from various oil-containing substances such as oilseeds, fishes and animals. Fatty acids, like carbohydrates, are important structural elements of biological membranes. They provide 30- 40% of the calories ingested each day in the average human diet.

## 1- Introduction

Due to the rapid increase in world population and consumption of oil-based industries, there is an unprecedented increase in the demand for vegetable and animal oils in the world. Fatty acids are long chain single carboxyl groups that contain organic acids. They mostly have an even number of carbons and are the building blocks of most lipids.Fatty acids have no of industrial applications.[1-6] Seeds contain a number of fatty acids which influences blood pressure and used in dietary nutrition. Fatty acids are used for arthritis, heart diseases, cancer, behavioral and mental disorder, depression, psoriasis and eczema etc.

Various functional groups in fatty acids such as keto, epoxy, hydroxy. cyclopropene, cyclopropane, cyclopentene, conjugated unsaturation, allenic unsaturation and furanoid function of oils of various species belonging to different plant tamilies. Fatty acids containing other functional groups undergo a

variety of reactions resulting in the formation of various industrially useful products. Ricinoleic acid (12 hydroxy cis-9-octadecenoic acid) is present in castor oil to the extent of 90%, which results in a variety of novel and interesting reactions, resulting in the creation of many industrial products[7]. Fats also provide some vitamins for use in the body. They support the vital organs of all the cells of the body and help maintain body temperature.

Unsaponifiable matter[8,9] is the portion of natural fats and fixed oils which is not saponified by alkali and contains hydrocarbons, sterols, carotenoids and fat soluble vitamins. Maxwell et al.[10] developed a rapid procedure for measuring unsaponifiable matter.

Fixed oils have been reviewed by various researchers[11-13]. Among all constituents of unsaponifiable matter, sterols are most important triterpenoidal natural crystalline polycyclic, hydroaromatic, secondary alcohols containing an aliphatic side chain. Sterols are optically active and are either saturated or unsaturated and occur in nature as free in combined state. In biological applications sterols are having hypolipidaemic, antifungal, antibacterial, anti-inflammatory, antiarthritic, antimalarial, antitumor, antidiabetic, antihistamine and antiemetic activities. Besides this large number of miscellaneous therapeutic applications are there[14-20].

Plant seeds contain oils and in good percentage The study of minor seed oils is a subject of great interest if it is to explore the possibility of new alternative sources for conventional oils, both for edible and other commercial purposes. Thus non-traditional or minor seed oils of plants **Tecoma argentia** and **Gliricidia maculata** which are collected from forest trees have been taken for investigation.

## 2- Materials and Methods

Air-dried powdered seeds of each plant were extracted separately with petroleum ether (60–80 °C) in a Soxhlet apparatus for 18–20 h. The extract was filtered and the solvent was distilled off. The extract was concentrated to one quarter of its volume. It was passed through a column of alumina (grade III) to remove the coloring matter. Upon removal of the solvent, the stabilized oil was tested for some physicochemical constants[21-22] . Which are given in the following Table I.

### Separation of unsaponifiable matter and mixed fatty acids [23]

The oil (100 g) was saponified by refluxing with 30 g of KOH in 500 ml of 04% ethanol for 3 h. Most of the ethanol was distilled off and the soap thus formed was dissolved in distilled water. The unreacted

substance was extracted with an aqueous soap solution with diethyl ether in a separatory funnel. The ether extract was washed with water several times and dried over anhydrous sodium sulphate. On removal of solvent at room temperature T..argentea (2.8%) and G. Maculata (4.2%) was obtained.

Aqueous soap solution after removing the malignant substance. The mixed fatty acids were acidified with 10% H2SO4 to regenerate and heated in a water bath. The solution was cooled and the free acid was extracted with diethyl ether. The ether extract was washed with water and dried over anhydrous sodium sulphate. The mixed fatty acids were obtained in T. argentea in yields of 69.1% and 82.7% on removal of solvent. In G. maculata.

**Separation of saturated and unsaturated fatty acids**

The mixed fatty acids were decompose into saturated and unsaturated fatty acids by Twitchell's method [24].

Mixed fatty acids (50 gm) were dissolved in 95% ethanol (250 ml) containing 1.5% glacial acetic acid. To the warm solution of fatty acids, boiling solution of lead acetate (35 gm lead acetate in 250ml 95% ethanol containing 1.5% glacial acetic acid) was mixed. The mixture was cooled at 15 °C overnight and the coagulated lead salts of saturated fatty acids were filtered and recrystallized from glacial acetic acid. On evaporating the alcohol, pure lead salts of unsaturated fatty acids were obtained from the filtrate.

**Table-I** Fixed oil tested for some physico-chemical constants

| S.NO. | Property | G.Maculata | T.Urgentia |
|---|---|---|---|
| 1 | Color | Yellow | Pale Yellow |
| 2 | Yield % | 21.2 | 16.0 |
| 3 | Specific gravity | 0.9216 | 0.8612 |
| 4 | Refractive index at $30^0$C | 1.5213 | 1.3918 |
| 5 | Acid value | 5.8 | 8.3 |
| 6 | Iodine value | 103.18 | 97.26 |

| | | | |
|---|---|---|---|
| 7 | Saponification value | 184.12 | 192.4 |

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**Preparation of methyl esters of fatty acids**

Mixed, saturated and unsaturated (1 gm each) fatty acids were methylated separately by refluxing with 10 ml of methanol containing 0.2 ml concentrated $H_2SO_4$, for one hour. The methyl ester thus formed was extracted with diethyl ether, the ether extract was washed with 5% sodium carbonate in water and dried. Methyl esters were obtained on removal of solvent from the ether extract.

**Gas liquid chromatography of methyl ester[22-23]**

The methyl ester was subjected to GLC separately. The experimental conditions were as follows:

| | |
|---|---|
| Column used | Silox 10c (Packed) |
| Injection temperature | 300°C |
| Detection temperature | 300°C |
| Oven temperature | 200°C |
| Carrier gas | Nitrogen |
| Flow rate of $N_2$ | 45 ml/min |
| Amount injected | 1µI |

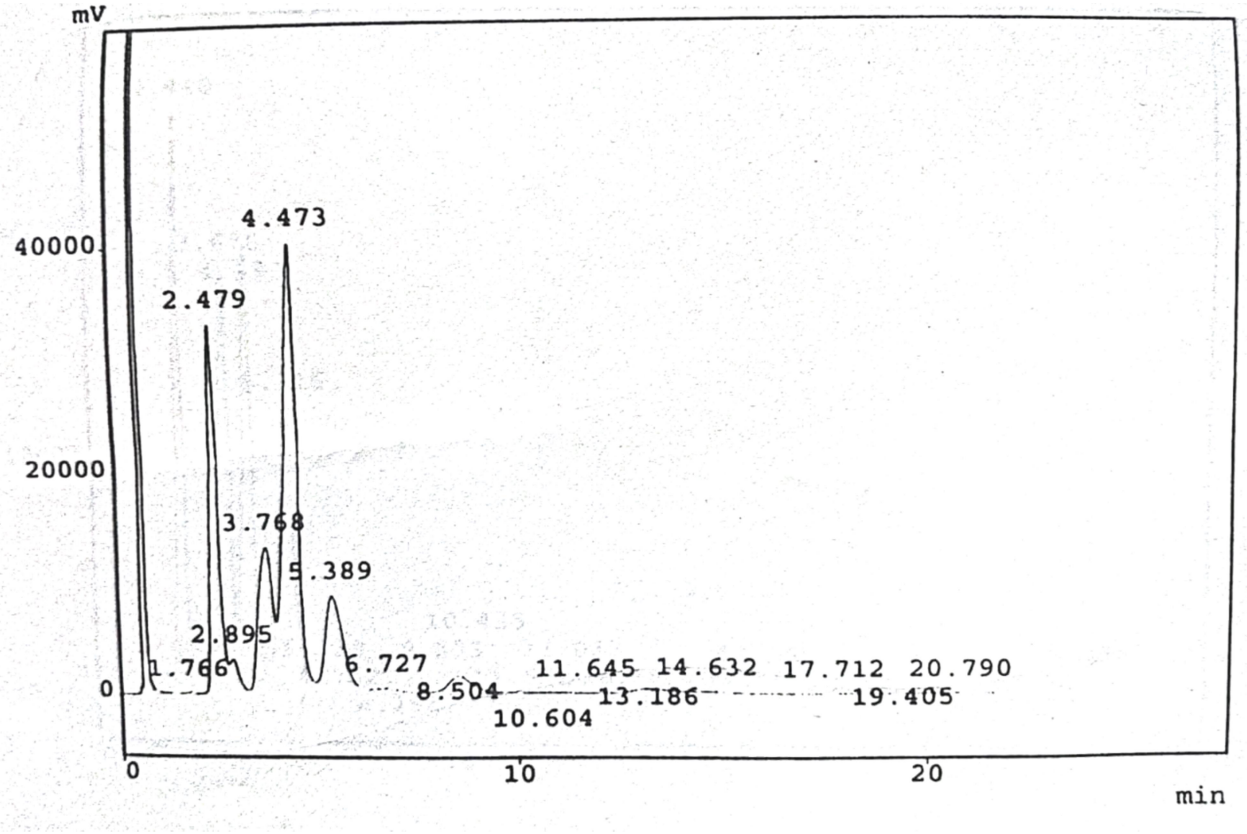


Fig 1: GLC of the Methyl ester of mixed Fatty acids (T.argentea)

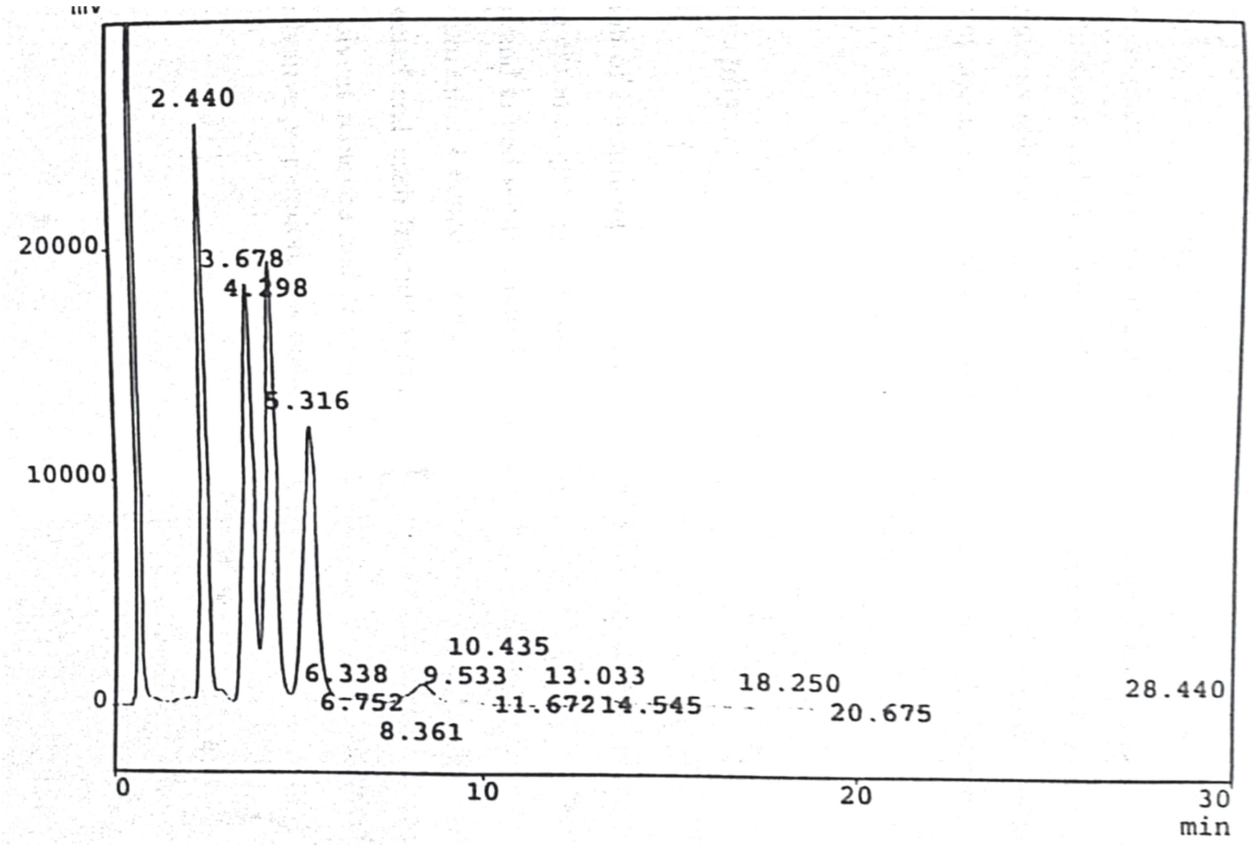


Fig 2: GLC of the Methyl ester of mixed Fatty acids (G.maculata)

The constituent fatty acids were identified from the retention times of authentic samples of methyl esters. The percentage composition of the acid was determined from the area of the peaks. The results of GLC of mixed acids are given in the following Table II and the chromatograms are given in Figures 1 and 2 above.

Table II: Percentage composition of the fatty acid

| S.NO. | Fatty acid | G.maculata (%) | T. argentea(%) |
|---|---|---|---|
| 1 | Stearic | 20.1029 | 33.4089 |
| 2 | Palmitic | - | 6.2912 |
| 3 | Linoleic | - | 28.2627 |

| | | | |
|---|---|---|---|
| 4 | Arachidic | - | 10.4176 |
| 5 | Linolenic | 18.3021 | - |
| 6 | Malvalic | 17.4880 | - |
| 7 | Parinaric | 21.4830 | 20.6350 |
| 8 | Palmitoleic | 22.4548 | - |

The saturated fatty acid was obtained by boiling its lead salts with dilute HCl and then extracted with ether at room temperature. The ether extract was washed with distilled water and dried over anhydrous sodium sulphate. After removal of ether, T. argentea contained 38.67% and G. maculata yielded 51.123% saturated fatty acids.

Soluble lead salts of unsaturated fatty acids were treated with dilute HCl to decompose the lead salts. Unsaturated fatty acids were extracted with ether, washed, and dried over anhydrous sodium sulphate. After removal of solvent, unsaturated fatty acids were found in 61.328% (T. argentea) and 48.876% G.maculata.

**3- Results and Discussions**

Fixed oils of T. argentea and G. maculata were analyzed. They contain fatty acids. sterols and hydrocarbons. They have been identitied by chemical tests and instrumental techniques.

T.argentea contain 16.1% fixed oil which consists of stearic acid (33.4089%). linoleic acid (28.2627%). palmitic acid (6.2912%), parinaric acid (20.6350%), arachidic acid (10.4176%) and unsaponifiable matter (2.8%) contain hydrocarbons, B-amyrin. B- stosterol and lupeol

G maculata seed contain 21 2% fixed oil. Fatty acids present in oil are stearic (20 1029%), palmillerc (22.4548%), linolenic (18.3021%), malvalic (17 488%), parinaric (21.4830%) acids. Unsaponifiable matter (42%) of the oil contains B- sitosterol.stigmasterol and glochidone

**4- Conclusion**

The saturated fatty acid was obtained by boiling its lead salts with dilute HCI and then extracted with ether at room temperature. The ether extract was washed with distilled water and dried over anhydrous

sodium sulphate. After removal of ether, 38.67% saturated fatty acids were obtained in T.argentea and 51.123% in G.maculata.

Soluble lead salts of unsaturated fatty acids were treated with dilute HCl to decompose the lead salts. Unsaturated fatty acids were extracted with ether, washed, and dried over anhydrous sodium sulphate. After removal of solvent, unsaturated fatty acids were found in 61.328% (T. argentea) and 48.876% G. maculata.

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