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Analysis of Fatty acids composition of the seed oil of the *Albizia lebbeck* (L.) Benth

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Abstract- Fatty acids composition of the siris is the very useful from the pharmacology as well as commercially point of view. Before that no attempts was done for the analysis of the fatty acids of the siris seeds. Fatty acids are very good for the several kinds of the medicines and the treatment of the diseases. They are the sources of the several famous oil sources like the sarson, sesame, palm oil. In this work, the fatty acid profile of the oils of *A lebbeck* (L.) Benth. are worked out. The result showed that *A. lebbeck* (L.) Benth. oil contained the highest percentage of Lenoleic acid and after oleic acid. A. lebbeck oil has about 25.157% monounsaturated fatty acids (MUFA), it has about 52.235% polyunsaturated fatty acid (PUFA), and it has about 22.608% saturated fatty acid (SFA) in packed column compared to capillary column 22.794% SFA, 25.711% MUFA and 51.495% PUFA.

Keywords- *Albizia lebbeck* (L.) Benth. Seed oil, fatty acids.

I. INTRODUCTION

The genus *Albizia* comprises approximately 150 species, mostly trees and shrubs native to tropical and subtropical regions of Asia and Africa [1]. *A. lebbeck* (L.) Benth. belongs to Fabaceae (a family. The Fabaceae and Leguminosae, commonly known as the legume, pea, or bean family, with 730 genera and over 19,400 species [2]. *A. lebbeck* (L.) Benth. (Family- Fabaceae) is commonly known as Siris, Shiris in Hindi [3]. It is an economically important plant for industrial and medicinal uses [4]. In ayurvedic literature the plant exhibited in treatment of allergic disorders, eczema, asthma and utricaria [5]. Oils and fats are recognized as essential nutrients in both animal and human diets. They provide the most concentrated source of energy of any foodstuff, supply essential fatty acids (which are precursors for important hormones, the prostaglandins), contribute greatly to the feeling of satiety after eating, are carriers for fat soluble vitamins, and serve to make foods more palatable [6]. Lipids consist of fatty acids, classified mostly according to the presence or absence of double bonds: saturated fatty acid (without double bonds), monounsaturated fatty acid (with one double bond), and polyunsaturated (with two or up to six double bonds). These fatty acids are widely occurring in natural fats and dietary oils, and they play an important role as nutritious substances and metabolites in living organisms. Many fatty acids, such as palmitic, linolenic, linoleic, oleic, stearic, and myristic acids are known to have antibacterial and antifungal properties [7]. Saturated fatty acids– hydrocarbon chains with single bonds between each of carbon atoms – found primarily in products derived from animal sources (meat, dairy products) tend to raise the levels of low density lipoprotein (LDL) cholesterol in the blood [8].

II. MATERIAL AND METHODS

The seeds of *Albizzia lebbeck* (L.) Benth. were collected form district of swai madhopur of Rajasthan, India. and were identified and authenticated by the Herbarium Department of Botany, University of Rajasthan, Jaipur (Rajasthan), India. A voucher specimen (No. RUBL-211789) were kept in the herbarium department for future reference.

Preparation of plant extracts:
The seeds were removed from their pods and ground to powder from using grinder- machine and the seed power to extraction by soxhlet extractor using n-hexane at 60 ^{0}C for 46 hours.

Figure: 1 gas chromatograph (Model Nuckon – 5700)

Reagents
All the reagents and solvents used were of HPLC grade.
• n- Heptane
• Alcoholic potassium hydroxide
• HPLC grade water

Preparation of fatty acid methyl esters (FAMEs):
Take 1 ml oil sample in a graduated cylinder with stopper. to which 10 ml n-Heptane have been added .Mix the content well ,add 3 ml of alcoholic potassium hydroxide and remaining HPLC grade water for making a 25 ml approx. Mixture and keep the mixture for 2 hrs approx with closing it with stopper for making a volatile mixture. 1 µl fatty acids methyl ester was injected, peaks were recorded for their respective RT (Retention time), areas by data processor unit of the gas chromatography.

Chromatography
Nuckon – 5700 gas chromatograph equipped with a flame-ionization detector (FID) and glass column, digital controls, separate independent proportional temperature controllers for oven, detector, Injector, Detector temperature 390 ^{0} C in 10 C steps set by thumbwheel switches, oven temperature 399 ^{0} C in 1 C step set by thumbwheel switches. Temperature programming: - microprocessor based programmer with rate 0.1 ^{0} C – 29.9 ^{0} C per minute with initial time hold up to 99 minute. Dual channel data station, 2 detectors can be operated simultaneously. Use Nitrogen gas cylinder *-60 psi. Hydrogen gas cylinder -20 psi. Zero air gas cylinder -20 psi.*

First analysis with capillary column: –
Set the sensitivity of the capillary column on 1000 and keep attenuator 1 or 2 point, keep on the polarity in analysis with capillary column, now inject the already prepared methyl ester (sample mixture) in 1 micro liter Syringe packed column. Than start the programming and software of gas chromatography instrument temperature of the oven start increasing gradually, with increase in the temperature fatty acids of the oil starts evaporating as per their boiling point and a graph start plotting on the computer screen. Gas chromatography instrument continue work till temperature of the oven reaches to 230 ^{0} C, as it reaches first of all off the programming, software of gas chromatography. Than save the graph in the computer system and off the oven, other parts of gas chromatography, note down the percentage amount, and retention time of the fatty acids form the peak of the graphs. Fame column capillary fused silica capillary column 5Ge of 30 m length 0.25 mm ID B px-70.

Second analysis with packed column: –
Open gas – Nitrogen gas cylinder *-60 psi. Hydrogen gas cylinder -20 psi. Zero air gas cylinder -20 psi.* Set the sensitivity of the packed column on 100 and keep attenuator 1 or 2 point, now inject the already prepared methyl ester (sample mixture) in 1 micro liter Syringe packed column. Than start the programming and software of gas chromatography machine.

Temperature of the oven start increasing gradually, with increase in the temperature fatty acids of the oil starts evaporating as per their boiling point and a graph starts plotting on the computer screen. Gas chromatography machine continue work till temperature of the oven reaches to 230 ^{0}C ,as it reaches first of all off the programming ,software of gas chromatography than save the graph in the computer system and off the oven ,other parts of gas chromatography ,note down the percentage amount ,retention time of the fatty acids form the peak of the graphs. Fame column packed s.s column of 2 m length packed with 2% sp- 2300and 3% sp -2310 on chromosorb w HP-100/120 mesh.

Certified Reference Materials (CRMs)
Sigma – Alorich, Catalog no 46961, Lot no – LC26752V, Canola oil analytical standard, Exp. May 2020, 1000 mg.

III. RESULT AND DISCUSSION

Total of the 10 fatty acids were determined with the help of the several methods speieaaly the capillary and the packed column, chromatography. Among them 5 fatty acid were found to be the saturated and the rest of the fatty acids were found to be the unsaturated fatty acids. Some of them found to be polyunsaturated fatty acids .Palmitic acid, linoleic acids as well as the palmitic acid were found to be the most abundant, while palmitic acid and the steric acid and the linoliec acid were found to be in the least amount. Polyunsaturated fatty acids also found in the good amount.

The seeds contain the large amount of the unsaturated fatty acids, while saturated fatty acids are preset in the fewer amounts. The seeds of the *Albizzia* are the very useful from the ethno botanically point of view ,they are the sources of the various kinds of the medicines of the ayuerveda ,however before our work no attempts has been done for the separation of the fatty acids from the seeds ,these are the first work ,so our basic focus is that how the seed oil can be used commercially for the several purposes. Saturated fatty acids form the valuable parts of the body structures, they are the part of the membranes and the other body organelles, they are responsible for the various kinds of the balance between the transports of the metabolites from the one cell to the another, some of the fatty acids are antimicrobial in natures. Theses fatty acids are the main parts of the several kinds of the metabolism in the body. These are also very good in the several kinds of the sugar metabolism; the fatty acid metabolism is the key factors for the heart patients in India as well as the other nations of the world. Like the saturated fatty acids the unsaturated fatty acids have the several roles they are useful in the signal transduction, hormone pathways, in the hormone metabolism as well as the lipid metabolisms.

The fatty acids discovery of the seeds oils imparts the new bioprospecting of the new fatty acids covered in the natures. They are the remedy of the several skin disorders as well as the several kinds of the other disorder of the unknown and the known pathogens.

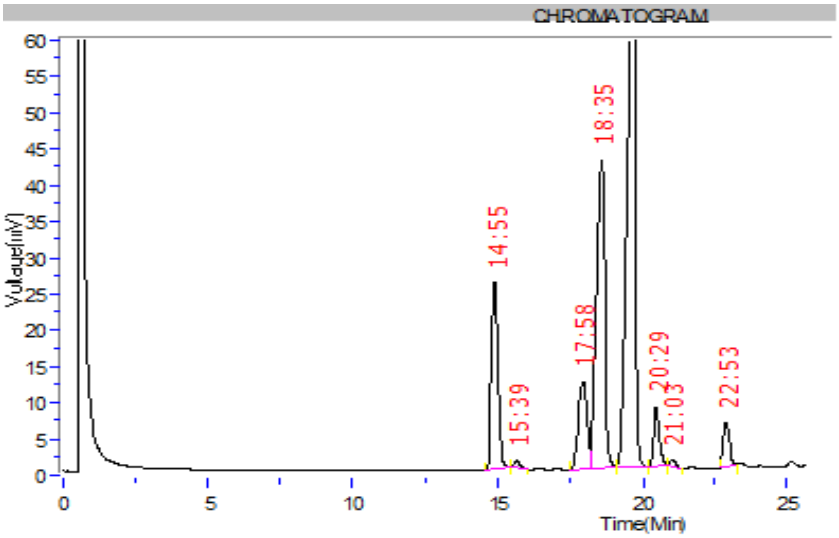

Figure: 2 Gas chromatogram (**Capillary column)** of *A. lebbeck* (L.) Benth. oil. Description of peaks is as follows: (14:55 Palmitic acid), (15:39 Palmitoleic), (17:59 Stearic acid), (18:36 Oleic acid), (19:42 Linoleic acid), (20:30) Linolenic acid), (21:3 Arachidic), (22:54 Behenic).

Table: 1 presenting the different parameters of the fatty oils of the seeds of *A. lebbeck* (L.) Benth.

Peak No.	RT (Min)	Area (mV-Sec)	Height (mVolt)	RF	Amount (ML)	Amount%	Component Name
1	14:55	384.664	25.767	1.000	384.664	11.938	Palmitic
2	15:39	15.108	1.057	1.000	15.108	0.470	Palmitoleic
3	17:59	250.825	12.169	1.000	250.825	7.784	Stearic
4	18:36	813.319	42.614	1.000	813.319	25.241	Oleic
5	19:42	1,542.082	88.013	1.000	1,542.082	47.858	Lenoleic
6	20:30	117.187	8.234	1.000	117.187	3.637	Linolenic
7	21:3	10.662	0.813	1.000	10.662	0.331	Arachidic
8	22:54	88.332	6.054	1.000	88.332	2.741	Behenic

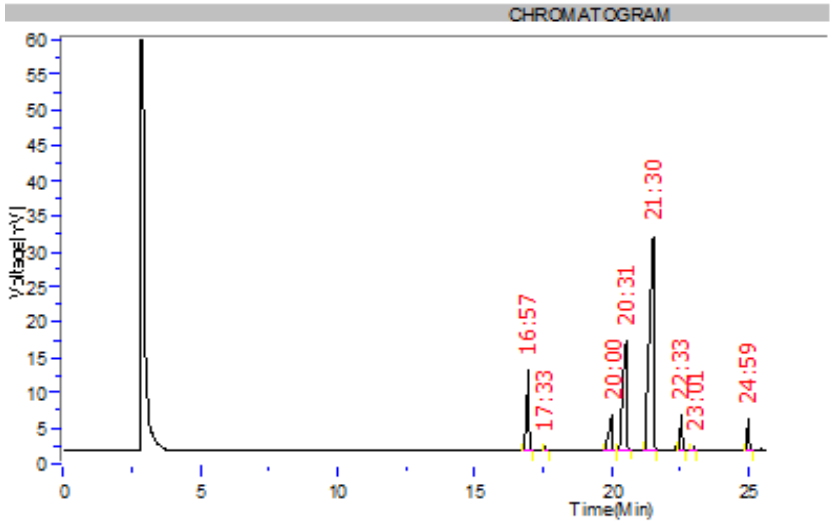

Figure: 3 Gas chromatogram (**Packed column)** of *A. lebbeck* (L.) Benth. oil. Description of peaks is as follows: (16:57 Palmitic acid), (17:33 Palmitoleic), (20:00 Stearic acid), (20:31 Oleic acid), (21:30 Linoleic acid), (22:33 Linolenic acid), (23:1 Arachidic), (24:00 Behenic).

Table: 2 presenting the different parameters of the fatty oils of the seeds of *A. lebbeck* (L.) Benth.

Peak No.	RT (Min)	Area (mV-Sec)	Height (mVolt)	RF	Amount (ML)	Amount%	Component Name
1	16:57	60.158	11.362	1.000	60.158	10.637	Palmitic
2	17:33	2.535	0.753	1.000	2.535	0.448	Palmitoleic
3	20:0	44.253	5.206	1.000	44.253	7.825	Stearic
4	20:31	139.743	15.607	1.000	139.743	24.709	Oleic
5	21:30	273.755	30.266	1.000	273.755	48.405	Lenoleic
6	22:33	21.660	5.111	1.000	21.660	3.830	Linolenic
7	23:1	2.639	0.606	1.000	2.639	0.467	Arachidic
8	24:0	20.808	4.607	1.000	20.808	3.679	Behenic

Table 3. The content of SFA, MUFA, PUFA (% w/w). (SFA- Saturated fatty acid, MUFA- Monounsaturated fatty acid, PUFA- Polyunsaturated fatty acids

	SFA	MUFA	PUFA	MUFA+ PUFA
Packed column	22.608	25.157	52.235	77.392
Capillary column	22.794	25.711	51.495	77.206

IV. CONCLUSION

Overall this is the short research work the fatty acid composition of the fatty acids, we worked on the amount of the saturated as well as the unsaturated fatty acids of the seed of the Albizzai siris, the seeds contains the good amount of the polyunsaturated fatty acids as well as the saturated fatty acids, the seeds has the good proteins as the commercial edible oil as well as the antiseptic oils of the pharmacologically values. *A lebbeck* (L.) Benth. seed oil useful knowledge base for further advanced research.

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