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Fatty Acid Composition of the Seed Pods of *Albizia lebbeck* and the Leaves of *Samanea saman*

Md. Ramjan Ali, Sadia Afrin Chhanda, Tanvir Muslim and Md. Azizur Rahman*

Department of Chemistry, Dhaka University, Dhaka-1000, Bangladesh

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I. Introduction

Every single function of the body depends on the presence of the right fats and fatty acids in cell membranes. Fatty acids are the building blocks of the fat in our bodies as well as in the foods. They are major sources of energy. Most diets contain a great deal of fatty acids in the form of triacylglycerol (esters with glycerol). Subsequently the fatty acids from this fat are released to provide energy for various aerobic tissues. They are precursors of essential substances in the body (structural and metabolic). For example, phospholipids are essential components of all cell membranes and of plasma lipoproteins and the essential fatty acids are precursors of prostaglandins and related regulators. Fatty acids also play various vital roles in the different industries. Importance of modern and improved method of processing seed oil and fat has been increased due to the scarcity of seed oils & their prices[1]. The search for new oil sources and their products to increase the number of healthy and nutritional foods, a latest nutritional concept, like the production of low calorie and low cholesterol foods will continue, with the advance of science and technology and increasing awareness to maintain standard health and nutritional status of life. Plants and animals are the source of all fats and oils or lipids. Specifically lipids from plants are important because of its special nature. Sometimes medicinal properties may also be exhibited by the fats and oils. *Albizia lebbeck* and *Samanea saman* belongs to the family Fabaceae[2, 3]. The isolation of fatty acids from the seed pods of *Albizia lebbeck* and the leaves of *Samanea saman* and their characterization may suggest the feasibility of their utilization. Hence, the work has been undertaken to investigate their fatty acid composition. This paper deals with the identification and quantification (relative proportion) of different fatty acids in the seed pods of *Albizia lebbeck* and in the leaves of *Samanea saman.*

II. Experimental

Solvent and reagents

All solvents, analytical or laboratory grade reagents used during the investigation were procured from Merck (Germany) and BDH (England). The commercial grade solvents were distilled before use.

Sample collection and preparation

Matured fruits (containing seeds) of *Albizia lebbeck* and fresh leaves of *Samanea saman* were collected locally. The seeds were separated from the pods and dried. The dried seed pods and leaves were powdered by grinding machine separately and preserved in air tight containers for further investigation.

Extraction with petroleum ether

The seed pod powder and leaf powder were extracted from petroleum ether (b.p. 60–80°C) separately. Each of the petroleum ether extracts was filtered and concentrated to dryness using a rotary evaporator. The percentage of yield of the petroleum ether extracts was recorded in Table 1.

Isolation and analysis of free and bound fatty acids

The free and bound fatty acids isolated from *Albizia lebbeck* and *Samanea saman* were converted into their methyl ester derivatives[4] separately and these were analyzed[4] by using GLC.

III. Results and Discussion

The seed pods of *Albizia lebbeck* and leaves of *Samanea saman* were separately collected, cleaned, dried and powdered. Both the powders were separately extracted with petroleum ether. From the results (Table-1), it is found that the petroleum ether extract of *Samanea saman* leaf is higher than that of *Albizia lebbeck* seed pod. This indicates that *Samanea saman* leaf contains higher amount of petroleum ether soluble compounds. This may be due to the presence of higher proportion of fatty materials in the leaves of *Samanea saman*.

Both the leaves of *Samanea saman* and the seed pods *Albizia lebbeck* contain higher amount of bound fatty acids than that of free fatty acids. This may be due to the fact that the bound fatty acids are associated with other organic compounds and hence the proportion of the FFA is relatively lower in both the samples. The total fatty acids content of leaves of *Samanea saman* is higher than the fatty acid content of the seed pods of *Albizia lebbeck*. This may be due to the fact that seed pods contain higher amounts of carbohydrates, proteins and minerals than that of the leaves. So, leaves of *Samanea saman* may be used as the better source of fatty acids than the seed pods of *Albizia lebbeck.*

It appears from Table 2, that both samples contain a mixture of different saturated and un-saturated fatty acids. The total saturated fatty acid in *Albizia lebbeck* seed pod and *Samanea saman* leaves are higher than their unsaturated fatty acids. This indicates that both the oils are rich in saturated fatty acids. Palmitic acid was found to be higher in both BFA and FFA of *Albizia lebbeck* seed pods than those of *Samanea saman* leaves. On the other hand behenic acid was found to be highest (58.87%) in BFA of *Samanea saman* leaves. The presence of stearic and arachidic were also significant in both the samples.

* Author for correspondence. e-mail: mazizurr@yahoo.com

Table 1. Amount of petroleum ether extract, bound and free fatty acids

Species	Amount (g/100 g of dry powder)			
	Petroleum ether Extract	Bound fatty acids (BFA)	Free fatty acids (FFA)	Total fatty acids
Albizia lebbeck	4.19	0.031	0.012	0.043
Samanea saman	5.15	1.637	0.668	2.305

Table 2. The total amount and relative percentages of free fatty acids and bound fatty acids

Fatty acid	Formula	Relative percentage (%)			
		Albizia lebbeck		*Samanea saman*	
		BFA	FFA	BFA	FFA
Myristic	$C_{14}H_{28}O_2$	–	–	–	1.52
Palmitic	$C_{16}H_{32}O_2$	31.98	29.17	6.70	31.62
Stearic	$C_{18}H_{36}O_2$	11.20	11.72	4.97	18.96
Arachidic	$C_{20}H_{40}O_2$	21.38	19.10	4.82	6.51
Behenic	$C_{22}H_{44}O_2$	22.17	31.08	58.87	7.30
Oleic	$C_{18}H_{34}O_2$	–	–	–	28.45
Linoleic	$C_{18}H_{32}O_2$	12.94	8.91	24.63	5.62
Total saturated		87.06	91.09	75.37	65.93
Total Unsaturated		12.94	8.91	24.63	34.07

Oliec acid was identified only in FFA of *Samanea saman* but linoleic acid was highest (24.63%) in BFA of *Samanea saman* leaves. Linoleic acid is also identified in FFA (8.91%) and BFA (12.94%) of *Albizia lebbeck* seed pod. The presence of fatty acids in both the samples is very similar to betel nut[5]. Among all this acids, the fatty acids palmitic, stearic, oleic and linoleic acids are common in butter[6]. On the other hand arachidic acid is identified in *Albizia lebbeck* seed pod and *Samanea saman* leaves but oils from soyabean, corn, cottonseed, linseed, coconut and butter are devoid of this acid[6]. Both oils contain significant proportion of linoleic acids (Table-2) which is an important unsaturated acid.

Linoleic acid is one of the essential polyunsaturated fatty acid which prevents cardiovascular diseases and its derivatives serve as structural component of the plasma membrane[7]. It also has, beneficial effect on blood lipids, lowering blood pressure and serum cholesterol. The nutritional value of linoleic acid is due its metabolism at the tissue levels, which produced the hormone like prostaglandins[8].

The unsaturated fatty acids linoleic and oleic acids decrease total blood cholesterol and low-density lipoprotein. These are also more prone to oxidation. Some of the unsaturated fatty acids, those are conjugated to fat-soluble antioxidants, have potential health benefit[9]. So the oils from *Albizia lebbeck* seed pod and *Samanea saman* leaves may be used as of linoleic acid or these oil may have medicinal properties. *Samanea. saman* leaves resembles corn oil and sunflower oil[10] and hence this oil may have nutritional value[10].

IV. Conclusion

The nature of the fatty acid composition and chemical properties indicates that the fatty acids from the pods of *Albizia lebbeck* and leaves of *Samanea saman* are a good source of fatty acids. In addition, the leaf of *Samanea saman* may be used as a good source of essential fatty acids–linolenic and oleic where the seed pods of *Albizia lebbeck* can be used as a good source of linolenic acid only. The fatty acid profile will also contribute to enrich knowledge for further advanced research in the field of phytochemistry.

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* Author for correspondence. e-mail: mazizurr@yahoo.com