

# PROXIMATE COMPOSITION AND PHYSIOCHEMICAL CHARACTERISTICS OF *Acacia nilotica* AND *Albizia lebbbeck*

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## ABSTRACT

The present study analysed the proximate composition of seed powder in which protein content was highest in *Albizialebbeck* (28.5±0.6%) and yield of oil was highest in *Acacia nilotica* (13.6±0.3%) seed oil of both plants having following composition: Peroxide value and Iodine value were highest (1.4±0.1 meq/kg), (140.5±0.1 g/100g) in *Acacianilotica*. Saponification value and Unsaponifiable matter were also highest in (219.4±0.7 mgKOH/g), (6.1±0.2%) *Acacianilotica*. Free fatty acid was highest in *Albizialebbeck* (1.7±0.0%). The fatty acids prominent in both plant was Linoleic acid (C<sub>18:2</sub>) which was highest (62.7±0.8%) in *Albizialebbeck* as compared to *Acacianilotica*. The prominent mineral in *Acacianilotica* was calcium (198.0±1.8%) which is lower than that of *Albizialebbeck* and in *Albizialebbeck* potassium (510.0±2.3%) was the prominent mineral.

**Keywords:** *Acacia Nilotica*, *Albizialebbeck*, *Fatty Acid Composition*, *Oil Composition*, *Proximate Composition*.

## I INTRODUCTION

*Acacia nilotica* (L.) Del. belongs to the family Mimosaceae and is widely distributed in tropical and sub-tropical countries. Ayurvedic medicine practices have declared that green pods and seeds of *A. nilotica* can provide the nutrients and therapeutic ingredients to prevent, mitigate and treat various diseases (Singh *et al.*, 2009a). It is used by traditional healers in Chattisgarh District of India for the treatment of various types of cancer. Different parts of *A. nilotica* are known to possess astringent, antibacterial, insect repellent, antioxidant, antidiabetic and antiviral properties (Bachaya *et al.*, 2009). Traditionally the bark, leaves, pods and flowers are used against cancer, cold, congestion, cough, diarrhea, dysentery, fever, gall bladder, hemorrhoid, ophthalmia, sclerosis, small pox, tuberculosis, leprosy, bleeding piles, leucoderma and menstrual problems (Ambasta, 1994; Bhargava *et al.*, 1998).

In West Africa, the bark and gum of this plant are used against cancer, tumors and indurations of liver and spleen, the root for tuberculosis, the wood for smallpox and the leaves for ulcer (Kalaivani and Mathew, 2010).

*Albizia lebbek* L. Benth (AL), locally known as shirish, a large deciduous tree, belongs to the family Fabaceae. It is a medium to large tree, of multistemmed widely spreading habit (Everist, 1986).

The nutritive values of the leaf, flower and pod of *A. lebbek* in rabbit and sheep have been reported (Gupta, 1981; Pradhan and Dayal, 1981; Lowry, 1987). Its leaves are reported to be good for ophthalmic diseases, night blindness, syphilis and ulcer, cold, cough, and respiratory disorders. The leaves are also used as cattle fodder, mulch, and manure due to high nitrogen contents. The bark of the plant is used as an astringent in the treatment of diarrhea. The bark has acrid taste and recommended for bronchitis, leprosy, scabies and helminthes infections. The plant is also reported to have antiseptic, anti-inflammatory, anti-dysenteric, anti-tumour and anti-tubercular properties.

## II MATERIALS AND METHODS

Dry pods of *A. nilotica* and *A. lebbek* were collected from forest area of District Palwal, India. The seeds were removed from their pods and ground to powder form using electric grinding machine. The powder seed and oil composition were determined by standard method of AOAC 1990.

### 2.1 Fatty Acid Spectrum

Preparation of methyl esters:

Method:

A suitable amount of oil sample was taken in a test tube and 0.5 ml of 0.5 N sodium methoxide was added and covered with aluminium foil and then immersed in a water bath at 65°C to a depth of half inch and was shaken vigorously for 2 - 3 min. The mixture became homogenous indicating the complete esterification of the oil sample. The test tube was removed from the water bath and cooled to room temperature. One ml of carbon disulphide was added and shaken for 1 - 2 min. Approximately 100 mg of activated charcoal was added mixed uniformly and filtered through Whatman No. 1 filter paper. The filtrate constituted all the methyl esters of fatty acids.

### 2.2 Fractionation of methyl esters by GLC

Methyl esters of fatty acids were separated using Chemito 8610 HT Gas chromatograph equipped with FID and a BPX70, 0.25ml fused silica column (SGE Pvt. Ltd., Ringwood, Victoria, Australia) was used. The carrier gas was hydrogen and injection was operated in the split mode, the split ratio being approximately 50 : 1. Injector and detector temperature were 270°C and 280°C respectively. The oven temperature was held at 70°C for 1 min. and then programmed at 30°C/min. to 170°C followed by further programming at 30°C/min. to 200°C and held at this temperature for 6 min. Data was captured and analysed with, Chemito 5000 integrator (Tashniwal Instruments, India Ltd.).

## 2.3 Mineral Contents

### Reagents:

Diacid mixture: Nitric acid and perchloric acid was mixed in ratio 5:1 just before use.

Hydrochloric mixture (1%): 1ml of conc. HCl was added in 50 ml distilled water and final volume was made upto 100 ml with distilled water.

### Method:

0.2 gm powdered sample of the seeds was digested with 15 ml of diacid mixture ( $5\text{HNO}_3:\text{HClO}_4$ ) in a conical flask by heating on hot plate in open space till clear white precipitates settle down at bottom of conical flask. The precipitates were dissolved in 1% HCl prepared in double distilled water, filtered and final volume of filtrate was made up to 50 ml with double distilled water and analyzed by using atomic absorption spectrometer.

## III RESULTS

The physiochemical characteristics of oil of *Acacianilotica* and *Albizialebbeck* were determined according to the standard methods of AOAC (1990), which were given in table 3.1. The free fatty acid were  $0.9\pm0.1\%$  &  $1.7\pm0.0\%$ , peroxide value of fresh oil were  $1.4\pm0.1$  meq/kg &  $0.9\pm0.1$  meq/kg, saponification values were  $219.4\pm0.7$  mgKOH/g &  $204.7\pm1.0$  mgKOH/g, unsaponifiable matter were  $6.1\pm0.2\%$  &  $3.7\pm0.2\%$ , iodine values were  $140.5\pm0.1$  g/100g &  $101.0\pm0.7$  g/100g.

Fatty acid Composition of seed oil of *Acacianilotica* and *Albizialebbeck* having the following composition:

Palmitic acid ( $\text{C}_{16:0}$ )  $13.7\pm0.4\%$  &  $13.5\pm0.3\%$ , stearic acid ( $\text{C}_{18:0}$ )  $4.4\pm0.1\%$  &  $1.1\pm0.0\%$ , oleic acid ( $\text{C}_{18:1}$ )  $30.6\pm0.3\%$  &  $12.6\pm0.4\%$ , linoleic acid ( $\text{C}_{18:2}$ )  $40.5\pm0.4\%$  &  $62.7\pm0.8\%$ , linolenic acid ( $\text{C}_{18:3}$ )  $2.6\pm0.3\%$  &  $2.0\pm0.1\%$ , arachidic acid ( $\text{C}_{20:0}$ )  $0.1\pm0.1\%$  &  $0.9\pm0.1\%$  and Behenic acid ( $\text{C}_{22:0}$ )  $1.6\pm0.2\%$  &  $2.3\pm0.1\%$  which is shown in table 3.2.

The *Acacianilotica* and *Albizialebbeck* seeds contained significant amount of important minerals shown below in Table 3.3. Calcium  $198.0\pm1.8$  mg/100g &  $280.0\pm1.7$  mg/100g, potassium  $110.0\pm1.1$  mg/100g &  $510.0\pm2.3$  mg/100g, sodium  $25.0\pm0.3$  mg/100g &  $62.5\pm1.2$  mg/100g, magnesium  $2.5\pm0.1$  mg/100g &  $7.1\pm0.4$  mg/100g, iron  $18.0\pm0.3$  mg/100g &  $2.3\pm0.2$  mg/100g, zinc  $2.4\pm0.0$  mg/100g &  $2.0\pm0.1$  mg/100g, cobalt  $1.9\pm0.1$  mg/100g & traces, manganese  $3.0\pm0.2$  &  $0.2\pm0.1$ , copper  $0.3\pm0.0$  mg/100g &  $0.6\pm0.3$  mg/100g and phosphorus  $51.4\pm1.5$  mg/100g &  $390.0\pm2.7$  mg/100g.

Yield of oil in *Acacia nilotica*  $13.6\pm0.3\%$  which is highest than in *Albizialebbeck*  $10.9\pm0.4\%$  and protein content were  $23.4\pm0.5\%$  &  $28.5\pm0.6\%$  in both plants.

**Table3.1: Physiochemical characteristics of seed oil of *Acacia nilotica* and *Albizia lebbek***

Parameters	Composition	
	Acacia nilotica	Albizia lebbek
Peroxide value (meq/kg)	1.4±0.1	0.9±0.1
Iodine value (g/100g)	140.5±0.1	101.0±0.7
Saponification value (mgKOH/g)	219.4±0.7	204.7±1.0
Unsaponifiable matter (%)	6.1±0.2	3.7±0.2
Free fatty acid (%)	0.9±0.1	1.7±0.0

Values are mean of three replicates ± standard error

**Table 3.2: Fatty acid Composition of seed oil of *Acacia nilotica* and *Albizia lebbek***

Parameters	Composition (%)	
	Acacia nilotica	Albizia lebbek
Palmitic acid ( $C_{16:0}$ )	13.7±0.4	13.5±0.3
Stearic acid ( $C_{18:0}$ )	4.4±0.1	1.1±0.0
Oleic acid ( $C_{18:1}$ )	30.6±0.3	12.6±0.4
Linoleic acid ( $C_{18:2}$ )	40.5±0.4	62.7±0.8
Linolenic acid ( $C_{18:3}$ )	2.6±0.3	2.0±0.1
Arachidic acid ( $C_{20:0}$ )	0.1±0.1	0.9±0.1
Behenic acid ( $C_{22:0}$ )	1.6±0.2	2.3±0.1

Values are mean of three replicates ± standard error

Table 3.3: Mineral Composition of seeds of *Acacianilotica* and *Albizialebbeck*

Parameters	Composition	
	Acacia nilotica	Albizialebbeck
Ca (mg/100g)	198.0±1.8	280.0±1.7
K (mg/100g)	110.0±1.1	510.0±2.3
Na (mg/100g)	25.0±0.3	62.5±1.2
Mg (mg/100g)	2.5±0.1	7.1±0.4
Fe (mg/100g)	18.0±0.3	2.3±0.2
Zn (mg/100g)	2.4±0.0	2.0±0.1
Co (mg/100g)	1.9±0.1	Traces
Mn (mg/100g)	3.0±0.2	0.2±0.1
Cu (mg/100g)	0.3±0.0	0.6±0.3
P (mg/100g)	51.4±1.5	390.0±2.7

Values are mean of three replicates ± standard error

## IV DISCUSSION

Table 3.1 presents the result of the physicochemical analysis of the oils of *A. nilotica* and *A. lebbeck*. The free fatty acid content was 0.9±0.1 % in *Acacianilotica* and *Albizialebbeck* had it as 1.7±0.0 % respectively. The iodine value is a measure of the unsaturation in oils. This value was found as 140.5±0.1 g/100g in *Acacianilotica* which placed it as the more unsaturated among both oils evaluated. *Acacianilotica* also had the highest saponification value (219.4±0.7 mg KOH/g) and unsaponifiable matter (6.1±0.2 mg KOH/g) among the studied oils. The peroxide value was 1.4±0.1 meq/kg in *Acacianilotica*, 0.9±0.1 meq/kg in *Albizialebbeck*.

The fatty acid composition of the seed oils of these plants is presented in Table 3.2. C18:2 was the dominant fatty acid in the seed oils of *Acacianilotica* (40.5 ± 0.4%) and *Albizialebbeck* (62.7 ± 0.8 %). C18:1 and C18:3 were highest in *Acacianilotica* (30.6 ± 0.3 % & 2.6 ± 0.3%), while C22:0 had the highest value in *Albizialebbeck* (2.3 ± 0.1%). C16:0 were (13.7 ± 0.4 %) in *Acacia nilotica* while (13.5 ± 0.3 %) in *Albizialebbeck*.

A total of ten minerals were determined in the seeds. The results of which shown in table 3.3. These minerals are known to play vital roles in both plants and animals (Schwartz; 1975) and they were accumulated in different amounts in the seeds. K was detected as the most accumulated metal in the seeds. This was found in the seed of *Albizialebbeckas*  $510.0 \pm 2.3\text{mg}/100\text{g}$  while the seeds of *Acacianilotica* had it as  $110.0 \pm 1.1$  respectively. Na, Ca, Mg and P were also detected high in the seeds of *Albizialebbeck*. Na was  $(62.5 \pm 1.2\text{mg}/100\text{g})$ , Ca  $(280.0 \pm 1.7\text{mg}/100\text{g})$  while Mg and P were  $(7.1 \pm 0.4\text{mg}/100\text{g})$  and  $(390.0 \pm 2.7\text{mg}/100\text{g})$ .

study support the fact that some medicinal plants commonly consumed in India are promising sources of potential antioxidants.

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