

## STUDIES ON THE PHYSICO-CHEMICAL PROPERTIES AND FATTY ACID COMPOSITION OF *NYCTANTHES ARBOR-TRISTIS* LINN LEAVES

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### Abstract

Seven fatty acids were isolated from pet-ether extract of *Nyctanthes arbor-tristis* Linn (Seuli) leaves. The relative percentages of the major fatty acids were identified by GLC as palmitic acid (23.88%), linoleic acid (8.95%), stearic acid (47.56%) and oleic acid (5.07%). The yield of the leaves fat was 2.10%. Acid value of seed oil was found to be 76.27 and suggests that this oil is inedible. Physico-chemical characteristic, such as acid value, iodine value, moisture, ash, lignin, crude fibre, fat, protein and carbohydrate of the Seuli leaf were also determined.

**Keywords:** Seuli leaves, *Nyctanthes arbor-tristis* Linn, fatty acids composition.

### Introduction

Bangladesh is flourished with plants, herbs and trees. Various plants are being used for medicinal purposes in Bangladesh and also in other parts of the Indian subcontinent. On the basis of the uses of these plants various traditional systems of medicine have been developed in this part of the world. In Ayurvedic and Unani system of medicine, decoction of the leaves of *Nyctanthes arbor-tristis* Linn is used in the treatment of sciatica, chronic fever, rheumatism, intestinal worms, laxative, cholagogue, diuretic, diaphoretic, expectorant and antimoebic purposes<sup>1,2</sup>.

*Nyctanthes arbor-tristis* Linn, a large shrub cultivated as a garden plant throughout Bangladesh is also found in sub-Himalayan region. Its Bengali name is Seuli. It is a C<sub>3</sub> plant<sup>3</sup>. It has highly fragrant flowers, white and yellow, which do not expand till evening and these flowers fall off before sunrise. Thus during the day the tree loses all its brightness and hence is called "The Sad Tree" (*Arbor-Tristis*). "*Nyctanthes*" means "Night-flowering". Present work mainly deals with the determination of physico-chemical characteristics and analysis of fatty acids in Seuli leaves.

### Experimental

The matured leaves of Seuli plants were collected from the Mymensingh region, Bangladesh during the month of November, 2002. The collected leaves were cleaned, dried and crushed mechanically. Leaves were powdered with machine and dried at 50°C for 3 hours.

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### *Physico-chemical studies*

Physico-chemical characteristics viz. colour, acid value, iodine value, moisture, ash, lignin, crude fibre, fat, protein and carbohydrate of Seuli leaves were determined as per standard method<sup>4-7</sup> and the results are shown in Table 1.

### *Extraction of leaves fat*

Solvent extraction method was employed for the extraction of fat from Seuli leaf. Dried powdered samples (150g) were extracted with low boiling petroleum ether (40<sup>0</sup> - 60<sup>0</sup>C bp) in a Soxhlet extractor (18 hours). The petroleum ether was removed in a Rotary Vacuum Evaporator (Buchii, Switzerland) at 40<sup>0</sup>-50<sup>0</sup>C. The extract was dried in desiccators over silica gel and finally the fat sample was kept in a nitrogen atmosphere in a refrigerator.

### *Preparation of leaves fatty acid methyl ester*

The esterification of the fat was carried out with BF<sub>3</sub>-MeOH complex<sup>8</sup>. 5 mg of fat was taken in a reaction tube and BF<sub>3</sub>-CH<sub>3</sub>OH reagent (5mL) was added and was boiled for 5 min. Hexane (5 mL) was added to it and boiled for further 1 min. After cooling the tube, a saturated salt solution was added and vortexed. Then the upper layer containing methyl esters was transferred to a vial with anhydrous sodium sulfate at the bottom. Then the ester was filtered through syringe filter and transferred to a small vial (2mL). The residual solvent was recovered by blowing nitrogen gas and stored in a refrigerator before analysis by GLC.

### *Preparation of Standard fatty acid methyl ester (FAME)*

Standard fatty acid methyl esters (LIPID STANDARD; Sigma) of caprylic acid, nonanoic acid, capric acid, undecanoic acid, lauric acid, myristic acid, palmitic acid, linoleic acid, oleic acid, stearic acid, arachidic acid and behenic acids were used (Fig.1) for the identification of the sample peaks.

The compositions of the fatty acids were identified by comparing their retention time. The peak areas were calculated by multiplying the height of the peak with the width at half height (area = height × width at half height). Relative percentage of the fatty acids were determined (Fig. 2) by comparing their peak areas and the fatty acid contents of Seuli leaves samples are given in Table 2.

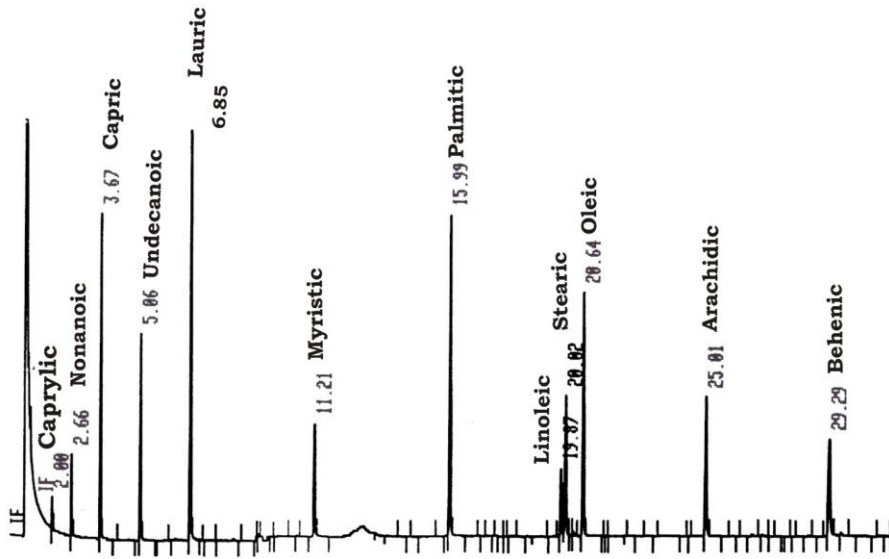


Fig. 1. Standard fatty acid methyl esters chromatogram analyzed by GLC.

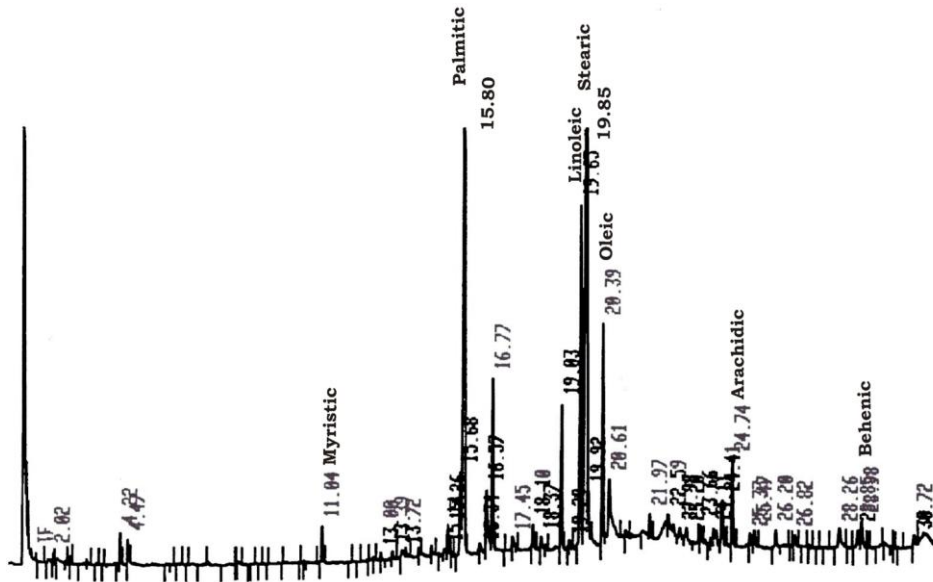


Fig. 2. Chromatogram of methyl ester of Seuli leaves fatty acid analyzed by GLC.

### *Gas Liquid Chromatography (GLC)*

The methyl esters of fatty acid were quantified by gas-liquid chromatography method using a capillary column (2000mm × 4mm) equipped with a flame ionization detector (Pye Unicam 4500). Column packing was done with 10% diethylene glycol succinate on 100-120 mesh diatomic CAW with column temperature 100<sup>0</sup>C, detector temperature 220<sup>0</sup>C, hydrogen flow rate 4mL/min and samples volume of injected 0.1mL was used.

### **Results and Discussion**

Physico-chemical characteristics (Table 1) of Seuli leaves fat was determined to be 2.10%. The fat was of dark green colour. It is a viscous semi solid substance at room temperature. Acid value of Seuli leaf fat was found to be 76.27. High acid value indicates that this oil is inedible. The iodine values of Seuli leaves fat were found to be 134.44. The result indicates that Seuli leaves fat is highly unsaturated.

**Table 1. Physico-chemical characteristics of *Nyctanthes arbor-tristis* Linn leaves.**

<b>Characteristics of leaf fat</b>	<b>Result</b>
Colour	Dark green
Appearance	Viscous semi solid substance
Moisture	50.01%
Ash	13.98%
Lignin	15.87%
Crude fibre	9.41%
Fat	2.10%
Protein	15.02%
Carbohydrate	9.48%
Acid value	76.27
Iodine value (Hanus method)	134.44

The Seuli leaf contained (Table 1) moisture 50.01%, ash 13.98%, lignin 15.87%, crude fibre 9.41%, fat 2.10%, protein 15.02% and carbohydrate 9.48%. Whereas Singh<sup>9</sup> reported the ash and protein content 11.0% and 16.20% respectively, which were comparable to the value determined by us.

The FAME compositions of Seuli leaves fat were determined by Gas Liquid Chromatograph (GLC). The relative percentages of the individual acids were found to be (Table 2) myristic acid 0.7%, palmitic acid 23.88%, linoleic acid 8.95%, oleic acid 5.07%, stearic acid 47.56%, arachidic acid 2.14% and behenic acid 0.87%. There are three unidentified peaks in the chromatogram, where the retention times were 16.77(min), 19.03(min), 20.61(min) and with relative percentages of 3.83, 3.21 and 3.72 respectively. It is evident from Table 2 that the percentages of stearic acid and palmitic acid were highest and the fat therefore may be tapped as a source of stearic acid and palmitic acid. Myristic and behenic acids were present in small amounts in the extract. Unsaturated fatty acids viz. oleic and linoleic acids were found to be moderate quantity.

### Conclusion

The Seuli leaves fat is non edible oil. The main component of stearic acid was found to be higher percentage in the leaf fat. We recommended that the oil will use the industrial purposed.

**Table 2. Fatty acids methyl ester composition of *Nyctanthes arbor-tristis* Linn leaf extract.**

Name of the acids	Retention time (min)	Area (mm)	Relative %
Myristic acid	11.04	1932	0.77
Palmitic acid	15.80	59564	23.88
Linoleic acid	19.65	22335	8.95
Stearic acid	19.85	118620	47.56
Oleic acid	20.39	12634	5.07
Arachidic acid	24.74	5336	2.14
Behenic acid	28.98	2163	0.87
Unknown	16.77	9559	3.83
Unknown	19.03	8015	3.21
Unknown	20.61	9276	3.72

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