Characteristics and Composition of Indian Wood Apple Seed and Oil

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ABSTRACT

Indian wood apple seed (*Feronia elephantum* Correa) constituting 6% (dry weight basis) of the fruit, contains 34% oil and 28% protein. The kernel comprises 62% of the seed. The oil is yellow with an iodine value 131, saponification value 192, unsaponifiable matter 1%. Fatty acid profile of oil by GLC is: palmitic 19.3, stearic 7.3, oleic 27.2, linoleic 19.8 and linolenic 26.4%.

INTRODUCTION

Wood apple (*Feronia elephantum* Correa) is a fruit crop of considerable importance in India. The tree is native to India and Sri Lanka and is found throughout the plains of India. All parts of wood apple tree are useful. Considerable data on the fruit, gum, leaves, bark and pulp are available in the literature (1). The tree produces a round, hard shelled (shell thickness 5 mm), and dull white fruit of assorted diameters (small 6 cm and big 12 cm). Inside the shell, a soft, brown acidulous fragrant pulp, with seeds freely embedded in it, is found. The pulp is edible and is frequently used in the Indian cookery. The pulp contains 3-5% pectin and forms an excellent material for jelly with agreeable flavor and consistency. There is no information in the literature on the nature and composition of wood apple seed and oil.

EXPERIMENTAL PROCEDURES

Wood apple fruit, fresh from the harvesting season (November – January) was procured from a local market. The shell and pulp were separated by breaking the fruit and scraping the inside part of the shell. The seed was recovered by agitating the fruit pulp repeatedly with hot water and straining the aqueous suspension through filter cloth. The wet seed was dried in the sun, and also by hot air in an air oven. The seed was ground and extracted by normal hexane in a batch extractor. The miscella was pooled and solvent distilled off. The resulting oil was used for further experiments. Moisture, protein, oil, FFA of oil, crude fibre and ash contents of the seed and characteristics of the oil were determined following the Official and Tentative Methods of the American Oil Chemists' Society (2).

Methyl esters were prepared by saponifying 1 to 2 g of the oil and methylating the free fatty acids. Thin layer chromatography (TLC) of the methyl esters was carried out on 0.25 mm thick Silica Gel C (ACME Chemical Works, Bombay) layers coated on glass plates (20 x 20 cm) using normal hexane/ethylether/acetic acid (90:10:1 v/v) as developing solvent and sulfuric acid for detection. Argentation TLC of the methyl esters was carried out on silica gel C plates impregnated with silver nitrate (5%) using n-hexane/ethyl ether (94:6 v/v) as developing solvent and 2′, 7′ dichlorofluorescein as spraying agent for detection under UV light. Methyl palmitate, elaidate, oleate, and methyl esters of linseed oil were used as reference compounds.

Gas liquid chromatography (GLC) of the methyl esters was carried out on a polyester column using a Toshniwal gas chromatograph equipped with a flame ionization detector. The polyester column, 2.4 m x 0.32 cm, was packed with Gas Chrom Q (80-100 mesh) coated with 10% EGSS-X. The column was maintained at 190 C. Flow rates of the carrier gas (N_2) were 40 ml per minute in both columns. Methyl heptadecanoate was used as internal standard.

RESULTS AND DISCUSSION

The wood apple fruit contains 47-58% shell (average 53%) and 32-38% pulp (average 36%). Wet seed constitutes ca. 11% and dry seed 6% of the weight of the whole seed. The seed is flat in shape with a pointed end. The seed coat is light brown while the kernel when fresh is soft and white in color. The characteristics and composition of wood apple seed are given in Table I. The characteristics of wood apple seed oil are given in Table II. The oil is yellow in color. Its iodine value indicates that it is a semi-drying oil like safflower oil and tobaccoseed oil. TLC of the methyl esters on silica gel indicated the absence of any unusual components, while argentation TLC showed the spots corresponding to saturated, mono-, di- and triunsaturated methyl esters only and the absence of *trans* unsaturated components. GLC

TABLE I

Characteristics and Composition of Wood Apple Seed

Seed size: Length mm (Av)	7
Breadth mm (Av)	4
Thickness mm (Av)	2.5
Seed index, wt. of 100 seeds, g	3.0
Moisture, %	4.0
Oil, %	34.0
Free fatty acid of extracted oil (% oleic)	0.7
Total protein, %	28.0
Total ash, %	4.0
Crude fibre, %	19.0
Hull/kernel ratio of the seed	38:62

TABLE II

Characteristics of Wood Apple Seed Oil

Characteristics	Wood apple seed oil
Specific gravity at 37.5 C	0.9149
Refractive index at 25 C	1.4674
Iodine value (Wijs)	131.0
Acid value	1.5
Saponification value	192
Unsaponifiable matter, %	1.0
Color	Yellow with orange tinge

TABLE III

Fatty Acid Composition (by GLC) of Wood Apple Seed Oil

Fatty acid	% by weight
Palmitic ..	19.3
Stearic ..	7.3
Oleic ..	27.2
Linoleic ..	19.8
Linolenic ..	26.4

analysis showed that a little more than a quarter of the fatty acids consisted of saturated acids, the major one (19.3%) being palmitic acid (Table III). Oleic and linolenic acids are present in nearly equal quantities, the latter (linolenic) content (26.4%) being quite high when compared to other common vegetable oils.

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