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THE FATTY ACIDS OF INDIGENOUS RESOURCES FOR POSSIBLE INDUSTRIAL APPLICATIONS

Part XI. Chemical Investigations and Utilization Studies on Seed Oil of *Bombax malabaricum* (Simal)

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The chemical composition of the seed oil of *Bombax malabaricum* locally known as simal or simbal has been evaluated. The seeds yielded 17.2 % pale oil, composed of myristic (3.4 %), palmitic (4.7 %) palmitoleic (7'2 %), stearic (9.2 %), oleic (44.3 %), linoleic (25.6 %) and behenic acid (3.7 %) and unsaponifiable matter (1.78 %).

Key words: Fatty acids composition, Seed oil, *Bombax Malbaricum.*

INTRODUCTION

Bombax malabaricum [1] locally known as simal or simbal is a tall deciduous tree with trunk usually undevided. Leaves 4-8 inches long lanceolate, acuminate at the base. Flowers crimson, large and numerous, appearing before new leaves on short thick pedicels, clustered towards the ends of the branches. Calyx thick, fleshy, cup-shaped, smooth outside, bright silky-hairy within. The seeds smooth, 25" long, packed in white cotton.

Bombax malabaricum is now being widely grown in Pakistan because its wood is used for making match sticks. The tree has rapid growth reaching large dimensions in deep moist soil. On dry rocky hills in Hazara and Rawalpindi, *simal*, though reproducing fairly well from seed, remains a small ungainly tree. Its cotton is used for stuffing pillows and quilts.

Pakistan faces an acute shortage of oils and fats for both edible and industrial purposes. In 1983-84 the quantity of edible oils imported was 760,000 tonnes [2], costing Rs. 6,000 millions in foreign exchange to meet the domestic liability which increases every year by 7 % and defeats the planner's efforts at self sufficiency. In continuation of the earlier studies [3-12] aiming at the screening of indigenous sources, the seed oil from *Bombax malabaricum* has now been evaluated. It has been estimated that almost 400 tonnes of the oil can be obtained from this source alone.

MATERIALS AND METHODS

Extraction of the oil. The crushed seeds (250 g.) were extracted with petroleum ether (b.p. 40-60°) in a Soxhlet apparatus for 4 hr. The oil was dried over sodium sulphate, filtered and the petroleum ether was distilled off to give a pale oil (43.0 g, 17.2 % yield). Various characteristicts of the oil as determined by standard physico-chemical methods [13, 14] are given in Table 1.

Table 1. Physico-chemical characteristics of the seed oil of Bombax malabaricum

1.	Refractive index at 30°	1.3830
2.	Acid value	11.7
3.	Iodine value	81.5
4.	Saponification value	177.3
5.	Sp. gr. 30°	0.9068

Saponification of the Oil, Liberation and Methylation of the Fatty Acids. The oil (5 g) was saponified with 0.5N ethanolic sodium hydroxide solution (20 ml) under reflux for 1/2 hr. The fatty acids were liberated from the saponified mass by 2N sulphuric acid. The liberated acids (4.928 g, 98.28 %) were converted to their methyl esters by reacting with methanol in the presence of concentrated sulphuric acid. The fatty acid mixture (1 g) was refluxed for 3 hr. with methanol (50 ml) and a few drops of concentrated sulphuric acid. Excess amount of methanol was distilled off. Methyl esters of the fatty acids were extracted with diethyl ether, dried over anhydrous sodium sulphate, filtered and the solvent removed under vacuum. The methyl esters thus obtained were checked by TLC and infrared spectrophotometer (Beckman – Model 5A). The absence of peak at 2.9 μ and shifting of C = O peak from 5.9 μ to 5.75 μ ensures complete esterification of the fatty acids.

Resolution and identification of fatty acids by gas chromatography [15]. Methyl esters of the total fatty acids were analysed on a PYE Unicam 104 gas chromatograph with flame ionization detector using ¼" i.d., 4 ft

glass column of 10 % diethylene glycol succinate, coated on 80-100 mesh celite, column temp. 160, injection temp 200°, dectector temp. 250° and with nitrogen as the carrier gas at a flow rate of 30 ml/min. The methyl esters were identified by comparing their retension times and co-injection of standard esters. The percentage of various acids was determined using PYE Unicam DP 88 computing integrator and are recorded in Table 2.

Table 2. Percentage of various acids present in the seed oil of *Bombax malabaricum*

1.	Myristic acid	3.4
2.	Palmitic acid	4.7
3.	Palmitoleic acid	7.2
4.	Stearic acid	9.2
5.	Oleic acid	44.3
6.	Linoleic acid	26.6
7.	Behenic acid	3.7

RESULTS AND DISCUSSIONS

The fatty oil from seeds of *Bombax malabaricum* was obtained by solvent extraction and the fatty acids mixture was obtained by saponification. The low saponification value (177.3) of the oil indicates the presence of fatty acids having long carbon chains. The iodine value measures the total unsaturation, thus serving as a guide for classifying as drying, semi drying or non-drying oil. In the present studies of seed oil of *Bombax malabaricum*, the iodine value (81.5) shows it to be a semi drying oil.

The methyl esters of the total fatty acids were analysed by vapour phase chromatography and the results are recorded in Table 2.

The above results show that oleic acid and linoleic acid are the major constituents of the oil. It is also evident that the percentage of saturated acids is a little higher (21.0 %). A study of its physical values and chemical composition indicate that the oil can be used for general purposes as semi drying oil and in soap industry.

REFERENCES

1. R.N. Parker, "The Forest Flora for the Punjab with Hazara and Delhi"(Government Printing Press , Lahore, West Pakistan, 1956), 3rd ed., p. 41.
2. Statistical Bulletin, Federal Bureau of Statistics, Statistics Division, Government of Pakistan, **32**, No. 6, p. 188 (June 1984).
3. M. Salim, M. Ashraf, S.A. Khan and M.K. Bhatty, Pakistan J. Sci. Ind. Res., **9**, 347 (1966).
4. Muhammed Ashraf, S.A. Khan, and M.K. Bhatty, Pakistan J. Sci. Ind. Res., **14**, 399 (1971).
5. M.A. Javed, S.A. Khan, M.I. Qureshi and M.K. Bhatty. Pakistan J. Sci. Ind. Res. **15**, 247 (1972).
6. S.A. Khan, M.I. Qureshi and M.K. Bhatty, Pakistan J. Sci. Ind. Res. **15**, 402 (1972).
7. M. Saleem, M. Sarwar, S.A. Khan, M.K. Bhatty, Pakistan J. Sci. Ind. Res., **20**, 405 (1975).
8. M. Saleem, Din Mohammad, Manzoor Ahmad, M.Y. Raie, S.A. Khan and M.K. Bhatty, Pakistan J. Sci. Ind. Res., **24**, 21 (1981).
9. S.A. Khan, Din Mohammad, J.I. Khan and M.K. Bhatty, Pakistan J. Sci Ind. Res., **28**, 27 (1984).
10. S.A. Khan, Khizar Hayat Khan, Shahina Zaka, Imran Waheed, M.Y. Raie and M.K. Bhatty, Pakistan J. Sci. Ind. Res., **28**, 400-2 (1985).
11. M. Nazir, S.A. Khan and M.K. Bhatty, Pakistan J. Sci. Ind. Res., **29**, 135 (1986).
12. Muhammad Ratique, F. M. Chaudhary and S.A. Khan, Pakistan J. Sci. Ind. Res., **29**, 193 (1986). Sci.
13. J. Devine and R.N. William, *Edible Oils and Fats* , (Pergamon Press Oxford, London, Paris, New York, 1961), Ist ed. p. 127-30.
14. K.A. William, *Oils, Fats and Fatty Foods* (J.A. Churchill Ltd., 1966). 4th ed., p. 95, 123, 132-3, 137, 139.
15. A.I.M. Kuleman, *Gas Chromatography* (Reinhold Publishing Corp., New York, 1959), 2nd ed., p. 27.