

❁ Cyclopropenoid Fatty Acids in Leguminosae Oils

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Seed oils of *Cassia grandis*, Linn and *Delonix elata*, Gamble, Syn. *Poinciana elata*, Linn, belonging to the Leguminosae family contain small amounts of sterculic and malvalic acids as determined by conversion of esters with $\text{AgNO}_3/\text{MeOH}$, NMR and IR.

Cassia grandis, Linn, is a small tree with pods 1.5–2 ft long. It is a native of tropical and Central America and the West Indies. It has been introduced into Indian Gardens. It flowers in April and May (1).

Delonix elata, Gamble, Syn. *Poinciana elata* is an erect tree, 20–30 ft high. It bears feathery foliage and handsome pale yellow flowers with reddish filaments. The leaves are said to be used in treating rheumatism and flatulence (2).

This paper describes the first report of the fatty acid composition of *Cassia grandis* and *Delonix elata* oils.

EXPERIMENTAL PROCEDURES

Seeds were ground and analyzed for oil content by overnight extraction with petroleum ether (b.p. 40–60 C) in a Soxhlet extractor. The solvent was removed in vacuo at 40 C. The analytical values of oils were determined according to standard AOCS methods (3).

The oils responded to the Halphen test (4), indicating the presence of cyclopropenoid fatty acids. However, the oils did not respond to the picric acid TLC test, indicating the absence of epoxy fatty acids (5). Reversed phase TLC of esters of both oils was carried out with acetonitrile-acetic acid-water (70:10:20, v/v/v) as the solvent system, and revealed a spot near the starting point corresponding to the spot exhibited by *Sterculia foetida* esters which were used as reference.

IR spectra of oils were determined as 1% solution in carbon tetrachloride on a Perkin-Elmer Model-577 instrument. NMR spectra were run in CDCl_3 on an EM-360 60 MHz spectrometer with tetramethylsilane as the internal standard.

TABLE 1
Analytical Data on Oils

	<i>Cassia grandis</i>	<i>Delonix elata</i>
Oil content in seeds	5.0%	13.5%
Unaponifiable matter	1.5%	1.0%
Iodine value	93.3	97.5
Saponification value	199.1	198.2
Halphen test	+ve	+ve
Picric acid TLC test	-ve	-ve
Infrared (I.R.)	1010 cm^{-1}	1010 cm^{-1}
Fatty acids		
Myristic	2.0	0.4
Palmitic	22.7	18.8
Stearic	5.9	14.6
Oleic	25.8	18.2
Linoleic	37.8	45.0
Malvalic	3.6	1.7
Sterculic	2.2	1.3

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The fatty acid methyl esters were prepared by transesterification of oil with absolute methanol that contained 1% sodium methoxide. The reaction was allowed to proceed by refluxing for 20 min, and methyl esters were extracted with ether as usual.

The methyl esters of each oil (200 mg) were treated with 60 ml of absolute methanol saturated with silver nitrate (6) (10 ml). The reaction was allowed to proceed at room temperature with stirring for 24 hr. The normal methyl esters and the reaction products from cyclopropene fatty esters were recovered from the reaction mixture by adding 100 ml of distilled water and extracting with ether. The extracts were dried over anhydrous sodium sulphate, and solvent was evaporated in a stream of nitrogen. GLC analysis was done on a Perkin Elmer Sigma unit with DEGS column. *Sterculia foetida* seed oil was used as a reference.

RESULTS AND DISCUSSION

The seeds of *Cassia grandis* and *Delonix elata* yielded 5.0% and 13.5% oil, respectively. Both species belong to the Leguminosae plant family. Analytical data are given in Table 1.

The oils responded to the Halphen test, indicating the presence of a cyclopropenoid functional group. Both oils showed a typical nuclear magnetic resonance (NMR) signal at 9.28 τ for cyclopropene hydrogens.

The methyl esters and oils of *Cassia grandis* and *Delonix elata* had the characteristic infrared absorption at 1010 cm^{-1} . The quantitation of total cyclopropenoid fatty acids by HBr titration (7) showed the presence of 6.0% and 3.2% by weight of cyclopropenoid acids in *Cassia grandis* and *Delonix elata* oils, respectively. *Cassia grandis* seed oil contains palmitic acid (22.7%) as the major component among the saturated acids, with smaller amounts of stearic (5.9%) and myristic (2.0%). The unsaturated acids are linoleic (37.8%) and oleic (25.8%). The cyclopropenoid acids are malvalic (3.6%) and sterculic (2.2%).

The seed oil of *Delonix elata* contains palmitic (18.8%) and stearic (14.6%) acids as the major component fatty acids among the saturated acids, with a small amount of myristic acid (0.4%). The unsaturated acids are oleic (18.2%) and linoleic (45.0%). The cyclopropenoid acids are malvalic (1.7%) and sterculic (1.3%). The results are summarized in Table 1.

REFERENCES

1. Cooke, T., *The Flora of the Presidency of Bombay, I*, Calcutta, Botanical Survey of India, 1958, p. 454.
2. *The Wealth of India, Raw Materials*, C.S.I.R., New Delhi, Vol. III, 1952, pp. 29–30.
3. *Official and Tentative Methods of the American Oil Chemists' Society*, 3rd edition, edited by W.E. Link, AOCS, Champaign, IL, 1973.
4. Halphen, G., *J. Pharm.* 6:390 (1897).
5. Fioriti, J.A. and R.J. Sims, *J. Chromatography* 32:761 (1968).
6. Schneider, C.L., S.P. Loke and D.T. Hopkins, *J. Am. Oil Chem. Soc.* 45:585 (1968).
7. Harris, J.A., F.C. Magne and E.L. Skau, *Ibid.* 40:718 (1963).

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