

Helicteres isora (Sterculiaceae) seed oil as a minor source of cyclopropenoid fatty acids

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ABSTRACT

The seed oil of *Helicteres isora* (Sterculiaceae) contained Cyclopropenoid fatty acids (CPFA) as a minor component in the seed glycerides. The structural elucidation of CPFA is performed using, Thin layer chromatography, Gas liquid chromatography, U.V, I.R and N.M.R spectroscopy. The Cyclopropenoid moiety is resolved into two components as silver nitrate-methanol derivatives of malvalic and sterculic acids.

Keywords: *Helicteres isora*, Cyclopropenoid fatty acids, sterculic and malvalic acids.

1. INTRODUCTION

Helicteres isora belongs to Sterculiaceae family (Figure 1). It is also called Indian screw tree. It has both nutritional and medicinal properties. The root juice and bark of *Helicteres isora* are considered to be expectorant, astringent, antilactagogue, to reduce gripping and a cure for snakebite [1]. Its fruits are used as stomachic, vermifuge, vulnerary and useful in bowel gripes [2]. Fried pods are given to children to kill intestinal worms [3]. The seed oil of *Helicteres isora* showed positive Halphen test which confirmed the presence of Cyclopropenoid fatty acids [4]. HBr titration method is used for quantitative estimation of total CPFA [5].



Figure -1: *Helicteres isora* plant with flower and pod

2. MATERIALS AND METHODS

The seeds were collected from different sites especially grown in arid and semi arid

regions. After proper cleaning, drying and weighing an exact amount of seeds were Soxhlet – extracted with petroleum ether (40° – 60°C) and the solvent was evaporated under vacuum using rotary evaporator. The analytical values of oil and seeds were determined according to the procedure recommended by American oil chemical society [6]. The results were reported as weight percentages (Table 1). Kjeldahl method was used to determine the protein content of the defatted seeds. Thin layer chromatographic techniques and silver ion TLC were used to resolve different fatty acid components of the oil. The fatty acids esters were prepared using transesterification of the seed oil. The GLC analyses of oil samples were performed by Amil Nucon gas chromatograph model No.5700 equipped with a flame ionization detector. The IR spectra were determined on Jasco-made FTIR spectrophotometer. The separation of CPFA fraction was done by preparative TLC. Shimadzu UV-1601 spectrophotometer was used to record UV spectra of the oil and its derivatives. The NMR spectra have been conducted with Bruker's X 300 spectrophotometer.

3. RESULTS AND DISCUSSION

During the course of chemical analyses, *Helicteres isora* seed oil responded positive Halphen test (red colour when heated with 1% solution of sulphur in CS₂) [4] and was taken for the estimation and characterization of Cyclopropenoid fatty acids. The literature showed that some work on fatty acids has been reported by Gunston and co-workers [7]. Light petroleum

composition of methyl ester of this fraction is given in (Table 2).

3.2. Characterization of fraction - II

The direct TLC of this fraction had R_f 0.55 and responded positively to Halphen test⁴. HBr-titration estimated CPFA upto 8.75% by weight^[5]. IR spectrum clearly gave bands at 1010 and 1852 cm^{-1} in addition to other bands for normal fatty acids. The base catalyzed trans-esterification of this fraction gave methyl esters which also showed the IR band for CPFA at 1010 cm^{-1} . The NMR spectrum of this fraction showed signals at τ 9.29 for cyclopropenoid group in addition to other usual fatty acid proton signals viz. τ 6.4 (3H, COOCH_3), τ 7.8 (2H, α to carbonyl), τ 8.8 (Chain CH_2) and τ 9.12 (3H, terminal CH_3). The U.V. spectrum indicated no conjugation or trans-unsaturation in this fraction. The GLC of methyl esters with silver nitrate in absolute methanol produced derivatives of CPFA following the procedure of Schneider and co-workers^[8]. The GLC chromatogram clearly established the presence of malvalic and sterculic acids in the seed oil using Sterculia foetida ester as reference standard (Table 2). The GLC data of Cyclopropenoid fatty acids were in close agreement with those obtained by HBr-titration^[5].

The experimental work showed conclusively the presence of CPFA in this fraction of the oil *H. isora* seed oil. The GLC analysis of AgNO_3 -methanol treated methyl esters clearly showed the presence of malvalic acid (3.25%) and sterculic acid (5.50%) in addition to the normal fatty acids. The AgNO_3 -methanol treated products formation from malvalic and sterculic esters has been depicted in scheme I.

4. CONCLUSION

In conclusion it may be added that analysis of AgNO_3 -Methanol treated esters of CPFA containing seed oil is a method of choice both for characterizing and estimating the individual sterculic and/or malvalic acid in the seed oils. This method of analysis has the advantage of not reacting with other unsaturated acids present in the oil. This method has been successfully used for seed oil containing low level of Cyclopropenoid material.

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