Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
https://www.phytojournal.com
JPP 2023; 12(6): 272-274
Received: 18-09-2023
Accepted: 21-10-2023

Srushti S Kale
Department of Botany,
Dr. Babasaheb Ambedkar
Marathwada University,
Aurangabad, Maharashtra, India

Arvind S Dhabe
Department of Botany,
Dr. Babasaheb Ambedkar
Marathwada University,
Aurangabad, Maharashtra, India

Corresponding Author:
Srushti S Kale
Department of Botany,
Dr. Babasaheb Ambedkar
Marathwada University,
Aurangabad, Maharashtra, India

Qualitative phytochemical screening and FTIR spectroscopic analysis of *Thalictrum dalzelli* hook leaf extract

Srushti S Kale and Arvind S Dhabe

DOI: https://doi.org/10.22271/phyto.2023.v12.i6c.14793

Abstract
The present study aim is to analyses the phytochemicals present in *Thalictrum dalzelli* Hook leaf extracts by using Qualitative phytochemical analysis and Fourier-transform infrared spectroscopy (FTIR).The leaf extracts were prepared using five different solvents. The phytochemical analysis and Fourier transform infrared spectroscopy (FTIR) analysis were performed using standard methods. The FTIR analysis shows the presence of different functional groups present in the leaf extracts. The present study generated the profile for the medicinally important plant *Thalictrum dalzelli* Hook. The present study provides evidences that different extracts of leaf is useful to cure many serious diseases which remained still problematic and for further isolation of bioactive compounds from the plant which could be of interest for the development of the new drug.

Keywords: *Thalictrum dalzelli* Hook, phytochemicals, fourier-transform infrared spectroscopy (FTIR)

Introduction
The genus Thalictrum belongs to the order Ranunculales of family Ranunculaceae. The order Ranunculales consists of 10 families, among which Ranunculaceae is the largest (with ca. 50 genera and more than 2000 species). (Cronquist A. 1981) [1]. To date more than 60 triterpenoids and their glycosides have been discovered in the genus, and most of them are new compounds. Those saponins, which have been isolated from plants of the Thalictrum genus, have considerable biological activity (Khamidullina EA *et al.* 2006) [2]. A careful study of the systematic location of the Thalictrum genus has been given by Bochanceva. At the end of the 1960's Tamura suggested intraspecific systematization of the Thalictrum genus, which takes into account the existing genus system. Tamura's systematization is currently considered to be the most advanced. At least 43 species of Thalictrum have been used because of their special and proven therapeutic effects. Until recently, studies on the chemical constituents of the Thalictrum genus have been mainly confined to the alkaloids. More than two hundred alkaloids have been isolated from this genus. (Kuzmanov B, 1982) [4].
The Thalictrum genus belongs to Ranunculaceae family and considered as extremely abundant medicinal plant source and more than 200 species are distributed worldwide (Chen SB, *et al.*, 2003) [5]. Thalictrum plants are rich in benzylisoquinoline derived alkaloids, at least 250 have been isolated from 60 species and most of them with strong biological activities, extracts and alkaloid isomers from Thalictrum are known to exhibit various pharmacological activities, including antitumor, antimicrobial, antiamebic and HIV antiviral activities (Chen SB, *et al.*, 2003) [5]. *Thalictrum dalzelli* Hook. is a small erect herb grown in hill forests. According to Red Data Book of Indian Plants, this species is categorized under 'Indeterminate' category (endangered or extinct), (Nayar MP, *et al.*, 1987) [6]. This plant is vulnerable and endemic to western Ghats of Maharshtra. (Tetali, *et al.* 2000) [12].

Materials and Methods
Collection, Authentication and Processing of plant material: The plant material was collected in 2021 from Harishchandra Gadh, It is a hill fort in the Ahmednagar district situated in the Malshej Ghat. It climbs up to an altitude of 4,670 ft. The plant authenticated by Sr. Prof. Arvind S. Dhabe, Head of Department and well known Taxonomist of Department of Botany, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad. The Voucher specimens were deposited in the BAMU herbarium, Dr. Babasaheb Ambedkar Marathwada University. The samples were washed thoroughly in running tap water to remove soil particles and adhered debris and finally washed with sterile distilled water.

The leaves were cut, shade dried, ground into a fine powder and stored in airtight polythene bags until use.

Extraction: The shaded dried leafs were powdered in the medical grinder. 100 grams of leaf powder was weighed, 300 ml of different solvents of Distilled water, Ethanol, Methanol, Chloroform and ether used each and individually with soxhlet extraction method. It was then transferred to glass vials and kept at 4 °C for future use.

Preliminary phytochemical analysis: Qualitative phytochemical analysis was carried out and the results observed were based on the color change or precipitate formation after the addition of specific reagents. (Savithramma N, *et al.* 2011) [7].

Fourier transform infrared spectrophotometer (FTIR): Fourier Transform Infrared Spectrophotometer (FTIR) is the most powerful tool for identifying the types of chemical bonds and functional groups present in compounds. (Oliveira RN, *et al.* 2016) [8]. The wavelength of light absorbed is characteristic of the chemical bond. By interpreting the infrared absorption spectrum, the chemical bonds in a molecule can be determined. Dried powder of leaf of *Thalictrum dalzelli* Hook. plant material was used for FTIR analysis. 10 mg of the dried extract powder was encapsulated in 100 mg of KBr pellet, in order to prepare translucent sample discs. The powdered sample of leaf specimen was loaded in FTIR spectroscope (Shimadzu, IR Affinity 1, Japan), with a Scan range from 400 to 4000 cm-1 with a resolution of 4 cm-1.

Results

Table 1: Preliminary phytochemical screening of Leaf of *Thalictrum dalzelli* Hook

Sr. No.	Phytochemicals	Aqueous Extract	Ethanolic Extract	Methanolic Extract	Chloroform Extract	Ether Extract
1.	Terpenoid	-	+	-	-	+
2.	Alkaloid	+	+	+	+	+
3.	Saponin	-	-	-	-	-
4.	Flavonoid	+	+	+	-	-
5.	Steroid	-	+	-	-	_
6.	Diterpene	-	+	+	+	+
7.	Phenol and tannin	+	+	+	+	-
8.	Protein	+	+	+	+	-
9.	Phytosterol	+	+	+	-	-

(- Absent, + Present)

Functional groups identification

The FTIR spectrum was used to identify the functional groups of the active components present in extract based on the peaks values in the region of IR radiation. When the extract was passed into the FTIR, the functional groups of the components were separated based on the ratio of its peak. The results of FTIR analysis confirmed the presence of alcohol, phenol, alkanes, aldehyde, aromatic compound, secondary alcohol, aromatic amines, and halogen compound.

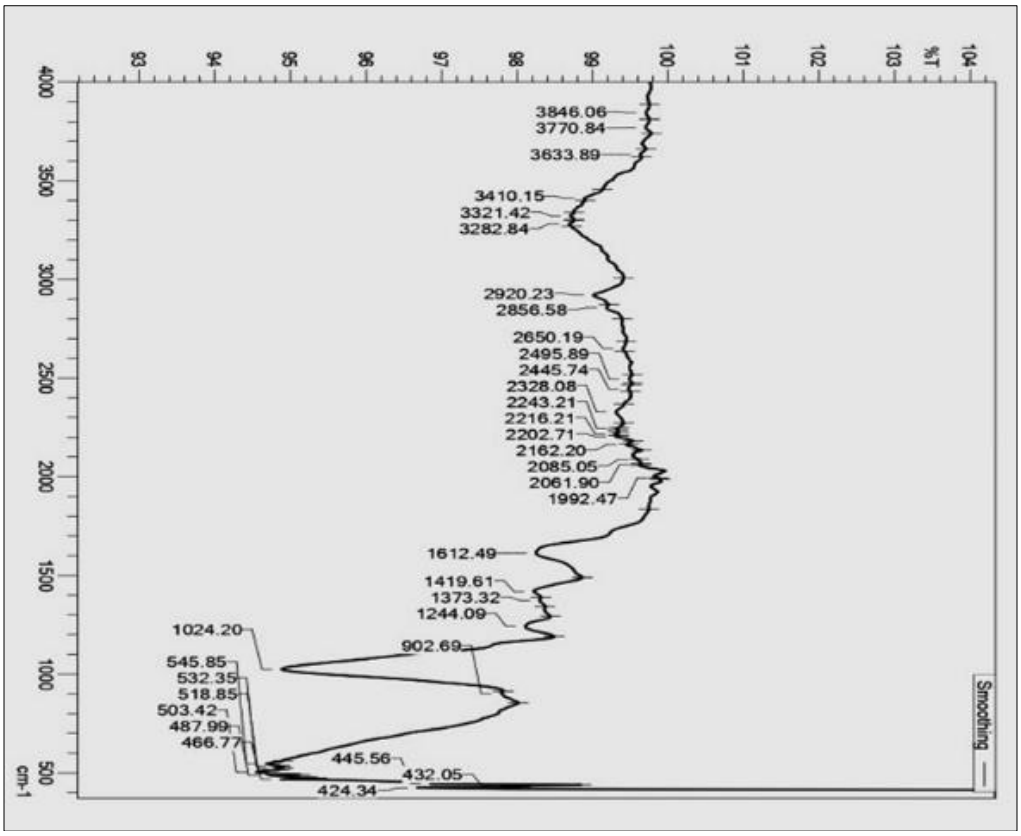

Fig 1: FTIR Spectrum of *Thalictrum dalzelli* Hook. Leaf

Table 2: FTIR Interpretation of compounds

Sr. No.	Absorption (cm-1)	Appearance	Chemical bonds	Compound Class
1.	3770.84	Sharp	O-H	Alcohol
2.	3321.42	Medium	N-H	Amine
3.	2920.23	Strong	C-H	Alkane
4.	2328.08	Medium	O=C=O	Carbon dioxide
4.	1612.49	Broad	C=C	alkene
5.	1419.61	Sharp	C-H	Alkane
6.	1244.09	Medium	C-N	Amine
7.	1024.20	Strong	S=O	Sulfoxide
8.	487	Sharp	C-Br	Halo

Discussion

The pharmacological action of crude drugs and other therapeutic uses are due to their therapeutically active constituents such as tannins, flavonoids, alkaloids and several other aromatic compounds or secondary metabolites of plants which serve as defense mechanism against predation by many microorganisms, insects and herbivores. So, the preliminary phytochemical analysis revealed pronounced importance because the leaf of plant *Thalictrum dalzelli* Hook. Possess varied composition of secondary metabolites. The FTIR analysis revealed the presence of alkaloids due to N-H stretching at 3321.42, polyphenols and flavonoids due to O-H stretching at 3770.84, terpenes due to C-H group 1419.61. The functional groups present in test plant are aldehydes, alkenes, amines, amides, alcohols, phenols, aromatics, carboxylic acids and anhydride, esters and lactones, ethers and organic halogen compounds. These were confirmed by FT-IR spectrophotometer study that predicted the presence of the groups: O-H, N-H, C-H, C=C, nitrates and silicates stretching. The presence of characteristic functional groups of carboxylic acids, anhydrides, alcohols, phenols, amines, amides, esters, ethers, sulphur derivatives, glycosides, nitrates, nitriles, isonitriles, organic halogens and carbohydrate could be responsible for the various medicinal properties of *Thalictrum dalzelli* Hook. plant.

Conclusion

In the present study analysis of *Thalictrum dalzelli* Hook. leaf was done. It will act as Pharmacognostical marker to distinguish the medicinally important endemic Thalictrum species. Thalictrum has tremendous medicinal values used in many traditional systems of medicine. It has multiple chemical components and still there is scope to explore more. Multiple chemical constituents and its utilization signify its high demand in the drug markets or pharmaceutical companies. In depth phytochemical studies along with *in vitro* studies with respect to their active principles can help in tapping the full medicinal potential of the genus. This spectroscopic technique is relatively simple, cost effective and can be useful to easily detect functional groups. The results of present study is a way to predict and compare the phytoconstituents present in this plant with other bioactive medicinally important plants.

Acknowledgement

The authors are thankful to the CSMNRF for financial support which enabled me to successfully complete the research and Department of Botany, Dr. Babasaheb Ambedkar Marathwada University for providing lab facility.

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