Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
Impact Factor (RJIF): 6.35
www.phytojournal.com
JPP 2025; 14(5): 323-327
Received: 02-06-2025
Accepted: 05-07-2025

Dr. GN Pramodini
Professor & HOD, Department of Pharmacognosy, Nehru College of Pharmacy, KUHS University, Thrissur, Kerala, India

Surya S Nair
M. Pharm Scholar, Department of Pharmacognosy, Nehru College of Pharmacy, KUHS University, Thrissur, Kerala, India

Corresponding Author:
Surya S Nair
M. Pharm Scholar, Department of Pharmacognosy, Nehru College of Pharmacy, KUHS University, Thrissur, Kerala, India

Phytochemical standardization of *Ipomoea mauritiana* tuber extract using HPTLC

GN Pramodini and Surya S Nair

DOI: https://www.doi.org/10.22271/phyto.2025.v14.i5e.15588

Abstract
Background: *Ipomoea mauritiana* Jacq. (Convolvulaceae) is extensively employed in Ayurvedic drug preparations, but its phytochemical standardization is limited. High-Performance Thin-Layer Chromatography (HPTLC) provides a sensitive method for the development of chemical fingerprints and marker identification.
Methods: Tubers were extracted with 80% ethanol using Soxhlet apparatus. The extract was analyzed using HPTLC on silica gel 60 F254 plates using toluene:ethyl acetate:methanol:formic acid (5:5:1:0.3) as the mobile phase. Chromatograms were detected under UV at 254 and 366 nm, and scopoletin and quercetin standards were used.
Results: Ten peaks were recorded at 254 nm, the largest peak (Rf 0.87) corresponding to scopoletin. Six peaks were recorded at 366 nm, with no clear detection of quercetin, indicating trace amounts only.
Conclusion: Scopoletin was established as a major marker of *I. mauritiana*, and a reproducible HPTLC fingerprint was developed. The findings are a sound foundation for standardization, authentication, and quality control of its herbal products.

Keywords: *Ipomoea mauritiana*, HPTLC fingerprinting, scopoletin, quercetin

Introduction
Kshiravidari, or *Ipomoea mauritiana*, is a climbing vine from the Convolvulaceae family commonly known as a morning glory species [1]. It is mentioned as Kshiravidari in the Ayurvedic Pharmacopoeia of India. The tubers, usually marketed as Vidari, are present in over 45 Ayurvedic preparations and are also taken separately as a medicine. Vidari is significant in classical formulations like Chyavanaprasha, in which it is considered for its extensive pharmaceutical uses like aphrodisiac, cardiotonic, demulcent, diuretic, refrigerant, galactagogue, and general tonic [2]. Phytochemically, *I. mauritiana* tubers are said to consist of a variety of bioactive compounds. Phytochemical screening indicated the occurrence of triterpenes/steroids, flavonoids, coumarins, alkaloids, phenolics, saponins, tannins, glycosides and other secondary metabolites [3]. The tuberous roots are particularly found to be richer in phytochemicals like scopoletin, β-sitosterol, taraxerol, and taraxerol acetate [4].
In the last few decades, there has been a remarkable surge in the usage of medicinal plants in the pharma and nutraceutical industries. Due to the ongoing influx of herbal products onto the world market, the need for effective analytical tools to provide safety, efficacy, and quality has increased exponentially. Among the most adaptable and reliable methods in this context is High-Performance Thin-Layer Chromatography (HPTLC). It yields reproducible results, sharp purity profiles, and precise assay values, and offers the possibility of analyzing several samples with mixed composition simultaneously [5, 6].

Materials and Methods
Extraction
25 g of powdered and dried tuber of *Ipomoea mauritiana* was extracted using a Soxhlet apparatus with 80% ethanol in an amount of 500 mL. The process was completed, and then the extract was passed through Whatman filter paper. The filtrate was concentrated by removing the solvent through evaporation. The crude extract thus obtained was kept in an airtight container, and the percentage yield was calculated using formula [7].

$$\text{Percentage yield} = \frac{\text{Weight of extract}}{\text{Weight of plant material taken}} \times 100$$

High Performance Thin Layer Chromatography

High-Performance Thin Layer Chromatography (HPTLC) was performed to create the chemical fingerprint of ethanolic extract of *Ipomoea mauritiana* tuber and to ascertain the presence of phytoconstituents scopoletin and quercetin. Standardized conditions were followed throughout the process.

(a) Stationary and Mobile Phase

The analysis was conducted on precoated silica gel 60 F254 HPTLC plates with a thickness of 0.2 mm. The mobile phase was toluene, ethyl acetate, methanol, and formic acid in the ratio 5:5:1:0.3 (v/v/v/v).

(b) Sample Application

The test solution was deposited in 1.0 µL bands on the HPTLC plates with a Linomat 4 automatic TLC sampler (CAMAG, Muttenz, Switzerland) in connection with a 100 µL Hamilton syringe (Bonaduz, Switzerland). This resulted in precise and reproducible deposition of the extract.

(c) Plate Development

Chromatographic separation was completed in a CAMAG Automated Developing Chamber 2 (ADC 2) twin-trough glass chambers (6.0 × 10.0 cm).

(d) Visualization and Derivatization

Following development, the plates were first scanned under UV light at 254 nm and 366 nm using a CAMAG TLC Visualizer to capture the separated bands. The plates were then derivatized through spraying with anisaldehyde sulphuric acid reagent and heating, which led to better visualization of phytochemical spots under visible light.

(e) Densitometric Scanning and Data Analysis

Densitometric scanning was conducted on a CAMAG Scanner 3 at both 254 nm and 366 nm. Chromatographic data, such as Rf values, peak areas, and intensities, were treated with CAMAG winCATS software to enable qualitative and quantitative analysis of the extract.

Results and Discussion

The HPTLC profiling of ethanolic extract of *Ipomoea mauritiana* tuber was performed with standard reference markers scopoletin and quercetin. Chromatographic separation was visualized under UV light at 254 nm and 366 nm, and densitometric scanning yielded information on Rf values, retention distances, peak areas, and percentage contributions.

HPTLC at 254 nm

The *Ipomoea mauritiana* extract chromatogram (Track 1) showed ten well-separated peaks with Rf values from 0.05 to 0.98, indicating the presence of several phytoconstituents. A prominent peak of the standard scopoletin (Track 2) was at Rf 0.85, which corresponded to a major peak at Rf 0.87 in the extract. This similarity establishes the presence of scopoletin in *Ipomoea mauritiana*.

HPTLC at 366 nm

The extract (Track 1) exhibited six peaks in the range of Rf values from 0.05 to 0.89. Authentic quercetin (Track 2) revealed a characteristic main peak at Rf 0.55 and a small peak at Rf 0.89. Although the extract had a corresponding peak at Rf 0.89 (22.67%), the lack of a peak at Rf 0.55 means that quercetin is either absent or present only in traces.

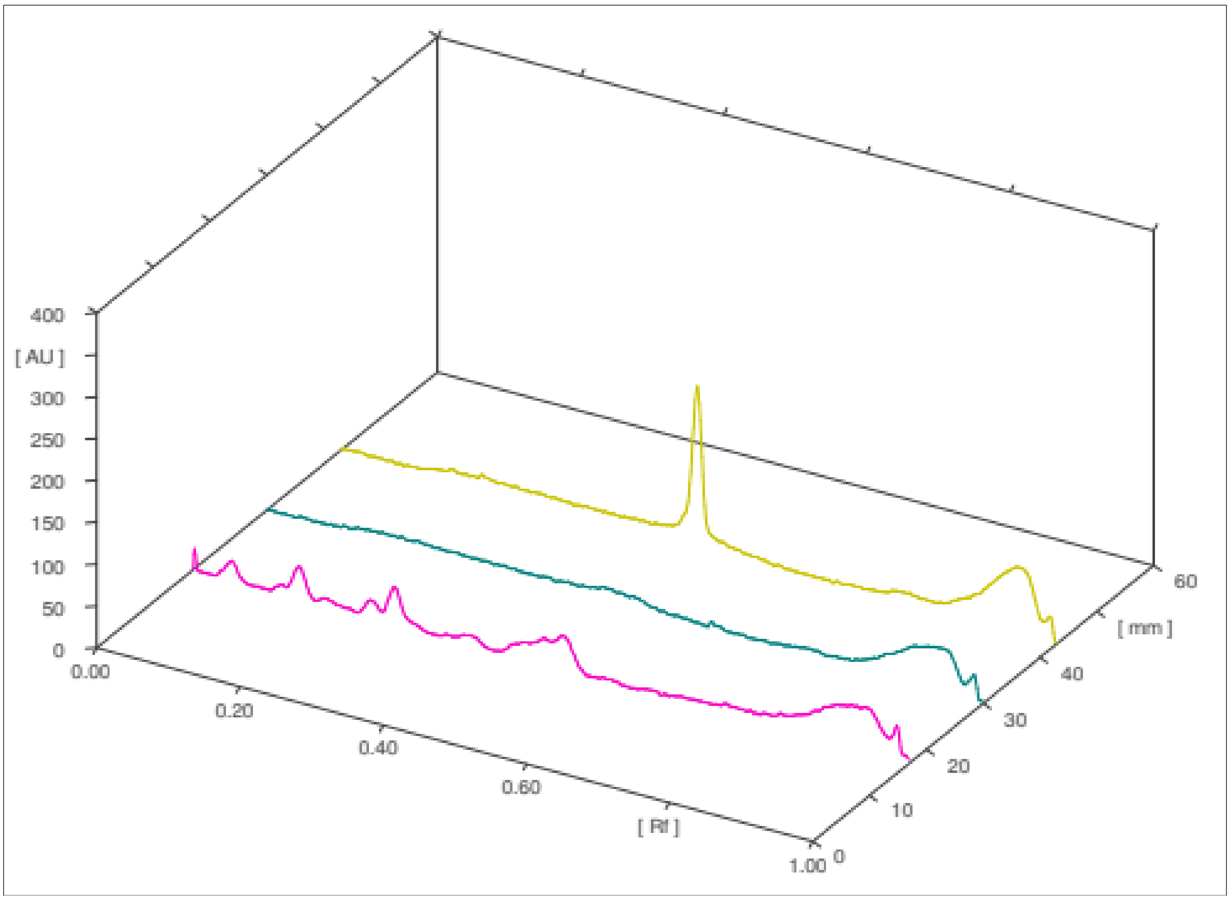

Fig 1: 3D densitogram showing all the tracks of *Ipomoea mauritiana* tuber extract and standard markers at the wavelength 254nm

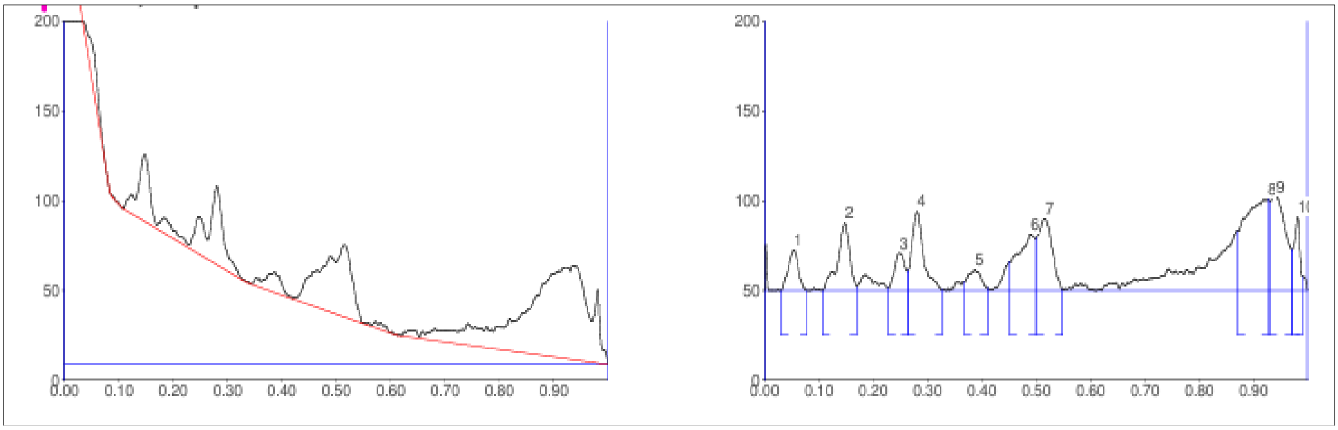

Fig 2: HPTLC densitogram of *Ipomoea mauritiana* tuber extract scanned at 254nm (Track 1)

Table 1: Peak characteristics of *Ipomoea mauritiana* extract obtained by HPTLC analysis (254nm)

Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.03	0.2	0.05	22.8	6.46	0.08	0.0	384.0	4.57	unknown *
2	0.11	0.1	0.15	37.7	10.68	0.17	2.0	776.7	9.24	unknown *
3	0.23	1.5	0.25	20.9	5.93	0.26	10.8	379.5	4.51	unknown *
4	0.27	11.2	0.28	44.0	12.47	0.33	0.5	869.2	10.34	unknown *
5	0.37	5.0	0.39	11.5	3.24	0.41	1.5	257.8	3.07	unknown *
6	0.45	15.9	0.49	31.6	8.94	0.50	28.8	936.9	11.14	unknown *
7	0.50	29.5	0.52	40.2	11.37	0.55	0.2	959.8	11.41	unknown *
8	0.87	32.9	0.93	51.1	14.47	0.93	51.0	2059.5	24.49	unknown *
9	0.93	49.3	0.94	52.4	14.84	0.97	22.9	1372.1	16.32	unknown *
10	0.97	23.0	0.98	40.9	11.58	0.99	7.8	413.8	4.92	unknown *

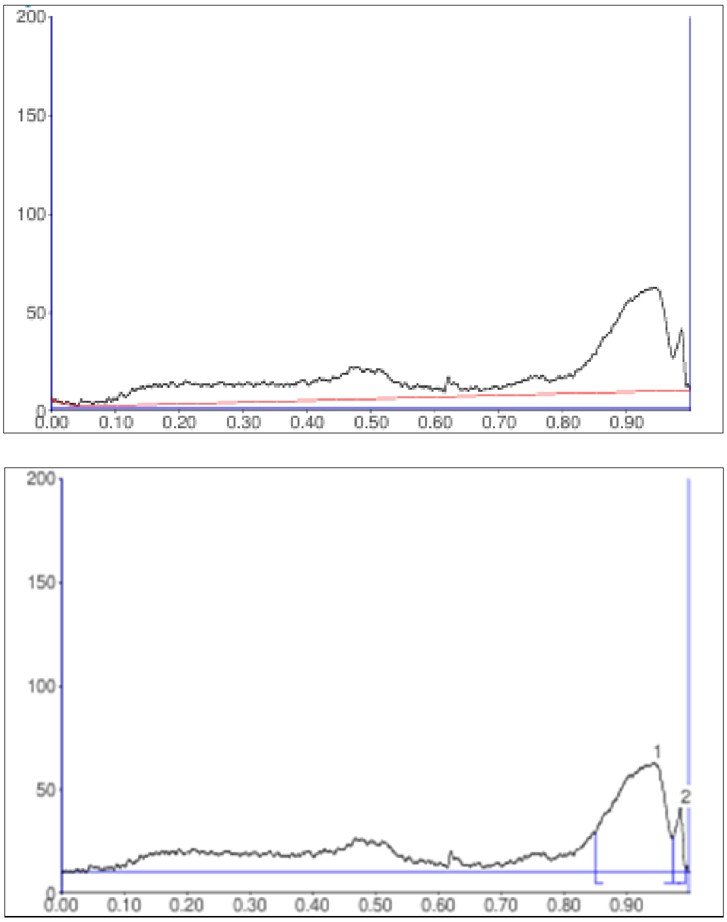

Fig 3: HPTLC densitogram of standard Scopoletin scanned at 254nm (Track 2)

Table 2: Peak characteristics of standard scopoletin obtained by HPTLC analysis

Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.85	19.1	0.94	52.5	62.94	0.97	16.6	3914.5	91.95	unknown *
2	0.97	17.0	0.99	30.9	37.06	1.00	2.0	342.8	8.05	unknown *

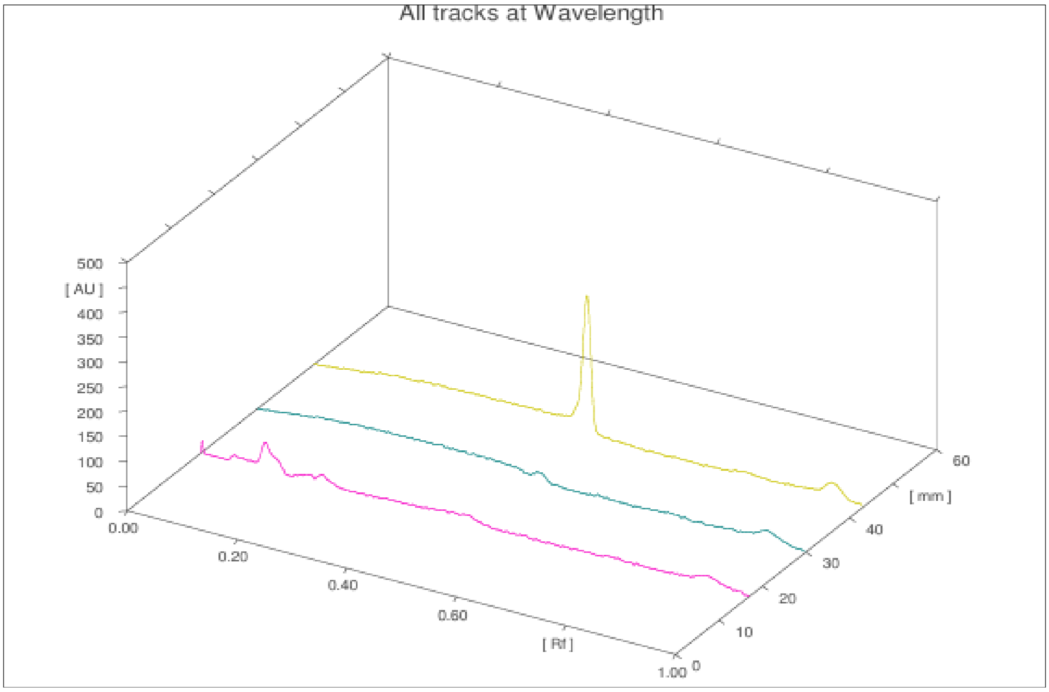

Fig 4: 3D densitogram showing all the tracks of *Ipomoea mauritiana* tuber extract and standard markers at the wavelength 366nm

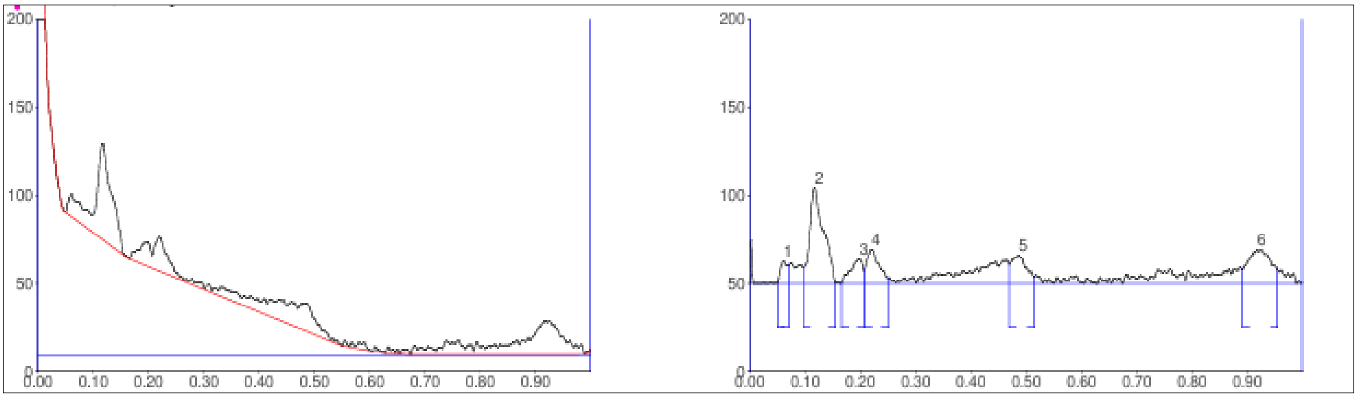

Fig 5: HPTLC densitogram of *Ipomoea mauritiana* tuber extract scanned at 366nm (Track 1)

Table 3: Peak characteristics of *Ipomoea mauritiana* obtained by HPTLC analysis (366nm)

Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.05	0.3	0.06	13.0	9.55	0.07	10.4	150.4	4.61	unknown *
2	0.10	9.4	0.12	54.6	39.99	0.16	0.4	1271.0	38.99	unknown *
3	0.17	0.5	0.20	13.9	10.22	0.21	7.3	286.3	8.78	unknown *
4	0.21	8.6	0.22	19.6	14.36	0.25	3.1	401.6	12.32	unknown *
5	0.47	11.0	0.49	16.1	11.76	0.52	3.8	411.8	12.63	unknown *
6	0.89	8.0	0.92	19.2	14.10	0.96	7.9	739.0	22.67	unknown *

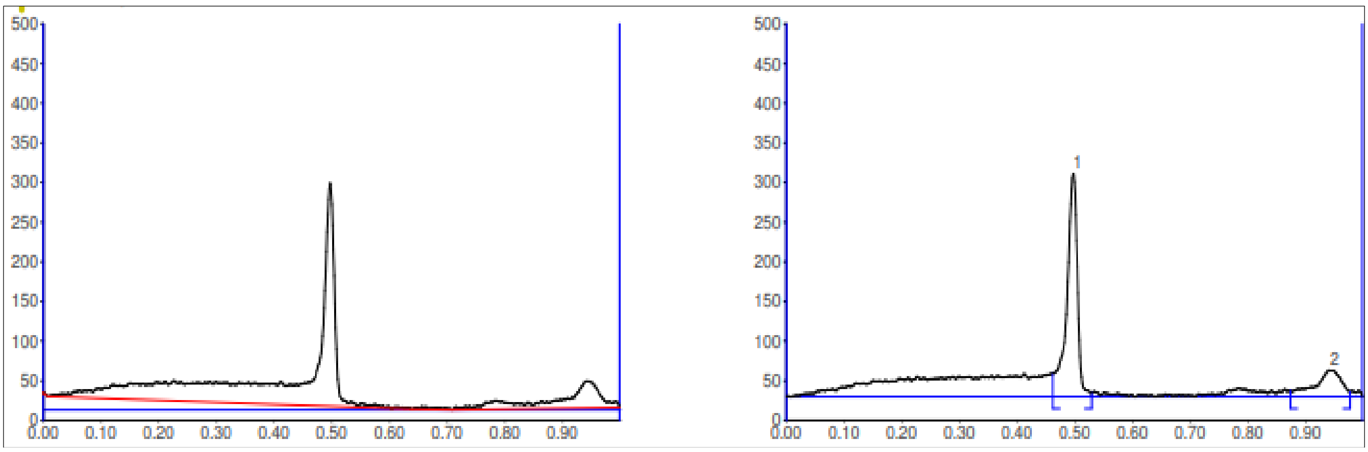

Fig 6: HPTLC densitogram of standard Quercetin scanned at 366 nm (Track 2)

Table 4: Peak characteristics of standard Quercetin obtained by HPTLC analysis (366nm)

Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned Substance
1	0.46	29.2	0.50	281.3	89.26	0.53	4.5	4828.0	76.94	unknown *
2	0.88	8.3	0.94	33.9	10.74	0.98	6.9	1447.0	23.06	unknown *

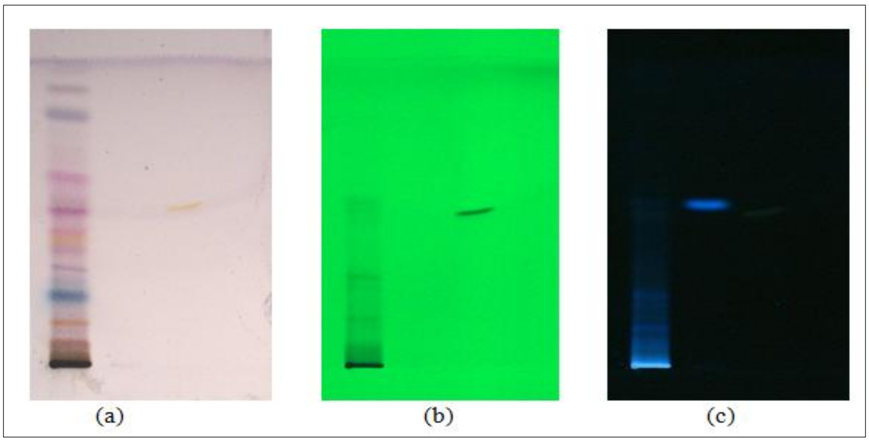

Fig 7: HPTLC chromatogram visualized under a: white light, b: UV 254nm, c: UV 366nm

The findings validate that scopoletin is a predominant phytochemical marker of *Ipomoea mauritiana* tuber extract, as shown by repeated Rf matching with the standard. In contrast, quercetin was not identified conclusively, indicating that its level in the tuber is minimal. The occurrence of scopoletin is noteworthy because it is reported to have various pharmacological activities, such as antioxidant, anti-inflammatory, and hepatoprotective activities. The HPTLC fingerprint obtained is thus a consistent chemical profile for standardization and quality control of *Ipomoea mauritiana* based preparations.

Conclusion

The study was able to establish a reproducible HPTLC fingerprint of *Ipomoea mauritiana* tuber extract and validated scopoletin as a principal phytochemical marker. The absence of a certain quercetin peak indicates that it does not exist or only exists in trace quantities. Identification of scopoletin is valuable as it has been known to have pharmacological advantages such as antioxidant, hepatoprotective, and anti-inflammatory effects. The HPTLC profile thus obtained can thus be used as a consistent tool for standardization, authentication, and quality control of *Ipomoea mauritiana* based products, predicting their constancy and therapeutic efficacy.

Acknowledgment

The authors appreciate the management and staff of Nehru College of Pharmacy, Pampady, Thiruvilwamala, Thrissur, for their unending help, guidance, and motivation in the successful accomplishment of this book.

References

1. Wikipedia Contributors. *Ipomoea mauritiana*. Wikipedia. Wikimedia Foundation; 2023.
2. Karthik SC, Padma V. Phytochemical and microscopic analysis of tubers of *Ipomoea mauritiana* Jacq. (*Convolvulaceae*). Pharmacogn Mag. 2009;5(19):102-107.
3. Alam I, Forid S, Roney M, Aluwi FF, Huq M. Antioxidant and antibacterial activity of *Ipomoea mauritiana* Jacq.: a traditionally used medicinal plant in Bangladesh. Clin Phytosci. 2020 May 30;6(1):35-42.
4. TK B, Dharmapal S, Udayan PS, Vijayan R, AV R. *In vitro* conservation of *Ipomoea mauritiana* Jacq. Int J Adv Agric Sci Technol. 2018 Mar;9(1):13-18.
5. Cimpoiu C. Analysis of some natural antioxidants by thin-layer chromatography and high-performance thin-layer chromatography. J Liq Chromatogr Relat Technol. 2006 Jun 1;29(7-8):1125-1142.
6. Jain A, Parashar AK, Nema RK, Narsinghani T. High performance thin layer chromatography (HPTLC): a modern analytical tool for chemical analysis. Curr Res Pharm Sci. 2014 Mar 30;4(1):8-14.
7. Pochapski MT, Fosquiera EC, Esmerino LA, Dos Santos EB, Farago PV, Santos FA, Groppo FC. Phytochemical screening, antioxidant, and antimicrobial activities of the crude leaves' extract from *Ipomoea batatas* (L.) Lam. Pharmacogn Mag. 2011 Apr;7(26):165-170.