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COMPREHENSIVE PHYTOCHEMICAL PROFILING AND SPECTROSCOPIC CHARACTERIZATION OF *PASSIFLORA FOETIDA* L.

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ABSTRACT

Passiflora foetida L. is a medicinal plant known for its diverse phytoconstituents. It is a herbaceous climber belonging to the family Passifloraceae and is characterized by its hairy leaves, axillary tendrils and distinctive flowers. The present study evaluated the macroscopic characteristics and phytochemical profile of *P. foetida* leaves using pharmacognostic, qualitative phytochemical, UV–Visible, FT-IR and GC–MS approaches. Qualitative screening showed variation among petroleum ether, chloroform, acetone, ethanol and aqueous extracts, with ethanol exhibiting the broadest profile. UV–Visible analysis showed absorption maxima at 206, 272, 331 and 411 nm, while FT-IR revealed characteristic functional-group regions. GC–MS tentatively identified 20 constituents, with n-hexadecanoic acid (11.064%) and neophytadiene (9.730%) as the major constituents based on relative peak area. The findings provide preliminary phytochemical and pharmacognostic characterization of *P. foetida* leaves and support further isolation, structural confirmation and biological evaluation of the identified constituents.

KEYWORDS: *Passiflora foetida*, phytochemical screening, UV–Vis, FT-IR, GC–MS, phytoconstituents, medicinal plant.

INTRODUCTION

Medicinal plants remain important sources of traditional healthcare and bioactive natural products. Their chemical diversity, together with variation caused by species, geographical origin, and environmental conditions makes systematic phytochemical characterization important for authentication, quality assessment and further investigation. Preliminary screening provides information on major phytochemical classes, whereas UV–Visible, FT-IR and GC–MS analyses provide complementary information on spectral features, functional groups and extract constituents (WHO, 2019, Newman and Cragg, 2020, Atanasov *et al*., 2021and Shafodino *et al*., 2024).

The genus Passiflora comprises more than 550 species and is recognized for medicinal, nutritional and ornamental importance. *P. foetida* L. Commonly known as stinking passion flower, is a herbaceous climbing plant belonging to the family Passifloraceae. It is characterized by slender pubescent stems, axillary tendrils, alternate lobed leaves, solitary flowers with a distinctive corona and berry-type fruits and flowers, have been investigated for their diverse phytochemical constituents and biological properties. *Passiflora* species contain flavonoids, phenolic acids, alkaloids, glycosides, terpenoids, steroids and other constituents associated with diverse biological activities (Nikolova *et al*., 2024; Zhang *et al*., 2023). Previous studies have reported diverse phytoconstituents in *P. foetida* L., including flavonoids, phenolic compounds, alkaloids, terpenoids and other secondary metabolites (Ponsuwan *et al*., 2024). These characteristics make *P. foetida* a relevant plant for preliminary phytochemical and pharmacognostic investigation.

However, previous studies have generally examined individual plant parts, solvent fractions or selected constituent groups. Therefore, the present study was undertaken to evaluate the macroscopic characteristics and preliminary phytochemical profile of *P. foetida* leaves and to characterize the ethanolic extract using UV–Visible, FT-IR and GC–MS analyses, providing complementary preliminary information for authentication and further phytochemical investigation.

MATERIALS AND METHODS

Collection of Plant material

P. foetida L., a traditional medicinal plant belonging to the family Passifloraceae, was selected for the present investigation. Fresh plant material was collected from Bhavani, Erode District, Latitude: 11.4708° N (or 11° 28′ 15″ N) Longitude: 77.1139° E (or 77° 6′ 50″ E) Tamil Nadu, South India. The collected plant material was used for macroscopic evaluation, phytochemical investigation, and spectroscopic and chromatographic analyses.

Preparation of plant powder

The collected plant material was thoroughly washed under running water to remove adhering soil and other foreign matter. The material was subsequently cut into smaller pieces using clean scissors or knives and shade-dried at room temperature for 10–12 days. The dried material was pulverized into a coarse powder. The resulting powder was stored appropriately and used for subsequent extraction and phytochemical investigations (Harborne, 1973).

Preparation of extracts

Leaves *P. foetida* of (500g) was shade dried, powdered and extracted with ethanol for 8 hours using soxhlet apparatus. The extract was then filtered through Whatman filter paper No.1 along with 2g sodium sulfate to remove the sediments and traces of water in the filtrate. Before filtering, the filter paper along with sodium sulphate is wetted with absolute alcohol. The filtrate is then concentrated by bubbling nitrogen gas into the solution and reduce the volume to 1ml. The extract contains both polar and non-polar phytocomponents.

Macroscopic evaluation

Macroscopic characteristics were examined using the naked eye and hand lens, following Ulmer and MacDougal (2004) and Dhawan *et al*. (2004). Habit, stem, leaf, floral, fruit and root characters were recorded.

Qualitative phytochemical screening

Preliminary qualitative screening of petroleum ether, chloroform, acetone, ethanol and aqueous extracts was performed according to Kokate *et al*. (1995). The extracts were tested for carbohydrates, proteins, amino acids, alkaloids, flavonoids, phenols, tannins, glycosides, terpenoids, saponins, coumarins, phlobatannins, quinones, anthraquinones, fixed oils and fats, and gums and mucilages using standard qualitative reactions.

Qualitative Phytochemical Screening

Detection of alkaloid

One hundred milliliter of extract was enthused with 3 ml of diluted hydrochloric acid added with filtered. The filtrate was tested carefully with reagents as follows.

Dragendorff's test

2µl liter for filtrate, 2ml of Dragendorff's reagent was added. Therefore a result of prominent yellow precipitate indicates the test was positive.

Dragendorff's reagent

Stock solution

Bismuth carbonate (5.2g) and sodium iodide (4g) were boiled for a few minutes with 50ml glacial acetic acid. After 12 hours, the precipitated sodium acetate crystals were filtered of using a sintered glass funnel. 40 ml Forty milliliter of a clear, red brown filtrate was mixed with 160ml of ethyl acetate and 1ml of distilled water; stored in amber-colored bottle.

Working solution

10 ml of the stock solution was mixed with 20ml of acetic acid and made up to 100ml with distilled water.

Detection of carbohydrate

The extract (100mg) was dissolved in 5ml of water and filtered. The filtrate was subjected to the following tests.

Fehling's test

1 ml of filtrate was boiled on water bath with 1ml each of Fehling solution I and II. A red precipitate indicates the presence of sugar.

Fehling's solution

Fehling's solution I: Copper sulphate (34.66g) was dissolved in distilled water and made up to 500ml with distilled water.

Fehling's solution II: Potassium sodium tartarate (173g) and sodium hydroxide (50g) was dissolved in water and made up to 500ml.

Detection of glycosides

50 ml of extract was hydrolysed with concentrated HCL for 2 hours on water bath, filtered and hydrolyses were subjected to the following tests.

Borntrager's test

2ml of filtrate, 3ml of chloroform was added and shaken. Chloroform layer was separated and 10% ammonia solution was added to it. Pink colour indicated the presence of glycosides.

Detection of saponins

Foam test

The extract (1mg) as dissolved in 2ml of distilled water and filtered through Whatman No.1 filter paper and filtrate was subjected to tests of proteins and amino acids.

Detection of proteins and amino acids

The extract (100mg) was dissolved in 10ml of distilled water and filtered through WhatmannNo.1 filter paper and the filtrate was subjected to tests of proteins and amino acids.

Biuret test

To 2ml of filtrate was treated with 2% of copper sulphate solution. To this, 1ml of ethanol (95%) was added followed by excess of potassium hydroxide pellets. Pink color in the ethanolic layer indicated to the presence of proteins.

Ninhydrin test

Two drops of ninhydrin solution (10 mg of ninhydrin in 200ml of acetone) were added to two ml of extract. Characteristic purple color indicated the presence of amino acids.

Detection of phenolic compounds

Ferric chloride test

The extract (50mg) was dissolved in 5ml of distilled water. To this, few drops of neutral 5% ferric chloride solution were added. To be a characteristic dark green color indicated the presence of phenolic compounds.

Test for flavonoids

2 ml of 2.0% NaOH mixture was mixed with 1ml of plant crude extract; concentrated yellow color was produced, which became colorless when we added 2 drops of diluted acid to mixture. This result showed the presence of flavonoids.

Test for terpenoids

To 5ml of methanol extract, 2ml of chloroform was added and mixed well. Add a little quantity of concentrated H2SO4 was carefully added to form of reddish brown layer.

Detection of steroids

2 ml of chloroform was added to the extract and a few drops of acetic anhydride were poured. Followed by the concentrated H_2SO^4.A mixture of blue and green colour showed the presence of steroids.

UV–Visible spectroscopic analysis

The extracts were examined under visible to the UV light for proximate analysis. For UV-VIS and FTIR spectrophotometer analysis, the extracts were centrifuged at 3000 rpm for 10 min and filtered through Whatmann No. 1filter paper by using high pressure vacuum pump. The sample is diluted to 1:10 with the same solvent. The extracts were scanned in the wavelength ranging from 200-1100 nm using Perkin Elmer Spectrophotometer and the characteristic peaks were detected Antony Sandosh *et al*., 2013, Theng and Korpenwar 2015.

FT-IR spectroscopic analysis

Working Principle

Working Principle Infrared spectroscopy is nondestructive technique for materials analysis and used in the laboratory for over seventy years. Infrared absorption spectroscopy is the study of interaction of infrared radiation with matter as a function of photon frequency. Fourier Transform Infrared Spectroscopy (FTIR) provides specific information about the vibration and rotation of the chemical bonding and molecular structures, making it useful for analyzing organic materials and certain inorganic materials. An infrared spectrum represents a fingerprint of a sample with absorption peaks which correspond to the frequencies of vibrations between the bonds of the atoms making up the material. Because each variety material is a unique combination of atoms, no two compounds produce the exact same infrared spectrum. Therefore, infrared spectroscopy can result in a positive classification (qualitative analysis) of every different kind of material. In addition, the size of the peaks in the spectrum is a direct indication of the amount of material present. With modern software algorithms, infrared is an excellent tool for quantitative analysis.

METHODOLOGY

The dehydrated powdered of ethanol extract of *S. marginata* Herb was used for FTIR analysis. The dried 10 mg of extract powdered was mixed with KBr salt and encapsulated in 100 mg of KBr pellet in order to prepare translucent sample discs. The infrared spectrum of solid was recorded in the scan range from 4400-450 cm-1 on a FTIR spectrophotometer, Perkin Elmer Spectrum (RX1) with a resolution of 1cm-1. Perkin Elmer spectrophotometer was used to detect characteristic peak and their functional group.

GC–MS analysis

GC–MS analysis was performed on the ethanol extract using a Thermo GC-Trace Ultra system (version 5.0) interfaced with a mass spectrometer. Separation was carried out using a DB-35MS capillary column (30 m × 0.25 mm internal diameter × 0.25 µm film thickness). Helium was used as the carrier gas at a constant flow rate of 1 ml min^{-1}, and an injection volume of 1 µl was used. Mass spectra were acquired under electron ionization conditions at an ionization energy of 70 eV. The mass range was set from 50 to 650 Da with a scan interval of 0.5 s. The solvent delay was 0–4 min and the total GC–MS run time was 37.5 min. The relative percentage of each identified component was calculated from its average peak area relative to the total peak area (Jennings and Shibamoto, 1980).

GPS map view



RESULTS

Macroscopic characters of *P. foetida* Linn.

P. foetida L. is a perennial herbaceous climber characterized by axillary tendrils. Its stem is slender, cylindrical, and extensively branched, covered in dense hair, and measures approximately 2 to 5 meters in length. The leaves are simple, alternate, and petiolate, ranging from 4 to 10 cm long and 4 to 12 cm wide, with dense hairs on both surfaces. The petiole is

slender, measuring 3 to 6 cm long, and glandular. The young stems are green, while the basal portions are light brown. The leaves are dark green on the upper surface and light green beneath. The inflorescences are solitary and located in the axils of the leaves. The flowers are white to pale yellow and feature a filamentous corona. The calyx consists of five green, hairy sepals, while the corolla has five free petals and three large hairy lobes.



(A) **(B)**

Figure 1: Macroscopic features of *P. foetida* Linn.: (A) Habit; (B) Twig with flower.

Table 1: External macroscopic characteristics of *P. foetida* Linn.

S.No.	Macroscopic character	Observation
1.	Habit	Herbaceous climber with axillary tendrils
2.	**STEM**	
	Structure	Slender, cylindrical, profusely branched, with glandular and non-glandular hairs
	Height	2–5 m in length
	Surface	Densely pubescent with glandular hairs
	Texture	Soft, slender, flexible and herbaceous
	Taste	Slightly bitter
	Odour	Unpleasant, fetid smell
	Colour	Green when young; light brown at the base
3.	**LEAF**	
	Structure	Simple, alternate and petiolate
	Size	Approximately 4–10 cm long and 4–12 cm wide
	Petiole	3–6 cm long, slender, green and hairy, bearing small glands
	Texture	Soft, thin, slightly membranous and flexible
	Taste	Slightly bitter
	Odour	Unpleasant, fetid smell
	Colour	Upper surface dark green; lower surface light green
4.	**INFLORESCENCE**	
	Arrangement of Calyx and Corolla	Solitary, axillary
5.	**FLOWER**	

	Colour	White to pale yellow with a characteristic corona of filamentous outgrowths
	Calyx	Five sepals, green and hairy
	Corolla	Five free petals, white to pale yellow
	Bracts	Three, large, hairy and laciniate
6.	**OVARY**	
	Ovary	Superior, unilocular, syncarpous
	Fruit	Berry
	Seeds	Numerous, small, flattened and embedded in pulpy aril
7.	**ROOT**	
	Root	Tap root

Qualitative phytochemical screening

A preliminary qualitative phytochemical screening of its leaves sample was conducted using extracts of petroleum ether, chloroform, acetone, ethanol, and water. The results revealed variations in the distribution of the tested phytoconstituents, as summarized in Table - 2.

Table 2: Qualitative Phytochemical Screening of different extracts of *P. foetida* L. Leaf powder.

Phytoconstituents	Test/Reagent	Petroleum Ether	Chloroform	Acetone	Ethanol	Aqueous
Protein	Biuret test	-	-	+	+	+
Carbohydrate	Barfoed's test	-	-	+	+	+
Amino acids	Ninhydrin test	-	-	+	+	+
Alkaloids	Wagner's test	-	+	+	+	+
Flavonoids	Ammonium hydroxide test	+	+	+	+	+
Phenols	Lead acetate test	+	+	+	+	+
Tannins	Ferric chloride test	+	-	+	+	+
Glycosides	Borntrager's test	+	+	+	+	+
Terpenoids	Liebermann-Burchard's test	+	+	+	+	-
Saponin	Foam test	+	-	-	+	+
Coumarin	NaOH test with UV observation	+	+	+	+	+
Quinone	Sulphuric acid test	+	+	+	+	-
Anthraquinone	Borntrager's test	+	+	+	+	-
Fixed oil & fat	Stain test	+	+	-	-	-
Gums & mucilage	Absolute alcohol precipitation test	+	-	+	-	+
Phlobatannins	Hydrochloric acid test	-	-	-	+	+

Note: **(+)** indicates the presence of chemical compound; **(-)** indicates the absence of chemical compound

The five extracts exhibited distinct phytochemical profiles, as summarized in Table 2. The petroleum ether extract tested positive for flavonoids, phenols, tannins, glycosides,

terpenoids, saponins, coumarin, quinone, anthraquinone, fixed oils and fats, as well as gums and mucilage. The chloroform extract was positive for alkaloids, flavonoids, phenols, glycosides, terpenoids, coumarin, quinone, anthraquinone, and fixed oils and fats. The acetone extract contained proteins, carbohydrates, amino acids, alkaloids, flavonoids, phenols, tannins, glycosides, terpenoids, coumarin, quinone, anthraquinone, and gums and mucilage. The ethanol extract displayed the broadest range of positive reactions, including proteins, carbohydrates, amino acids, alkaloids, flavonoids, phenols, tannins, glycosides, terpenoids, saponins, coumarin, quinone, anthraquinone, and phlobatannins. The aqueous extract tested positive for proteins, carbohydrates, amino acids, alkaloids, flavonoids, phenols, tannins, glycosides, saponins, coumarin, phlobatannins, and gums and mucilage. Each extract reveals a unique combination of phytochemicals.

3.3 UV–Visible spectroscopic analysis

The ethanolic leaf extract showed absorption maxima at 206 nm (1.495 AU), 272 nm (0.521 AU), 331 nm (0.508 AU) and 411 nm (0.543 AU). The highest absorbance in the visible/near-infrared portion was 0.444 AU at 666 nm. The spectrum and corresponding values are presented in Figure 2 and Table 3.

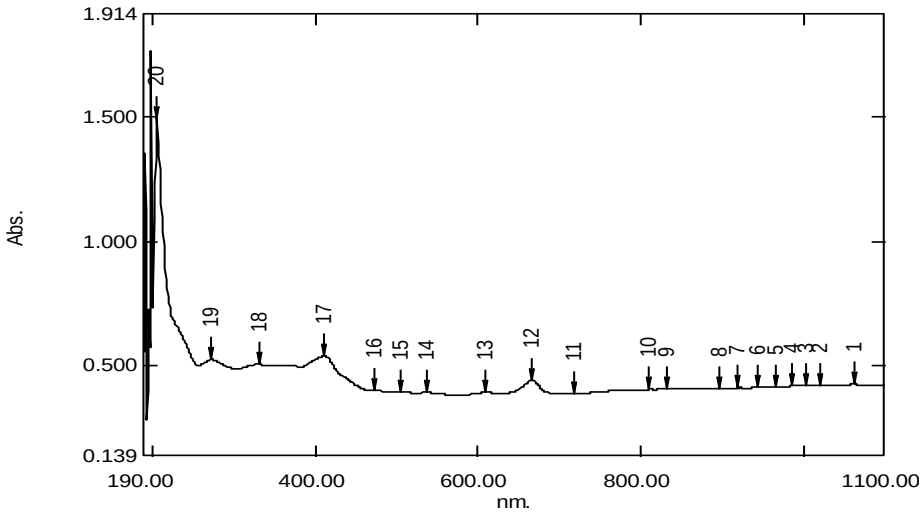


Figure 2: UV – VIS Spectrum of ethanol of *P. foetida* Linn.

SCALE

X axis= Wavelength (nm) of the leaves

Y axis= Absorbance (AU) of the leaves

Table 3: UV – Vis peak of ethanol extracts of *P. foetida* L.

S.NO	Wavelength (nm)	Absorbance (AU)
1.	1062.00	0.428
2.	1021.00	0.423
3.	1003.00	0.423
4.	987.00	0.422
5.	966.00	0.420
6.	945.00	0.418
7.	920.00	0.414
8.	897.00	0.413
9.	832.00	0.409
10.	810.00	0.407
11.	718.00	0.392
12.	666.00	0.444
13.	608.00	0.395
14.	537.00	0.397
15.	506.00	0.399
16.	473.00	0.404
17.	411.00	0,543
18.	331.00	0.508
19.	272.00	0.521
20.	206.00	1.495

FT-IR spectroscopic analysis

The ethanolic leaf extract exhibited 22 absorption peaks ranging from 416.62 to 3988.79 cm^{-1}, representing regions associated with O–H/N–H, C–H, C–O, C–N, C=C, C=O and other vibrations. Prominent peaks included 894.97, 1732.08, 2916.37, 3232.70, 3830.63 and 3988.79 cm^{-1}. The spectrum and detailed assignments are presented in Figure 3 and Table - 4.

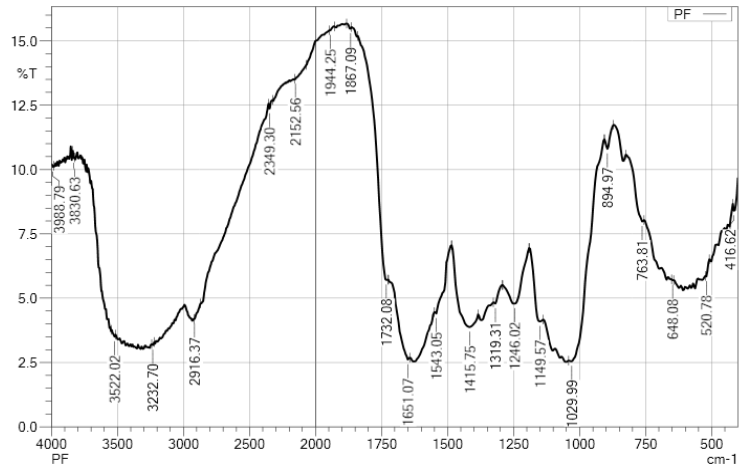


Figure 2: FT-IR Analysis of Ethanolic leaf extract of *P. foetida* L.

SCALE

X axis=Frequency of the leaves

Y axis=Intensity of the leaves

Table 4: FT-IR Spectral peak and values and functional groups of ethanol extract of *P. foetida* L.

S. No.	Peak Position (cm^{-1})	Functional Group	Intensity	Wavelength	Characteristic vibration
1.	416.62	Metal-O	8.4	Medium	M-O Stretch
2.	520.78	Metal-O	5.84	Medium	M-O or C-Br Stretch
3.	648.08	C-Cl	5.69	Medium	C-X Stretch
4.	763.81	Aromatic C-H	7.98	Medium	C-H out of Plane bending
5.	894.97	Alkene / Aromatic	10.8	Strong	=C-H out of Plane bending
6.	1029.99	C – O	2.55	Weak	C-O stretching (alcohol/ether)
7.	1149.57	C-O / C-N	4.10	Weak	C-O or C-N stretch
8.	1246.02	C-O / C-N	4.79	Weak	C-O stretching (ester / ether)
9.	1319.31	C-O / C-N	4.79	Weak	C-N or C-O stretching
10.	1415.75	CH_2 / CH_3	3.88	Weak	C-H bending
11.	1543.05	Aromatic C=C / N-O	4.40	Weak	C=C stretching / NO_2 asymmetric
12.	1651.07	C=C / C=O	2.61	Weak	Alkene C=C or amide C=O stretch
13.	1732.08	Carbonyl (C=O)	5.71	Medium	C=O stretching (ester/ ketone)
14.	1867.09	Anhydride/ Overtone	15.48	Strong	CO stretching (anhydride region)
15.	1944.25	Overtone / Combination band	15.41	Strong	Combination / overtone
16.	2152.56	C≡C / C≡N	13.51	Strong	Trible-bond stretch
17.	2349.30	CO_2	12.36	Strong	O=C=O asymmetric stretch
18.	2916.37	Alkane C-H	4.19	Weak	C-H stretching (CH_2 / CH_3)
19.	3232.70	O-H / N-H	3.18	Weak	O-H or N-H stretching
20.	3522.02	O-H	3.50	Weak	O-H stretching (hydrogen bonded)
21.	3830.63	Free O-H	10.44	Strong	Free O-H stretching
22.	3988.79	O-H (overtone)	10.10	Strong	O-H overtone / high frequency stretch

Gas Chromatography Mass Spectrometry Analysis of *P. foetida* L.,

GC–MS tentatively identified 20 constituents, with n-hexadecanoic acid (11.064%) and neophytadiene (9.730%) as the predominant constituents based on relative peak area. The detection of n-hexadecanoic acid is consistent with previous reports for *P. foetida*, although constituent profiles and abundances can vary with plant part and extraction procedure (Paulraj *et al*., 2014). The remaining detected constituents included decane, benzyl alcohol, benzene, 1-(1,5-dimethyl-4-hexenyl)-4-methylbenzene, 2,4-di-tert-butylphenol, 2(4H)-benzofuranone derivative, hexadecane, loliolide, octadecane, 3,7,11,15-tetramethylhexadecane, 3,7,11,15-tetramethyl-2-hexadecene, pseudophytol (6E,10Z-) and pentacosane. The chromatogram and retention times of the identified constituents are presented in Figure 4 and Table 5.

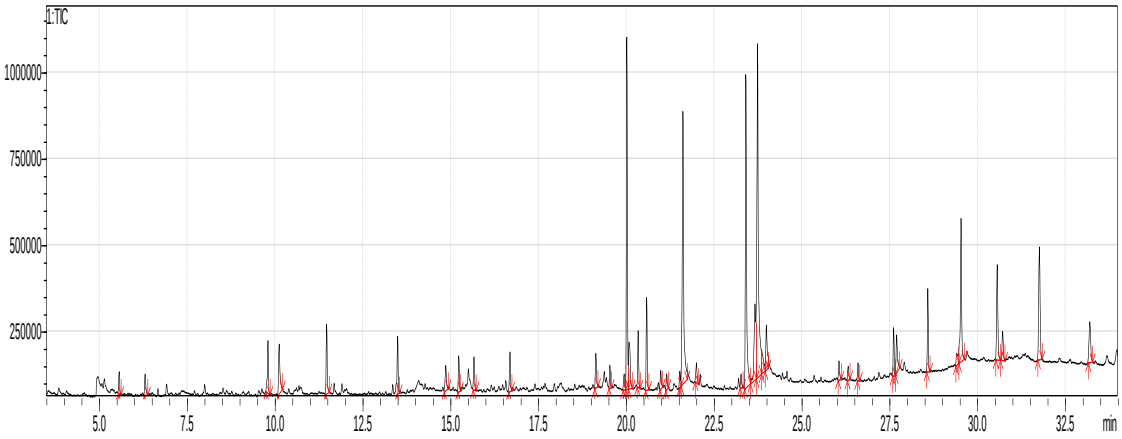


Figure 4: GC-MS Chromatogram of *P. foetida* L.,

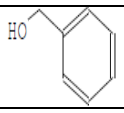
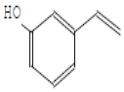
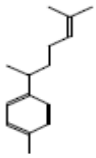
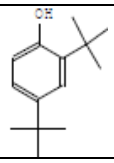
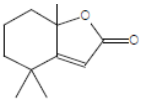
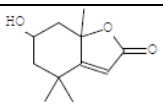
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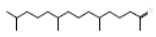
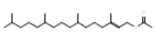
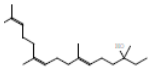
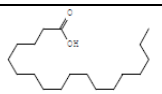
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X axis = Retention time

Y axis = Abundance

Table 5: Gas Chromatography and Mass Spectrometry Analysis of *P. foetida* L., from Ethanol Extract.

S. No	R. Time	Compound name	Molecular weight	Molecular formula	Area %	Chemi Cal struc Ture	Biological activities
1.	5.570	Decane	142 g/mol	$C_{10}H_{22}$	0.606		Antibacterial and antifungal activity
2.	6.309	Benzyl alcohol	108 g/mol	C_7H_8O	0.677		Preservatives, antiparasitic activity
3.	9.807	Dodecane	170 g/mol	$C_{12}H_{26}$	1.662		Antimicrobial,Natural insect repellent
4.	10.124	3-Ethenylphenol	120 g/mol	C_8H_8O	1.897		Antimicrobial and antioxidant activity,
5.	11.477	Anethole	148 g/mol	$C_{10}H_{12}O$	2.000		Anti-inflammatory Anticancer, Estrogenic activity
6.	13.498	Tetradecane	198 g/mol	$C_{14}H_3O$	1.560		Synergistically with phytochemical,Antifungal activity
7.	14.869	Benzene, 1-(1,5-dimethyl-4-hexenyl)-4-methylbenzene	202 g/mol	$C_{15}H_{22}$	0.860		Anti-inflammatory, antimicrobial &antioxidant potential
8.	15.239	2,4-Di-tert-butylphenol	206 g/mol	$C_{14}H_{22}O$	0.951		Anti oxidant
9.	15.672	2(4H)-Benzofuranone 5,6,7,7a-tetrahydro-4,4,7a-trimethyl, (R)-	180 g/mol	$C_{11}H_{16}O_2$	1.043		Scavenges free radical
10.	16.696	Hexadecane	226 g/mol	$C_{16}H_{34}$	1.119		Serve as a carbon source and natural insect repellent
11.	19.141	Loliolide	196 g/mol	$C_{11}H_{16}O_3$	1.060		Cytotoxic/ anticancer, Insecticidal/ Allelopathic
12.	19.541	Octadecane	254 g/mol	$C_{18}H_{38}$	0.566		Serve as a carbon source, natural insect repellent or protective barrier.
13.	19.945	3,7,11,15-Tetramethyl hexadecane	280 g/mol	$C_{20}H_{40}$	0.440		Geochemical biomarker and Antimicrobial activity
14.	20.023	Neophytadiene	278 g/mol	$C_{20}H_{38}$	9.730		Antioxidant insecticidal activity, anti inflammatory

15.	20.086	2-Pentadecanone6,10,14-trimethyl-	268 g/mol	$C_{18}H_{36}O$	2.282		Antibacterial and antifungal free radical scavenging
16.	20.345	3,7,11,15-Tetramethyl-2-hexadecene	338 g/mol	$C_{22}H_{42}O_2$	1.545		Antimicrobial, anti inflammatory antioxidant
17.	21.621	n-Hexadecanoic acid	256 g/mol	$C_{16}H_{32}O_2$	11.064		Cytotoxic activity, free radical scavenging
18.	22.003	Pseudo phytol(6E,10Z-)	292 g/mol	$C_{20}H_{36}O$	0.687		Antibacterial and antifungal effect
19.	23.996	Octadecanoic acid	284 g/mol	$C_{18}H_{36}O_2$	1.638		Cytotoxic/ effects strong antioxidant potential
20.	26.605	Pentacosane	352 g/mol	$C_{25}H_{52}$	0.458		Acts as water-loss prevention compound.

DISCUSSION

Macroscopic characteristics

The observed herbaceous climbing habit, axillary tendrils, slender pubescent stem, alternate petiolate leaves, solitary axillary flowers, filamentous corona, prominent bracts and berry-type fruits were consistent with previously reported diagnostic features of *P. foetida* (Krishnaveni and Thaakur, 2008; Ning *et al*., 2023). These characters support preliminary botanical authentication before phytochemical analysis.

Qualitative phytochemical screening

The five solvent extracts showed variation in phytochemical profiles, with ethanol exhibiting the broadest qualitative profile. The detection of alkaloids, flavonoids, phenols, tannins, glycosides and saponins agrees with previous investigations of *P. foetida* (Antony *et al*., 2021; Tandoro *et al*., 2020). The broader ethanol profile may reflect its ability to extract constituents of different polarities, consistent with earlier studies reporting solvent-dependent phytochemical variation in *P. foetida* (Yusof and Mahmood, 2021; Suksomran *et al*., 2022).

UV–Visible spectroscopic analysis

The ethanolic leaf extract showed absorption maxima at 206, 272, 331 and 411 nm. These bands represent the overall spectral characteristics of the crude extract and may reflect contributions from multiple UV-absorbing constituents. Similar use of UV–Visible spectroscopy for preliminary characterization of *P. foetida* extracts has been reported (Patil and Lade, 2018; Fadillah *et al*., 2017). Individual compounds cannot be assigned conclusively from these maxima alone.

FT-IR spectroscopic analysis

The FT-IR spectrum showed 22 peaks across 416.62–3988.79 cm^{-1}, including regions associated with O–H/N–H, C–H, C–O, C–N, C=C and C=O vibrations. The C–H stretching region around 2916 cm^{-1} and carbonyl/C–O regions were comparable with previous FT-IR studies of *P. foetida* (Shankar *et al*., 2017).

The strong band at 894.97 cm^{-1} and bands at 1732.08 and 2916.37 cm^{-1} were assigned to characteristic bending/stretching regions. Because crude-extract FT-IR spectra contain overlapping signals, these assignments indicate functional-group regions rather than definitive compound identities.

The strong absorption observed at 894.97 cm^{-1} in the present study was assigned to alkene/aromatic C–H out-of-plane bending, while bands at 1732.08 cm^{-1} and 2916.37 cm^{-1} were associated with carbonyl and aliphatic C–H stretching vibrations, respectively. The broad high-wavenumber absorptions observed around 3232.70–3988.79 cm^{-1} are consistent with O–H/N–H stretching regions. These assignments should be regarded as functional-group indications rather than definitive identification of individual compounds, since FT-IR analysis of a crude extract reflects overlapping contributions from multiple constituents.

GC–MS analysis

GC–MS analysis of the ethanolic leaf extract of *P. foetida* L. revealed 20 tentatively identified constituents belonging to different chemical classes, including hydrocarbons, aromatic compounds, phenolic derivatives, fatty acids and terpenoid-related compounds. n-Hexadecanoic acid (11.064%) was the predominant constituent, followed by neophytadiene (9.730%), while 2-pentadecanone, 6,10,14-trimethyl- (2.282%), anethole (2.000%), 3-ethenylphenol (1.897%) and octadecanoic acid (1.638%) occurred in comparatively lower proportions. The predominance of n-hexadecanoic acid is consistent with its previous detection in *P. foetida* extracts, although its abundance may vary with plant part and extraction conditions (Paulraj *et al*., 2014).

Recent GCMS studies of *P. foetida* leaves and floral material have likewise demonstrated substantial chemical diversity, with differences attributable to plant organ and extraction procedure (Abubakar *et al*., 2025; Doifode *et al*., 2026; Thomas *et al*., 2025). The compounds detected here should be regarded as tentatively identified unless confirmed by authentic standards or complementary analytical techniques.

CONCLUSION

The present study provided preliminary phytochemical and pharmacognostic characterization of *P. foetida* leaves. Macroscopic evaluation showed characteristic diagnostic features, while qualitative screening demonstrated solvent-dependent phytochemical variation, with ethanol showing the broadest profile. UV–Visible and FT-IR analyses provided complementary spectral information, and GC–MS tentatively identified 20 constituents, with n-hexadecanoic acid and neophytadiene as the predominant compounds based on relative peak area. Further isolation, structural confirmation and biological evaluation are required to establish the significance of the identified constituents.

REFERENCES

1. Newman, D. J., and Cragg, G. M. Natural products as sources of new drugs over the nearly four decades from 01/1981 to 09/2019. Journal of Natural Products, 2020; 83(3): 770–803.
2. Atanasov, A. G., Zotchev, S. B., Dirsch, V. M., and Supuran, C. T. International Natural Product Sciences Taskforce. Natural products in drug discovery, 2021; 20(3): 200–216.
3. Shafodino, F. S., Lusilao, J. M., and Mwapagha, L. M. Preparation of medicinally active extracts and phytochemical characterisation of phytoconstituents from medicinal plants. Natural Product Research, 2024; 38(20): 3508-3518.
4. Nikolova, K., Velikova, M., Gentscheva, G., Gerasimova, A., Slavov, P., Harbaliev, N., Makedonski, L., Buhalova, D., Petkova, N., and Gavrilova, A. Chemical Compositions, Pharmacological Properties and Medicinal Effects of Genus Passiflora L.: A Review. *Plants*, 2024; 13(2): 228.
5. Zhang, J., Tao, S., Hou, G., Zhao, F., Meng, Q., and Tan, S. Phytochemistry, nutritional composition, health benefits and future prospects of Passiflora: A review. Food Chemistry, 2023; 428: 136825.
6. Ponsuwan, K., Nathabumroong, S., Lekphrom, R., Sorin, S., Saengboonmee, C., Senawong, T., and Schevenels, F. T. Passifetilactones AE, fatty acid lactones from the fruit and flowers of *Passiflora foetida* with cytotoxic activity. Journal of Natural Products, 2024; 87(6): 1652-1659.
7. Harborne, J. B. Phytochemical Methods: A Guide to Modern Techniques of Plant Analysis. Chapman and Hall, London, 1973.
8. Ulmer, T., and MacDougal, J. M. Passiflora: Passionflowers of the World. Timber Press, Portland, Oregon, USA., 2004.

9. Dhawan, K., Dhawan, S., and Sharma, A. Passiflora: A review update. Journal of Ethnopharmacology, 2004; 94(1): 1–23.
10. Kokate, C. K., Purohit, A. P., and Gokhale, S. B. Pharmacognosy. Nirali Prakashan, Pune, India, 1995.
11. Antony Sandosh, T., Paul John Peter, M., and Yesu Raj, J. Phytochemical analysis of Stylosanthes fruticosa using UV-Vis, FTIR and GC-MS, 2013.
12. Theng, K. B., and Korpenwar, A. N. Phytochemical analysis of ethanol extract of Ampelocissus latifolia (Roxb.) Planch tuberous root using UV-Vis, FTIR and GC-MS. International Journal of Pharmaceutical Sciences and Research, 2015; 6(9): 3936–3942.
13. Jennings, W., and Shibamoto, T. Qualitative Analysis of Flavor and Fragrance Volatiles by Glass Capillary Gas Chromatography. Academic Press, New York, USA., 1980; 472.
14. Krishnaveni, A., and Thaakur, S. R. Pharmacognostical and preliminary phytochemical studies of *Passiflora foetida*. Ancient Science of Life., 2008; 27(3): 19–23.
15. Loh Yan Ning, Azmi, A. A. A. R., Syamsumir, D. F., Wan Ismail, W. I., & Maulidiani, M. Phytochemical screening, TLC profile and ^{1}H NMR analysis of *Passiflora foetida* extracts. Universiti Malaysia Terengganu Journal of Undergraduate Research, 2023; 5(2): 65–74.
16. Tandoro, Y., Widyawati, P. S., Budianta, T. D. W., and Sumargo, G. Phytochemical identification and antioxidant activity of *Passiflora foetida* fruits and leaves extracts: A comparative study. International Journal of Pharmacy and Pharmaceutical Sciences, 2020; 12(6): 55–58.
17. Antony, N. M., Fernandes, J., and Mathew, J. Phytochemical and pharmacological investigation of stems of *Passiflora foetida*. Journal of Pharmaceutical Research International, 2021; 33(58B): 408–414.
18. Yusof, N. A., and Mahmood, A. Proximate composition of dried powder of *Passiflora foetida* leaves and fruits and its phytochemical content of crude aqueous and ethanol extract. Universiti Malaysia Terengganu Journal of Undergraduate Research, 2021; 3(4): 99–108.
19. Patil, A. S., and Lade, B. D. Wound stress induced secondary metabolites in Passiflora foetida: Exploration of antimicrobial compounds. Saudi Journal of Medical and Pharmaceutical Sciences, 2018; 4(5): 613–627.
20. Fadillah, A., Rahmadani, A., and Rijai, L. Analisis Kadar Total Flavonoid dan Uji Aktivitas Antioksidan Ekstrak Daun Kelubut (Passiflora foetida L.). Proceeding of Mulawarman Pharmaceuticals Conferences, 2017; 5(1): 21–28.

21. Shankar, R., Lale, S. K., Mudaiya, R. K., Gaur, S. K., and Dhiman, K. S. Exploration of therapeutically important medicinal plants in Ambedkar Nagar, Sant Kabir Nagar and Siddhartha Nagar districts of Uttar Pradesh and need for conservation. World Journal of Pharmaceutical Research, 2017; 6(6): 631–666.
22. Paulraj, M. G., Shanmugam, N., and Ignacimuthu, S. Antifeedant activity and toxicity of two alkaloids from Adhatoda vasica Nees leaves against diamondback moth Plutella xylostella (Linn.) larvae. Archives of Phytopathology and Plant Protection, 2014; 47(15): 1832.
23. Doifode, S., Bhosle, S., & Sharifi-Rad, M. Phytochemical screening and in vitro pharmacological evaluation of Passiflora foetida L. leaf extract found in the vicinity of Lonar Lake: A distinctive saline crater lake in India. Proceedings of the Indian National Science Academy, 2026.
24. Selvamony, S., Thomas, A. W. J., Antonysamy, J. M., Chemical composition of Helminthostachys zeylanica (L.) Hook. (Ophioglossaceae) aerial parts acetone extracts and their bio-potency – In silico and in vitro bioassay approach. Food and Chemical Toxicology, 2025; 206: 115772.
25. Abubakar, K. S., and Lubabatu, M. J. GC-MS profiling and secondary metabolite analysis of selected plant extracts for potential anti-hyperglycemic activity. African Journal of Advances in Science and Technology Research, 2025; 18(1): 94–110