Indian Journal of Natural Sciences www.tnsroindia.org.in ©IJONS

Vol.16 / Issue 89 / April/ 2025 *International Bimonthly (Print) – Open Access* *ISSN: 0976 – 0997*

RESEARCH ARTICLE

Phytochemical and Physicochemical Profiling of *Pyrrosia lanceolata* (L.)Farw

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Received: 21 Nov 2024 Revised: 29 Dec 2024 Accepted: 28 Feb 2025

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ABSTRACT

The present study was proposed to investigate the secondary metabolites of *Pyrossia lanceolata*, (L.) Farwell which belongs to the family Polypodiaceae. The leaves of *Pyrossia lanceolata* were analysed for the phytochemicals and its biological activities. Preliminary phytochemical screening reported the presence of flavanoids and phenol in petroleum ether, flavanoids, saponin and steroid in chloroform, quinones, steroids and terpenoids in ethyl acetate and glycosides, phenol, quinines, saponins, steroids, tannin and terpenoids in methanol extract. Quantitative estimation of phytochemicals showed the 80 mg/g of phenol, 94.50 mglg of saponin, 155mg/g of tannin and terpenoid of 93.79 mg/g. Physicochemical analysis showed the 11.11% of moisture content, 3.92% of total ash content, 2.88% of Water-soluble ash, 0.65% of Acid soluble ash and 1.69% of Sulphated ash. Fluorescence analysis showed the varying colour under different chemicals plays an important role in the determination of the quality and purity of the drugs.

Keywords: Pteridophytes, ferns, *Pyrrosialanceolata*, phytochemicals, physicochemical analysis, fluorescence analysis, GC-MS, antioxidant activity, herbal medicine.

INTRODUCTION

Pteridophyta, one of the primary divisions of the plant kingdom, encompasses ferns and their close relatives and has thrived for millions of years. According to Chang *et al*. (2011), approximately 1,200 species of ferns and over 250 different genera are distributed worldwide. Pteridophytes represent the second-largest group of plants, following

angiosperms. Ferns, in particular, serve as a valuable source of pharmaceutical intermediates, food, dietary supplements and chemical entities used in synthesizing pharmaceuticals (Hammond *et al*., 1998). Their diverse medicinal properties have been recognized since antiquity, with references from Theophrastus, a Greek philosopher and Indian scholars such as Sushruta and Charaka, who noted the medicinal uses of ferns as early as 300 B.C. Today, plant-based medicines are crucial, particularly in underdeveloped nations. The World Health Organization (WHO) estimates that 80% of the population in these regions depends on traditional medicine, which frequently involves plant extracts (Vadivel and Arockia, 2021). As global interest shifts towards plant-derived pharmaceuticals, the importance of medicinal plants continues to rise. Emphasis is increasingly placed on the safety, efficacy and economic benefits of herbal remedies (Glombitz *et al*., 1994; Mahabir and Gulliford, 1997). One critical aspect of ensuring the quality and efficacy of plant-based medicines is the standardization process, which assesses the concentration of active ingredients and adheres to physical and chemical standards. Each fern species has unique physicochemical properties that must be understood to properly evaluate its medicinal potential. Physicochemical analysis examines aspects such as moisture content, total ash, acid-insoluble ash and sulphated ash, offering insights into the quality and purity of inorganic compounds (Tatiya *et al*., 2012). Fluorescence, the emission of light by a substance exposed to light or UV radiation, is another vital tool in pharmacognostic studies. It helps in identifying adulterants and authenticating raw plant materials, including ferns (Dominic and Madhavan, 2012). By comparing fluorescence intensities, researchers can distinguish between different plant species and detect the presence of specific drugs in mixtures (Kasthuri and Ramesh, 2018). Ferns, like other plants, produce phytochemical compounds that protect them from environmental stressors such as pollution, UV exposure, drought and pathogens. While phytochemicals are not essential nutrients for humans, they play a crucial role in preventing certain diseases due to their antioxidant, antimicrobial and anticancer properties (Selvi *et al*., 2016). These secondary metabolites are abundant, with thousands of known phytochemicals and likely many more yet to be discovered. Identifying these compounds helps predict a plant's pharmacological activity and modern techniques such as Gas Chromatography-Mass Spectrometry (GC-MS) have become essential tools in phytochemical screening (Ojo, 2020). Recent ethnobotanical and pharmacological studies have revealed the medicinal and pharmaceutical potential of various fern species, though many remain unexplored. Despite the rich diversity of ferns in Valparai Hills, their medicinal value has received relatively little attention compared to higher plants. Notably, no prior research has examined the physicochemical properties or chemical composition of *Pyrrosia lanceolata*, a small fern belonging to the Polypodiaceae family. This study aims to fill that gap by providing comprehensive insights into the physicochemical and phytochemical properties of *P. lanceolata* (L.) Farwell.

MATERIALS AND METHODS

Plant Collection and identification

The plant material for the present study was collected from the Valparai Hills, Western Ghats. The collected specimen was identified as *Pyrrosia lanceolata* (L.) Farwell with the reference No- CPB2092. The healthy and matured plant material was thoroughly washed in running tap water to remove debris and then shade dried at room temperature for 2 months. The dried material was then finely powdered and stored for further studies.

Systematic position

Kingdom : Plantae
Phylum : Tracheophyta
Division :Polypodiophyta.
Class : Polypodiopsida
Order : Polypodiales
Family : Polypodiaceae
Genus : Pyrossia
Species : lanceolata
Binomial name: *Pyrossialanceolata* (L.) Farwell

Synonym

Acrostichumlanceolatum L., *Pyrrosiaadnascens* (Sw.), *Acrostichumdubium*Poir,*Candolleaheterophylla* Mirb.,*Candollealanceolata* (L.) Mirb.,*Craspedariapertusa* (Roxb. ex Hook.) Link, *Cyclophoruscornutus* Copel.,*Cyclophorusdimorphus* Copel., *Cyclophorusgiesenhagenii* (Christ) C. Chr.,*Cyclophorusglaber* Desv.

Common name: Lanceleaf Tongue Fern

Description

Pyrrosialanceolata(L.)Farwell. belongs to the family Polypodiaceae. Rhizome long creeping up to 2 mm thick, slender densely covered by scales lanceolate up to 5 × 1 mm, uniformly pale brown spot at the sub axial region, leaf simple, lanceolate, elliptical or linear- lanceolate up to 14 × 1 cm, apex acute, base decurrent up to the winged type stipe. Sori irregularly distributed mainly in the distal part of thepinna orbicular up to 2 mm in diameter. Dark brown, naked, spore reniform or planoconvex, 60 × 50 µm, pale brown, exine with few prominent tubercles.

Preparation of sample

The leaves were washed multiple times with tap water and further with distilled water to remove fine impurities. Leaves were shade dried for two months to remove all the moisture content and to preserve maximum of the bioactive compounds. The dried leaves were cut down into small pieces of size upto 1-2cm. The cut down parts were crushed using a laboratory blender and then sieved through a mesh size of 3mm in order to remove the coarse materials. The fine powder was then packed in an airtight container.

Physiochemical study

Physiochemical studies include moisture content, total ash values, acid –insoluble ash, water soluble ash, sulphated ash to determine the quality and purity of the leaf powder of *P. lanceolata* (Badhsheeba and Vadivel, 2020).

Moisture content

About 5g of the dry plant powder sample was weighed (Wt0), into a pre-dried and weighed tarred porcelain crucible. The sample was dried in an oven at 100-105ºC until two consecutive weighing's (Wt2) do not differ by more than 5mg.The moisture content of the samples was calculated by concerning the crude-dried drug.

$$\text{Moisture content} = \frac{Wt0 - Wt2}{Wt2} \times 100$$

Where Wt0 = Weight of original sample,
Wt2 = Weight of secondarily dried sample.

Total Ash Value:

A Silica crucible was heated to redness for 10mins and cooled in a desiccator and weighed (W1).About 5gm of the ground air-dried sample was transferred to the crucible and weighed along with the contents accurately (W2). The sample was ignited gradually in an electrical muffle furnace, increasing the heat to 500-600ºC until it is white, indicating the absence of carbon. It was cooled in a desiccator and reweighed (W3).

$$\text{Total ash} = \frac{\text{Weight of crucible with ash (W3)} - \text{weight of crucible(w1)}}{\text{Weight of crucible with sample (W2)} - \text{weight of crucible (w1)}} \times 100$$

Where W1 = Weight of crucible,
W2 = Weight of crucible with sample,
W3 = Weight of crucible with ash.

Acid-insoluble Ash

10ml of 2M HCL was added to the crucible containing the total ash, covered with a watch-glass and boiled gently for 5minutes. The watch-glass was washed with 5ml of hot water and the washings were added to the crucible. The insoluble matter was filtered on an ashless filter paper and washed with hot water until the filtrate is neutral. The filter-paper containing the insoluble matter was transferred to the original crucible, dried on a hot plate and ignited to constant weight (W4).

Acid insoluble Ash=weight of the crucible with ash–weight of the crucible

$$\frac{\text{weight of the crucible with ash–weight of the crucible}}{\text{Weight of the sample}} \times 100$$

Water Soluble Ash

To the crucible containing the total ash, 25ml of water was added and boiled for 5 minutes. The filter was washed with hot water and then ignited in a crucible for 15 minutes at a temperature not exceeding 450ºC.The residue was allowed to cool in desiccator for 30 minutes and then re-weighed, calculations were done according to equations.

Water soluble ash = Total ash weight – water insoluble residue of total ash

$$\frac{\text{Total ash weight – water insoluble residue of total ash}}{\text{Weight of sample}} \times 100$$

Sulphated Ash

A silica crucible was heated to redness for 10 minutes, allowed to cool in desiccators and weighed (W1). 1g of substance was accurately weighed and transferred to the crucible and weighed along with the contents accurately (W2). It was ignited gently at first until the substance was thoroughly charred. Then the residue was cooled and moistened with 1ml concentrated sulfuric acid, heated gently until the white fumes are no longer evolved and ignited at 800 ± 25ºC until all black particles have disappeared. The ignition was conducted in a place protected from air currents. The crucible was allowed to cool, and a few drops of concentrated Sulphuric acid were added and heated. Ignited as before, allowed to cool, and weighed (W3). The operation was repeated until two successive weighing does not differ by more than 0.5mg.

Sulphated ash = W3-W1

$$\frac{\text{W3-W1}}{\text{W2-W1}} \times 100$$

Where W1 = Weight of crucible

W2 = Weight of crucible with sample,

W3 = Weight of crucible with sample after ignition

UV- Fluoresence analysis

A small quantity of dried and finely powdered sample were treated with different organic and inorganic solvents like Conc.H_2SO_4, Dil.H_2SO_4,Conc.HCL,DilHCL,NaOH,Dil.NaOH, KOH, dil. KOH, oxalic acid, dil. oxalic acid, acetic acid, dil. acetic acid, iodine, ninhydrin, acetone, petroleum ether, isopropyl alcohol, chloroform, ethyl acetate, butanol, methanol and distilled water. The powdered sample were placed on a slide and were subjected to fluorescence analysis in day light, white light and UV- light (365nm). The development of colour was noted within 1-2 min in order to avoid drying and resultant colour change (Muthu and Siva 2018).

Preparation of extract

Organic solvents in the increasing order of polarity (petroleum ether, chloroform, Ethyl acetate and Methanol) were used to extract the powder sample of *P. lanceolata* according to the method described by Harbone, 1998. The sample were sequentially extracted using a soxhlet apparatus at a temperature(40-60ºC) and was subjected to detect the presence of different phytochemical constituents.

Preliminary phytochemical screening

The phytochemical screening of *P. lanceolata* leaves using different solvents in the increasing order of polarity helps in the identification of presence and absence of phytochemicals present in the different solvent extracts. The tests performed for the phytochemical screening are listed below:

Test for Alkaloid- Mayer's test (Jadhav*et al.,* 2019)

To 1ml of extract, 2ml of Mayer's reagent was added. The formation of yellow coloured precipitate indicated the presence of alkaloid.

Test for Glycosides- Bontrager's test (Shakoor*et al*., 2013)

To 2ml of fern extract, 3ml of chloroform and 1ml of 10% ammonium solution was added. Formation of pink colour indicated the presence of glycosides.

Test for phenol-$FeCl_3$ test (Kalpana*et al*., 2014)

To 1ml of extract, 1ml of 5% $FeCl_3$ solution was added. Formation of bluish black colour indicated the presence of phenol.

Test for Quinones (Kalpana *et al*., 2014)

To1ml of extract, conc.H_2SO_4 was added. Formation of red colour indicated the presence of quinones.

Test for Tannins(Kalpana *et al*., 2014)

To 1ml of extract, 5% $FeCl_3$ solution was added. The formation of brownish green colour indicated the presence of tannin.

Test for Flavanoid(Kalpana *et al*., 2014)

To 3ml of extract, 4ml of 1N NaOHwas added. The formation of intense yellow colour indicated the presence of flavonoids.

Test for Saponin-Foam test (Jadhav *et al.,* 2019)

1ml of extract was shaken vigorously with 20ml distilled water for 5-10 minutes in graduated cylinders. Formation of one-centimeter layer of foam indicated the presence of saponin.

Test for Steroids(Jadhav *et al.,* 2019)

To 1ml extract, 2ml of chloroform and 1ml of H_2SO_4 was added. The formation of reddish brown ring at interface indicated the presence of steroids.

Test for Terpenoid(Jadhav et al., 2019).

To 1ml of extract, 2ml of chloroform and Conc.$H_2SO_4$was added and the formation of reddish brown colour indicated the presence of terpenoid.

Quantitative phytochemical analysis

Determination of total alkaloids

5g of the sample was weighed into a 250ml beaker and 200ml of 10% acetic acid in ethanol was added, covered and allowed to stand for 4 hours. This was filtered and the extract was concentrated on a water bath to one-quarter of the original volume. Concentrate ammonium hydroxide was added drop wise to the extract until the precipitation was complete. The whole solution was allowed to settle and the precipitate was collected and washed with dilute ammonium hydroxide and then filtered. The residue was alkaloid which was dried and weighed (Harborne, 1973).

Determination of total saponin

An amount of 10g of each extract was taken and 50 ml of 20% aqueous ethanol was dissolved. The samples were heated and continuously stirred for four hours at 55°C under water bath. The mixture was filtered and residue re-extracted with another 200 ml 20% ethanol. The combined extracts were reduced to 40 ml over water bath at about 90°C.The concentrate was transferred into a 250 ml separatory funnel and 20 ml diethyl ether was added and shaken vigoroursly. The aqueous layer was recovered while the ether layer was discarded. The purification process was repeated.60 ml of n-butanol was added the combined n-butanol extracts were washed twice with 10 ml of 5% aqueous sodium chloride. The remaining solution was heated in a water bath. After evaporation, the samples were dried in the oven to a constant weight and the saponin content was calculated (Obdoni and Ochuko, 2001).

Determination of total terpenoids

10g of powder sample was soaked in alcohol for a day. Later on, it was filtered and petroleum ether was use for purpose of extraction. The extracted material was weighed and considered as terpenoids (Sharma *et al.,* 2015).

Determination of total tannins

The methanolic extract (1ml) was mixed with Folin-Ciocaltau reagent (0.5ml), followed by the addition of saturated sodium carbonate(Na_2CO_3) solution (1ml) and distilled water (8ml). The reaction mixture was allowed to stand for 30 minutes at room temperature. The supernatant was obtained by centrifugation and absorbance was recorded at 725nm using UV- Spectrophotometer. Increasing concentration of standard tannic acid was prepared and the tannic acid concentration was plotted for a standard graph. The tannin content was expressed as mg tannic acid equivalent (TAE)/g of the sample (Devi *et al*., 2014).

RESULTS AND DISCUSSION

Physicochemical analysis

The present study was carried out on the leaves of *P. lanceolata,* which belongs to the family Polypodiaceae. The physicochemical parameters such as moisture content, total ash, water-soluble ash, acid-soluble ash, sulphated ash were mainly used in judging the purity and quality of the drug and the results are recorded in table 1. Moisture is one of the major factors responsible for the deterioration of drugs and herbal formulations. The moisture promotes the degradation processes caused by enzymes, development of microorganisms, oxidation and hydrolysis reactions. This study recorded moisture content of 11.11% which is deemed to be good as the water content in herbal drugs should not be greater than 14%. Similar result was obtained in *Acrostichumaureum* leaf sample and the moisture content was 9.27% which is below 14%. (Vadivel and Arockia, 2021). A high ash value is indicative of contamination, substitution or adulteration by minerals. The residue remaining after incineration of plant material is the total ash or ash value. Ash value represents both physiological ash and non-physiological ash. Physiological ash is derived from plant tissue due to biochemical processes while non-physiological ash consists of residue of the extraneous matter (such as sand, soil *etc*.,) deliberately or non-deliberately adhering to plant sample itself. Physiological ash gets dissolved in the dilute acid; while, some of the non-physiological ash remains un-dissolved. Total ash may compose of carbonates, phosphates, nitrates, sulphates, chlorides and silicates of various metals which are taken up from the soil or environment. In the present investigation, the total ash content of *P. lanceolata* leaves was found to be 3.92%, which is less than the maximum acceptable limit of total ash (14%) recommended by European Pharmacopoeia. Acid insoluble ash is a part of total ash and measures the amount of silica present especially as sand and siliceous earth in the samples. The values also indicate the magnitude of presence of oxalates, carbonates, phosphates, oxides and silicates. Therefore, the values are indices of excellence of herbal remedies. Water-soluble ash is the part of the total ash content, which is soluble in water. This study shows 2.88% of water-soluble ash and 0.65% of acid-soluble ash and 1.69% of sulphated ash in *P. lanceolata*leaves. Similar work was reported by Jeethu and Bindhu in 2017 on *H arifolia* leaf powder.The result revealed 3.39±0.4% of moisture content, 6.03%of total ash, 1.11±0.05% of acid soluble ash and 3.99±0.14% of water soluble ash. Selvi*et al*. (2016) studied the physicochemical analysis of the rhizome of

Drynariaquercifolia L. The study revealed that the moisture content is about 3%, water-soluble ash 6%, and the sulphated ash value as 6%.

UV-Fluorescence analysis

Fluorescence is the phenomenon exhibited by various chemical constituents present in the powder sample. Some constituents show fluorescence in the visible range in daylight. The ultra violet light produces fluorescence in many products, which do not visibly fluorescence in daylight. If the substances themselves are not fluorescent, they may often be converted into fluorescent derivatives or decomposition products by the application of different reagents (Ansari, 2006). Hence, some drugs are often assessed qualitatively in this way and it is an important parameter of pharmacognostical evaluation. In the present study, characters of *P. lanceolata* leaf powder were analyzed and the results were tabulated in table 2 and figu The leaf powder of *P. lanceolata* was treated with various strong acids, bases and some solvents were tabulated. The untreated leaf powder was appeared to be green in UV light and dark green in white light. When powder treated with distilled water, dark green in white light was changed into green under UV light. When powder of the sample is treated with 50% of oxalic acid, yellowish green was appeared in white light and light green in UV light. The powder when treated with acetic acid, yellow in white light changed into greenish brown colour. The leaf powder treated appeared to be brownish green in UV light source when treated with 50% acetic acid from yellowish green. The powder reacted well with solvents and it appeared as green, yellowish green, dark green and brownish green in UV light on addition of butanol, isopropyl alcohol, ethyl acetate and sodium hydroxide. Vadivel and Arockiabadhsheeba (2021) studied the fluorescence analysis of leaf powder of *A. aureum.* Brown colour was observed when the leaf powder was treated with 1N HCl, 1N HNO_3, petroleum ether and 50% sulphuric acid, as well as the powder without any chemical treatment was observed under visible light. Green colour was observed under UV light of short wavelength (254nm) when treated with 1N HCl, 1N HNO_3, methanol, chloroform and 40% NaOH. Various colours like light brown, yellowish-brown, light green, dark green, dark brown, and black were also observed under different light conditions. Selvi *et al*. (2016) carried out the fluorescence analysis of leaf powder of *Drynariaquercifolia*. In visible light the leaf powder exhibit various shades of green and brown fluorescence, various shades of green, blue and brown were found in under UV light. Mini *et al.*(2019) reported the fluoresence analysis of dried powder of *P.hetrophylla.* The leaf powder appeared to be dark green in Chloroform at visible light and black in UV light. On addition with strong base 1N NaOH powder appeared to be dark brown in visible light and black in UV light. On addition with acetic acid, powder appeared to be brown in visible light and pinkish red in UV light. On addition with water, powder appeared to be dark green in visible light and black in UV light.

Preliminary phytochemical screening

The properties of medicinal values mainly depend upon the phytochemicals present in the sample. Therefore the present study was undertaken to evaluate the phytochemical constituents of the leaves to confirm the presence and absence of phytochemicals. The phytochemical test was conducted using different solvents such as petroleum ether, chloroform, ethyl acetate and methanol based on the increasing order of polarity. The petroleum ether extract of *P.lanceolata*showed the presence of flavanoids and phenol. The chloroform extract of *P.lanceolata* showed the presence of flavanoids, saponin and steroid. The ethyl acetate showed the positive results for quinines, steroids and terpenoids. The polar solvent methanol exhibited the presence of major phytochemicals such as glycosides, phenol, quinines, saponins, steroids, tannin and terpenoids. The preliminary phytochemicals of *P. lanceolata* was recorded and tabulated in table 3. Similar phytochemical work was carried out byRuby and Sara (2014) in the leaves of *Pyrossialanceolata.* The result revealed the presence of various secondary metabolites *viz*., alkaloids, carbohydrates, glycosides, fixed oils, fats Terpenoids, flavanoids, anthroquinones and phenols in DMSO and ethanol extract of *Pyrossialanceolata*. Alkaloids, phenol, terpenoids, flavanoids were present in Petroleum ether and chloroform extract of *Pyrossialanceolata*. In the present study,the methanolic extract demonstrated maximum occurrence of phytochemicals compared to petroleum ether and chloroform. Similarly, Vijayakumari *et al*. (2022) studied phytochemical screening on aerial part of *Christellaparasitica* using petroleum ether, ethyl acetate and distilled water as solvents. Steroids, tannins, quinones, terpenoids, phenols and phlobatannins were present in all the extracts. Alkaloids, saponins, flavonoids and glycosides were absent in distilled water. Lawrence and Paul (2020) reported the

presence of various phytochemicals in the frond of *Microlepiaspeluncae*. The result revealed the presence of various secondary metabolites *viz*., cardiac glycosides, flavonoids, glycosides, phenolic groups, saponins, tannins and terpenoids in methanol extract and it showed maximum number of phytochemicals. Next to methanol extract, chloroform and acetone extract showed the presence of eleven compounds, ethyl acetate showed the presence of ten compounds, followed by hexane extract with nine compounds. Paul (2018) screened the preliminary phytochemicals of *A. caudatum* using hexane, benzene, acetone and methanol as solvents. The results expressed the presence of alkaloids, saponins and triterpenoids infourdifferent extracts, cardiac glycosides, flavonoids and tannins in three extracts, diterpenes in two extracts followed by coumarin and steroids in only one extract followed by anthocyanin, anthraquinones and emodins

have no results. Among the four different extracts, themethanol extract showed the presence of the maximum number (7) of compounds. Next to methanol, acetone, benzene and hexane extracts showed the presence of six compounds each.

Quantitative phytochemical analysis

Based on the major phytochemicals present in methanolic extract in preliminary phytochemical screening, quantitative analysis was carried out to determine the amount of phenol, saponins, terpenoids and tannins in *P. lanceolata.* The highest amount of flavonoid content was examined followed by tannin, terpenoid, saponinand alkaloid. The values are shown in table 4. Similar work was done by Devi e*t al*. (2014)in four pteridophytes namely *Actinopterisradiata, Drynariaquercifolia, Dryopteriscochleata* and *Pityrogrammacalomelanos.* Total phenol and total tannins were subjected for quantitative analysis using the four fern extracts. *Pityrogrammacalomelanos* had maximum tannin content (17.181 ± 0.441 mg TAE/g) and highest phenol (13.781 ± 0.481 mg GAE/g) content. However *Drynariaquercifolia* had least tannin (6.332 ± 0.187 mg TAE/g) and least phenol (7.131 ± 0.184 mg GAE/g) content. Manivannan *et al.* (2021) studied the phytochemical profile of *Bolbitisappendiculata* using different solvents. In this acetone extract showed high amount of phenol 364.93 ± 11.7 mg GAE/g and tripenoids 115.67 ± 1.04 mg/g. Methanol extract showed maximum amount of tannins 40.14 ± 0.8 mg GAE/g and sterols 3.7 ± 0.1 mg/g. Highest amount of flavonoids (1733.33 ± 72.1 mg QE/g was observed in chloroform extract.

CONCLUSION

The study on *Pyrrosialanceolata* (L.) Farwell highlights its rich phytochemical profile and promising biological potential, laying the groundwork for future applications in herbal medicine and pharmaceutical development. The identification of key bioactive compounds, including flavonoids, phenols, saponins, tannins, and terpenoids, underscores the therapeutic potential of *P. lanceolata*. Moving forward, more extensive research is needed to isolate and characterize these compounds, investigate their specific pharmacological effects, and understand their mechanisms of action. Advanced in vivo and in vitro studies could further validate the observed bioactivities, while clinical trials may pave the way for incorporating *P. lanceolata* extracts into mainstream medicinal use. Additionally, standardizing the physicochemical and fluorescence profiles will enhance quality control, ensuring consistent and safe applications. These findings position *Pyrrosialanceolata* as a promising candidate for future natural therapies, potentially contributing to innovative treatments for various health conditions.

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Table 1. Physicochemical analysis of *P. lanceolata* leaves

S.No	Tests	Amount in %
1.	Moisture content	11.11
2.	Total Ash	3.92
3.	Water-Soluble Ash	2.88
4.	Acid- Soluble Ash	0.65
5.	Sulphated Ash	1.69

Table 2. Fluorescence analysis of *P. lanceolata* leaf powder

Treatments	Visible light	White light	UV- light
Normal Powder	Pale green	Dark green	Pale green
Powder + Water	Light green	Yellowish green	Green
Powder +Methanol	Olive green	Yellowish green	Yellowish green
Powder +Butanol	Pale green	Yellowish green	Green
Powder +Ethyl acetate	Yellowish green	Dark green	Dark green
Powder + Chloroform	Pale green	Dark green	Dark green
Powder +Isopropyl alchol	Pale green	Dark green	Yellowish green
Powder +Petroleum ether	Pale green	Yellowish green	Yellowish green
Powder +Acetone	Yellowish green	Dark green	Yellowish green
Powder + Ninhydrin	Pale green	Yellowish green	Yellowish green
Powder + Iodine	Yellowish green	Pale yellowish green	Dark green
Powder + Acetic acid (50%)	Pale green	Yellowish green	Green
Powder + Acetic acid (100%)	Yellowish green	Pale green	Greenish brown
Powder + Con.H_2SO_4	Reddish brown	Yellowish brown	Brown
Powder +Con. HCl	Green	Reddish brown	Dark green
Powder +Oxalic acid (50%)	Yellowish brown	Green	Brownish yellow
Powder +Oxalic acid (100%)	Yellowish brown	Pale yellowish	Green
Powder + NaOH(50%)	Yellowish brown	Yellowish green	Yellowish brown
Powder + KOH (50%)	Brownish	Yellowish brown	Brown
Powder + KOH (100%)	Brownish yellow	Yellowish green	Green
Dilute H2SO4	Dark green	Yellowish green	Dark green
Dilute HCl	Dark green	Yellowish green	Yellowish green

Table 3.Preliminary phytochemical screening of *P. lanceolata* using different solvents

S.No	Phytochemicals	Petroleum ether	Chloroform	Ethyl acetate	Methanol
1.	Alkaloids	_	_	_	_
2.	Glycosides	_	_	_	+
3.	Tannin	_	_	_	+
4.	Saponins	_	+	_	+
5.	Terpenoids	_	_	+	+
6.	Flavanoids	+	+	_	_
7.	Steroids	_	+	+	+
8.	Phenols	+	_	_	+
9.	Quinones	_	_	+	+

+ = Present - = Absent

Table 4: Quantitative phytochemical analysis of *P. lanceolata* methanolic extract

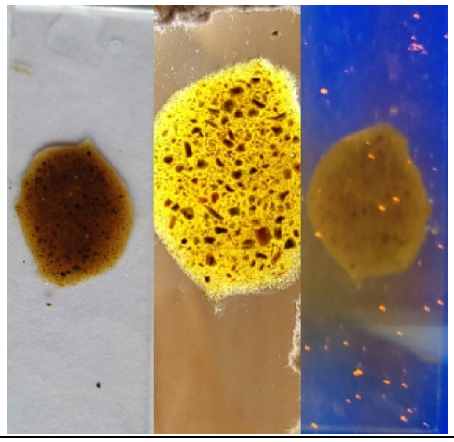
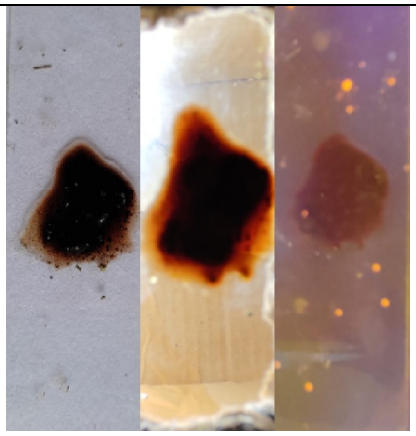
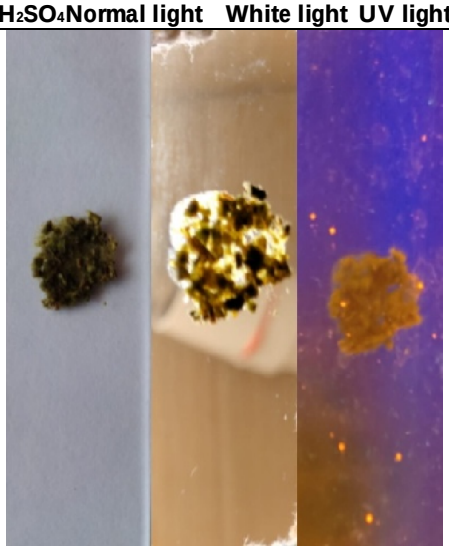
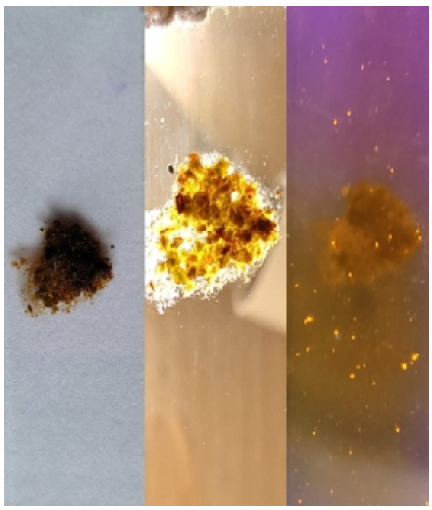
S.No	Phytochemicals	Amount (mg/g)
1.	Phenol	8.5
2.	Saponin	9.45
3.	Tannin	15.5
4.	Terpenoids	9.38

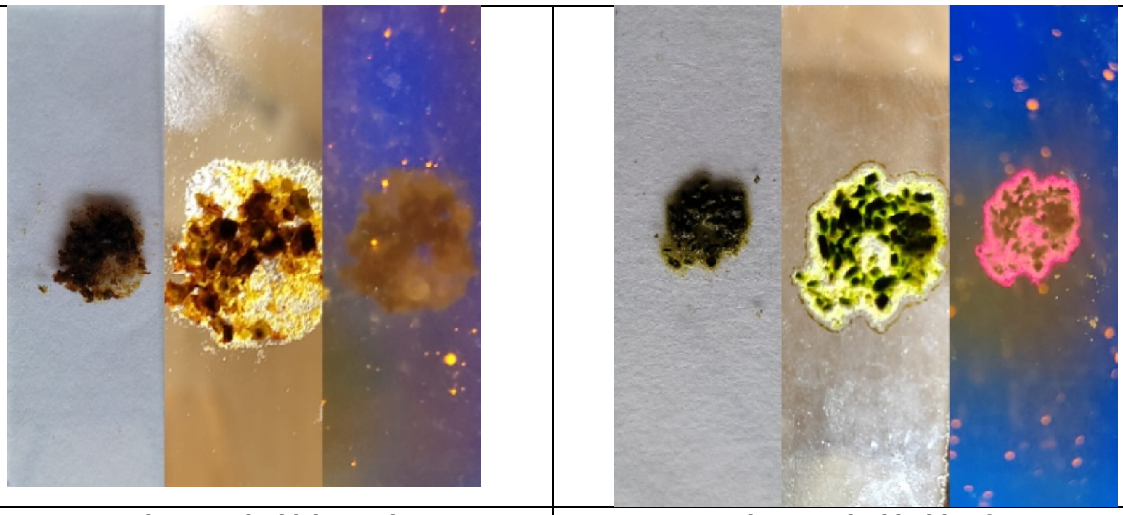
Fig 1.Habit of *P.lanceolata*

Fig 2.Sorus of *P.lanceolata*

Water soluble ash Acid insoluble ash Sulphated ash

Figure 3.Physicochemical analysis of *P. lanceolata*

	
Powder treated with NaOH H_2SO_4Normal light White light UV light	**Powder treated with Conc. Normal light White light UV light**
	
Powder treated with Distilled water Normal light White light UV light	**Powder treated with Conc.HCl Normal light White light UV light**



Powder treated with butanol	Powder treated with chloroform
Normal light White light UV light	Normal light White light UV light

Figure 4.*P. lanceolata*leaf pow der treated with various chemicals