



ISSN: 2347-6567

International Journal of Allied Medical Sciences and Clinical Research (IJAMSCR)

IJPAP | Vol.14 | Issue 1 | Jan - Mar -2026

www.ijamscr.com

DOI : <https://doi.org/10.61096/ijpar.v14.iss1.2026.194-198>

Research Article

Preliminary Phytochemical Screening of *Syzygium cumini* (L.) Skeels Flowers (*Jambu Pushpa*)

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	Abstract
Published on: 23.02.2026	<p>Introduction- <i>Syzygium cumini</i> (L.) Skeels, commonly known as <i>Jambu</i>, is a well-recognized medicinal plant in traditional systems of medicine. The present study was undertaken to evaluate the preliminary phytochemical constituents of <i>Syzygium cumini</i> flowers.</p>
Published by: Futuristic Publications	<p>Methods- Dried and powdered flowers were subjected to successive solvent extraction using petroleum ether, chloroform, ethanol, and distilled water in increasing order of polarity. The obtained extracts were screened for preliminary phytochemical constituents employing standard qualitative chemical tests to detect alkaloids, flavonoids, tannins, phenolics, glycosides, saponins, carbohydrates, and steroids.</p>
2026 All rights reserved.	<p>Results- Phytochemical screening revealed the presence of multiple bioactive constituents in different extracts. Ethanol and aqueous extracts showed a strong presence of flavonoids, tannins, phenolic compounds, glycosides, saponins, and carbohydrates. Alkaloids were detected in chloroform, ethanol, and aqueous extracts. Steroidal compounds were predominantly observed in petroleum ether and chloroform extracts, indicating their non-polar nature.</p>
 Creative Commons Attribution 4.0 International License.	<p>Conclusion- The findings confirm that <i>Jambu Pushpa</i> contains diverse phytoconstituents that may contribute to its reported medicinal properties. The presence of flavonoids, phenolics, and glycosides particularly suggests potential antioxidant and therapeutic relevance. Further quantitative estimation and advanced chromatographic studies are recommended for isolation, characterization, and validation of the active principles.</p>
	<p>Keywords: <i>Syzygium cumini</i>, <i>Jambu Pushpa</i>, phytochemical screening, flavonoids, tannins, medicinal plant.</p>

INTRODUCTION

Medicinal plants continue to serve as a cornerstone of traditional and modern healthcare systems owing to their diverse and complex phytochemical profiles. These natural sources of bioactive compounds provide a wide range of therapeutic benefits with relatively fewer side effects compared to many synthetic drugs. Among such medicinally important plants, *Syzygium cumini* belong to Myrtaceae family, commonly known as *Jamun* or *Jambu*, occupies a significant position in traditional systems of medicine such as *Ayurveda*, *Unani*, and *Siddha*. The plant is widely distributed throughout India and other regions of Southeast Asia and has long been valued for its multifaceted therapeutic properties. Different parts of *Syzygium cumini* including fruits, seeds, bark, and leaves have been extensively investigated for their pharmacological potential. Numerous studies have demonstrated its antidiabetic, antioxidant, antimicrobial, anti-inflammatory, hepatoprotective, and cardioprotective activities. The seeds, in particular, are well recognized for their hypoglycemic activity and are commonly used in the management of diabetes mellitus. The fruits are rich in anthocyanins, flavonoids, and phenolic compounds, which contribute to their strong antioxidant potential. However, despite the substantial scientific literature on the fruits and seeds, comparatively limited research has focused on the flowers (*Jambu Pushpa*). Flowers represent a vital reproductive part of the plant and are known to synthesize and accumulate a variety of secondary metabolites, including flavonoids, phenolic acids, tannins, glycosides, alkaloids, and essential oils. These phytoconstituents play an essential role in plant defense mechanisms and may possess significant pharmacological activities beneficial for human health. The relatively underexplored nature of *Jambu* flowers highlights the need for systematic phytochemical evaluation to determine their therapeutic potential and scientific relevance. Phytochemical screening is a fundamental step in the standardization and validation of medicinal plants. It involves the qualitative identification of major classes of bioactive secondary metabolites present in plant materials. These secondary metabolites are largely responsible for the biological and therapeutic effects attributed to medicinal plants. For example, flavonoids and phenolic compounds exhibit antioxidant and anti-inflammatory properties;

alkaloids may demonstrate analgesic and antimicrobial activities; tannins possess astringent and antimicrobial effects; saponins are known for their expectorant and immunomodulatory actions; and glycosides may contribute to cardioprotective or other systemic effects. In the present investigation, an attempt was made to qualitatively evaluate the phytochemical constituents of *Jambu* flowers using standard procedures. Dried and powdered flower material was subjected to successive solvent extraction to separate phytoconstituents based on polarity. The extracts were screened for major secondary metabolites such as alkaloids, flavonoids, tannins, glycosides, saponins, carbohydrates, and steroids through established qualitative tests. This systematic evaluation provides a scientific foundation for further quantitative analysis and bioactivity guided studies, thereby supporting the therapeutic potential and standardization of *Syzygium cumini* flowers

MATERIALS AND METHODS

Collection and Authentication

- Fresh flowers of *Syzygium cumini* were collected during the flowering season and authenticated by the department of *Dravyaguna Vigyan*. The collected material was shade dried, powdered and stored in airtight containers.

Preparation of Extract-

- Approximately 100 grams of dried flower powder was successively extracted with petroleum ether, chloroform, ethanol and distilled water by maceration for 72 hours. The extracts were filtered and concentrated under reduced pressure.

Qualitative Phytochemical Analysis-

- Qualitative phytochemical screening was performed to detect the presence or absence of major classes of secondary metabolites in the extracts. Standard pharmacognostic procedures were followed for each test, and the development of characteristic color changes or precipitates indicated positive reactions.

Detection of Alkaloids-

- **Dragendorff's Test-** A small portion of the extract was acidified with dilute hydrochloric acid and filtered. To the filtrate, Dragendorff's

reagent (solution of potassium bismuth iodide) was added. Formation of an orange or reddish-brown precipitate indicates the presence of alkaloids. Alkaloids react with bismuth potassium iodide to form insoluble complexes.

- **Mayer's Test-** To the acidified filtrate, Mayer's reagent (potassium mercuric iodide solution) was added. Formation of a cream or pale yellow precipitate confirms the presence of alkaloids. Alkaloids form insoluble complexes with mercuric potassium iodide.

Detection of Flavonoids(Shinoda Test)-

- Flavonoids are polyphenolic compounds known for antioxidant properties. A small quantity of extract was dissolved in ethanol. A few fragments of magnesium ribbon were added, followed by concentrated hydrochloric acid drop wise. Development of a pink, crimson, or red coloration indicates the presence of flavonoids. Magnesium reduces flavonoids in the presence of hydrochloric acid, producing colored flavilium salts.

Detection of Tannins and Phenolic Compounds(Ferric Chloride Test)-

- Tannins and phenolics are important antioxidant and astringent compounds. To the extract solution, a few drops of 5% ferric chloride solution were added. Formation of a blue-black color (hydrolyzable tannins) or greenish-black color (condensed tannins) confirms the presence of tannins and phenolic compounds. Phenolic hydroxyl groups form colored complexes with ferric ions.

Detection of Saponins (Foam Test)-

- Saponins are glycosides with surfactant properties. About 1 ml of extract was diluted with distilled water and shaken vigorously for 10-15 minutes in a graduated cylinder. Persistent froth lasting for at least 10 minutes indicates the presence of saponins. Saponins

reduce surface tension, leading to stable foam formation.

Detection of Glycosides (Keller- Killiani Test)-

- This test is specific for cardiac glycosides. The extract was treated with glacial acetic acid containing a trace of ferric chloride solution. Concentrated sulfuric acid was carefully added along the side of the test tube. Formation of a brown ring at the interface indicates the presence of deoxysugar characteristic of cardiac glycosides. A bluish-green layer may appear in the upper layer. Deoxysugars present in cardiac glycosides react with ferric chloride and sulfuric acid to produce a colored complex.

Detection of Carbohydrates (Molisch's Test)-

- Carbohydrates are primary metabolites detected using Molisch's test. To the extract solution, a few drops of Molisch's reagent (alpha naphthol solution) were added. Concentrated sulfuric acid was carefully poured along the sides of the test tube to form a layer. Formation of a violet or purple ring at the interface confirms the presence of carbohydrates. Concentrated sulfuric acid dehydrates carbohydrates to form furfural derivatives, which react with alpha naphthol to produce a violet-colored complex.

Detection of Steroids (Salkowski Test)-

- Steroids are important phytoconstituents with hormonal and anti inflammatory activities. The extract was dissolved in chloroform, and concentrated sulfuric acid was carefully added along the side of the test tube. Appearance of a red or reddish-brown coloration in the chloroform layer and green fluorescence in the acid layer indicates the presence of steroids. Sulfuric acid reacts with steroidal nuclei to produce characteristic color changes.

RESULTS

Table-1

Sl No	Phytoconstituents	Petroleum Ether	Chloroform	Ethanol	Aqueous
1.	Alkaloids	–	+	+	+
2.	Flavonoids	–	–	+	+
3.	Tannins	–	–	+	+

4.	Saponins	–	–	+	+
5.	Glycosides	–	+	+	+
6.	Carbohydrates	–	–	+	+
7.	Steroids	+	+	+	–

DISCUSSION

- The present qualitative phytochemical investigation of the flowers of *Syzygium cumini* (*Jambu Pushpa*) demonstrates a distinct solvent-dependent distribution of secondary metabolites. The extraction pattern observed across petroleum ether, chloroform, ethanol, and aqueous solvents reflects the influence of solvent polarity on the solubility of phytoconstituents. Such polarity guided extraction is fundamental in pharmacognostic evaluation and provides insight into the chemical nature of bioactive compounds present in the plant material. In the current study, alkaloids were detected in chloroform, ethanol, and aqueous extracts but were absent in petroleum ether.
 - **Alkaloids** are generally basic nitrogen containing compounds with moderate polarity, which explains their absence in non polar petroleum ether and presence in moderately polar and polar solvents. The detection of alkaloids in polar extracts is pharmacologically relevant, as these compounds are known to exhibit diverse biological activities including antidiabetic, antimicrobial, and anti-inflammatory effects. Considering the traditional use of *Syzygium cumini* in metabolic disorders, particularly diabetes mellitus and the presence of alkaloids in flower extracts may contribute to its therapeutic potential.
 - **Flavonoids** and tannins were observed exclusively in ethanol and aqueous extracts, indicating their pronounced polarity. These polyphenolic compounds are well-recognized for their antioxidant and free radical scavenging activities. Their absence in petroleum ether and chloroform extracts further confirms their hydrophilic character. The presence of flavonoids in polar extracts suggests that ethanol and aqueous fractions may possess significant antioxidant capacity.
- Tannins, being high molecular weight phenolic compounds, are also responsible for astringent, antimicrobial, and wound-healing properties. The concurrent presence of flavonoids and tannins strengthens the possibility that the polar extracts of *Jambu Pushpa* may exhibit protective effects against oxidative stress related disorders.
- **Saponins** were detected in ethanol and aqueous extracts, while absent in petroleum ether and chloroform fractions. Saponins are amphiphilic glycosides that typically show better solubility in polar solvents due to their sugar moiety. Pharmacologically, saponins are associated with hypoglycemic, cholesterol-lowering, immunomodulatory, and anti-inflammatory activities. Their detection in polar extracts aligns with the traditional aqueous preparations used in indigenous medicinal systems, supporting the relevance of water-based formulations.
 - **Glycosides** were present in chloroform, ethanol, and aqueous extracts but absent in petroleum ether. This distribution suggests that the glycosides present in the flowers possess moderate to high polarity. Glycosidic compounds are often implicated in cardioprotective and antidiabetic mechanisms. The detection of glycosides across multiple solvent extracts indicates their abundance and potential contribution to the plant's pharmacological activity.
 - **Carbohydrates** were identified in ethanol and aqueous extracts, consistent with their polar nature. Although carbohydrates are primarily nutritional constituents, they may also contribute to demulcent and immunomodulatory effects. Their presence in aqueous extract further supports the suitability of water as a solvent for extracting bioactive constituents from floral material.
 - **Steroids** showed a contrasting distribution pattern, being present in petroleum ether and

chloroform extracts, slightly present in ethanol, and absent in aqueous extract. This clearly demonstrates their non-polar to moderately non-polar character. Steroidal compounds are known for anti-inflammatory and membrane-stabilizing properties. The predominance of steroids in non-polar fractions suggests that petroleum ether and chloroform extracts may be more suitable for investigating anti-inflammatory potential.

- Among all extracts, the ethanol extract exhibited the broadest spectrum of phytoconstituents, followed closely by the aqueous extract. This finding highlights ethanol as an efficient solvent capable of extracting both moderately polar and highly polar phytochemicals. Such results are consistent with previous pharmacognostic studies reporting that hydroalcoholic and ethanolic extracts of *Syzygium cumini* possess enhanced phytochemical diversity and biological activity. The overall phytochemical profile indicates that Jambu Pushpa contains a rich array of secondary metabolites, particularly in polar extracts. The coexistence of alkaloids, flavonoids, tannins, saponins, and glycosides suggests possible synergistic interactions that may enhance therapeutic efficacy. These findings provide a scientific basis for the traditional use of *Syzygium cumini* flowers and support further investigations involving quantitative estimation, chromatographic profiling, and pharmacological evaluation.

CONCLUSION

The preliminary phytochemical investigation confirms that *Jambu Pushpa* contains multiple secondary metabolites including flavonoids, tannins, alkaloids, glycosides, saponins, and steroids. These constituents may be responsible for its therapeutic properties. Further studies involving quantitative estimation, chromatographic profiling, and bioactivity evaluation are warranted. In conclusion, the present study confirms that solvent polarity plays a crucial role in the extraction of bioactive compounds from *Syzygium cumini* flowers. The predominance of pharmacologically significant constituents in ethanol and aqueous extracts suggests that these fractions warrant further exploration for antioxidant, antidiabetic, and anti-inflammatory activities. The results lay a foundation for future phytochemical isolation studies and bioactivity-guided fractionation of *Jambu Pushpa*.

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