

Chapter 6

Phytochemical screening of bark of *Symplocos racemosa* Roxb. (Symplocaceae)

Rajesh Kumar Verma¹, Nibedita Jena^{2*} and Sanjeet Kumar²

¹Department of Dravyaguna, Naiminath Ayurvedic Medical College and Research Centre, Agra, Uttar Pradesh, India

²Ambika Prasad Research Foundation, Odisha, India

*Email-Id: nibeditajena838@gmail.com

DOI:



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ABSTRACT

Present study investigated the phytochemical profile of *Symplocos racemosa* bark using n-hexane, ethanol, and aqueous extracts. The analysis revealed the consistent presence of tannins, saponins, phenols, and reducing sugars across all three extracts. The presence of diverse phytoconstituents provides a deep understanding of plant's unique bioactive composition along with biological activities. The findings contribute to understanding the plant's potential therapeutic applications and need further research for more pharmacological exploration.

Keywords: Bioactive composition, Consistent, pharmacological exploration, phytoconstituents

INTRODUCTION

In current scenario of contemporary global health challenges including the rise in antimicrobial resistance, chronic diseases, and the growing burden of metabolic disorders, medicinal plants have been the major sources of therapeutic potential to treat several health ailments (Prestinaci et al., 2015). Therefore, the study of plant phytochemicals has gained significant attention in recent years, towards the need for novel and sustainable solutions to combat global health issues (Kumar et al., 2023). Keeping this in view, an attempt has been made to analysis the bioactive compounds present in the bark of *Symplocos racemosa*. It is commonly known as Lodha belongs to Symplocaceae (Acharya et al., 2016). *S. racemosa* is a well-recognized medicinal plant in traditional Ayurvedic medicine, with its bark being particularly valued for its therapeutic properties (Shukla et al., 2024). The bark is rich in diverse phytochemical constituents, which contribute to its broad pharmacological potential (Johnson et al., 2018). Its antimicrobial properties can offer alternative therapies in combating resistant infections, while its anti-inflammatory and antioxidant actions may help address chronic diseases like diabetes, cardiovascular conditions and neurodegenerative disorders (Gupta et al., 2024). Present investigation aims to find out the valuable bioactive compounds present in the bark extract for documentation. Integrating such traditional botanical resources into modern medicine could play a vital role in addressing global healthcare disparities and promoting sustainable health solutions.



Figure 1: Bark of *S. racemosa*

METHODOLOGY

The barks of *S. racemosa* were collected from Rourkela Forest Division, Sundargarh, Odisha, India. The plant species was identified by the authors (Figure 1). The collected barks were allowed to dry and powdered by help of machinery device (Figure 2). The Soxhlet extraction was adopted using three different extracts (n-hexane, ethanol and aqueous) for phytochemical screening. Detection of nine secondary metabolites were conducted using standard methods (Jena et al., 2025; Kapil et al., 2025; Lyngdoh et al., 2025).



Figure 2: Dried bark powder of *S. racemosa* for experimental work

Test for tannin: About 1 ml of the bark extract was added with 4-5 drops of 10% lead acetate solution. Then the formation of gelatinous precipitate confirmed the presence of tannin.

Test for saponin: About 1 ml of the bark extract was added to 1 ml of distilled water and shaken well. The formation of persistent froth was observed confirming the presence of saponin.

Test for flavonoids: About 1 ml of the bark extract was taken. Added 2 ml of NaOH solution and 4-5 drops of dilute HCl to it. The colour initially turned to an intense yellow colour with NaOH solution and later became colourless which confirmed the presence of flavonoids.

Test for terpenoids: To 1ml of the bark extract, 5-6 drops of concentrated sulphuric acid. Then the reddish-brown interface confirmed the presence of terpenoids.

Test for phenols: About 1 ml of the bark extract was taken. A few drops of 5% ferric chloride solution were added. The dark bluish-black appearance confirmed the presence of phenolic compounds.

Test for reducing sugars: About 1 ml of the bark extract was taken. 2 drops of Fehling's solution A followed by Fehling's solution B were added and kept in the water bath for few minutes.

Test for steroids: To 1 ml of the bark extract, added 1 ml of chloroform followed by 1 ml of concentrated sulphuric acid into it. The appearance of upper red and lower yellow with green fluorescence provides the presence of steroids.

Test for alkaloid: About 1 ml of the bark extract was taken. Added 3-4 drops of Dragendorff's reagent to it. The formation of a reddish-brown precipitate confirmed the presence of alkaloids.

Test for carbonyl compounds: About 1 ml of the bark extract was taken in a test tube. Added 3-4 drops of 2,4- Dinitrophenylhydrazine (DNPH) reagent. The formation of yellow crystal confirmed the presence of carbonyl compounds.

RESULTS AND DISCUSSION

The qualitative phytochemical analysis of *S. racemosa* revealed the presence of diverse bioactive compounds. Tannin, Saponin, phenols and reducing sugars were detected in all three extracts (n-hexane, ethanol and aqueous) (Table 1; Figure 3-5). Alkaloids were present in both ethanol and aqueous extracts but absent in n-hexane extract. These phytoconstituents have reported pharmacological properties. Traditionally, the leaf, root and bark powder of *S. racemosa* have been used as drug in therapeutical aspects (Johnson et al., 2018). Phenols present in the bark extract preventing the progress of various oxidative stresses, indicate antioxidant activity (Maitra and Satardekar 2017). The plant also possesses anticancer and hepatoprotective activity (Johnson et al., 2018). Review of literature suggests that the presence of tannin and saponins showed significant antiulcerogenic activity (Krishna et al., 2013).

Table 1: Detection of secondary metabolites of *S. racemosa* bark using different extracts

Bioactive compounds	Extracts		
	n-Hexane	Ethanol	Aqueous
Tannin	Detected	Detected	Detected
Saponin	Detected	Detected	Detected
Flavonoids	Not detected	Not detected	Not detected
Terpenoids	Not detected	Not detected	Not detected

Phenols	Detected	Detected	Detected
Reducing sugar	Detected	Detected	Detected
Steroids	Not detected	Not detected	Not detected
Alkaloid	Not detected	Detected	Detected
Carbonyl compounds	Not detected	Not detected	Not detected



Figure 3: Qualitative phytochemical screening of *S. racemosa* bark using n-hexane extract



Figure 4: Qualitative phytochemical screening of *S. racemosa* bark using ethanol extract



Figure 5: Qualitative phytochemical screening of *S. racemosa* bark using aqueous extract

CONCLUSION

S. racemosa bark represents a potent natural resource with significant medicinal potential, rooted in its rich composition of bioactive compounds such as saponin, phenols, tannin, alkaloids, and reducing sugars. These constituents contribute to a wide range of pharmacological effects, including antimicrobial, anti-inflammatory, anticancer, hepatoprotective and antioxidant properties. As the world faces escalating health challenges, ranging from antibiotic resistance to chronic inflammatory and metabolic diseases, the therapeutic applications of *S. racemosa* bark offer a promising, plant-based alternative for modern medicine. Further scientific exploration and clinical validation of its bioactive components could lead to the development of novel, effective, and affordable treatments that support global health resilience and sustainability.

REFERENCES

- Acharya N, Acharya S, Shah U, Shah R and Hingorani L. (2016). A comprehensive analysis on *Symplocos racemosa* Roxb.: traditional uses, botany, phytochemistry and pharmacological activities. *Journal of Ethnopharmacology*. 181: 236-251.
- Gupta V, Nille GC and Chaudhary AK. (2024). Unlocking antioxidant potential in *Symplocos racemosa* Roxb. (Lodhra): a phytochemical exploration via high-resolution mass spectrometry. *International Journal of Ayurvedic Medicine*. 15(S1): 19-25.
- Jena N, Mukherjee S and Rath SK. (2025). *Plants and Secondary Metabolites*, Volume 6. Ambika Prasad Research Foundation, India.

- Johnson T, Krishnakumar K and Dineshkumar B. (2018). Phyto-pharmacological review of *Symplocos racemosa* bark. Journal of Bio Innovation. 7(4): 611-617.
- Kapil MJ, Sharma BP, Jena N and Kumar S. (2025). Exploring the phytoconstituents of flowers *Eragrostis unioides* (Retz.) Nees ex Steud., through TLC profiling & phytochemical screening. In: Plants and Secondary Metabolites, Volume 6. Ambika Prasad Research Foundation, India.
- Krishna G, Divya M, Ramya, Rohita K, Dolly S and Kumar KP. (2013). Pharmacological evaluation of *Symplocos racemosa* bark extracts on experimentally induced ulceritis in rat model. Elixir Pharmacy. 55: 12964-12966.
- Kumar APN, Kumar M, Jose A, Tomer V, Oz E, Proestos C, Zeng M, Elobeid TKS and Oz F. (2023). Major phytochemicals: recent advances in health benefits and extraction method. Molecules. 28(2): 887. DOI: 10.3390/molecules28020887.
- Lyngdoh D, Sahu JK, Jena N, Kumar S and Patra A. (2025). Analysis of secondary metabolites flowers of *Blepharis maderaspatensis* (L.) B. Heyne ex Roth. In: Plants and Secondary Metabolites, Volume 6. Ambika Prasad Research Foundation, India.
- Maitra S and Satardekar K. (2017). Pharmacological study of *Symplocos racemosa* Roxb. International Journal of Pharmacy & Pharmaceutical Research. 9(1): 106-113.

Prestinaci F, Pezzotti P and Pantosti A. (2015). Antimicrobial resistance: a global multifaceted phenomenon. *Pathogens and Global Health*. 109(7): 309-318.

Shukla L, Gupta P and Korde P. (2024). Review of lodhra (*Symplocos racemosa* Roxb.)- its other types and therapeutic potential. *World Journal of Pharmacy and Pharmaceutical Sciences*. 13(11): 1251-1263.