J. Biodivers. Conservation 9(1): 116-123 ISSN: 2457-0761 (online)
2025 http://www.aprfjournal.in

Research Article

Analysis of bioactive compounds of selected parasitic plants of Odisha state and validation of their tribal claims

Sweta Mishra and Sakti Kanta Rath*

Department of Life Sciences, Rama Devi Women's University, Bhubaneswar, Odisha, India

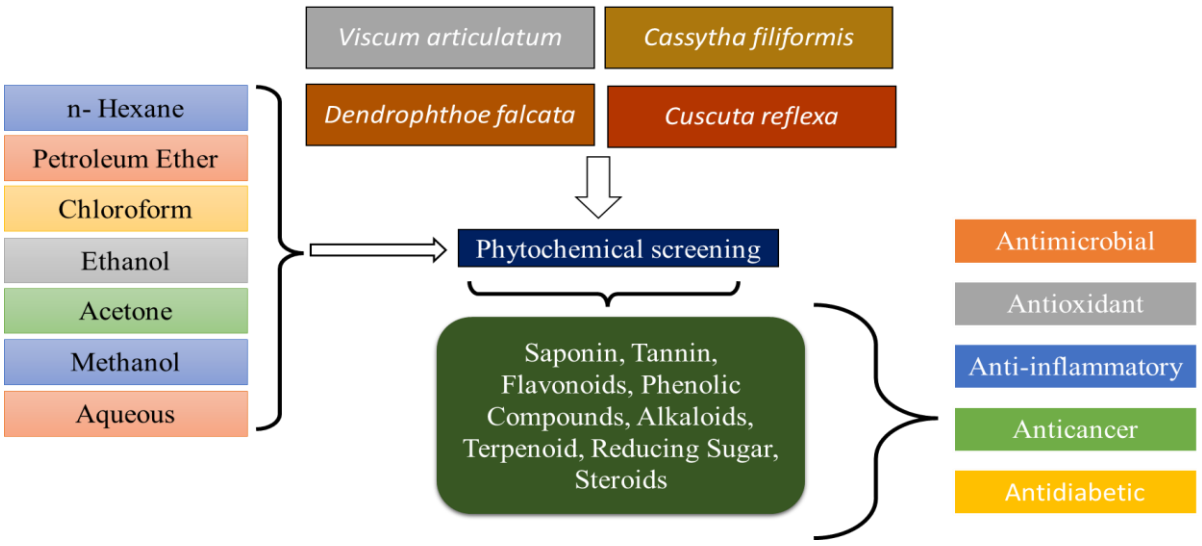
*E-mail: saktikantarath@rdwu.ac.in; ORCID: https://orcid.org/0000-0002-3204-9357

DOI: https://doi.org/10.5281/zenodo.15036684

Article Details: Received: 2024-12-15 | Accepted: 2025-03-15 | Available online: 2025-03-16

Abstract: Phytochemical screening of four parasitic plants (*Viscum articulatum*, *Cassytha filiformis*, *Dendrophthoe falcata*, and *Cuscuta reflexa*) is carried out and findings are presented. The results revealed that saponin, tannin, flavonoids, phenolic compounds, alkaloids, terpenoid, reducing sugar, and steroids are detected. The availability of diverse secondary metabolites indicates the pharmacological potential of selected parasitic plants of Odisha.

Keywords: Parasitic plants, bioactive compounds, Odisha, pharmacological potentials



Graphical abstract

Introduction

Parasitic plants, also known as holoparasites or hemiparasites, are organisms that derive their nutrients by attaching themselves to host plants (Press and Graves, 1995). These plants have evolved unique strategies to survive and thrive at the expense of their hosts (Hibberd and Jeschke, 2001). Despite their parasitic nature, many of these plants have been used in traditional medicine for centuries, particularly in tropical and subtropical regions (Kawanda et al., 2013). Recent studies have highlighted the potential of parasitic plants as a rich source of bioactive compounds with medicinal properties (Rai et al., 2016). Phytochemical screening of these plants has revealed the presence of diverse secondary metabolites, including alkaloids, flavonoids, phenolic acids, and terpenoids (Kumar and Jena, 2014). These compounds have been reported to possess antimicrobial, antioxidant, anti-inflammatory, and anticancer activities (Pal et al., 2006; Suresh et al., 2011; Rai et al., 2016). However, the phytochemical diversity of parasitic plants remains largely unexplored, and systematic studies are needed to uncover their full potential. Present study aims to investigate the phytochemical profile of selected parasitic plants, with a focus on identifying bioactive compounds with potential therapeutic applications (*Viscum articulatum*, *Cassytha filiformis*, *Dendrophthoe falcata*, and *Cuscuta reflexa*).

Methodology

The plant parts of *Viscum articulatum*, *Cassytha filiformis*, *Dendrophthoe falcata*, and *Cuscuta reflexa* were collected from Sundargarh district, Odisha (Plate 1). Second author identified the plant. The Soxhlet extraction method used for phytochemical analysis (Devi et al., 2023). Nine different bioactive compounds were detected using standard methods (Kumar et al., 2013).

Plate 1: Selected parasitic plants of Odisha for qualitative analysis of bioactive compounds, a) *Viscum articulatum*, b) *Cassytha filiformis*, c) *Dendrophthoe falcata*, d) *Cuscuta reflexa*

Results and discussion

Qualitative phytochemical analysis was carried out and results are tabulated in Tables 1-4 (Plate 2). The table 1 indicates the presence (+) or absence (-) of different secondary metabolites in extracts obtained using different solvents. It was observed that saponin was present in n-hexane and aqueous extracts. Tannin was widely distributed across all solvents, with highest concentration in ethanol, acetone, methanol, and aqueous extracts. Flavonoids were detected in all solvents, with moderate to high concentration. Phenolic compounds were found in all solvents, except chloroform. Terpenoid was only detected in chloroform and ethanol extracts. Steroid was not detected in any solvent. Alkaloid was present in all solvents, with moderate concentration. Carbonyl was not detected in any solvent. Reducing sugar was detected in all solvents except n-Hexane and petroleum ether (Table 1).

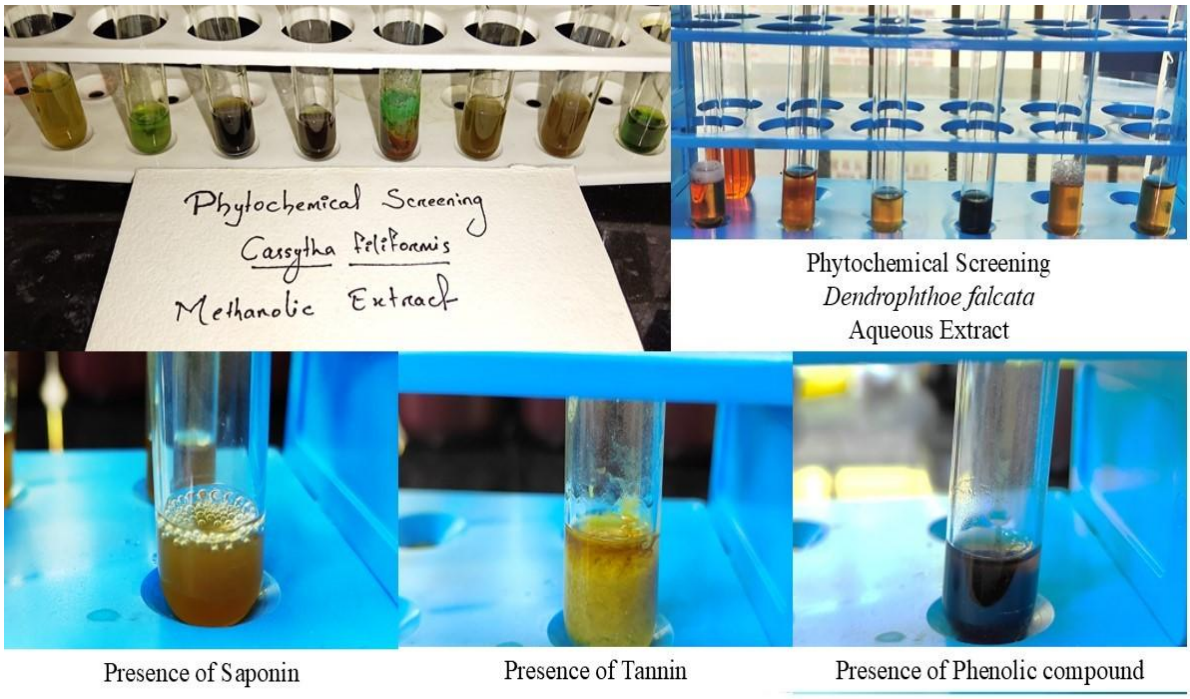


Plate 2: Phytochemical screening of selected parasitic plants

Table 1: Phytochemical screening of different extracts of *D. falcata*

Secondary metabolites	n-Hexane	Petroleum Ether	Chloroform	Ethanol	Acetone	Methanol	Aqueous
Saponin	+	-	-	-	-	-	++
Tannin	+	++	+	+++	+++	+++	+++
Flavonoids	+	+	+	++	++	++	++
Phenolic compound	+	+	-	++	+++	+++	+++
Terpenoid	-	-	+	++	-	-	-
Steroid	-	-	-	-	-	-	-
Alkaloid	+	+	+	+	+	+	++

Carbonyl	-	-	-	-	-	-	-
Reducing sugar	-	-	+++	+++	+	+	+++

(-: negative; +: positive)

The above results indicate that *D. falcata* is rich sources of bioactive compounds. Ethanol, acetone, methanol and aqueous are suitable solvents for extracting medicinally important compounds from this parasitic plant (Table 1).

Table 2: Phytochemical screening of different extracts of *C. reflexa*

	n-Hexane	Petroleum Ether	Chloroform	Ethanol	Acetone	Methanol	Aqueous
Saponin	-	-	+	-	+++	+++	+++
Tannin	-	-	+	+++	+++	+++	+++
Flavonoids	-	-	-	++	-	-	++
Phenolic compound	+	+	++	++	+++	+++	+++
Terpenoid	-	-	-	++	-	-	++
Steroid	-	-	-	-	-	-	-
Alkaloid	+	-	-	-	-	-	-
Carbonyl	-	-	-	-	-	-	-
Reducing sugar	-	-	++	++	++	+++	+++

(-: negative; +: positive)

Phytochemical screening of *C. reflexa* revealed that Saponins were predominantly detected in aqueous, acetone and methanol solvents. Tannins were found in high concentrations in aqueous, ethanol, acetone, and methanol solvents. Flavonoids were detected in only ethanol and aqueous solvents. Phenolic compounds were widely distributed across all solvents. Terpenoids were found in ethanol and aqueous extracts. Reducing sugar was detected in chloroform, ethanol, acetone, methanol, and aqueous extracts (Table 2). Due to presence of diverse bioactive compounds *C. reflexa* might have pharmacological potentials. It should have antimicrobial and antioxidant activities potential due to presence of saponins, tannins, and phenolic compounds. Anti-inflammatory and anticancer properties are possible due to flavonoids and phenolic compounds. Antimicrobial and antifungal activities potential due to terpenoids.

Table 3: Phytochemical screening of different extracts of *V. articulatum*

	n-Hexane	Petroleum Ether	Chloroform	Ethanol	Acetone	Methanol	Aqueous
Saponin	-	-	+	++	+++	+++	+++
Tannin	-	-	+	+++	+++	+++	+++

Flavonoids	-	-	-	+	-	-	-
Phenolic compound	-	+	++	++	++	+++	+++
Terpenoid	-	-	-	-	-	-	-
Steroid	-	-	-	-	-	-	-
Alkaloid	-	-	-	-	-	+	+
Carbonyl	-	-	-	-	-	-	-
Reducing sugar	-	+	++	++	+++	+++	+++

(-: negative; +: positive)

Table 4: Phytochemical screening of different extracts of *C. filiformis*

	n-Hexane	Petroleum Ether	Chloroform	Ethanol	Acetone	Methanol	Aqueous
Saponin	-	+	++	-	++	+	+++
Tannin	-	-	-	-	-	++	+++
Flavonoids	-	-	-	-	++	+	+
Phenolic compound	-	-	++	++	++	+++	+++
Terpenoid	-	-	-	-	-	-	-
Steroid	-	-	-	-	++	+++	-
Alkaloid	-	-	-	-	-	-	-
Carbonyl	-	-	-	-	+	+	-
Reducing sugar	-	-	++	++	++	+++	+++

(-: negative; +: positive)

The seven extracts of *V. articulatum* showed the presence of Reducing sugar in all extracts except n-hexane, saponins were predominantly extracted in polar solvents (ethanol, acetone, methanol, and aqueous). Tannins were abundant in ethanol, acetone, methanol, and aqueous solvents. Phenolic compounds were widely distributed across solvents, with highest concentrations in ethanol, acetone, methanol, and aqueous.

Table 5: Tribal claims on selected parasitic plants

Plant name	Parts uses	Traditional practices
Viscum articulatum	Leaves	Leaves are macerated with seed oil of *Pongamia pinnata* and used to reduce the inflammation.
Cassytha filiformis	Whole plant	Whole plant paste is used to cure joint pain.

Dendrophthoe falcata	Leaves	Leaves paste with mustard oil is used to cure wounds in cattle.
Cuscuta reflexa	Whole plant	Whole plant paste promotes hair growth. Whole plant decoction is used to cure dandruff problems.

Table 6: Correlation with detected compounds and tribal claims

Medicinal claims	Compounds detected	Co-relation	Supporting literature
To reduce the inflammation.	Presence of tannin, phenolic compounds, and flavonoids in *Viscum articulatum.*	*Viscum articulatum* is might be responsible to reduce the inflammation due to presence of tannin, phenolic compounds, and flavonoids.	Fabbrini et al., (2022)
To cure joint pain.	Presence of steroids in *Cassytha filiformis.*	*Cassytha filiformis* might be responsible to reduce pain due to the presence of steroids in acetone and methanol extracts.	Vyvey, (2010)
To cure wounds in cattle.	Presence of tannin in *Dendrophthoe falcata.*	Presence of tannin in all extracts of *Dendrophthoe falcata* showed the therapeutic activities against wounds in cattle.	Chokotho and van Hasselt, (2005)
To cure dandruff problems.	Presence of saponin in *Cuscuta reflexa.*	Presence of saponin in aqueous extract might be responsible bioactive compounds to cure dandruff problems.	Xiao et al., (2021)

Alkaloids were detected only in methanol and aqueous solvents (Table 3). Phytochemical screening of different extracts of *C. filiformis* showed the presence of saponin, tannin, flavonoids, phenolic compounds, steroid, carbonyl and reducing sugar (Table 4). Tannins were abundant in methanol and

aqueous solvents. Phenolic compounds were widely distributed across solvents, with highest concentrations in acetone, methanol, and aqueous. Flavonoids were detected in acetone, methanol, and aqueous solvents. Steroids were found in ethanol and methanol extracts. Reducing sugars were present in chloroform, ethanol, acetone, methanol, and aqueous extracts (Table 4).

Conclusion

The phytochemical screening of the parasitic plant extracts revealed a diverse range of secondary metabolites, including saponins, tannins, flavonoids, phenolic compounds, steroids, and reducing sugars. The distribution of these compounds varied across different solvents, indicating the importance of solvent selection in extracting bioactive compounds. The parasitic plant exhibits potential antimicrobial, antioxidant, and anti-inflammatory activities due to the presence of saponins, tannins, and phenolic compounds. The plant may possess anticancer properties due to the presence of flavonoids and phenolic compounds. The findings provide a foundation for future research on the medicinal properties of these plants. Polar solvents (ethanol, acetone, methanol, and aqueous) are recommended for extracting bioactive compounds from this parasitic plant. Further studies are necessary to explore the plant's potential medicinal applications.

Acknowledgement

Authors are thankful to the Dr. Sanjeet Kumar, Ambika Prasad Research Foundation, Odisha, India for identification of plant species. Authors are also thankful to the Science and Technology Department, Government of Odisha, Bhubaneswar, Odisha, India (Vide Approval Number – 4357/ST, dt. 21.10.2021) for financial support of present works. Authors are grateful to the local communities & forest officials of study areas.

References

Chokotho L and van Hasselt E. (2005). The use of tannins in the local treatment of burn wounds - a pilot study. Malawi Med Journal. 17(1):19-20.

Devi RS, Satapathy KB and Kumar S. (2023). Validation of tribal claims for formulation of future drugs through evaluation of ethno-pharmacological values of *Ludwigia adscendens*. Medicinal Plants. 15(4): 691-697.

Fabbrini M, D'Amico F, Barone M, Conti G, Mengoli M, Brigidi P and Turroni S. (2022). Polyphenol and Tannin Nutraceuticals and Their Metabolites: How the Human Gut Microbiota Influences Their Properties. Biomolecules. 12(7):875. DOI: 10.3390/biom12070875.

Hibberd JM and Jeschke WD. (2001). Solute flux into parasitic plants. Journal of Experimental Botany. 52(363): 2043-2059.

Kumar A, Rani S, Sagwal S and Niketa (2012) Recent review on plant molecular biology, phytophysiology, phytochemistry and ethnopharmacology of *Cuscuta reflexa* Roxb. A wonderful parasitic plant. International Research Journal of Pharmacy 3(7): 30–38.

Kumar S and Jena PK. (2014). Chromatographic, antibacterial, and FT-IR analysis of *Dioscorea pentaphylla* L. tuber extracts. Plant Science Research. 36(1&2): 83-90.

Kwanda N, Noikotr K, Sudmoon R, Tanee T and Chaveerach A. (2013). Medicinal parasitic plants on diverse hosts with their usages and barcodes. Journal of Natural Medicine. 67: 438–445. DOI:10.1007/s11418-012-0695-2

Pal DK, Mandal M, Senthil Kumar GP and Padhiari A (2006) Antibacterial activity of *Cuscuta reflexa* stem and *Corchorus olitorious* seed. Fitoterapia. 77: 589–591.

Press MC and Graves JD. (1995). Parasitic plants. Chapman & Hall, London.

Rai DK, Sharma V, Pal K and Gupta RK. (2016). Comparative phytochemical analysis of *Cuscuta reflexa* Roxb. parasite grown on north India by GC-MS. Tropical Plant Research. 3(2): 428-433.

Suresh V, Sruthi V, Padmaja B and Asha VV (2011) In vitro anti-inflammatory and anti-cancer activities of *Cuscuta reflexa* Roxb. Journal of Ethnopharmacology 134: 872–877.

Vyvey M. (2010). Steroids as pain relief adjuvants. Can Fam Physician. 56(12):1295-1297.

Xiao L, Zhang X, Chen Z, Li B and Li L. (2021). A Timosaponin B-II containing scalp care solution for improvement of scalp hydration, dandruff reduction, and hair loss prevention: A comparative study on healthy volunteers before and after application. Journal of Cosmetic Dermatology. 20(3): 819–824.