Journal of Science Research International (JSRI)
ISSN: 2456-6365 (Online)

OPEN ACCESS

QUALITATIVE ANALYSIS OF PHYTOCHEMICALS IN *ERANTHEMUM CAPENSE* L. AND *ERANTHEMUM ROSEUM* (VAHL) R.BR. EX ROEM. & SCHULT.

Priyanka V. Patil, Suraj P. Devkar and Sagar A. Deshmukh*

Department of Botany,

The New College, Kolhapur (Affiliated to Shivaji University, Kolhapur)- 416 012 Maharashtra, India.

**Corresponding author E-mail: sageraea@newcollege.ac.in*

ORCID- https://orcid.org/0009-0006-6421-7796

Received: 21 January 2025	Revised: 15 February 2026	Accepted: 07 March 2026	Published: 27 March 2026

DOI: **https://doi.org/10.5281/zenodo.19245648**

Abstract:

Qualitative phytochemical analysis is crucial for the identification of phytochemical constituents in medicinal plants, as their medicinal value is primarily attributed to the presence of specific bioactive compounds. The objective of the present study was to investigate the presence of phytochemical constituents in aqueous, methanolic, acetone and petroleum ether extracts of the roots, stems and leaves of two Eranthemum species, namely E. capense and E. roseum. In this analysis, the presence of alkaloids, anthocyanins, betacyanins, cardiac glycosides, coumarins, flavonoids, glycosides, phenols, quinones, saponins, steroids, tannins and terpenoids was screened. Among the extracts tested, the methanolic extract showed the highest number of phytochemicals, followed by acetone, petroleum ether, and aqueous extracts. The positive results obtained in various phytochemical tests indicate that Eranthemum species are important due to the presence of diverse bioactive constituents.

Keywords: *Acanthaceae, Eranthemum, Phytochemical, Qualitative Screening.*

1. Introduction

The *Acanthaceae* is a large family of dicotyledonous flowering plants comprising 346 genera and over 4,300 species distributed worldwide. There is increasing interest in indigenous medicinal plants for their accurate identification, classification, and therapeutic applications. Important secondary metabolites such as glycosides, flavonoids, alkaloids, triterpenoids, fatty acid methyl esters and fatty acids are present in this family (1). Plants of the *Acanthaceae* family are widely utilized as commercial crops, ornamentals, medicinal plants, food sources and natural colorants. Numerous species exhibit medicinal properties and are used in the treatment of ailments such as beriberi, paralysis, pain, toothache, asthma and cough (2). The Western Ghats are a major biodiversity hotspot with a rich diversity of plant species. Commonly known as the Sahyadri Mountains, they extend for about 1,600

kilometers along the western coast of India. This region is well known for its extensive range of medicinal plants and is estimated to harbour over 7,500 species of flowering plants. Since the dawn of human civilization, medicinal plants have been used for a variety of therapeutic purposes (3).

Eranthemum L. belongs to the family *Acanthaceae*. Approximately 23 species are distributed worldwide, of which about 15 species are found in India. In the Western Ghats, around five species are reported. *E. capense* is distributed across India, Myanmar and Sri Lanka (4, 5, 6). It is a subshrub endemic to Peninsular India with a wide distribution in regions such as Goa, Chikmagalur, Tamil Nadu, Mangalore, Mysore and Udupi. Ethnobotanically, *E. capense* is used in various regions of India for its medicinal properties. In Kerala, the leaves are used for their anti-inflammatory activity and in the treatment of dysentery and diabetes (7, 8). In the Eastern Ghats of Andhra Pradesh, plant latex is used to treat blisters and boils (9). In South India, the plant is also used in traditional medicine for managing typhoid (10). Qualitative phytochemical screening of the methanolic extract of *E. capense* has revealed the presence of alkaloids, flavonoids and terpenoids (11).

E. roseum is native to Bangladesh and India (4). Its habitat includes moist deciduous forests and open areas (12, 13). In India, particularly in the South-Western Satpuda Hills, Leghapani, a decoction of the whole *E. roseum* plant is traditionally used for treatment of leg pain and swellings (14). In South India, the roots and leaves of *E. roseum* are traditionally used to treat skin diseases (15, 16). In Maharashtra, vertigo is treated using the root, either in paste form or by inhaling its odor (17). In the same region, *E. roseum* paste is used to treat leucoderma; it is also applied to heal foot cracks, reduce pain and promote wound healing (18, 19). The juice of *E. roseum* has long been used in Maharashtra to treat stomach aches and diabetes (20–23). In several regions of India, *E. roseum* has been widely utilized to manage various conditions, including fever, acidity, typhoid, leucorrhea, inflammation, jaundice, body heat, ulcers and snake bites (24–33). A decoction of the flowers is traditionally used in Maharashtra to treat irregular menstruation (34). Phytochemical studies indicate that the leaves of *E. roseum* contain flavonoids such as 7-OMe apigenin, 7,4′-diOMe luteolin and 7,3′,4′-triOMe luteolin. The roots contain saponin glycosides, carbohydrates, proteins, steroidal sapogenins and terpenoids, while the flowers are rich in flavonoids and anthocyanins (13). Further phytochemical investigations have confirmed the presence of steroidal saponin glycosides in the roots (35). Aqueous and methanolic extracts of the roots have been reported to contain saponins, glycosides, polysaccharides and proteins, whereas petroleum ether and chloroform extracts contain steroidal sapogenins (12, 13). Phytochemicals constitute a large group of compounds found in plants, including primary and secondary metabolites that support various biological processes such as plant growth, defense mechanisms and protection (36, 37). Qualitative phytochemical analysis is used to detect the presence of various bioactive compounds in plant extracts, including alkaloids, carbohydrates, flavonoids, tannins, saponins, terpenoids, glycosides, volatile oils and phenolic compounds.

2. Material and Methods

2.1 Collection of plant materials

Eranthemum species were collected from different localities. The plant materials were taxonomically identified and authenticated by the Department of Botany, The New College, Kolhapur. The roots, stems and leaves were cleaned with tap water. To prevent the degradation of heat-sensitive phytoconstituents, the collected plant materials were shade-dried at room temperature. After drying, the plant parts were finely powdered using an electric mixer. The dried material was then sieved to obtain a uniform fine powder for extraction. The powder was stored in a plastic jar with an airtight lid until further use.

2.2 Preparation of sample

For qualitative phytochemical analysis, samples were prepared by dissolving 5 g of plant material powder in 50 ml of solvent. The mixture was kept on an electric shaker (Thenmotek OS-8101) at a rotating speed of 150 rpm for 24 hours (overnight). It was then first filtered through a double layer of muslin cloth, followed by filtration using Whatman No. 1 filter paper. Different solvents were used for qualitative phytochemical analysis. Polar solvents dissolve polar compounds, whereas non-polar solvents dissolve non-polar compounds. Thus, different phytochemicals are extracted using different solvents based on their polarity. In this study, four solvents water, methanol, acetone and petroleum ether were used. Plant material can be extracted using various methods to isolate phytochemicals. The shaker extraction method was chosen due to its simplicity and efficiency, as it enhances the interaction between the plant material and the solvent, thereby increasing the extraction yield. All procedures were carried out under laboratory conditions.

2.3 Phytochemical test

Qualitative phytochemical tests used in this study were compiled from various published sources. Table 1 presents the preliminary tests conducted for the identification of different phytochemicals.

Table 1: Qualitative Tests for Phytochemical Screening

Phytochemical Class	Test	Reference
Carbohydrates	Barfoed's Test	38, 39
	Seliwanoff's Test	39, 40
	Resorcinol Test	41, 42
Alkaloids	Hager's Test	38, 39,43
	Mayer's Test	38, 42, 44, 45
	Wagener's Test	42, 46
Flavonoids	Alkaline reagent Test	46-49
	Lead acetate Test	44, 46, 47, 50, 51
	Ferric chloride Test	47
Phenolic Compound	Ferric chloride Test	38, 44
	Lead acetate Test	38
	Ellagic Acid Test	52, 53
Tannins	Braymer's Test	54, 55
	10% NaOH Test	54
Reducing Sugar	Benedict's Test	38, 46, 54
	Fehling's Test	38, 54
Cardiac glycosides	Keller – Killani Test	54, 56
	Baljet's Test	57, 58
Saponins	Foam Test	44
Phytosterols	Salkowski's Test	44, 54
Phlobatannins	HCL Test	42, 59
Anthraquinones	Borntrager's Test	49, 55, 59
Glycosides	Conc. H_2SO_4 Test	52, 53
Volatile Oil		60

3. Result and Discussion

Alkaloids, flavonoids, phenolic compounds, cardiac glycosides, tannins, glycosides, saponins, anthraquinones, phytosterols, volatile oils, carbohydrates and proteins were identified among the phytochemicals present in various extracts of *E. capense* and *E. roseum*, as summarized in Tables 2 and 3.

Table 2: Qualitative Phytochemical analysis of *Eranthemum capense*

***E. capense* Leaves**						***E. capense* Stem**					***E. capense* Root**			
Test	**Methanol**	**Aqueous**	**Petroleum Ether**	**Acetone**		**Methanol**	**Aqueous**	**Petroleum Ether**	**Acetone**		**Methanol**	**Aqueous**	**Petroleum Ether**	**Acetone**
Carbohydrates														
Barfoed's Test	–	–	–	–		–	–	–	–		–	–	–	–
Seliwanoff's Test	–	+	–	–		–	+	–	-		-	-	-	-
Resorcinol Test	+++	+	-	+		++	+	-	-		+	++	-	-
Alkaloids														
Hager's Test	-	-	-	-		-	-	-	-		-	-	-	-
Mayer's Test	-	-	-	+		++	-	+++	+		++	-	++	+
Wagener's Test	-	+	+	++		+	+	+	+		++	+	++	+
Flavonoids														
Alkaline reagent Test	+	+	+	++		-	+	+	++		+	+	+	+++
Lead acetate Test	-	-	+	-		+++	-	-	+++		+++	-	-	+++
Ferric chloride Test	+++	+	-	++		-	-	-	-		-	-	-	-
Phenolic Compound														
Ferric chloride Test	+++	-	-	+++		+	-	-	+		-	-	-	-
Lead acetate Test	-	+	+	-		+++	-	++	-		+	+	+	+++
Ellagic Acid Test	-	+	-	+++		-	+	-	+++		-	-	-	-

Tannins														
Braymer's Test	+++	-	-	+		+	++	-	-		-	-	-	-
10% NaOH Test	+	+	+	++		+++	-	+	+		+++	-	+	+
Reducing Sugar														
Benedict's Test	++	++	-	-		+	-	-	-		++	-	-	-
Fehling's Test	-	+	-	-		-	++	-	+		+	-	+	-
Cardiac glycosides														
Keller – Killani Test	-	-	-	-		++	-	+	-		-	-	-	-
Baljet's Test	+++	+	-			-	++	-	+		+++	++	-	-
Saponins														
Foam Test	++	+	-	+		+	++	-	-		+	++	-	-
Phytosterols														
Salkowski's Test	++	-	-	-		+++	-	+++			++	-	-	-
Phlobatannins														
HCL Test	-	+	-	-		-	+	-	-		-	+	-	-
Anthraquinones														
Borntrager's Test	-	-	-	-		-	-	-	-		-	-	-	-
Glycosides														
Conc. H_2SO_4 Test	++	-	-	-		-	-	-	-		-	-	-	-
Volatile Oil														
	-	-	++	-		+	-	++	-		+	-	++	+

+++=High, ++=Moderate, +=Slight, -=Negative

Qualitative phytochemical screening of *Eranthemum capense* revealed a varied distribution of bioactive constituents in the leaves, stems and roots, depending on the solvent used. In the leaves, the methanolic extract contained carbohydrates, flavonoids, tannins, reducing sugars, saponins, phytosterols and phenolic compounds, while the aqueous extract showed a moderate presence of reducing sugars, carbohydrates and phenolic compounds. The

petroleum ether extract showed the presence of flavonoids, phenolic compounds and volatile oils, whereas the acetone extract contained alkaloids along with flavonoids, phenolic compounds and tannins. The methanolic extract of the stem exhibited flavonoids, phenolic compounds, tannins and phytosterols. The aqueous extract contained reducing sugars, tannins and cardiac glycosides, while the petroleum ether extract revealed the presence of flavonoids and alkaloids. The acetone extract showed flavonoids and phenolic compounds. In the roots, the methanolic extract was rich in alkaloids, flavonoids, tannins, reducing sugars, phytosterols and cardiac glycosides. The aqueous extract contained carbohydrates, saponins and cardiac glycosides, whereas the petroleum ether extract showed alkaloids and volatile oils. The acetone extract contained flavonoids and phenolic compounds.

Table 3: Qualitative Phytochemical analysis of *Eranthemum roseum*

***E. roseum* Leaves**						***E. roseum* Stem**					***E. roseum* Root**			
Test	**Methanol**	**Aqueous**	**Petroleum Ether**	**Acetone**		**Methanol**	**Aqueous**	**Petroleum Ether**	**Acetone**		**Methanol**	**Aqueous**	**Petroleum Ether**	**Acetone**
Carbohydrates														
Barfoed's Test	-	-	-	-		-	-	-	-		-	-	-	-
Seliwanoff's Test	-	++	-	-		-	++	-	-		-	++	-	-
Resorcinol Test	+	+++	-	-		-	++	-	-		-	++	-	-
Alkaloids														
Hager's Test	+++	-	+	-		++	-	-	-		-	-	-	-
Mayer's Test	+++	-	-	-		+++	-	-	-		++	-	+	+
Wagener's Test	+++	-	++	-		++	-	+	-		+++	-	++	+
Flavonoids														
Alkaline reagent Test	-	-	+	-		-	-	+	-		-	-	+	+++
Lead acetate Test	+++	-	-	-		+++	-	-	-		+++	-	-	-
Ferric chloride Test	+++	-	-	+		+	-	-	-		+++	-	-	-

Phenolic Compound														
Ferric chloride Test	+++	-	-	+++		-	-	-	-		-	-	-	-
Lead acetate Test	+	-	-	-		+	-	-	+++		+++	-	-	+
Ellagic Acid Test	-	-	-	+++		-	-	-	-		+++	-	-	-
Tannins														
Braymer's Test	+	-	-	++		-	-	-	-		-	-	-	-
10% NaOH Test	+	-	-	+++		-	-	+	+++		-	-	-	+++
Reducing Sugar														
Benedict's Test	+++	++	-	+		+++	++	-	+		-	-	-	-
Fehling's Test	++	-	-	-		-	+	-	-		-	+	-	-
Cardiac glycosides														
Keller – Killani Test	+++	-	-	+++		-	-	-	-		-	-	-	-
Baljet's Test	-	-	-	-		+++	-	-	++		+++	-	-	+++
Saponins														
Foam Test	-	++	-	-		-	+	-	-		+	++	-	-
Phytosterols														
Salkowski's Test	-	-	-	-		-	-	+++	-		-	-	-	-
Phlobatannins														
HCL Test	-	+	-	-		-	+	-	-		-	+	-	-
Anthraquinones														
Borntrager's Test	-	+	-	-		-	+	-	-		-	-	-	-
Glycosides														
Conc. H_2SO_4 Test	-	+++	+++	-		++	++	-	-		-	-	+++	++
Volatile Oil														
	-	-	+++	-		+++	-	-	-		+++	-	-	-

+++=High, ++=Moderate, +=Slight, -=Negative

The distribution of phytochemical compounds varied across different plant parts and solvent extracts. In the leaves, the methanolic extract contained flavonoids, alkaloids, phenolic compounds, reducing sugars and cardiac glycosides, while the aqueous extract showed the presence of carbohydrates, reducing sugars, saponins and glycosides. The petroleum ether extract contained alkaloids, glycosides and volatile oils, whereas the acetone extract was characterized by tannins, phenolic compounds and cardiac glycosides. In the stem, the methanolic extract exhibited alkaloids, flavonoids, reducing sugars, phytosterols, glycosides, cardiac glycosides and volatile oils. The aqueous extract contained carbohydrates, reducing sugars and glycosides, while the petroleum ether extract showed alkaloids and glycosides. The acetone extract contained tannins, phenolic compounds and cardiac glycosides. In the roots, the methanolic extract was rich in alkaloids, flavonoids, phenolic compounds, volatile oils and cardiac glycosides. The aqueous extract contained carbohydrates and saponins, whereas the petroleum ether extract showed flavonoids, glycosides and cardiac glycosides. The acetone extract contained flavonoids, tannins, glycosides and cardiac glycosides. Both *E. capense* and *E. roseum* are rich in diverse bioactive compounds, including flavonoids, phenolic compounds, alkaloids, tannins, reducing sugars, phytosterols, cardiac glycosides, glycosides and volatile oils, indicating their potential pharmacological significance.

Conclusion

The qualitative phytochemical screening of *E. roseum* and *E. capense* revealed a broad spectrum of bioactive constituents distributed in the leaves, stems and roots across different solvent extracts. In both species, methanolic extracts exhibited the highest phytochemical diversity, indicating their superior efficiency in extracting secondary metabolites such as alkaloids, flavonoids, phenolic compounds, cardiac glycosides, reducing sugars, phytosterols and volatile oils. Aqueous extracts were mainly characterized by the presence of carbohydrates, reducing sugars, saponins and glycosides, whereas petroleum ether extracts predominantly contained non-polar compounds such as volatile oils, along with certain alkaloids and flavonoids. Acetone extracts showed moderate phytochemical diversity, including tannins, phenolic compounds, glycosides and cardiac glycosides. The consistent occurrence of flavonoids and phenolic compounds across most extracts of both species suggests their abundance and possible contribution to biological activity. Overall, the results indicate the phytochemical richness of *E. roseum* and *E. capense*, thereby providing a scientific basis for further studies on the isolation, characterization and biological evaluation of their active constituents. Further research may lead to the isolation of additional bioactive compounds from selected *Eranthemum* species, which could be utilized for medicinal purposes in the future.

Acknowledgement

The authors gratefully acknowledge the Principal of The New College, Kolhapur, for providing the essential facilities. Special thanks are extended to Dr. P. D. Chavan and Dr. D. K. Gaikwad for their valuable guidance and support.

Author contributions

PVP was responsible for data collection, experimentation, writing and compilation and also critically reviewed and revised the manuscript as required. SPD reviewed the manuscript. SAD provided supervision, technical guidance and final editing. All authors read and approved the final version of the manuscript.

Funding

This manuscript did not receive any funding from external agencies.

Declarations

Ethical statement

This article does not contain any studies with human participants or animals performed by any of the authors.

Conflict of interest

All authors declare that they have no conflict of interest.

References

1. Khan, I. (2017), Ethnobotany and medicinal uses of folklore medicinal plants belonging to family Acanthaceae: An updated review. *MOJ biology and medicine*. 1(2), 34–38.
2. Saensouk, p., ragsasilp, a., thawara, n., boonma, t., appamaraka, s., sengthong, a., & saensouk, s. (2024). Ethnobotanical study of acanthaceae family in kantarawichai district, maha sarakham province, thailand. *Biod iversitas: journal of biological diversity*, 25(8), 2570-2582.
3. Malavika j. (2023). Important medicinal plants of Western Ghats: A Review. *International journal of new media studies*, 10(2), 72-77.
4. Plants of the World Online (POWO). (2026). *Plants of the World Online*. Royal Botanic Gardens, Kew. https://powo.science.kew.org/
5. Botanical Survey of India. (2024, June 23). *Eranthemum*. Botanical Survey of India. http://efloraIndia.gov.in
6. Karthikeyan, S., Sanjappa, M., & Moorthy, S. (2009). *Flowering plants of India* (Vol. 1, Part 4, pp. 1–365). Botanical Survey of India.
7. Chandrashekara, U. M., & Thasini, V. M. (2016). Non-crop edible plants and medicinal plants in home garden agroforestry system of Palakkad District, Kerala. *International Journal of Ecology and Environmental Sciences, 42*(2), 183–191.
8. Thomas, B., & Mohanan, M. (2023). Significance and use of medicinal and edible plants: A case study. *Devagiri Journal of Science, 9*(1), 16–45.
9. Rao, D. M., Rao, U. V. U., & Sudharshanam, G. (2006). Ethno-medico-botanical studies from Rayalaseema region of southern Eastern Ghats, Andhra Pradesh, India. *Ethnobotanical Leaflets, 10,* 98–207.
10. Kumar, J. U., MJ, K. C., & Semotiuk, A. J. (2019). Indigenous knowledge on medicinal plants used by ethnic communities of South India. *Ethnobotany Research and Applications, 18,* 1–112. https://doi.org/10.32859/era.18.16.1-112
11. Zinka, R. B., Penumala, M., Shaik, J. B., Kandrakonda, Y. R., Mothukuru, S. L., Verri, K. P., & Gangaiah, D. A. (2023). *In vitro* assessment for anti-acetylcholinesterase and antioxidant activities of methanolic extracts of Indian medicinal plants and their phytochemical screening. *Bulletin of Environmental Pharmacology and Life Sciences, 12*(1), 146–156.
12. Katariya, M., Surana, S., Tatiya, A., Jain, A., Desai, D., & Shastri, K. (2008). Pharmacognostical and physico-chemical standardization of root of *Eranthemum roseum* (Vahl) R. Br. *Pharmacognosy Magazine, 4*(13), 75-79.
13. Mumtha, L. (2024). A review on the taxonomy, ethnobotany, chemistry and pharmacology of *Eranthemum roseum*. *African Journal of Biomedical Research, 27*(4), 8381–8385.
14. Mahajan, D. R., Tatiya, A. U., Girase, M. V., Patil, C. R., Jamkhande, P. G., Surana, S. J., & Kalaskar, M. G. (2022). Phytochemical and pharmacological validation of folklore medicine practiced in south-western Satpuda

Ranges (India) for management of inflammatory conditions. *Journal of Ethnopharmacology, 285,* 114813. https://doi.org/10.1016/j.jep.2021.114813

15. Kumar, J. U., MJ, K. C., & Semotiuk, A. J. (2019). Indigenous knowledge on medicinal plants used by ethnic communities of South India. *Ethnobotany Research and Applications, 18,* 1–112. https://doi.org/10.32859/era.18.16.1-112
16. Ingle, P., & Pawar, M. (2022). Ethnobotanical survey of medicinal plants used to cure skin diseases. *Agriculture Development towards Sustainability, 1,* 16–17.
17. Jagtap, S. D., Deokule, S. S., & Bhosle, S. V. (2008). Ethnomedico botanical uses of endemic and RET plants utilised by the Korku tribe of Amravati district, Maharashtra. *Indian Journal of Traditional Knowledge, 7*(2), 284–287.
18. Kanthale, P. R., & Biradar, S. D. (2013). Ethnomedicinal wisdom of tribals of Mahur forest of Nanded district, Maharashtra, India. *Recent Research in Science and Technology, 4*(10), 67–70.
19. Ghalme, R. L. (2020). Ethno-medicinal plants for skin diseases and wounds from Dapoli Tehsil of Ratnagiri district, Maharashtra (India). *Flora and Fauna, 26*(1), 58–64.
20. Jagtap, S. D., Deokule, S. S., & Bhosle, S. V. (2008). Ethnomedico botanical uses of endemic and RET plants utilised by the Korku tribe of Amravati district, Maharashtra. *Indian Journal of Traditional Knowledge, 7*(2), 284–287.
21. Mali, P. Y., & Bhadane, V. V. (2011). Ethno-medicinal wisdom of tribals of Aurangabad district (MS), India. *Indian Journal of Natural Products and Resources, 2*(1), 102–109.
22. Savinaya, M. S., Patil, S. S., Narayana, J., & Krishna, V. (2016). Traditional medicinal knowledge and diversity of medicinal plants in Sharavathi Valley region of Central Western Ghats. *International Journal of Herbal Medicine, 4,* 124–130.
23. Shaikh, S., & Mulay, J. R. (2019). Utilitarian aspects of Durgawadi sacred grove, Tahasil Junner, District Pune, Maharashtra, India. *International Journal of Current Advanced Research, 8*(3), 18008–18030.
24. Kumbhojkar, M. S., Bonde, S. D., & Kulkarni, D. K. (1999). Mapping indigenous medicinal plant resources from Mahadeokoli tribes in Western Ghats, Maharashtra. *Indian Journal of Plant Genetic Resources, 12*(2), 191–200.
25. Samvatsar, S., & Diwanji, V. B. (2004). Plants used for the treatment of different types of fevers by Bhils and its subtribes in India. *Indian Journal of Traditional Knowledge, 3*(1), 96–100.
26. Ahirrao, Y. A., & Patil, D. A. (2007). Ethnomedicinal investigation in Nandurbar district of Maharashtra. *Ancient Science of Life, 27*(2), 50–56. https://doi.org/10.4103/0257-7941.37041
27. Jain, A. S., Surana, S. J., Gokhale, S. B., Tatiya, A. U., & Bothara, R. C. (2007). Antimicrobial properties of *Eranthemum roseum* (Vahl) R. Br. *Iranian Journal of Pharmaceutical Research, 6*(2), 131–133.
28. Kamble, S. Y., More, T. N., Patil, S. R., Pawar, S. G., Bindurani, R., & Bodhankar, S. L. (2008). Plants used by the tribes of Northwest Maharashtra for the treatment of gastrointestinal disorders. *Indian Journal of Traditional Knowledge, 7*(2), 321–325.
29. Kamble, S. Y., Patil, S. R., Sawant, P. S., Sawant, S., Pawar, S. G., & Singh, E. A. (2010). Studies on plants used in traditional medicine by Bhilla tribe of Maharashtra. *Indian Journal of Traditional Knowledge, 9*(3), 591–598.

30. Patil, P. H., Gagarani, M. B., Patil, S. P., & Surana, S. J. (2014). Antidiabetic effect of roots of *Eranthemum roseum* Vahl. R. Br. *Indian Journal of Basic and Applied Medical Research, 3*(2), 536–543.
31. Lahange, S. M., Porte, S. M., & Bhangare, A. N. (2016). Traditional medicine used for malaria in India. *International Journal of Medical and Health Research, 2*(1), 39–46.
32. Atre, N. M., & Khedkar, D. D. (2023). Herbal remedies for respiratory ailments from Melghat region: A review with relevance to COVID-19 symptoms. *Journal of Herbal Medicine, 42,* 100744. https://doi.org/10.1016/j.hermed.2023.100744
33. Gorat, J., Mahala, U., Kokni, F., & Modi, N. (2021). Study of ethno-medicinal plants used by the tribes of Silvassa, Dadra and Nagar Haveli (UT), India. *International Journal of Creative Research Thought, 9,* 2320–2882.
34. Mhatre, K., & Shinde, R. (2014). Ethno-medicinal plants used by Thakar tribe, Raigad district. *Ethnobotany, 26,* 45–48.
35. Tatiya, A. U., Desai, D. G., Surana, S. J., & Patil, P. H. (2007). Anti-inflammatory and nitric oxide scavenging activity of roots of *Eranthemum roseum*. *Indian Drugs, 44*(11), 815–818.
36. Molyneux, R. J., Lee, S.T., Gardener, L.E., & Panter K. E. (2007). Phytochemicals: The good, the bad, and the ugly? Phytochem, 68(22-24), 2973-2985. https://doi.org/10.1016/j.phytochem.2007.0 9.004.
37. Mercy, A. G., Light, W. F., & Gospel, S. A. (2017). Qualitative and quantitative phytochemical screening of some plants used in ethnomedicine in the Niger Delta region of Nigeria. Journal of food and Nutrition Sciences, 5(5), 198-205. https://doi.org/10.11648/j.jfns.20170505.16,
38. Raaman, N. (2006). *Phytochemical techniques*. New India Publishing.
39. Sadasivam, S., & Manickam, A. (2005). *Biochemical methods* (3rd ed.). New Age International Publishers.
40. Basumatary, A. R. (2016). Preliminary phytochemical screening of some compounds from plant stem bark extracts of *Tabernaemontana divaricata* Linn. used by Bodo community at Kokrajhar District, Assam, India. *Archives of Applied Science Research, 8*(8), 47–52.
41. Basumatary, A. R. (2016). Preliminary phytochemical screening of some compounds from plant stem bark extracts of *Tabernaemontana divaricata* Linn. used by Bodo community at Kokrajhar District, Assam, India. *Archives of Applied Science Research, 8*(8), 47–52.
42. Auwal, M. S., Saka, S., Mairiga, I. A., Sanda, K. A., Shuaibu, A., & Ibrahim, A. (2014). Preliminary phytochemical and elemental analysis of aqueous and fractionated pod extracts of *Acacia nilotica* (Thorn mimosa). *Veterinary Research Forum: An International Quarterly Journal, 5*(2), 95-100.
43. De Silva, G. O., Abeysundara, A. T., & Aponso, M. M. W. (2017). Extraction methods, qualitative and quantitative techniques for screening of phytochemicals from plants. *American Journal of Essential Oils and Natural Products, 5*(2), 29–32.
44. Tiwari, P., Kumar, B., Kaur, M., Kaur, G., & Kaur, H. (2011). Phytochemical screening and extraction: A review. *Internationale Pharmaceutica Sciencia, 1*(1), 98–106.
45. Shaikh, J. R., & Patil, M. (2020). Qualitative tests for preliminary phytochemical screening: An overview. *International Journal of Chemical Studies, 8*(2), 603–608.
46. Shaikh, J. R., & Patil, M. (2020). Qualitative tests for preliminary phytochemical screening: An overview. *International Journal of Chemical Studies, 8*(2), 603–608.

47. Audu, S. A., Mohammad, I., & Kaita, H. A. (2007). Phytochemical screening of the leaves of *Lophira lanceolata* (Ochanaceae). *Life Science Journal, 4*(4), 75–79.
48. Yadav, R. N. S., & Agarwala, M. (2011). Phytochemical analysis of some medicinal plants. *Journal of Phytology, 3*(12), 10–14.
49. Gul, R., Jan, S. U., Syed, F., Sherani, F., & Jahan, N. (2017). Preliminary phytochemical screening, quantitative analysis of alkaloids, and antioxidant activity of crude plant extracts from *Ephedra intermedia* indigenous to Balochistan. *The Scientific World Journal, 2017,* 1–7. https://doi.org/10.1155/2017/5873648
50. Silva, G. O., Abeysundara, A. T., & Aponso, M. M. W. (2017). Extraction methods, qualitative and quantitative techniques for screening of phytochemicals from plants. *American Journal of Essential Oils and Natural Products, 5*(2), 29–32.
51. Kawade, M., Ingole, V., Shinde, A., & Katade, S. (2025). Qualitative phytochemical screening and metal analysis of some selected medicinal plants. *27*, 1313-1317.
52. Sheel, R., Nisha, K., & Kumar, J. (2014). Preliminary phytochemical screening of methanolic extract of *Clerodendron infortunatum*. *IOSR Journal of Applied Chemistry, 7*(1), 10–13.
53. Bhatt, S., & Dhyani, S. (2012). Preliminary phytochemical screening of *Ailanthus excelsa* Roxb. *International Journal of Current Pharmaceutical Research, 4*(1), 87–89.
54. Singh, V., & Kumar, R. (2017). Study of phytochemical analysis and antioxidant activity of *Allium sativum* of Bundelkhand region. *International Journal of Life Sciences Scientific Research, 3*(6), 1451–1458.
55. Uma, K. S., Parthiban, P., & Kalpana, S. (2017). Pharmacognostical and preliminary phytochemical screening of Aavaarai Vidhai Chooranam. *Asian Journal of Pharmaceutical and Clinical Research, 10*(10), 111–116.
56. Nanna, R. S., Banala, M., Pamulaparthi, A., Kurra, A., & Kagithoju, S. (2013). Evaluation of phytochemicals and fluorescent analysis of seed and leaf extracts of *Cajanus cajan* L. *International Journal of Pharmaceutical Sciences Review and Research, 22*(1), 11–18.
57. Rahman, M. A., Rahman, M. A., & Ahmed, N. U. (2013). Phytochemical and biological activities of ethanolic extract of *C. hirsute* leaves. *Bangladesh Journal of Scientific and Industrial Research, 48*(1), 43–50.
58. Kumar, V., & Jat, R. K. (2018). Phytochemical estimation of medicinal plant *Achyranthes aspera* root. *International Journal of Research in Pharmacy and Pharmaceutical Sciences, 3*(1), 190–193.
59. Njoku, O. V., & Obi, C. (2009). Phytochemical constituents of some selected medicinal plants. *African Journal of Pure and Applied Chemistry, 3*(11), 228–233.
60. Patel, P., Patel, N., Patel, D., Desai, S., & Meshram, D. (2014). Phytochemical analysis and antifungal activity of *Moringa oleifera*. *International Journal of Pharmacy and Pharmaceutical Sciences, 6*(5), 144–147.