

Cyathocline lyrata: A brief study on phytochemical and pharmacological profile

Neeraja. S. A*¹, Dr. R. Xavier Arulappa², Mrs. Anila Kumari. V. S³

1. *Student, Seventh Semester B Pharm, Sree Krishna College of Pharmacy and Research Centre, Parassala, Thiruvananthapuram, Kerala, India- 695502

2. HOD and Professor, Department of Pharmaceutical Chemistry, Sree Krishna College of Pharmacy and Research Centre, Parassala, Thiruvananthapuram.

3. Assistant Professor, Department of Pharmaceutical Chemistry, Sree Krishna College of Pharmacy and Research Centre, Parassala, Thiruvananthapuram.

Date of Submission: 15-07-2024

Date of Acceptance: 26-07-2024

ABSTRACT

Cyathocline lyrata leaf collected from Melghat Forest Tal- Chikhaldara, Dist- Amravati. The plant Cyathocline lyrata belongs to family Asteraceae. It is a slender delicate annual herb; growing to 20-25 cm high, branched grooved stem has soft hair covering it. Whole plant is strongly aromatic and it is arranged stalk less leave is toothed covered with soft hair and flowers occurs in corymbs at the end of branched in rose-purple colour. This plant is widely distributed in widespread in Himalaya (Kashmir to Bhutan), Assam, India, Burma, Thailand, Indo- China and China. Santamarine, costunolide, glycoside, eudesmanolide and guianolide are the chemical constituents of Cyathocline that possess anti-inflammatory, anti-arthritic activity, antimicrobial, anticancer activity and antifungal activity. The study that characterizes Cyathocline lyrata foliar micromorphological peculiarities and to describe the taxonomic significance of foliar micromorphological data using scanning electron microscopy (SEM). Thin layer chromatography was an important tool in the separation, identifications and estimation of different components. TLC was performed on the precoated TLC aluminium sheets material silica gel F-254. The TLC chamber was saturated with the solvent and after applying the spot on TLC plates were kept for development of chromatogram. Then the separations were visualized by the detecting reagent/methods and were studied. This review that provides the information of phytochemistry, pharmacological properties, clinical value, extraction and also identified the clinical potential by chemical analysis.

KEYWORDS Cyathocline lyrata, anti-inflammatory, antimicrobial, anticancer activity and antifungal activity.

I. INTRODUCTION

Medicinal plants are widely used as folk medicine in non-industrialized societies, mainly because they are readily available and cheaper than modern medicines. The annual global export value of the thousands of types of plants with medicinal properties was estimated to be US\$60 billion per year and growing at the rate of 6% per annum. In many countries, there is little regulation of traditional medicine, but the World Health Organization coordinates a network to encourage safe and rational use.¹

Cyathocline lyrata leaf collected from Melghat Forest Tal- Chikhaldara, Dist- Amravati. The plant Cyathocline lyrata belongs to family Asteraceae. It is commonly called as Jungli kante and sevati. It is a slender delicate annual herb; growing to 20-25 cm high, branched grooved stem has soft hair covering it. Whole plant is strongly aromatic. Alternatively arrange stalk less leave are toothed covered with soft hair and flowers occurs in corymbs at the end of branched in rose-purple colour. Cyathocline lyrata widely spread in Himalayas range, Assam, India (Local area of Maharashtra). Usually met with on the banks of streams and in moist localities. Worth growing in gardens in moist regions a native of India. Cyathocline lyrata is well known drug in Indigenous system of medicine for its various uses as a bitter tonic. It acts as germicide and appetizer. The essential oil of aerial part of Cyathocline lyrata had shown fairly pharmacological activity. It also shows antioxidant, insect repellent and antimicrobial activity. Cyathocline lyrata is used for isolation of essential oil. Biological screen includes tests for antibacterial, antiprotozoal, antiviral, antifungal and pharmacological activities.²



Fig:1 Plant of *Cyathocline lyrata*

TAXONOMY

Kingdom	Plantae
Phylum	Magnoliophyta
Class	Angiospermae
Category	Campanulids
Order	Asterales
Family	Asteraceae
Subfamily	Asteroideae
Genus	<i>Cyathocline</i>
Species	<i>Cyathocline lyrata</i>

VERNACULAR NAMES

SL.NO	LANGUAGES	VERNACULAR NAMES
1	English	Purple bane
2	Hindi	Bandhaniya
3	Gujarati	Okharad, Gangotri
4	Marathi	Gangotra
5	Nepali	Gal Phule
6	Assamese	Gal phule

GEOGRAPHICAL DISTRIBUTION

This plant is widely distributed in widespread in Himalaya (Kashmir to Bhutan), Assam, India, Burma, Thailand, Indo- China and China³.

- **Continental: Asia-Temperate**
- **Regional: Indian subcontinent**
 - Assam, East Himalaya, India, Nepal, Pakistan, West Himalaya
- **Regional: China**
 - China South-Central, China Southeast
- **Continental: Asia-Tropical**
- **Regional: Indo-China**
 - Cambodia, Laos, Vietnam
- **Regional: Southeastern Asia**
 - Bangladesh, Myanmar, Thailand

BOTANICAL DESCRIPTION

Cyathocline lyrata is an erect annual herb, growing in the range of 20- 50 cm of height. Branched, grooved stem has soft hair covering it. The whole plant is strongly aromatic. It has alternately arranged stalk, less leaves are toothed, covered with soft hair, and 3-12 cm long. Flowers are purple in colour, develop corymbs at the top of branches and the head of the flower is across 5-8cm. Leaves sessile, variable in size and shape, 1 to 2 pinnatifid, 5-15 cm long, upper leaves smaller, segments serrate-dentate to lobed, glabrescent or thinly hairy. Flowers variable in colour, borne in terminal corymbose panicles composed of heads 4-5 mm across on 2-5 mm long peduncles; involucre bracts pilose, linear-lanceolate, acute, 2-2.5 mm long; corolla composed of marginal filiform flowers 1.2-1.4 mm long and disc flowers 2mm long with glandular-hairy lobes. Achenes 0.3mm long, pappus absent³.

Microscopy

The epidermal cuticular membrane has a smooth ornamentation layer. The length of stomata ranges from 15 to 30 μ m and the width range from 10 to 20 μ m . Both glandular and non-glandular trichomes were observed on the surface of the leaf but some trichomes are deciduous in nature, mostly non-glandular ones. The length of trichomes ranges from 40 to 200 μ m. The glandular head has a size of 30 to 40 μ m. Capitulate mushroom-like multicellular type of glandular trichomes noted in this species. The Glandular hairs are stalked or sessile and one-to-many-celled. The body and head of the trichome are variable in structure as observed in *Cyathocline lyrata*⁴.

PHYTOCHEMICAL ANALYSIS OF CYATHOCLINE LYRATA⁵

Phytochemical analysis	Tests performed	Chloroform extract	Methanolic extract	Aqueous extract
Carbohydrates	Molisch's test	+	+	++
Reducing Sugar	Fehling's test	++	+	++
	Benedict's test	++	+	++
Protein	Biuret test	+	+	+
	Xanthoproteic test	-	++	+
Amino acid	Ninhydrin test	+	+	++
Steroid	Ring test	++	-	-
Phytosterols	Liebermann Burchard test	+	-	-
Tannins	Ferric Chloride test	-	-	-
Phenolic Compound	Lead Acetate test	+	+	++
Anthranol Glycosides	Borotrager's test	+	-	-
Cardiac Glycosides	Legal test	++	+	+
Terpenoids	Salkowski's test	+	+	+
Alkaloids	Wagner's test	+	+	+
Saponins	Foam test	-	-	+

++indicates: strong presence, + indicates: weak presence, - indicates: strong absence

PHYTOCHEMISTRY

From *C. lyrata*, two novel sesquiterpene lactones, Eudesmanolide and Isoivangustin, as well as the guaianolide – 6- hydroxy- 4,10- guaianadien- 8, 12-olide, have been isolated. HNMR spectrum data of Isoivangustin and its hydrogenated derivative were found to be comparable to the signals of Alantolactone, Ivangustin, and lactone that were epimeric at C-8. . The antibacterial and antifungal properties of the oil were investigated by screening it in its purest form and at dilutions of 1:10, 1:100, and 1:1000 in ethylene glycol.

Carbohydrates are found in the stem and root of *Tridax procumbens*, with 232.5 g/100g and 402.8 g/100g, respectively. The protein content of *Tridax procumbens* stem and root was found to be 121.6 g/100g and 11.61.9 g/100g, respectively. The vitamin C content of *Tridax procumbens* stem and root was determined to be 0.03680.87 g/100g and 0.00750.48 g/100g, respectively. Phytochemical analysis shows that the alkaloid, saponins, steroids, flavonoids, tannins, and glycosides present in *Vernoniaplant* extract and absence of tannins and glycosides⁶.

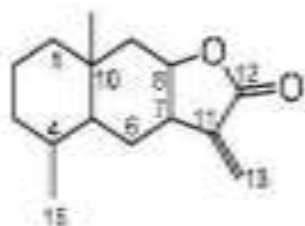


Fig:10 Santamarine



Fig:11 Eudesmanolide

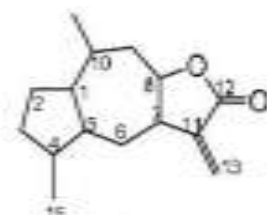


Fig:12 Guianolid

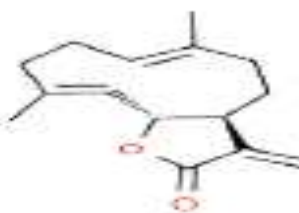


Fig:13 Costunolide

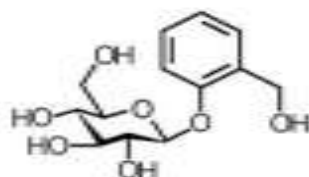


Fig:14 Glycosides

PHARMACOLOGICAL ACTIVITIES

Anticancer activity of *Cyathocline lyrata*

The santamarine, 9-beta-acetoxycostunolide and 9-beta-acetoxyparthenolide exhibit significant anticancer activities in vitro. The inhibitory effects of santamarine and 9-beta-acetoxycostunolide on L1210 cells are cytotoxic rather than just cytostatic. They block mitosis and reduce uptake of thymidine. The mechanism of the cytotoxicity of santamarine and 9-beta-acetoxycostunolide to L1210 cells could be related to alkylation of the sulfhydryl enzymes involved in nucleic acids and protein synthesis, as previously found for other sesquiterpenes with the alpha-methylene-gamma-lactone moiety present in santamarine, 9-beta-acetoxycostunolide and 9-beta-acetoxyparthenolide. It may also be related to suppression of microtubular protein⁷.

Anti-inflammatory Potential of *Cyathocline lyrata*

Cyathocline lyrata has anti-inflammatory effect. The results have been obtained in carefully controlled experiments with laboratory animals. Therefore, the statistical validity of the findings has been proved and they provide a scientific foundation for the use of the biologically active ingredients of *Cyathocline lyrata* in inflammatory conditions⁸.

Anti-arthritic activity of methanol extract of *Cyathocline lyrata*

It has antimicrobial, anthelmintic, hypotensive and stomach relieving properties. It is used to treat inflammations and pulmonary tuberculosis and also sesquiterpene lactones like santamarine, 9- β -acetoxycostunolide and 9- β -acetoxyparthenolide isolated from *C. lyrata* exhibited significant anticancer activities in vitro. Literature survey revealed the presence of chemical constituents like eudesmanolide, guaianolide, sesquiterpene lactones, isoivangustin and guaianolide, 6- α -hydroxy-4(14), 10(15)-gainadien-8 α -, 12-olide. Some sesquiterpene

lactones isolated from other plants have been found to possess good anti-inflammatory activities⁹.

Antioxidant activity & antimicrobial activity of *Cyathocline lyrata*

Cyathocline lyrata has been subjected to preliminary screening of phytoconstituents and FTIR. The study revealed the presence of phytochemical compounds and presence of functional groups of compounds such as secondary amine, aldehydic, carboxylic, disulfide, Ar-nitro, Ar-phosphate, silicone or organic siloxane, amide group. The study concluded that the methanolic extracts show significant antioxidant activities in a concentration dependent manner and also show significant antibacterial activity hence the plant contains potential antibacterial components that may be useful for evolution of pharmaceutical for the therapy of ailments and also plant extracts can be used for the treatment of infections caused by the strains of the test bacterial organisms¹⁰.

II. CONCLUSION

This comprehensive review has explored the ethnobotany, phytochemistry, pharmacology, and clinical applications of *Cyathocline lyrata*, highlighting its potential as a valuable medicinal plant. The phytochemical studies have identified various bioactive compounds such as Santamarine, Costunolide, glycoside, Eudesmanolide and Guaianolide of *Cyathocline lyrata*, being the most abundant and extensively studied constituent. The pharmacological studies have demonstrated the diverse biological activities of *Cyathocline lyrata* and its constituents, including anti-inflammatory, anti-arthritic activity, antimicrobial, anticancer activity and antifungal activity. The development of standardized and well-characterized *Cyathocline lyrata* extracts and formulations is crucial for ensuring consistent and reproducible therapeutic effects. Further research on the pharmacokinetics, bioavailability, and stability of *Cyathocline lyrata* constituents is needed to optimize the formulation and delivery of these products. Exploring the potential of *Cyathocline lyrata* as an adjuvant

therapy or in combination with other medicinal plants or conventional drugs could lead to the development of novel and more effective therapeutic strategies for various diseases.. However, further research is needed to fully unravel the mechanisms of action, optimize the formulations, and establish the long-term safety and efficacy of Cyathocline lyrata in clinical settings. With continued research and development, Cyathocline lyrata could play a significant role in the management of various diseases and contribute to the advancement of natural product-based therapies.

REFERENCES

- [1]. Ahn K. The worldwide trend of using botanical drugs and strategies for developing global drugs. BMB reports. 2017 March 5 Vol 3rd edition Pg No:111.
- [2]. Shrivastava, R. Anthelmintic properties of essential oil of Cyathocline lyrata Cass.1979;Vol 41th edition (6): Pg No: 228-229.
- [3]. Kapoor LD. CRC handbook of Ayurvedic medicinal plants. CRC press; 2018 Jan 18. Vol 1st edition; Pg No: 424
- [4]. Erdogan I. Epidermal Leaf Micromorphology of Some Tanacetum L. (Asteraceae) Taxa in Turkey. Gazi University Journal of Science. 2017 Nov 12; Vol 30th edition (4); Pg No: 30-41.
- [5]. Khalid SA, Duddeck H, Gonzalez-Sierra M. Isolation and characterization of an antimalarial agent of the neem tree *Azadirachta indica*. Journal of natural products. 1989 Sep5; Vol 2nd edition (5); Pg No: 922-927.
- [6]. Joshi A, Baghel V, Pathak AK, Tailang M. Phytochemical investigation and medicinal importance of Cyathocline lyrata. International Journal of Research in Ayurveda and Pharmacy (IJRAP). 2010; Vol 1st edition (2); Pg No:302-305.
- [7]. Ma G, Chong L, Li Z, Cheung AH, Tattersall MH. Anticancer activities of sesquiterpene lactones from *Cyathocline purpurea* in vitro. Cancer chemotherapy and pharmacology. 2009 Jun; Vol 64th edition; Pg No:143-52.
- [8]. Malviya KG, Shivhare UD, Srivastav P, Shivhare SC. Evaluation of Anti-inflammatory Potential of Cyathocline lyrata Cass Plant Extract by using Carrageenan Induced and Formalin Induced Rat Paw Edema. Asian Journal of Research in Pharmaceutical Science.2013; Vol 3rd edition (2); Pg No: 904.
- [9]. Bihani GV, Rojatkar SR, Bodhankar SL. Anti-arthritis activity of methanol extract of *Cyathocline purpurea* (whole plant) in Freund's complete adjuvant-induced arthritis in rats. Biomedicine & Aging Pathology. 2014 Jul 1; Vol 4th edition (3); Pg No:197-206.
- [10]. Ofor IB, Obeagu EI, OCHEI K, ODO M. International Journal of Current Research in Chemistry and Pharmaceutical Sciences. Int. J. Curr. Res. Chem. Pharm. Sci. 2016; Vol 3rd edition (2); Pg No: 20-28.