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Case Study

MOLECULAR AND TAXONOMIC REVIEW OF THE GENUS *CYATHOCLINE* CASS (ASTERACEAE): A CASE STUDY

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ABSTRACT

The family Asteraceae (nom. Alt. Compositae) is one of the largest and highly evolved, most advanced family amongs all the dicotyledons. The Asteraceae distributed worldwide due to its habitat diversity. India represent many species, amongs them some species are endemic in their distribution. The genus *Cyathocline* Cass. represent four species in India as per data but actually only Three species are there. The genus *Cyathocline* Cass. distributed mainly in Western ghats and Eastern ghats of India showing endemism. *Cyathocline lutea* and *Cyathocline manilaliana* are only restricted to India. The genus also shows many medicinal properties due to its phytochemical constituents.

Keywords: Taxonomic Review, *Cyathocline* Cass., Endemism, Phytochemical, Medicinal.

1. INTRODUCTION

1.1. General Scenario of the Family Asteraceae (Bercht. & J. Presl.)

The family Asteraceae (nom. alt. Compositae) is the largest, most advanced and highly evolved family among the dicotyledons. Asteraceae represented by about 43 tribes, over 24000 species belongs to 1600-1700 genera [1]. The family currently has 32913 legitimate species belonging to 1911 genera, under 13 subfamilies [2]. As per recent data Asteraceae represents 1568 genera and 25000 taxa [3]. The family represents much important tribes and genus in India, distributed throught the country. At present in India family comprises 1314 species under 204 genera and 20 tribes [4, 5]. There are 202 species are endemic to India [4].

The family is very interesting for the taxonomic study due to its great diversity in habit and habitat. The members of the family are easily identify by some pecular features such as head/capitulum type of inflorescence, presence of pappus [5-8].

1.2. Systematic position of the Family Asteraceae

Systematic position of the family in different systems of classification are given below [9-16].

Taxonomic Category	Bentham & Hooker (1862-83)	Engler & Prantl (1887-1915)	Hutchison (1973)	Cronquist (1988)	Thorne & Reveal (2007)	Takhajan (2009)	APG-IV (2016)
Kingdom		Plantae					
Division/ Phylum/Clade		Embroyophyta Siphonogama	Angiospermae/ Herbaceae	Magnoliophyta		Magnoliophyta	Angiosperms
Sub-division/ Sub-phylum		Angiospermae	Dicotyledones				Clade: Eudicots
Class	Dicotyledons	Dicotyledoneae		Magnoliopsida	Magnoliopsida	Magnoliopsida	Clade: Core Eudicots
Sub-class	Gamopetalae	Metachlamydeae		Asteridae	Asteridae	Asteridae	Clade: Superasterids
Series	Inferae						Clade: Asterids
Superorder					Asteranae	Asteranae	Clade: Campanulids
Order	Asterales	Campanulatae	Asterales	Asterales	Asterales	Asterales	Asterales
Sub-order							
Family	Asteraceae	Asteraceae	Asteraceae	Asteraceae	Asteraceae	Asteraceae	Asteraceae

1.3. Taxonomic Review of the Genus *Cyathocline* Cass. (Cassini)

Cyathocline Cass., a small genus has been treated as a member of subtribe Grangeinae of tribe Asterae (Asteraceae) represented by four species in tropical Asia [17]. They include *Cyathocline lutea* Law ex Wight, *Cyathocline jacquemontii* Gagnep, *Cyathocline purpurea* (Buch.-Ham. Ex D. Don) Kuntze, and *Cyathocline manilaliana* C. P. Raju and R. R. V. Raju [2].

The genus also represents some synonymous species and most of them are endemic as per IUCN. *Cyathocline purpurea* is most common but remaining taxa are endemic as per data [18, 19].

India represents all the four species but Karthikeyan et. al. (2009) reported only two species *Cyathocline lutea* and *Cyathocline purpurea* from India, but in actual there are three taxa of this genus. The pappus is absent from this genus [20-22]. The genus mainly distributed in China, Indochina, Bhutan, Bangladesh, Nepal, Peninsular India, Satpura Mountain Ranges, Pune, Nashik, Nagpur and Ahmednagar plateaus at high altitudes [6-8,20-26].

The species *Cyathocline manilaliana,* was described from Telangana in 1999 by C. P. Raju & R. R. Raju. Recent remark for this species is Types specimen is not traced or deposited [24, 27]. *Cyathocline jacquemontii* discovered by Fayed in 1979 and deposited their holotype in herbaria, but now this species is considered as synonym of *Cyathocline purpurea* [28].

Recently, Molecular investigation was done on *Cyathociline purpurea.* Based on data available from Plastid trnl-F & nuclear ribosomal DNA ITS sequences, the phylogeny of *Cyathocline purpurea* was established with additional help of karyotypic morphology and micro-morphological data. The conclusion come out from this data, it should be merged with *Blumea balsamifera* and gives a new combination *Blumea purpurea* (O.Kuntze) [29]. The synonymous and accepted names of the taxa are given in the following table [2, 12].

Sr. No.	Accepted Name as per ICBN/ICN	Synonymous Name with Author
1.	*Cyathocline purpurea* (Buch.-Ham. Ex D. Don) Kuntze	*Artemisia hirsuta* Rottler ex Spreng, *Artemisia paniculata* Rottler ex Wight, *Artemisia stricta* DC, *Artemisia stricta* f. diffusa Pamp., *Cyathocline birmanica* Gand., *Cyathocline lyrata* Cass. *Cyathocline purpurea* var purpurea, *Cyathocline stricta* DC. *Dichrocephala minutiflora* Vaniot, *Dichrocephala minutifolia* Vaniot *Tanacetum purpureum* Buch-Ham. ex D.Don
2.	*Cyathocline lutea* Law ex Wight	*Cyathocline flava* C. B. Clarke
3.	*Cyathocline manilaliana* C. P. Raju and R. R. V. Raju	No synonyms recorded

Fig. 1: General Distribution of the Genus *Cyathocline* Cass. in India

2. GENERAL BACKGROUND OF THE PHYTO-CHEMICAL, MEDICINAL AND OTHER WORK

Phytochemical data of *Cyathocline purpurea* indicates the abundance of fatty acids, terpenoids, alkaloids, glycosides but tannins, phenols present in less quantity [30-32]. *Cyathocline purpurea* extracts contains some important marker compounds such as 10 [15]-guainadien-8β, 6α-hydroxyl-4 [14], punctoperin β, 12-olide and embelin, this compounds also helpful for chemotaxonomical identification of *Cyathocline purpurea* plant. Some compounds like 6α-hydroxyl-4 [14], 10 [15]-guainadien-8β, 12-olide shows anticancer activity [31]. Phyto-chemical analysis shown that *Cyathocline lutea* reveals the presence of alkaloids, tannins and

flavonoids and *Cyathocline purpurea* reveals the presence of flavonoids and glycosides [34].

Essential oil from *Cyathocline purpurea* also showing antibacterial activity against some human pathogenic bacteria [35]. Sesquiterpene lactones from *Cyathocline purpurea* such as santamarine, 9β-acetoxycostunolide & 9β-acetoxyparthenolide investigated for its anticancer activity and shows very well supporting results in vitro [33].

Besides of above medicinal properties *C. purpurea* contains Guaianolide having Anti-inflammatory and Antioxidant property [36]. The frequency of cytomixis in PMC shows 10.5% and aneuploid report reveals 9 chromosomes from *Cyathocline lutea* [37].

2.1. Summary of the genus by species [1-37]

2.1.1. Cyathocline Purpurea (Buch.-Ham. Ex D. Don) Kuntze

A purple flowered small and erect herb, mostly flower bloom between November-April without pappus, distributed worldwide at high altitude like Western ghats. The species also synonymously known by *Cyathocline jacquemontii, Cyathocline lyrata, Cyathocline birmanica, Cyathocline stricta, Artemisia hirsute, Tanacetum purpurium*. It contains Guaianolide having antioxidant property.

2.1.2. Cyathocline lutea Law ex Wight

Small yellow flowered and erect herb, mostly flower bloom between October-December without pappus, rare in Maharashtra distributed at high altitude like Nashik, Junnar. The species also synonymously known by *Cyathocline flava*.

2.1.3. Cyathocline manilaliana C. P. Raju and R. R. V. Raju

Erect aromatic herb, flower bloom between February-April. It is restricted to Adilabad District of the Telangana state and Nagpur of Maharashtra State. Recently its Holotype was not found.

3. CONCLUSION

A persual of the available literature shows that Phytochemical, taxonomical, cytological, medicinal etc. investigations have been fairly extensive in some taxa of this genus. As per present taxonomic status, this genus represents only three taxa in India.

There are many controversies regarding taxonomic status and positions of species associated with this genus which will be solve by different investigations like molecular, anatomical etc. Most of the species of the genus are endemic in their distribution, some are categorized as endangered. Present study will be helpful for designing conservation strategies for such species.

Conflict Of Interest

There is no conflict of interest.

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