

Recollections and taxo-ecological studies of *Coleochaete scutata* Bréb., *Coleochaete pseudosoluta* Gauthier-Lièvre and *Coleochaete conchata* Möb., West Bengal, India

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Abstract

The present work had been carried out from Hooghly district, West Bengal, India in order to explore species diversity of the taxon *Coleochaete* Bréb. of the family Coleochaetaceae under the order Chaetophorales belonging to the class Chlorophyceae. There were some structural complexities and variations among the species. A total number of three species namely *Coleochaete scutata* Bréb., *Coleochaete pseudosoluta* Gauthier-Lièvre and *Coleochaete conchata* Möb. were collected and identified first time from this area. They were described with illustrations and some other valuable information. Shape, size and colour of vegetative and reproductive cells or structures were considered as taxonomic parameters for their identifications. Among them, *Coleochaete scutata* Bréb. was very common while other two species were rare in occurrence in this district. They are all epiphytes on submerged angiospermic plants. Perusal of cited literatures revealed that the above mentioned species were third time reports from West Bengal, India. Limnological study of water analysis showed that water was weakly alkaline and the aquatic ecosystems were oligotrophic and monomictic types.

Key words: Taxo-ecology, *Coleochaete* Bréb., West Bengal, India.

Introduction

Algal populations generally grow in water bodies and play significant roles as primary producer and supply energy for all aquatic organisms through aquatic food chains and webs. Recent research activities on algae as biofuel, alternative source of foods or super foods, algal genetic engineering, algae as bio-indicator in water pollution and algal nanobiotechnology etc. are rapidly growing areas in the field of Biosciences which are all developing based on the classical algal taxonomic works (Rai and Rai, 2012).

Coleochaetaceae represented by few genera and is a small family among the freshwater algae in the class Chlorophyceae. Primarily, they are epiphytic on angiospermic plants and sometimes attached on nonliving substratum. Presently, the taxon *Coleochaete* Bréb. possesses about 16 species and this alga is unique due to its presumed sister position in the evolution of land plants (Szymańska, 2003; Halder, 2015). The molecular and phylogenetic analyses showed that this taxon is monophyletic in origin (Delwiche *et al.* 2002).

These three species were collected from swampy lands (freshwater ecosystems) at Madhusudanpur and Diara. The two sites were located within Hooghly district, West Bengal, India (Halder and Sinha, 2013; 2014a, b, c). Considering, the complexity and variations of the morphological features among these species and the paucity of information of Coleochaetalean algae from this location, the present work was undertaken.

Some limnological data of aquatic bodies (temperature, pH, NO₃-N, PO₄³⁻, K, DO, BOD, COD, TDS and SO₄²⁻) during sampling time of algal species had been analyzed and exhibited that they were helped for their growth and occurrence.

The previous records of Saxena (1962), Kargupta and Sarma (1991) and Keshri (2010) were produced from West Bengal and by Singh (1941), Venkataraman (1957), Kamat (1962, 1975), Randhawa and Venkataraman (1962), Patel (1968), Prasad and Asthana (1978), Tiwary (1984), Habib and Pandey (1992) and Srivastava and Misra (2009) from India on the taxonomy of those species.

Materials and Methods

Algal samples were collected in plastic and glass containers from fresh water habitats at Madhusudanpur (23°01'N; 88°40'E) and Diara (22°79'N; 88°28'E) of Hooghly district (20°30'32"-23°1'20"N; 87°30'20"-80°30'15"E). Detailed taxonomic study was made by examining specimens under Olympus trinocular microscope (Model-CH20i) for descriptions of these species and microphotographs were taken using Canon Power Shot A480 camera. The samples were preserved in 4% formalin. Identifications of the taxa were accomplished with the help of authentic literatures (Tiffany and Britton, 1952; Prescott, 1962; Printz, 1964; Picińska-Fałtynowicz & Semmerling, 2001; Islam & Irfanullah, 2005; Srivastava & Misra, 2009; Keshri, 2010). The pH and temperature of the aquatic bodies were determined at the sites immediately after collections with the help of portable pH meter (Model No. PP9046 Philips, India) and Zeal's mercury thermometers (UK). The other limnological parameters such as nitrate-nitrogen (NO₃-N), phosphate (PO₄³⁻), potassium (K), dissolved oxygen (DO), biochemical oxygen demand (BOD), chemical oxygen demand (COD), total dissolved solids (TDS) and sulphate (SO₄²⁻) of waters were estimated by UV-VIS Spectrophotometry (CECIL CE- 7200) following the standard method (APHA, 2005). All the physico-chemical parameters in ecological notes are expressed in mg l⁻¹ except pH and temperature.

Results and Discussion

Three species of *Coleochaete* Bréb. namely *Coleochaete scutata* Bréb., *Coleochaete pseudosoluta* Gauthier-Lièvre and *Coleochaete conchata* Möbius belonging to the family Coleochaetaceae of the order Chaetophorales under the class Chlorophyceae were described below with author citation, habitat, date of collection, ecological notes, significance and occurrence for the first time from Hooghly district, West Bengal, India. The figure of habitat of *Coleochaete* Bréb. had also been provided below (Plate 1, Fig.1).

Key to the species

1. Filaments compactly adjoined and forming pseudoparenchymatous monostromatic disc-----
-----*Coleochaete scutata*
1. Filaments not so ----- (2)
2. Filaments loosely spreading; irregularly branched; radiated from a common centre-----
----- *C. pseudosoluta*
2. Filaments not so; cells embedded in mucilage; rounded and wavy ----- *C. conchata*

Taxonomic description

1. *Coleochaete scutata* Bréb. in Ann. Sci. Nat. Bot. Ser. 3, 1: 29, pl.2, figs. 1-7, 1844; Tiffany & Britton, The Algae Illinois 44, pl.10, fig.74, 1952; Prescott, Algae of the Western Great Lakes Area 130, pl.18, fig. 9, 1962; Picińska-Fałtynowicz & Semmerling in Acta Bot. Cassub. 2: 112, fig. 11, 2001; Srivastava & Misra in Ecoprint 16: 60, figs.1, 4-5, 2009 (Pl. 1, Figs. 2-3).

Taxonomic characters: Thallus aquatic, epiphytic, dioecious, heterotrichous, mucilaginous, greenish and circular in outline; 153.0-218.0 μm broad; filaments radiated from a common centre, compactly adjoined and forming pseudoparenchymatous monostromatic disc; cells rectangular, quadrangular to polygonal; vegetative cells 30.0 μm long, 20.0 μm broad and thick walled; chloroplast single and parietal with one pyrenoid; male thallus large, vegetative cells of male thallus smaller than female one; antheridia grow in groups of 2 to 8; oogonia cone shaped or subglobose; 34.0- 40.0 μm long, 24.0-31.0 μm broad; spermatocarp spherical, corticated and 55.0-88.0 μm in diameter; oospore brownish with smooth wall.

Habitat: In swampy land at Madhusudanpur, Hooghly, West Bengal.

Collection Number and date: NH 349 (10-12-2006).

Ecological notes: Madhusudanpur, water temperature: 20°C; pH: 7.0; $\text{NO}_3\text{-N}$: 0.1; PO_4^{3-} : 0.18; K: 16.0; DO: 10.0; BOD: 3.4; COD: 90.0; TDS: 132.0; SO_4^{2-} : 6.2

Ecological significance: Primary producer in the aquatic body.

Occurrence: Very common

2. *Coleochaete pseudosoluta* Gauthier-Lièvre in Bull. Soc. Hist. Nat. Afr. Nord. 47: 41, pl. 3, figs 36-38, 1950; Printz in Hydrobiol. 24: 354, pl. 92, fig. 6, 1964; Picińska-Fałtynowicz & Semmerling in Acta Bot. Cassub. 2: 112, fig. 9, 2001 (Pl. 1, Fig. 4).

Taxonomic characters: Thallus epiphytic, microscopic, mucilaginous, flat and expansion, consists of filaments; filaments loosely arranged; adjoined laterally or not; vegetative cells rectangular to cylindrical, sometimes quadrate; 5.5-10.5 μm broad and 8.5-20.5 μm long; cell wall thick; apical cells with rounded tips or sometimes elongated; chloroplast single, pyrenoid one; spermatocarp spherical or sub spherical, corticated, brown; 20.0-30.0 μm broad and 30.-40.0 μm long; oospore 15.0-30.0 μm in diameter.

Habitat: In swampy land at Diara, Hooghly district, West Bengal

Collection Number and date: NH 371(26-12-2006).

Ecological notes: Diara, water temperature: 18°C; pH: 7.3; $\text{NO}_3\text{-N}$: 0.2; PO_4^{3-} : 0.24; K: 20.0; DO: 8.0; BOD: 4.2; COD: 110.0; TDS: 142.0; SO_4^{2-} : 7.4

Ecological significance: Play significant role as primary producer in the aquatic food chain.

Occurrence: rare

3. *Coleochaete conchata* Möbius in Flora 75: 426, figs. 6-7, 1892; Printz in Hydrobiol. 24: 356, pl. 3, figs. 5-6, 1964; Islam & Irfanullah in Bangladesh J. Plant Taxon. 12: 31, pl. 5, figs. 70-71, 2005; Keshri in Alg. Stud. 134: 45, pl. 2, figs. 8-9, 2010 (Pl. 1, Fig. 5).

Taxonomic characters: Thallus epiphytic, microscopic, embedded in watery mucilage, prostrate and erect systems not distinguished; filaments radiated from a common centre, loosely arranged, gradually separated from each other towards the periphery of the thallus; centrally located cells are more or less compact and peripheral cells rounded, sub-spherical, angular or pentahexagonal and inflated with wavy margins; vegetative cells 10.5-20.0 μm broad and 14.5-30.0 μm long; apical cells with rounded tips; chloroplast in each cell single, parietal with one pyrenoid; antheridia 6.0-8.0 μm broad and 8.5-10.0 μm long; spermatocarp spherical, corticated and 50.0-90.0 μm in diameter; oospore brownish and 30.5-50.5 μm in diameter.

Habitat: In swampy land at Madhusudanpur, Hooghly, West Bengal

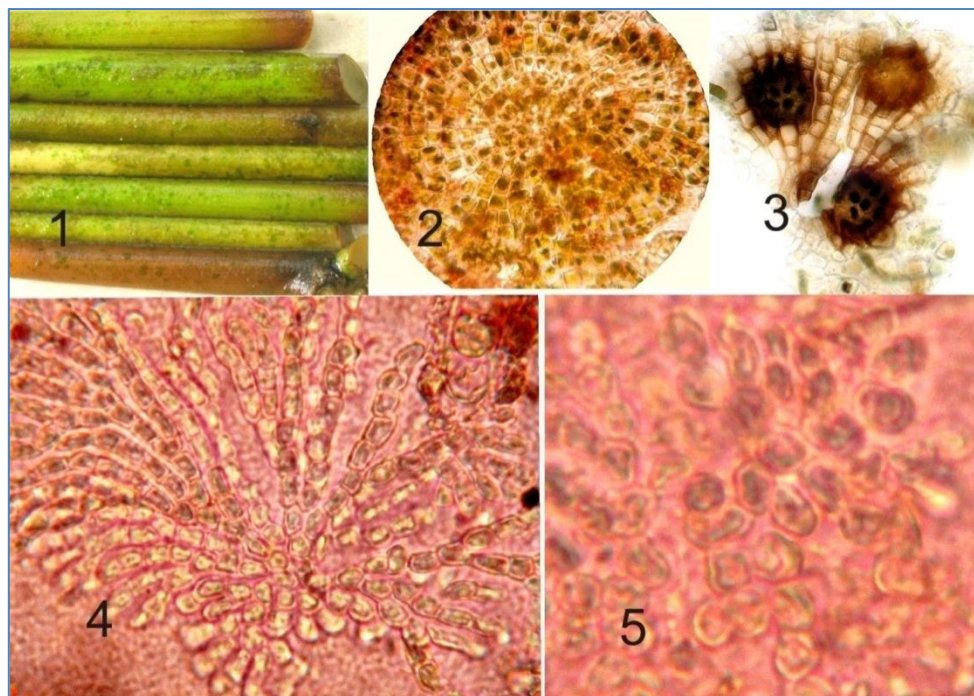
Collection Number and date: NH 349 (10-12-2006).

Ecological notes: Madhusudanpur, water temperature: 20°C; pH: 7.0; NO₃-N: 0.1; PO₄³⁻: 0.18; K: 16.0; DO: 10.0; BOD: 3.4; COD: 90.0; TDS: 132.0; SO₄²⁻: 6.2

Ecological significance: Primary producer in this aquatic body.

Occurrence: rare

So, the taxonomic study showed species diversity scenario of this taxon from this location while limnological study revealed that water was weakly alkaline in these aquatic bodies and they were oligotrophic and monomictic categories. Therefore, this type of study will be helpful for documentation of algal flora and future algological works from this area.



20µm
Figs. 1-5

Plate 1: Fig.1. Habitat of *Coleochaete* Bréb., Figs. 2-3. *Coleochaete scutata* Bréb., Fig. 4. *C. pseudosoluta* Gauthier-Lièvre, Fig. 5. *C. conchata* Möb.

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