



Taxonomic study of *Enteromorpha compressa* (L.) Nees (Ulvales, Chlorophyceae) in West Bengal, India

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Abstract

Enteromorpha compressa (L.) Nees was identified from sea habitat during the taxonomic investigation of marine filamentous green algae in 2016 at Bakkhali in South 24 Parganas district, West Bengal, India. The thallus is light green, branched, crispate and vegetative cells are variables in sizes and thick walled. The species was found abundant mostly during winter (December-February) to early summer (March) in the water column as attached benthic form. It preferred to grow in sunny places. This is the first report from West Bengal, India.

Introduction

Seaweeds have a great nutritional interests since the ancient times because of low calorie carbohydrates, valuable source of proteins, polyunsaturated fatty acids, rich in vitamins, minerals and dietary fibers (Lahaye, 1991; Benjama and Masniyom, 2011) as well as presence of important bioactive compounds of pharmaceutical values (Ortiz *et al.*, 2006). Survey of literatures revealed that green seaweeds also contain higher protein contents (10–30% of dry weight). World widely, about 150 species of seaweeds are consumed as human food (Kumari *et al.*, 2010). *Enteromorpha* Link is a macrophytic green alga found mainly in sea waters (Romano *et al.* 2003, Żbikowski *et al.* 2005). It is an edible marine macroalga, commonly refers to seaweed (Fleurance, 1999; Benjama and Masniyom, 2011) and delimits or prevents some diseases such as obesity, diabetes, heart diseases and disease like cancer (Lahaye and Jegou, 1993). The alga shows antioxidant activity particularly ethyl acetate fraction demonstrates higher antioxidant activity following the DPPH scavenging method (Shanab *et al.*, 2011). There are 588 names of this genus are enlisted in the database of which only 22 names are currently accepted taxonomically in algaebase (www.algaebase.org; Guiry, 2016). The species are found in a wide range of habitats and able to grow in estuarine to brackish conditions, some are occur on wave exposed intertidal shores, while others can be found at depths of up to 40 m on the sea level (Heesch *et al.*, 2007). They are also able to tolerant low salinity of waters. A molecular phylogenetic analysis based on 5.8S rDNA and ITS2 sequences demonstrated a monophyletic *Enteromorpha* Link-clade that falls within the paraphyletic genus *Ulva* L. (Malta *et al.*, 1999). The species belonging to this genus have a simple and very variable morphology. Branching types, diameter and morphology of branches, cell dimensions, cell organization (longitudinal and/or transverse rows) and number of pyrenoids in the chloroplasts are characteristics that used for the identification of *Enteromorpha* Link species (Coppejans *et al.*, 2004).

Bakkhali is a Ganga deltaic Island which is situated near seaside of Bay of Bengal and Sunderban area. It is an important tourist spot due to its natural beauty and of a stretched sea beach (about 7 km) towards Frasergunj Island in West Bengal, India. *Casuarina* L. trees lines are one of the most important features and attracted thousands of tourists in this beach. Salinity of this site also helps the occurrence and growth of mangrove vegetation.

Earlier, Chacko *et al.*, (1955) first recorded this species from Krusadai Island, Gulf of Manner in Tamil Nadu. Sreenivasa Rao and Kale (1970) reported the alga from Gopnath in Gujarat coast. Following them, Zingde *et al.*, (1976) enlisted it from Goa state. Next, Dhargalkar *et al.*, (1980) documented it from Maharashtra coast. After that, Nair *et al.*, (1982) and Ohno and Mairh (1982) described this species from southern Kerala coast and Okha in Gujarat. Latter, Untawale *et al.*, (1983) and Agadi (1985) reported it from Lakshadweep Island and Karnataka coast. After a gap, Raman *et al.*, (2004) and Rath and Adhikary (2006) recorded the green alga from North coastal area of Andhra Pradesh and Chilika lake in Orissa, respectively.

Recent times, marine algae research is progressing rapidly in India. However, algal diversities and population studies are rarely done from coastal region in West Bengal, India and the taxon was poorly studied. Therefore, the present study was undertaken from sea beach area at Bakkhali. This study is very important regarding taxonomical aspects because it contributes to provide new records of algal species of marine water algae in India.

Materials and Methods

Algal sample was collected in plastic containers from marine water habitat at Bakkhali sea beach (21°.55'N, 88°.26'E) of South 24 Parganas district, West Bengal, India (Fig 1). Detailed taxonomic work was done by examining the specimens under Olympus trinocular microscope (Model-CH20i). The sample was preserved in 4% formalin solution and voucher specimen was deposited in the Botany Department, University of Kalyani, Nadia, West Bengal. Identification of the taxon was carried out with the help of authentic literatures (Sreenivasa Rao and Kale, 1970; Joshi and Krishnamurthy, 1972; Islam, 1973, 1976; Nair *et al.*, 1982; Krishnamurthy, 2000).



Fig 1: Map of study site

Results and Discussion

Enteromorpha compressa (L.) Nees which was collected from sea beach at Bakkhali in South 24 Parganas district, West Bengal, India had been morpho-taxonomically described for the first time. Each currently accepted names had been provided with its author/s name. On the basis of Fritsch (1956) system of classification the taxon was categorized.

Class: Chlorophyceae; order: Ulotrichales; family: Ulvaceae

Genus: *Enteromorpha* Link

Enteromorpha compressa (Linnaeus) Nees in Hor. Phys. Berols.: Index [2], 1820 (Fig 2)

Ulva compressa Linnaeus, 1753

Description: Plant tubular, multicellular, light green, crispate and attached with the substratum by rhizoidal like holdfast; more branching near base of the thallus and forming bushy appearance; branches unilateral, slender and apices tapering; cells smaller, variable in size or irregular, thick walled, compressed and arranged in rows; cells 8.5-10.5 μm long and 10.5-12.0 μm broad; uninucleate; chloroplast single and parietal in each cell.

Collection Number: Voucher specimen SNS 150; **Dated:** 10.01.2016

Habitat: Seawater at Bakkhali in South 24 Parganas district, West Bengal, India

Ecological note: Epilithic, light greenish, tubular, pH: 7.1, temperature: 20°C.



Fig 2: Microphotograph of *Enteromorpha compressa* (L.) Nees

A key goal of taxonomic investigation or biodiversity exploration is the discovery of new species. Sometimes newly found organisms do not fit into existing data/records published in literatures or monographs (Vecchione *et al.*, 2000). The common green seaweed *Enteromorpha* Link represents an extensive morphological plasticity and contains numerous variants which makes the taxonomic status of this genus problematic (Ding *et al.*, 2014). The authors while working on taxonomic identification of the taxon on the species level emphasized only morpho-taxonomic features without taking any anatomical and cytological characteristics. From, West Bengal (a tropical state) in India scanty information is available on the taxonomy of this genus. Naskar and Santra (1985) first enlisted one species of this genus named as *Enteromorpha tubulosa* (Kütz.) Kütz. from brackish sewage fed fisheries of Sundarbans in South 24 Parganas district of West Bengal, India but they did not described it morpho-taxonomically with illustrations. They only pointed out that the alga normally grown in salted brackish water as a branched filamentous form. In the present work, authors also noticed this marine macroalga as tubular-linear branched multicellular form. Latter, Santra and Pal (1988) gave a systematic account of two species of the above said genus such as *Enteromorpha intestinalis* (L.) Link and *E. prolifera* (Müll.) J. Ag. from mangrove delta region of this state. So, prior to reporting of the present species, only three species of the genus had been documented earlier from this state. Islam (1976) during the taxonomic study of marine algae from Sundarbans area in Bangladesh noticed some features of this species like: i) bright green thallus, ii) numerous branched or unbranched branches, iii) branch base unconstricted but expanded, iv) branchlets with uniseriate cells, v) cells variable in sizes, vi) pyrenoid present in each cell. Morphological examination of the species exhibited more or less same features as described above in respect of color, hold fast, habit, branching pattern, cells shape and arrangement etc. Thus, the present study, has confirmed the earlier findings.

Conclusion

This study would be helpful for proper identification of the taxon and might be considered a contribution towards exploration of the marine algal species from West Bengal, India. Further, study is needed to assess nutritional and pharmaceutical values of this species so that it could be utilized as important seaweed for human beings.

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