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Diversity of Algae (Cholorophyceae) in Paddy Fields of Lalgutwa Area, Ranchi, Jharkhand

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ABSTRACT

The distribution of Chlorophyceae (Green algae) in relation to seasonal variation of paddy fields at Lalgutwa area, Ranchi has been under taken for the first time in this area. A regular seasonal collection has been made during several field trips in year 2010 to 2011. Total 24 chlorophycean taxa with wide range of thallus structure were collected belonging to various orders i.e., *Chlorococcales, Ulotrichales, Cladophorales, Oedogoniales, Zygnematales* etc. Moderate temperature, high light nutrient and water availability appears to be better conditions for algal growth in the rice field habitat. This study reveals that comparatively lesser number of Chlorophycean members is growing in summers in comparison to rainy and winter seasons.

INTRODUCTION

The use of blue green algae as biofertilizer for rice crop was first reported by (De, 1939). Algalization seems to have little effect on the physical properties of the soil; however, it may improve soil aggregation (Sankarama, 1971). The importance of algae fertilizer as source of nitrogen has been well documented by many workers on inoculated soil in both pot and field experiments (Alimagnob, V & T, Yoshida 1975; Macraei, C., & T.F, Castro 1967; Watanabea, 1962). Rice is an exclusive crop plant of aquatic habitat, largely raised in an anaerobic or partially anaerobic submerged environment. Rice field ecosystem provides favourable environment for the growth of various group of algae with respect to their requirement of light, water, temperature and nutrient availability. The chemical properties which undergo changes on submergence are essentially the complex transformation of various elements. These depend on factors like the redox potential, pH, nature and quantity of organic matter, base status of the soil and microbiological activity (Venkataraman, G.S 1972). The maintenance of a healthy aquatic ecosystem depends on the abiotic properties of water and the biological diversity of the ecosystem (Harikrishnan *et al.*, 1999). In addition to the economic benefits, paddy field ecosystem help in maintenance of nutrient recycling, trophic structures balance, water recharge and most importantly harbours diverse floral communities (Dhyani *et al*., 2007). The green algae play the important role acting as primary producer and also increase the fertility of the soil in paddy fields. Algae has been used as cheap sources of animal and plant nutrients, industrial exploitation of variety of value added products has already been initiated ,medicinal potential of many of these being exhaustively explored for application. Many algae has been identified as bioindicator of the type and extent of pollution and their involvement in bioremediation of the problem has far reaching implication in protecting the water bodies. Thus, it is essential to study algal community in fluctuating physico-chemical scenario of habitat like paddy fields area to conserve and to maintain the ecosystem. Keeping these views in mind an attempt has been made during the year 2010 to 2011 to survey the distribution of the green algae in certain paddy field of Lalgutwa area, Ranchi which has been recorded for the first time.

The capital city of state Jharkhand, Ranchi experiences subtropical climate, which is characterized by hot summer from March to May and well distributed rainfall during southwest monsoon from June to October. Winter season is marked by dry

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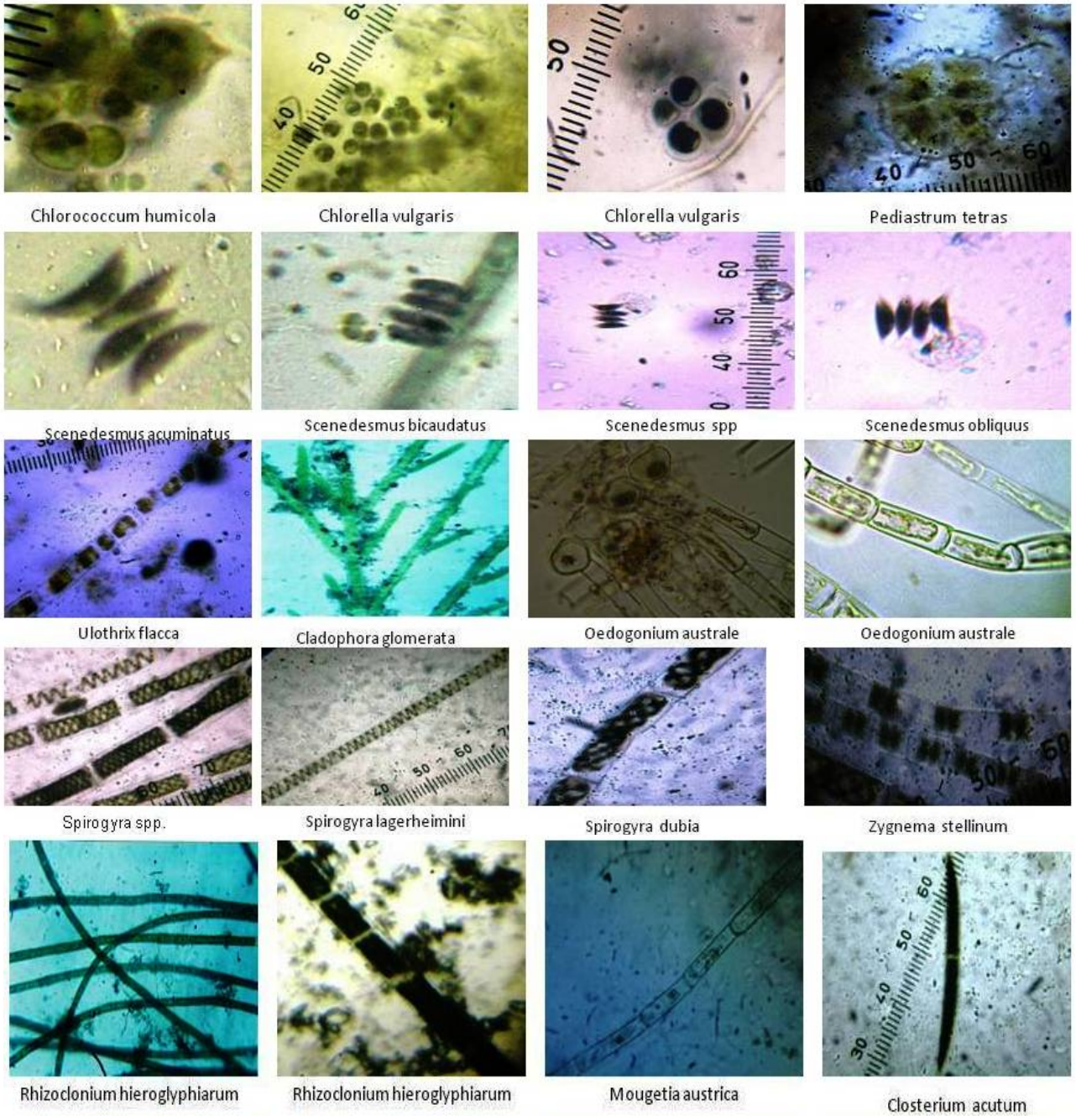
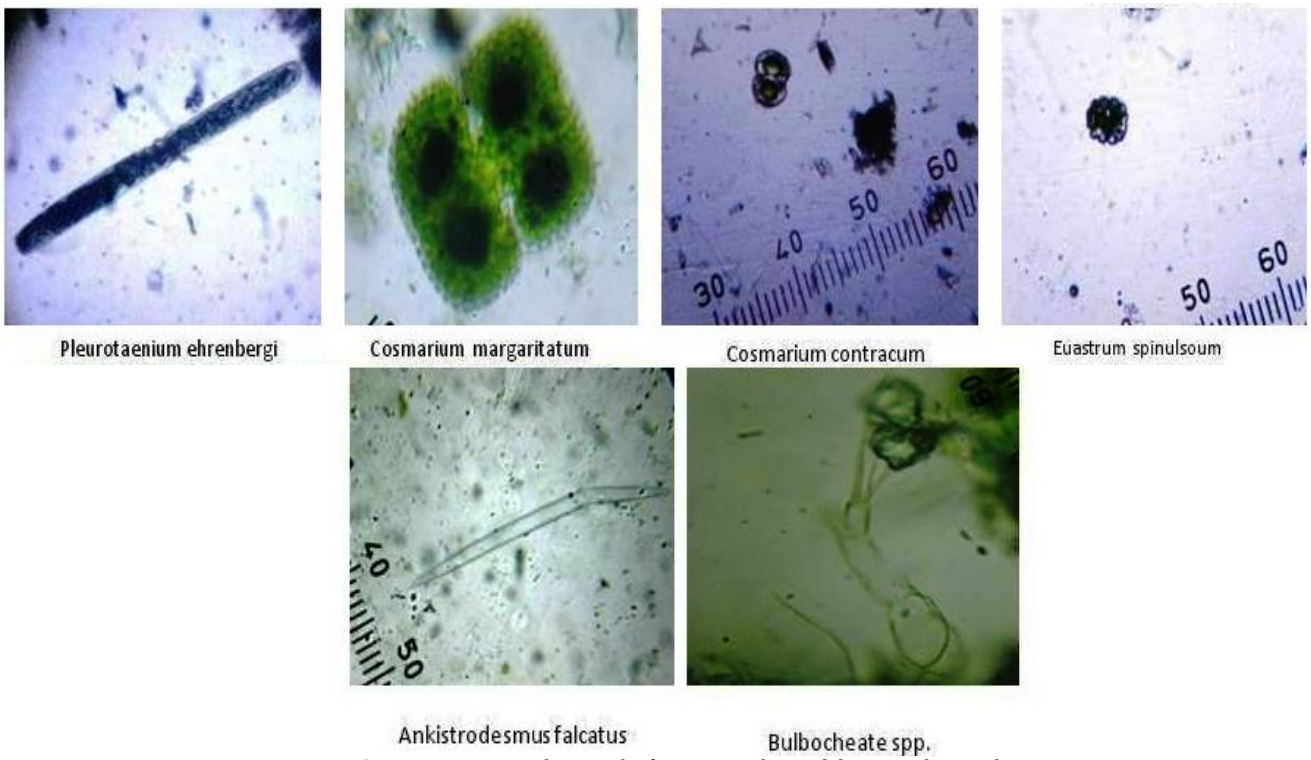
and cold weather during the month of November to February. Rice fields of Lalgutwa area is about 8-10 km away from Ranchi.

MATERIAL AND METHODS

The study area has been divided into two different site i.e., Road side paddy field area and Rice fields near Institute of Forest Productivity, Lalgutwa, Ranchi. The algal materials were collected in the specimen tubes from waterlogged and moist soil surfaces. The filamentous form which are epiphytes and their filaments float on water were collected in wide mouthed bottles with finger and forceps directly. Surface water was also taken for the study of phytoplankton and desmids. The snails were directly collected which shows green surface and collection also taken from the aquatic plants surface and near rice plants by scarping the surface.

The collected specimens were brought to the Algal Biotechnology Laboratory, University department of Botany, Ranchi University, Ranchi; carefully washed and preserved in 4%formaldehyde solution. Temporary Mounts of algal specimen were prepared with suitable stains and observed under compound microscope (ALCO AM-35). Micrometric measurement with the help of stage and ocular micrometer has been taken & Camera Lucida diagrams were made for the morph-taxonomical identification with the help of standard monographs, available research papers and publication some microphotographs of dominant forms were also taken by a digital camera (Annexure 1).





Annexure. 1: Microphotograph of some taxa observed during study period.

Table. 1 (Annexure 2): Seasonal variation of chlorophyceae during investigation; Key: +=Present, ++=Dominant,* =Not Observed.

NAME OF ALGAL TAXA	SEASONAL VARIATION ON TAXA DISTRIBUTION		
	WINTER	SUMMER	RAINY
Order-Chlorococcales			
1. Chlorococcum humicola	+	*	*
2. Chlorella vulgaris	+	*	+
3. Hydrodictyon reticulatum	+	*	+
4. Pediastrum tetras	++	*	+
5. Scenedesmus acuminatus	+	*	++
6. Scenedesmus bicaudatus	+	*	+
7. Scenedesmus spp.	+	+	*
8. Scenedesmus obliquus	++	+	+
Order-Ulotrichales			
9. Ulothrix flacca	+	*	*
Order-Cladophorales			
10. Cladophora glomerata	++	*	+
11. Rhizoclonium hieroglyphiarum	++	+	+
Order-Oedogoniales			
12. Oedogonium australe	+	*	+
13. Bulbocheate spp.	*	*	+
Order-Zygnematales			
14. Spirogyra spp.	+	+	+
15. Spirogyra lagerheimini	++	*	+
16. Spirogyra dubia	+	+	++
17. Zygnema stellinum	+	*	++
18. Mougestica austrica	*	*	+
19. Closterium acutum	+	*	++
20. Pleuotaenium ehrenbergi	+	+	+
21. Cosmarium margaritatum	+	*	+
22. Cosmarium contractum	++	*	+
23. Euastrum spinulosum	*	+	++
24. Ankistrodesmus falcatus	*	+	+

RESULT AND DISCUSSION

During this present investigation out of total 24 taxa of Chlorophyceae belonging to 5 Orders where **,** *Chlorococcales* represent 5 genera and 9 species ,*Ulotrichales* 1 genera with 1 species ,*Cladophorales* with 2 genera and 2 species following *Oedogoniales* 2 genera and 1 species similarly order *Zygnematales* have been found with total 8 genera and 11 species. (Table-1, Annexure-2).

Seasonal fluctuations on populations of algae were seen in most of the seasons in present investigation. Algae population were drastically reduced in advent of monsoon due to the ploughing and field preparation activities where field flooded with suspended soil particles. A qualitative study of algae in paddy fields by (Gupta,1966) showed that the algae began to grow one month after the first monsoon rain; the algal community was poor in both quality and quantity and was dominated by *Spirogyra* sp. associated with *Anabaena* sp. Higher population of *Cosmarium* and *Euastrum* species were also observed in this time. After paddy sowing in field most of the member of Chlorococcales, Cladophorales, Conjugales, Cladophorales and Zygnematles flourished well while members of Ulotrichales, and Oedogoniales were represent very few taxa. In addition to this, the luxuriant growth of Bacillariophyceae and Chlorophyceae were present due to pudding of soil where it releases large quantities of readily available nutrients into the flood waters (Kaul *et al*., 1978).

Higher population of *Cosmarium Scendesmus, Pediastrum,* and *Pleuotaenium* species was observed during the period of August to October, during these months the water level declined gradually in rice field. It was found that population of algae belongs to above mentioned order were less in number during advent of summer month. The seasonal fluctuation in *Cladophora* showed distinct change; as its colony were mainly grow in snail appears during July but full growth was observed only in the month of August. The population of the *Chlorella vulgaris* was very low throughout the year except rainy seasons. During study period *Hydrodictyon* was present as green mat at every point of collection especially in month of August to September. In the month of March onwards number gradually decreases with respect to relative genera of chlorophyceae.

Algal diversities are natural occurrences, and may occur with stability depending on weather and water conditions of the particular habitat. The occurrence of rich algal flora results generally at the place where there are high levels of nutrients present, together with the occurrence of favorable environmental conditions. However, human shift can often generate and hasten the pace of algal growth. In the current condition of world the algae are beneficial in various ways and its potential application for benefit of human beings as well as for other organisms. So, it is necessary to conserve algal genetic resources of local habitat and to do more systematic work on it which is possible only after understanding the ecology and habitats of various algal forms. These findings will be of great use to scientific works in future to explore more and more about fresh water Chlorophyceae of rice fields and other habitat of the area.

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