Indian J. Applied & Pure Bio. Vol. 39(3), 1620-1626 (2024). **ISSN: 0970-2091**
A web of Science Journal

Paddy field algae in Bhadravathi taluk of Karnataka

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Abstract

The present study was carried out on the varieties of phytoplankton/algae in the paddy fields of Bhadravathi taluk of Shivamogga district, Karnataka for a period of six months (January to June 2017). A total of 32 species belonging to 23 genera were identified with 07 classes viz., Bacillariophyceae, Chlorophyceae, Klebsormidiophyceae, Myxophyceae, Zygnematophyceae, Ulvophyceae, Euglenophyceae and they are represented throughout the study period. Bacillariophyceae having 10 species followed by Cyanophyceae with 09 species respectively. During the present study dominant genera found *are Navicula, , Pinnularia,* and *Trachelomonas.* Although the paddy fields are used for humans to grow the crops and open for various activities and they need regular monitoring.

Key words : Phytoplankton, Occurrence, Paddy field, Bhadravathi taluk.

Phytoplankton are the main producers in an aquatic ecosystems. They form the basis of food webs by providing a food base for other animals and therefore indicate the fishing potential of the area[21]. The productivity of a water body is determined by estimating the amount of plankton it contains[7,25]. Their distribution, abundance and diversity indicate the health of the aquatic ecosystem in general and its trophic status in particular[3,9, 14,22].

Phytoplankton are used in many countries for pollutant biomonitoring, since they cannot control their movements and therefore cannot escape environmental pollution[7,25]. Phytoplankton distribution, abundance, species diversity and species composition are also used to evaluate the biological integrity of water bodies.

Phytoplankton is one of the main components of nitrogen-fixing biomass in rice fields. The agricultural importance of phytoplankton in rice cultivation is directly related to the ability of phytoplankton to fix nitrogen and other positive effects on plants and soil. Nitrogen is the second limiting factor for plant growth in many areas, and the efficiency of this element is balanced by

fertilizers.

Phytoplankton plays an important role in maintaining and building soil fertility and increases rice growth and yield as a natural biofertilizer. In phytoplankton, blue-green algae are photosynthetic nitrogen fixers and are free-living. Cyanobacteria/Blue green algae are also a type of phytoplankton, and have the advantage of being organisms that can absorb many different types of pollutants and have the potential for biodegradation. They secrete growth-promoting substances such as hormones like auxin and gibberellins, vitamins, and amino acids. Their gelatinous structure increases their water-holding capacity. They increase soil biomass after they die and decompose. They prevent weed growth. They increase the phosphate content of the soil by excreting organic acids.

Nitrogen fixation is one of the most important biological processes. The atmosphere contains about 70% nitrogen, but most plants cannot utilize it. Bound nitrogen such as ammonium, nitrate, and nitrite can be utilized. Nitrogen is the most common nutrient limiting agricultural crop production. Cyanobacteria are an alternative nitrogen source to natural fertilizers. Organic fertilizers are chosen because they are environmentally friendly, fuel independent, cheap, and easily available. Cyanobacteria are widely distributed throughout the world as phytoplankton, and contribute to fertility as free-living organisms or in symbiotic relationships. The presence of cyanobacteria in rice paddies has been reported in many papers. Reports from many countries indicate that the cyanobacterial flora is abundant with many species. The present study aimed to identify and document the phytoplankton from various sites in paddy fields soils of Bhadravathi taluk.

Sampling sites :

The study was conducted from January to June 2017 in Bhadravathi taluk areas (Figure 1). The area includes Ujjanipura, Balemaradahalli, Thimmalapura,Tharekatte, Kalanakatte, Haralikoppa, Nanjapura, Hiriyuru, Bommanakatte, Honnatti Hosuru, Gondi, Haleganguru were selected for phytoplankton sampling. The geographical location of the area is about 67.0536 square kilometers (25.8895 square mi). These waterlogged paddy fields (Figure 1A) are used for single rice crop during dry season and remain under water for 5-6 months in the rainy season.

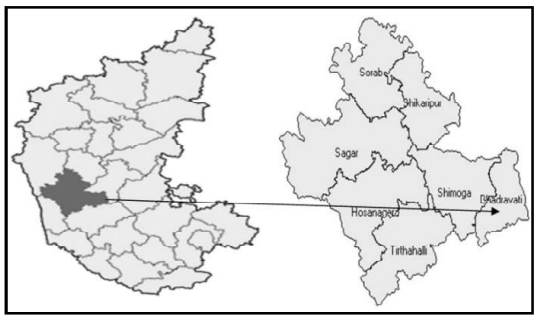

Figure 1. Study area map showing Bhadravathi taluk

Phytoplankton collection and analysis :

The soil sample for phytoplankton is collected directly from each village's paddy field at the depth of 15cm from the surface. Then the collected soil is kept under sunlight for 2 days to dry the water present in the soil. After complete evaporation of water present in the soil, the solid state of soil is crushed like powder. The different paddy fields soil is

Figure 1A. Different sites of paddy fields in Bhadravathi taluk

crushed in separate trays. Then the small amount of soil is taken in separate beakers for different soils. Then add water to the beakers containing soil. The upper floating soil particles are removed from blotting paper. Finally, the floating water is used for identification of phytoplankton on glass slide and added 2-3 drops of lugol's solution and then observed under research compound microscope.

Identification of the phytoplankton was conducted under research compound microscope at 100x magnification with bright place. The qualitative identification of planktonic organisms has been done with the help of monographs and plankton are identified down to the species level[1,5,10-13].

The main outcome of this study is to know more about phytoplankton in paddy fields of Bhadravati taluk and to understand better its role in the propagation potential of crop cultivation.

In this study, 32 species belonging to 23 genera were identified with 07 classes viz., Bacillariophyceae (31.25%), Chlorophyceae (9.38%), Klebsormidiophyceae (3.12%), Myxophyceae (28.12%), Zygnematophyceae (12.5%), Ulvophyceae (3.12%), Euglenophyceae (12.5%) (Figure 6) and they are represented throughout the study period. Bacillariophyceae having 10 species followed by Cyanophyceae with 09 species respectively.

In the context of the recognition of the importance of phytoplankton in paddy fields and its multifunctional role in village paddy fields. The project is planned to be implemented in 2016-2017 with the main objective of sustainable development of phytoplankton through improved agricultural production. It aims to provide phytoplankton in paddy fields in large quantities and measure and enhance the multifunctionality of rice cultivation. Initially, the objective of this project is to cover

Table-1. Distribution of Phytoplankton in the Paddy Fields in Bhadravathi taluk

Sl. No	Species	Class	Sites
1	*Calothrix fusca*	Cyanophyceae	Bommanakatte
2	*Chroococcus dispersus*		Haleganguru
3	*Anabaena circinalis*		Hiriyuru
4	*Aphanocapsa endophytica*		Kalankatte, Thimlapura
5	*Oscillatoria tenuis*		Hiriyuru
6	*Cylindrospermum minutissimum*		Tharikatte, Bommanakatte
7	*Spirulina platensis*		Thimlapura, Ujjnipura
8	*Nostoc commune*		Gondi, Nanjapura
9	*Chroococcus pallidus*		Balemarnahalli
10	*Opephora pacifica*	Bacillariophyceae	Haralikoppa
11	*Ceratoneis closterium*		Haleganguru
12	*Navicula seminulum*		Gondi
13	*Pinnularia viridis*		Kalankatte
14	*Pinnularia interrupta*		Nanjapura
15	*Navicula cryptocephala*		Honnatti hosuru
16	*Navicula cuspidata*		Tharikatte
17	*Navicula twoutiensis*		Ujjnipura
18	*Navicula mutica*	Bacillariophyceae	Bommanakatte
19	*Nitzschia palea*		Thimlapura
20	*Gloeocystis gigas*	Chlorophyceae	Hiriyuru
21	*Scenedesmus bijuga*		Balemarnahalli
22	*Haematococcus lacustris*		Haralikoppa
23	*Closterium tumidum*	Zygnemetophyceae	Tharikatte
24	*Cosmarium moniliformae*		Haleganguru
25	*Mougeotia scalaris*		Honnatti hossuru
26	*Spirogyra britannica*		Nanjapura
27	*Trachelomonas hispida*	Euglenophyceae	Bommanakatte
28	*Trachelomonas armata* (stein)		Hiriyuru
29	*Trachelomonas armata (longispina)*		Ujjnipura
30	*Trachelomonas globularia var. gigas*		Kalankatte
31	*Ulothrix tenuissima*	Ulvophyceae	Gondi
32	*Elakatothrix viridis*	Klebsormidiophyceae	Bommanakatte

Figure 2:- (1)Calothrix fusca (2) Chroococcus dispersus (3)Anabaena circinalis (4) Aphanocapsa endophytica (5) Oscillatoria tenuis (6) Cylindrospermum minutissimum (7) Spirulina platensis (8) Nostoc commune (9) Chroococcus pallidus.

Figure 3 : (10)Opephora pacifica (11) Ceratoneis closterium (12)Navicula seminulum (13) Pinnularia viridis (14) Pinnularia interrupta (15)Navicula cryptocephala (16) Navicula cuspidata (17) Navicula twoutiensis (18)Navicula mutica.

Figure 4: (19)Nitzschia palea, (20)Gloeocystis gigas, (21)Scenedesmus bijuga, (22)Haematococcus lacustris, (23) Closterium tumidum, (24)Cosmarium moniliformae (25)Mougeotia scalaris, (26)Spirogyra Britannica, (27)Trachelomonas hispida.

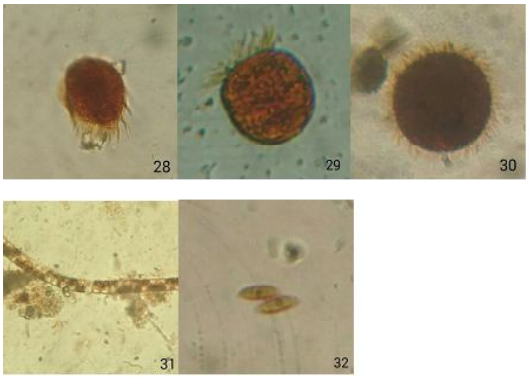

Figure 5: (28)Trachelomonas armata (stein) (29)Trachelomonas armata (longispina) (30)Trachelomonas globularia var. gigas (31)Ulothrix tenuissima & (32) Elakatothrix viridis.

all aspects of the project in 13 villages of Bhadravati taluk namely Bommanakatte, Nanjapura, Tharikatte, Haleganguru, Thimmlapura, Kalankatte, Hiriyuru, Honnatti hossuru, Balemarnahalli, Gondi, Haralikoppa and Ujjnipura. There are two phases: soil

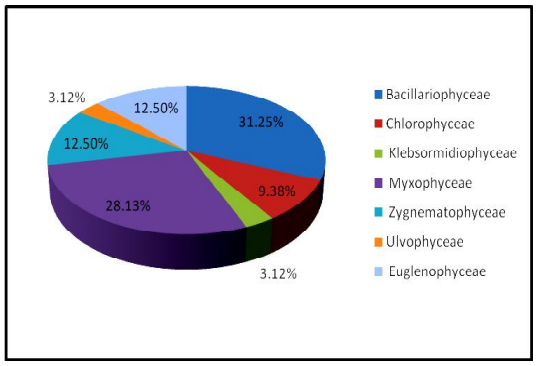

Figure 6. Class wise percentage occurrence of paddy field algae in Bhadravathi taluk

collection from irrigated and farmed lands and analysis of the multifunctional role of phytoplankton in paddy fields. In most of the paddy fields, urea, complex and NPK are used as chemical fertilizers.

Several reports have shown that Nostoc and Anabaena are widespread[19]. Major heterocystus nitrogen fixing cyanobacterial species Aloosira, Cylindrospermum, Nostoc, Anabaena, Tolypothrix and Calothrix have been detected in soils of Cuttack and Odisha [27] .Distribution profile of cyanobacteria isolated from soils of West Bengal[24]. Various researchers have studied the cyanobacteria flora in paddy fields of our country[6,15,17,18,20,23] and some attempts have been made to investigate its diversity in Odisha as well[4,8,26].

Amit and Sahu[2] studied the distribution of green algae (Chlorophyta) in relation to seasonal variations in paddy fields in Lalgutwa region of Ranchi and found that the region contains a wide range of cyanobacteria, a total of about 240 species. They were the first to clearly state that there are a number of green algal taxa ranging from phyllomorphs up to different orders, namely H. Chlorococcales, Urotrichales, Cladophorales, Oedogonales, Zygnematales etc. Maheshwari[16] reported high diversity of heterocystic cyanobacteria in paddy fields of Bundi district, Rajasthan, where 12 species were clearly evident.

The outcome of the study is to "gain a better understanding of the types of phytoplankton found in paddy fields of Bhadravati taluk". The outcome is a quantitative assessment of the types of phytoplankton present in paddy fields. Therefore, the report concludes that based on the outcome of the majority of species of Cyanobacteria and Bacillariophyceae were found in paddy fields of Bhadravati taluk villages.

From the study, it can be concluded that paddy fields promote a great biodiversity of cyanobacteria and other algae found in different areas of the paddy fields. The presence of phytoplankton in paddy fields which fixes atmospheric nitrogen also enhances soil fertility. Hence, there is a need to conserve and tackle the algal genetic resources of the local habitats in a more systematic way. This can only be done by understanding the ecology and habitats of different forms of algae. The study concludes that the highest diversity of phytoplankton present in paddy fields is present in the Bhadravathi taluk region.

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