BLUE GREEN ALGAE USE AS A BIOFERTILIZER

Srabanika Bardhan

Department of Botany,

Maharaja Bir Bikram College, Agartala, India.

Abstract: The present communication deals with the blue green algal flora of West District of Tripura. The survey comprises 20 blue green algae belonging to Cyanophyceae. Describe the use of blue green algae as an alternative source to the synthetic nitrogen fertilizers. In cropping system, nitrogen is the most common limiting nutrient needed to increase agricultural production. This nitrogen can be obtained at high cost from commercial fertilizer or at very cost through biological nitrogen fixation by blue green algae as bio fertilizer can minimize the ecological disturbance. They are cost effective, ecofriendly and when they are required in bulk can be generated at the farm itself. The other plus point is that after using 3-4 years continuously there is no need of application of bio fertilizers because parental inoculums are sufficient for growth and multiplication. The addition of nitrogen fixing blue green algae, as a bio fertilizer, to paddy fields, is a prerequisite for the improve yield and continued high standard of rice cultivation at Tripura. Bio fertilizers can protect the natural atmosphere without any pollution. These are harmless and ecofriendly low cost input supplementary to chemical fertilizers which can also save the ecological and economical condition of tribal communities.

***Index Terms*: Blue Green Algae, Biofertilizer, Heterocyst, NPK, Pollution, Ecofriendly**

I. INTRODUCTION

Algae are weeds that are autotrophic in nature. These weeds exist in both, multicellular forms. The term algae mean 'Seaweeds' in Latin. This plant has been prominently been used for various purposes in many South-east Asian Countries. Modern technology has also made the derivation of many different substances from algae like most other plants.

Algae is one of the best example of putting eco-friendly resources to use as none of the products derived from algae are considered to be pollutants. Many products of algae can be used to curb pollution. Algae can also be used to treat sewage and is an excellent alternative for chemical fertilizers. It can be used to curb and arrest the toxic chemicals that are present in water bodies. It is also the ideal substitute for chemical dyes and pigments. In many industries algae bioreactors are used to curb the emission of carbon and carbon compounds. The microscopic green plants cleaned up the earth's atmosphere millions of years ago and scientists hope they can do it now by helping remove greenhouse gases and create new oil reserves.

In the present work the effects of some blue green algae as a nitrogen fixer in the rice fields are discussed. Blue green algae (BGA) can easily fix nitrogen due to the presence of specialized cells called Heterocyst (large, thick walled and metabolically in active cells), which depends on vegetative cells for energy to fix nitrogen while the fixed nitrogen is utilized by the vegetative cells for growth and development. BGA are very common in the rice fields. If no chemical fertilizers are added, inoculation of the algae can increase the crop production. The BGA are not inhibited by the presence of chemical fertilizers.

On the other hand, presence of inorganic minerals (Super phosphate) accelerates their growth. They are easy to produce and mass produced in cement tanks filled with fresh water. Since they are not requiring any processing, they are quite cheap. Examples of some algal bio fertilizers are Anabaena, Nostoc, Oscillatoria and Microcystis (which grow at Tripura in large scale) which have proved beneficial in the case of certain crops like rice, vegetables etc.

If we utilize BGA as an ideal fertilizer and this can solve the problem of acute storage of fertilizer in the country. Nitrogen is one of the most essential fertilizers for crop plant [1]. Though it constitutes 70% of our atmosphere, the crop plants are unable to exploit it directly from the nature. BGA can absorb it easily and increase the soil fertility in natural way. To support crop production the fertilizer consumption has increased too many folds. Many tons of chemical fertilizers consumed per year which make country self-dependent in food production but it detorate environment and cause harmful impacts on living beings. These fertilizers easily reach into water bodies through rain water, which affect the living beings including growth inhabiting microorganisms. The excess uses of chemical fertilizers in agriculture are costly and also have various adverse effects on soils. BGA have unique properties to provide natural and serve as a good substitute of chemical fertilizers.

Biofertilizers can minimize the ecological disturbance. There are cost effective, eco-friendly and when they are required in bulk can be generated at the farm itself. The other plus point is that after using 3-4 years continuously there is no need of application of bio fertilizers because parental moeulums are sufficient for growth and multiplication. In terms of N.P.K. it was found to be superior to farmyard manure and other type of manure.

Figure 1: Different locations of sample collection

II. MATERIALS AND METHODS

Comprehensive collection of different samples was made regularly to identify the blue-green types, growth and distribution in localized areas. Sixty samples were collected from eighty six different localities from different rice fields. Samples were collected through spoon taking the surface layer of the different parts of the field. After collection, sufficient water was added with the sample to keep the algae alive. Immediately after collection the materials were taken to the laboratory and morpho-taxonomic studies were made. Although 86 locations were selected for collection. Eighty-six locations are showing in Map of West Tripura in **Fig. 1.**

The PH of all the samples was studied by electrode type PH meter of Philips Holand. In these process materials collected fresh was diluted and electrodes were in the sample solution and PH was recorded. It was observed in the work that the field's PH remained acidic where BGA were high in number; there PH values remained 5-6.

III. KEY TO THE IDENTIFICATION ADOPTED IN THIS COURSE OF STUDY

Present knowledge of algae indicates that there are more than 80 thousand species along with different forms. Thus, providing Key to the identification of each species will lead to voluminous books which are not required in this context. The main Key used for the species identified in this course is [2]:-

IV. RESULTS

After examining the samples from 86 locations 20 genera and 64 sps of BGA were distinguished. Table 1 is showing members of different blue green algae collected during the course of this investigation.

Table 1: Members of different blue green algae collected during the course of investigation

Sl.no.	Name of Texa	Places of collection
1	*Microcystis viridis* (A.Br) Lemm.	Wet rice field
2	*Chroococcus minutus* (Kutz.) Nag	
3	*C.dispersus* (Keissler) Lemm.var.minor.Smith	
4	*Glocothece rupestris* (lyngb) Bornet	
5	*Aphanocapsa banaresensis*, Bharadwaja	
6	*Aphanothece stagnima* (Spreng) A.Br	
7	*Oscillatoria margaritifera* (Kutz) Gomont	
8	*O.miniata* (Zanard) Hauck ex Gomont	
9	*O.annae* Van Goor	
10	*O.sancta* (Kutz) Gomont	
11	*O.limosa* Ag.exGomont	
12	*O.subbrevis* Schimidte	
13	*O.curviceps* Ag. Ex Gomont	
14	*O.princeps* Vaucher ex Gomont	
15	*O.princeps* Vaucher ex Gomont var pseudolimosa Ghose	
16	*O.proboscidea* Gomont	
17	*O.chlorina* Kutz ex Gomont	
18	*O.boryana* Bory ex Gomont	
19	*O. raoi* De Toni J	
20	*O.amphibian* Ag ex Gomont	
21	*O. acuta* Bruhl ex Biswas	-Do-
22	*Phormidium anomala* Rao C.B	
23	*P.ambiguum* Gomont	
24	*P.retzii (Ag) Gomont*	
25	*P.corium* (Ag) Gomont	
26	*Lyngbya birgei* Smith G.M	
27	*L.hieronymusii* Lemm forma robusta Paukutty	
28	*L. arboricola* Bruhl et Biswas	
29	*L. arboricola* Bruhl et Bishwas under *Porphyrosiphon notarisii* (Menegh) Kutz ex Gomont	
30	*L.aestuarii* Liebm ex Gomont	
31	*L.aestuarii* Liebm ex Gomont f. spectabolis Gom	
32	*L. majuscule* Harvey ex Gomont	
33	*L. majuscule* Harvey ex Gomont	
	Var *chakiaense* De. Toni	
34	*L. martensiana* Menegh ex Gomont	
35	*L. magnifica* Gardener	
36	*Anabaenopsis cricularis* (G.S west) wolosz et Miller	
37	*Cylindrospermum musicola* Kutz ex Born et Flah	
38	*C. licheniforme* Kutz ex Born et Flah	
39	*Wollea bharadwajae* Singh R.N	
40	*Nostoc linekia* (Roth) bornet ex Born et Flah	
41	*N. linekia* Var arvense rao	
42	*Anabaena sphaerica* Bornet et Flahault Var attenuate Bharadwaja	
43	*A.ambigua* rao	
44	*A.orientalis* Dixit	
45	*A.iyengari* Bharadwaja	
46	*A.iyengari* Bharadwaja Var. attenuate rao C.B	
47	*A.flos-aquae* Lyngb Berb ex Born et Flah	
48	*Aulosira prolifica* Bharadwaja	
49	*Scytonematopsis kashyapi* (Bharadwaja) Geitler	
50	*Scytonemachiastum Geitler* Var minor Parukutty	
51	*S. simplex* Bharadwaja	
52	*S. coactile* Montagne ex Born et Flah	-Do-
53	*S.schmiditii* Gom	
54	*S.iyengari* Bharadwaja	
55	*S. hofmanni* Ag ex Born et Flah	
56	*S. bewsii* Fritsch et Rich	
57	*S. mirabile* (Dillw) Born	

58	*Tolypothrix nodosa* Bharadwaja	
59	*Calothrix scopulorum* (weber et Mohr) Ag ex Born et Flah	
60	*C. fusca* (Kutz) Born et Flah	
61	*C. castellii* (Massal) Born et Flah	
	Var *somastipurense* Rao	
62	*Rivularia beccarina* (De not) Born et Flah	
63	*R. aquatic* De Wilde	
64	*Gloeotrichia pisum*Thuret ex Born et Flah	

Mainly four nitrogen fixing blue-green algae namely Anabaena 6 sps. Microcystis one spp, Oscillatoria 15 sps. Nostoc 2 sps mixed cultures were applied (5kg in 5000 sqm field) as bio-fertilizers to four paddy soil samples, like Gandhigram paddy field, A.D. Nagar paddy field, Lankamura paddy field, Ramnagar paddy field.

The results showed that algal bio-fertilizer enhanced the growth of the rice significantly, which was noticeable in the dry weight of the straw, for all sources of soil. An increase the number of spikes was shown only in the soil samples from Lankamura paddy field and Ramnagar paddy field; those from these fields increase in stem height also. Rice grown on Gandhigram and A.D. Nagar did not show any appreciable change in the number of spike or height treatment with the bio-fertilizer.

Rice yield also measured as seed weight per pot was significantly increased with application of algal fertilizer. The percentage increase in yield ranged from 15% in Gandhigram field, 20% in A.D. Nagar field, in 20% in Lankamura field and 30% in Ramnagar field respectively.

Although the application of algal bio-fertilizer can significantly improve the growth and yield of rice, individual seed size and weight. [3, 4]

V. CONCLUSION

From the result, we can concluded that the addition of nitrogen fixing blue-green algae, as a bio fertilizer, to paddy fields, is a prerequisite for the improve yield and continued high standard of rice cultivation [5, 6] at Tripura. Bio-fertilizers can protect the natural atmosphere without any pollution. These are harmless and eco-friendly low cost input supplementary to chemical fertilizers.

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