Determination of Spirulina platensis's ability to improve the DO content in Waste Water

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Abstract- *DO is an important to access the water quality. Spirulina platensis being photosynthetic in nature, was studied to analyze its potential in improving the DO ratio in wastewater, in vitro (two forms of Spirulina platensis – aged and fresh), were utilizing in treating the Wastewater versus the River water. It was observed that the level of DO increases considerably from 2.2 mg/L in River Water to 3.4mg/L in Waste Water incubated with fresh Spirulina platensis(incubated for 7 days) and to 3.0mg/L with aged Spirulina platensis (incubated for 28days). Along with enhanced levels of DO, the level for COD was also reduced from 20mg/l/ppm in Wastewater to 4.0mg/l/ppm in wastewater with fresh Spirulina platensis.*

Keywords- Dissolved oxygen, COD, Wastewater, Spirulina platensis.

I. INTRODUCTION

Water Pollution has drastically affected the aquatic life in addition to reducing its ability to support in maintaining a safer food chain. In addition to accumulation of toxins another factor depleting waters quality is reduced levels of Dissolved oxygen (Dissolved Oxygen refers to the amount of Oxygen present in water) (below 1mg/mL) are highly toxic to aquatic life [1], also the quality of water can be determined by COD(COD or Chemical Oxygen Demand is the amount of oxygen needed to oxidize the organic matter present in water), higher the COD,more is the presence of oxidizing bacteria which results in depleting the DO content[2-3].Blue Green Algae, Spirulina platensis being photosynthetic in nature has the capacity of utilizing the carbon dioxide and releasing oxygen into the atmosphere and water bodies[4] . Through unusual levels can cause bloom fermentation, killing the aquatic life [5].The present study was focused on the ability of blue green algae in improving the DO content and reducing the COD by infusing oxygen in water bodies.

II. METHODS AND METHDOLOGY

Spirulina platensis mother culture was obtained from OfERR Nallayan Research Centre for Sustainable Development, Tamil Nadu India. It was cultivated in an open tank with a nutrient medium at a temperature of 26 -300 C for 14 days under sunlight and continuous agitation. Zarrouk's medium was used to cultivate Spirulina platensis. The media includes macronutrients and micronutrients. The composition for Zarrouk's media is as follow:-

CONSTITUENT	AMOUNT TO BE ADDED(g/L)
Sodium Bicarbonate	18.0
Sodium Nitrate	2.5
Di-potassium Phosphate	0.5
Potassium Sulphate	1.0
Sodium Chloride	1.0
Calcium Chloride Dihydrate	0.04
Ethylene di-amine tetra-acetic acid disodium salt (Na_2EDTA)	0.08
Magnesium Sulphate	0.2
Ferrous Sulfate Heptahydrate	0.01
A_5 Micronutrient Solution	1mL

A_5 Micronutrient:-

CONSTITUENT	AMOUNT TO BE ADDED (g/L)
Boric Acid	2.86
Manganese Chloride Tetra	1.81

hydrate	
Zinc Sulphate Heptahydrate	0.22
Copper Sulphate	0.08
Ammonium Molybdate	0.39

High pH and temperature are the key factors for large scale production of Spirulina cultures. High alkanity (pH=9) of the media will inhibit the growth of contaminating organism. The optimal temperature for Spirulina culture is in the range of 35-380C. After the successful growth of Spirulina platensis, we performed two tests to detect the amount of dissolved oxygen and chemical oxygen demand present in wastewater, as well as in wastewater that lacks Spirulina platensis sample in it and compared the results.

III. PERFORMED TESTS

ESTIMATION OF CHEMICAL OXYGEN DEMAND (COD): -15ml sample were taken in three conical flasks.Spirulina platensis sample were taken in two conical flasks and river water were taken in third conical flask.5ml of Potassium Dichromate were added to each flask and kept in boiling water bath (1000C) for 30 minutes. After Boiling, it was allowed to cool.To it, added 5 ml of Potassium Iodide and then 5 ml of conc. Sulfuric acid. The content of each flask was titrated with (0.1M) Sodium Thiosulfate until pale yellow color appeared.Then added 1 ml of Starch solution to each flask, the solution turned to blue in color.Again titrated with (0.1M) Sodium Thiosulfate; blue color disappeared.Then readings were noted to find out the volume of Sodium Thiosulfate used for each sample.

Where, COD (mg/L) = 8x1000xDilution Factor xMolarity x (VB-VS)

Volume of sample (in ml)

ESTIMATION OF DISSOLVED OXYGEN: -15 ml of Spirulina platensis were taken in sample BOD bottles.1 ml of Sodium Iodide (4M) and Sodium Hydroxide (8M) were added to each BOD bottle. Then added 1 ml of Manganoussulphate solution and the bottle was shaken well and kept them open for 5 minute to settle the precipitate. After this, added 2 ml of conc. Sulphuric acid and placed the caps on the bottles. All BOD bottles were shaken well till the precipitate was dissolved. Samples were transferred to conical flasks and titrated with Standard Sodium thiosulfate solution (0.025N), till the color changed from dark yellow to light yellow. Then added few drops of starch indicator and continued to titrate till the color of the solution became either colorless or changed to its original sample color. Noted down volume of 0.025N Sodium thiosulfate consumed. The volume of 0.025N Sodium thiosulfate used was calculated.

Where, DO (in mg/l) =ml of sodium thiosulfate (0.025N) consumed.

IV. RESULTS

The water sample was tested for its dissolved oxygen content. Following results were obtained:

RESULTS OF DO:-

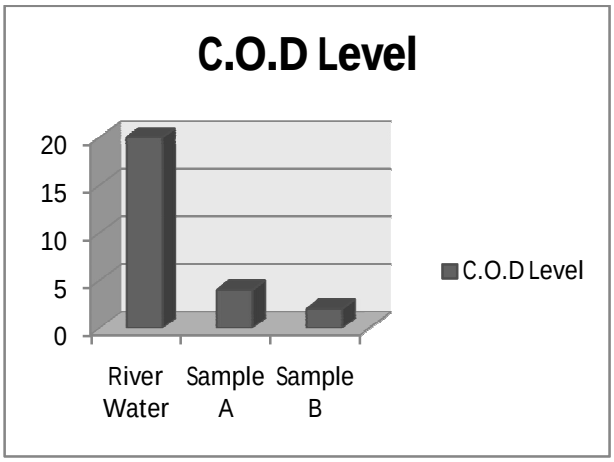
Sample	**Dissolved oxygen (after 24Hrs)**
River water	2.2 mg/l
Sample A(River Water + Fresh Spirulina platensis ;7Days Old Culture)	3.4 mg/l
Sample B (River Water + Aged Spirulina platensis ;28Days Old Culture)	3.0 mg/l

Table 1.Showing the DO level for Samples

RESULTS OF COD:-

Sample	COD
River Water	20 mg/l/ppm
Sample A (River Water + Fresh Spirulina platensis; 7Days Old)	8 mg/l/ppm
Sample B (River Water + Aged Spirulina platensis;28 Days Old Culture)	6 mg/l/ppm

Table 2.Showing COD level for Samples



DISSCUSION: As observed, Spirulina platensis was successfully able to increase the DO and reduce the COD indicating improved environment for the aquatic life and plants. Without Spirulina platensis the DO content was insufficient to sustain aquatic life which considerably increases after Spirulina platensis incubation.

IV. CONCLUSION

Spirulina is filamentous cyanobacteria which is grown in the severe environment .It is also suggested that Spirulina absorb and reduce the organic and inorganic compounds from the aqueous solution .It are an indication of decrease water pollution. It also helps in improving the environment for water bodies. It also plays an important role in waste water treatment. Blue green algae helps to improve DO level in water bodies and also reduces the COD level in them, thereby keeping the Aquatic life healthy and safe. Thus Spirulina can be a good supplement in treating wastewater .

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