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Treatment Of Grey Water Using Hydrocarbon Producing Botryococcus braunii

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Abstract: Increasing demand and depleting resources leads to the search of new method for the treatment and reuse of waste water generated becomes a big challenge. The project discusses about the possibilities in integrated reuse of grey water. The secondarily treated grey water is rich in nitrogen, phosphorus and other nutrients; hence it needs a tertiary treatment to eliminate these compounds. The tertiary treatment was carried out using the microalgae *Botryococcus braunii* grown in laboratory, the microalgae *Botryococcuc braunii* contains high amount of oil which can be used for the production of biodiesel. Experiments were carried out in laboratory scale Erlenmeyer flasks which was filled with secondarily treated grey water inoculated with microalgae *Botryococcus braunii*. The pH of the grey water was maintained under 7.51 in room temperature, 12h light/12 h darkness cycles were maintained, light intensity has been maintained higher than 1.2 ± 0.2 Klux. The compounds initially present in treated grey water like nitrogen and phosphorus is reduced considerably and it is used for landscaping purpose.
Keywords: Nitrogen, Phosphorus, Grey water, Micro algae.

1. Introduction

It was estimated that apart from drinking water, farmers would need approximately 4000 km^3 of water in 2050, as against 2700 km^3, if no new technological changes are incorporated[7]. Algae play a major role in the treatment of wastewater. Nutrient present in this wstewater is utilized by the algae, the biomass produced can be used for bioenergy production[1,2,4,5]. Algae can be used to treat both municipal and industrial wastewater. Algae play a major role in aerobic treatment of wastewater in the secondary treatment process[3]. Algae based municipal wastewater treatment systems are mainly used for nutrient removal (removal of nitrogen and phosphorous). Algae have the ability to accumulate the heavy metals and thereby remove toxic compounds from the wastewater. In some cases, algae also play a role in the removal of pathogens in the tertiary treatment stage[6].

2. Materials And Methods

2.1.Experimental setup:

The batch mode experiments were conducted in laboratory condition.

2.2. Greywater Collection:

Grey water is collected from APJ men's hostel, Arunai Engineering College, Thiruvannamalai. It contains several types of organic and inorganic load.

2.3. Isolation and purification of algal species:

Botryococcus braunii. is isolated from nearby waste stabilization pond. An isolated algae is grown in Chu 13 medium and it is incubated at 25 ± 1ºC in humidity incubater and light intensity was maintained at 1.2 ± 0.2 klux (16:8 light photoperiod).

2.4. Priliminary Treatment of grey water:

The collected sample contain some larger particles, those particles are removed by screening and grid removal. Reduction of excess hazardous inorganic pollutants should be achived by cultivation of algae.

2.5. Cultivation of algae in grey water:

The isolated microalgae was inoculated to the priliminary treated grey water and the pH of medium was maintain at 8.0. Light intensity is maintained between 1.2 ± 0.2 klux at 12:12 Light-darkness cycles. Temperature should be maintained at 28-30^{0}C. Cultivating Flask was kept in rotating orbitary shaker.

2.6. Analysis of Grey Water:

The collected Grey water (before and after treatment) was analyzed for various physic-chemical and microbiological parameters such as pH, TS, TDS, TSS, Total hardness, BOD, COD, Nitrate, Nitrogen (NH_4), Phosphorus, Total coliforms.

3. Results And Discussion:

The total nitrogen and phosphorus content were reduced significantly after treatment using microalgae. similarly other parameters also did not have levels high enough to be toxic and they will not pose a high risk when the treated water is used for irrigation or other rough purpose like construction.

Table 1: Physico-chemical characteristics of grey water before and after treatment:

Parameter	Units	Raw Grey Water	Primarily Treated	Treated
pH	-	7.48	7.35	7.51
TS	ppm	760	600	401.3
TDS	ppm	892	431	312
TSS	ppm	564	24.5	12.3
Total hardness	ppm	750	452	342.1
BOD	ppm	279.6	113.1	66.74
COD	ppm	986	227.8	85.61
Nitrate	ppm	0.24	0.1	0.073
Nitrogen (NH_4)	ppm	14.21	12.14	0.31
Phosphorus	ppm	9.64	7.69	2.16
Total coliforms	Numbers/100ml	10^6-10^9	10^4-10^5	0.416

4. Conclusion:

The isolated strain showed good response towards the treatment of grey water. On the other hand the species failed to tolerate the stress when grown on untreated grey water. The result of this study indicates that the isolated species can be cultivated in grey water for the removal of organic load and the future work is focused on the production of Biofuel[1,4].

Abbrevations:

TS - Total Solids.
TDS - Total Dissolved Solids.
TSS - Total Suspended Solids.
BOD - Bio chemical Oxygen Demand.
COD - Chemical Oxygen Demand.

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