Lipid Production from Algae – Cultivation in Various Waste Media for Biofuel Production

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Abstract

Growth of algae in different waste media was investigated based on the yield of the lipid. The waste media used in this study included the biosolids, vegetable preservative, biosurfactant (produced from used vegetable oil) and sand slurry. Algae grown in the biosolids had the highest lipid content.

1. Introduction:

Algae are large group of diverse, simple, autotrophic organism. They are both unicellular and multicellular. They are photosynthetic like other green plants. In recent years there has been a rapid growth in investigating the use of algae to produce lipids as a replacement for fossil fuels (Hossain et al. 2008). Biofuel are biodegradable and emit less Carbon-di-oxide. Researchers have investigated the types of algae and there yield under various environmental conditions. All algae consist of proteins, carbohydrates, fats in varying proportions. The percentage of the above mentioned constituents vary with the type of algae. Lipid consist of fatty acids which is the main component that can be extracted and converted as biofuel (Huet al. 2008). There are algae types that are comprised up to 40% lipid content (dry weight) (Griffiths et al. 2008).

2. Objective:

The objective of this study was to investigate the growth of algae in different waste media (recycle waste) such as vegetable preservative, biosurfactant, sand slurry and biosolids (from a chemical plant) and to quantify the lipid production.

3. Materials and Methods

3.1 Collection of Algal strain and media for growth: The algae strain was collected close to a swimming pool and based on microscopic study, the strain was identified as Chlorococcum. The Algae was further grown in waste medium like vegetable preservative (2 mL/1000 mL of water), biosurfactant (4 mL/1000 mL) of water, Sand Slurry (5 gm/1000 mL of water) and Biosolids (2 gm/1000 mL of water). The study was performed in continuously stirred batch reactors in room conditions.

3.2 Analytical Methods: The lipid content of algae from each medium was measured using Solvent Extraction Method. Chloroform/Methanol (2:1) was used (Lee et al. July 1998 & Vijayaraghavan et al. 2009) and is one of the widely used solvent extraction methods. In this method Chloroform and methanol are added to 5 gm of algae in the ratio of 2:1. The mixture was left on shaker for about 3 to 4 hours at room temperature. Another 5 mL of Chloroform and 5 mL of water was added and mixture was again shaken for 30 minutes. Extract was filtered through Whatman no.1 filter paper with slight suction. The filtrate was transferred to a glass cylinder and allowed for separation of layers. Methanol-water layer was removed by aspiration.

After re-extraction of residue cells, the chloroform extracts were heated to dryness at a temperature of 35 to 45 deg.C to give a total lipid content (dry weight).

4. Analysis:

Of the media analyzed, biosolids (Woertz et al. 2009) or sludge produced the highest amount of lipid, about 15%. The biosolid waste product from the chemical plant had a pH of 7.2 and would have been rich in phosphorus, nitrogen (essential for the growth of algae) and organic matter to have the highest lipid production. The medium that produced the second highest lipid was the sand slurry medium. The growth of algae was observed on the sand particles.

Fig1. Green Algae - Chloroccocum

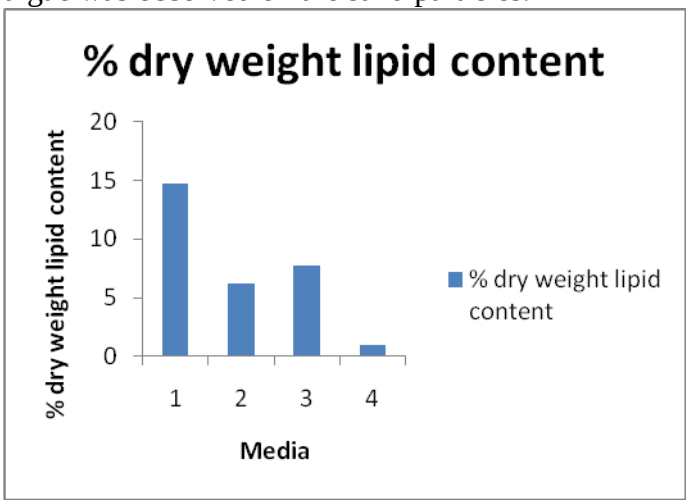

Figure 2: Dry weight lipid contents in various media (1.Biosolids 2. Vegetable preservative 3. Sand slurry 4. Biosurfactant)

5. Conclusion:

The biosolids media had the highest lipid production of 15%. The algal growth in sand slurry produced the second highest amount of lipids.

6. Acknowledgement

This study was supported by the Center for Innovative Grouting Materials and Technology (CIGMAT) with funding from various industries.

7. Reference:

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