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FTIR analysis for investigating transitions in the biochemical compositions of indigenous algae

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Development of high throughput method for tracking the transitions in the biochemical constituents in algal cells has become an important task from a bio-chemical engineering and biotechnology perspective. In the present study an ATR-FTIR (Attenuated Total Reflectance-Fourier Transform Infrared) spectrographic technique was developed for quantifying changes in various biochemical components of an algal cell as polysaccharides, protein, lipid and phosphates of cultured algal cells to rate its lipid accumulation abilities. Based on a statistical approach and efficient peak fitting, the measured ATR-FTIR spectra from algal cells were analysed using the spectra of the known quantities of the substances to determine their relative contribution to the overall cellular spectrum. From this specific absorption, absolute macromolecular cell composition was calculated using calibration curves, which have been validated by independent biochemical methods by elemental analysis. This technique can be used for research for investigations in time-resolved changes in quantifying the cellular composition of algae in algal biochemistry i.e. lipid production, nutrient and toxicant accumulation, stress response etc. and can provide solutions to several environmental problem. The non-destructive spectrometric technique improves the efficiency of algal screening processes during bioreactor working and analysis, and can act as a potential tool in metabolic engineering of algal cells.

Keywords: FTIR spectroscopy, algal lipid, biochemical composition, lipid accumulation, stress response.

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Influence of fungal strain Curvularia lunata on polyethylene waste films

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Polyethylene is one of the most widely used polymers which cause serious environment pollution and is certainly a cancer in nature. It is regarded to be a biological hazard since it is almost non- degradable.

Polyethylene films, 20-micron thick carrier bags were used to study the degradation pattern using the fungal strain Curvularia lunata. Polyethylene films were inoculated with fungal culture. The fungal culture was allowed to degrade the films. After regular time intervals the degraded films were harvested. The degraded film was characterized by FT-IR, SEM, contact angle measurement, weight change and the thermal properties were studied by TGA and DSC. The weight change results show 12-14% degradation in 90 days of culture exposure. The SEM analyses showed microbial adhesion of fungal mycelia and several pits were observed on the surface of the film which suggested that the fungi penetrated into the polyethylene matrix during degradation making the strips physically weak. The fungal strain increased the surface hydrophilicity through enzymatic oxidation and offered improved electron exchange between microbes and polyethylene, followed by biofilm formation. It is well known that oxidized forms of polyethylene surfaces are more susceptible for microbial attack and degradation than the hydrophobic non ionic polyethylene surfaces. This can be easily supported by the FT-IR spectra of the control and fungus treated polyethylene films. The result showed that the fungal strain Curvularia lunata despite the availability of other organic carbon of materials could utilize the plastics as their carbon source and hence degrade the polyethylene films.

Biography

Manisha Sharma has completed her masters in Biotechnology from Berhampur University and presently working as a research scholar in Indian institute of Technology (IIT), Kharagpur.

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