

MARATHI VIDNYAN PARISHAD

Title: "Production of Algae Bio-fuel using Pulsed Electric Field & Waste-water Management of Coastal Cities in India by Harvesting Algae Culture on Wastewater."

Name of Contestants:

- 1) Renapurkar Vaibhav Sharanam
- 2) Selukar Sakshi Sanjay
- 3) Waghmode Shreya Jalinder
- 4) Ghade Rameshwar Pandurang

Name of the Expert: Dr. Amol M. Dethe

Introduction:

Algae bio-fuel is being looked forth as a "Future Fuel" for its astonishingly beneficial and eco-friendly properties that will help to substitute the use of fossil fuel in the upcoming future.

❖ Reasons for choosing Algae for our project:

- Algae is available abundantly everywhere in ecosystem.
- Algal cells contain 40-50% of oil/ lipids.
- Algae have short generation cycles and fast population growth rate (7-8 days).
- As algae are photosynthetic, they absorb the CO₂ from the environment which naturally reduces the CO₂ level.
- Algae can be grown on wastewater effectively.

❖ Aim of the project:

"To develop an efficient and economic technique for the better extraction of bio-fuel from algal cells harvested from wastewater."

Coastal cities like Mumbai are facing a great problem to manage tremendous quantity of wastewater increasing day by day. In spite of the fact that there are huge recyclers to treat wastewater, the seas are dangerously polluted and the ecological balance is interrupted. Our aim is also to show up how integrating algae culture with wastewater management can result in directly balancing the eco-system.

❖ Procedural details:

Studying the cell biology and behavior of Algal cells towards electric pulses, we have used electroporation technique for extracting lipids from algal cells. Lipids are extracted from algal cells by exposing the algal cells in an aqueous medium to an electric field sufficient to cause release of lipids from said cells. In the system, an electric field is formed between two electrodes connected with an electrical power supply and configured such that during use an aqueous medium containing the algal cells passes between the electrodes to extract lipids therefrom.

Sequential details of our project are given below:

- We have used easily available pond algae species "Chlorella" which is cultured on wastewater.
- The algal culture is allowed to grow naturally for 7-8 days till the cell mass is matured completely.
- Matured cell mass is then transferred into the system containing aqueous medium for further treatment.
 - i) Air pump attached to the system is turned on to maintain the homogeneity of the medium.
 - ii) After 4 to 5 minutes, electric pulses of high intensity (2KV) are allowed to pass for approximately 2 seconds between the electrodes situated at the ends of the system.
 - iii) The electric field applied to the system disrupts the algae cells to release its intracellular components and lipid content.
 - iv) The extracted algal crude oil will then form a layer on the upper surface of water due to differences in densities.
 - v) The piping system attached superficially to the system will drain away the aqueous medium containing water, ruptured algal cells and released oil.
 - vi) Finally, a stopcock funnel is used to separate oil and water physically on the basis of their densities.

❖ **Inferences:**

- PEF technique is more economic than the chemical based methods for extraction of algae bio-fuel.
- It does not include complicated procedures and the oil extraction is easy.
- It is less time consuming compared to the chemical based methods.

❖ **Conclusion:**

Energy and energy services are the backbone of sustainable development of India. Algae bio-fuel is a clean burning, non-toxic and Carbon-neutral with respect to global warming. Algae bio-fuel after transforming into bio-diesel for its practical use can be burned in any existing engine.
