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## **Current status of Research on algal bio-fuels in India**

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Various companies and research setups for algal fuels are coming up and are backed by big investors in India. Algae have recently received a lot of attention as a new biomass source for the production of renewable energy. Some of the main characteristics which set algae apart from other biomass sources are that algae (can) have a high biomass yield per unit of light and area, can have a high oil or starch content, do not require agricultural land, fresh water is not essential and nutrients can be supplied by wastewater and CO<sub>2</sub> by combustion gas. Still algal biomass production technology suffers from lack of economic viability. Identification of suitable robust strains with high productivity, growth engineering and harvesting technology are some of the issues involved. Indian scientists have been working on these aspects for a long time.

Macro algae have been considered as an attractive renewable source for bio-energy molecules due to various advantages like higher biomass production rate per unit area and easier depolymerization as they contain less complex cell wall metrics. Extensive work has been done by Indian scientists on utilization of seaweeds for food and pharmaceutical applications. In India, seaweeds collected from natural vegetation are used for the production of phycocolloids such as agar and alginates. CSMCRI, Bhavnagar, has long been working on the cultivation of various seaweeds and recently forayed into value addition for seaweed products. Seaweeds like *Gracilaria*, *Gelidium*, *Kappaphycus* etc are being cultivated in large scale. Several other groups are working on various aspects of algal biofuels technologies. Indian funding agencies like CSIR and DBT are focusing on marine micro algae also as feedstock for bio-fuels. PERC, Chennai, developed an algal farm in Kolkata in which nutrient inputs have been optimized and productivity stabilized and contamination controlled. Harvesting was accomplished by a combination of autoflocculation and chemical flocculation (PHYCOFLOC)

One of the major hurdles in the production technology is the nutrient costs. Sivasubramanian and his team from PERC, Chennai, who have been involved in developing algae based technology to treat industrial effluents and wastewater strongly believe that integrating waste treatment with biomass production can be a viable option to make the whole process economically feasible. .

Indian research should focus on identification of suitable strains of algae which will perform uniformly during all seasons with consistently good biomass productivity, integration of biomass production with waste treatment and harvesting and extraction technologies. Fermenting organisms working in saline environment for producing bioethanol, technology for production of nutraceutically and pharmaceutically valuable products from algae, indigenous photobioreactors and hybrid systems are to be developed