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Application of bioenergy for energy or materials: Future perspective through energy efficiency

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The demand for energy continued to outstrip supply and necessitated the development of biomass option. Residues were the most popular forms of renewable energy and currently biofuel production became much promising. Agricultural wastes contained high moisture content and could be decomposed easily by microbes. Agricultural wastes were abundantly available globally and could be converted to energy and useful chemicals by a number of microorganisms. Compost or bio-fertiliser could be produced with the inoculation of appropriated thermophilic microbes which increased the decomposition rate, shortened the maturity period and improved the compost (or bio-fertiliser) quality. The objective of the present research was to promote the biomass technology and involved adaptive research, demonstration and dissemination of results. With a view to fulfill the objective, a massive field survey was conducted to assess the availability of raw materials as well as the present situation of biomass technologies. In the present communication, an attempt had also been made to present an overview of present and future use of biomass as an industrial feedstock for production of fuels, chemicals and other materials. We may conclude from the review paper that biomass technology must be encouraged, promoted, invested, implemented, and demonstrated, not only in urban areas but also in remote rural areas.

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Biodiesel production using algae-fungi consortium

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Microalgae are a promising alternative oil resource in recent time. These have higher biomass and lipid productivity per unit area than vegetable oils and the algae-based biodiesel combustion is essentially carbon neutral. High production cost, inefficient dewatering techniques, and poorly-developed extraction methods are three major bottlenecks of algae-based biodiesel production. Hence, algae-fungus co-culture can be a complementary consortium where increased biomass can be produced with enhanced lipid content and high bioflocculation efficiency. The carbon and nitrogen sources present in the medium will be conjointly utilized by the two microorganisms of widely different phylogenetic origin resulting in an increased oleaginous biomass production. In this study, a consortium of two oleaginous microorganisms, viz., *Chlorella minutissima* MCC27 and *Aspergillus awamori* were co-cultivated in a modified N 11 medium. The symbiosis and differential growth of *Chlorella minutissima* MCC27 and *Aspergillus awamori* in the co-cultivation system were analyzed under different growth conditions and compared with their axenic cultures. The growth of *Chlorella minutissima* MCC27 in co-culture was found to be 3.8 fold higher against the autotrophic axenic culture, while 1.5 fold higher than the mixotrophically grown axenic algal culture on the 6th day of incubation. Different carbon sources (glucose, glycerol and acetate) and nitrate sources (KNO_3, urea and yeast extract) were evaluated for higher biomass yield. Synergistically, the effects of algae-fungi association on total lipid yield and FAME composition were investigated. Further, different pretreatment methods were screened for developing an efficient technology for maximum extraction of lipid from the consortial biomass.

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