Summary

SUMMARY

Biodiesel is an efficient, clean, non-toxic and biodegradable energy alternative to petroleum fuels. It is produced from vegetable oils or fats either by chemical catalysis or by enzyme catalysis with methanol or ethanol. The enzyme lipase is most preferred to overcome the disadvantages of chemical catalysis.

The present investigation aims at identifying good lipase producing fungi and their possible application as catalyst for conversion of *Jatropha* and Karanja *(Pongamia)* oil to biodiesel.

Out of 20 fungi isolated from oil rich soil samples of Coimbatore 6 fungi namely *Aspergillus terreus*, *Mucor racemosus*, *Penicillium candidum*, *Rhizopus oryzae*, *Trichoderma viride.* proved to be efficient lipase producers in Palmer's medium. The efficiency of these fungi were also tested in other media such as SOB medium, MYGP medium and Czapek's dox medium. Suitable medium for these fungi was identified by modifying the process parameters such as pH, temperature, Carbon (along with either *Jatropha / Pongamia* oil) and nitrogen source, in the medium in which significant lipase production was recorded by each fungi.

Biodiesel yield from both the vegetable oils using the chemicals catalyst (KOH/NaOH) alcohol (Ethanol / Methanol / Butanol / Isopropyl alcohol) were tested by base method and Acid –base method. KOH and methanol were found to be important for better biodiesel yield.

Similarly biodiesel yield using crude enzymes (extra cellular enzyme source) of the 5 fungi excepting *Aspergillus oryzae* were studied for transesterification. Intracellular (whole cell enzymes), partially purified enzymes, were also investigated for their efficiency to yield significant percentage of biodiesel from both the vegetable oils.

Among the 5 fungi studied the lipase of *Rhizopus oryzae* showed good results and hence the extra cellular enzyme of this fungi was purified and lyophilized for further use, to study biodiesel yield in comparison with commercial lipase enzyme.

The lyophilized enzyme was also immobilized and tested for its efficiency. The characteristics of biodiesel obtained from the above methods were tested and compared with International standards, viz., ASTM and EN.

GC-MS Profile of the biodiesel obtained from both the vegetable oils were studied using extra cellular enzyme of *Rhizopus oryzae* and found to have methyl esters. The same biodiesel was tested for its engine performance and emission characteristics in comparison with Petroleum diesel.

Since *Rhizopus oryzae* was found to be a good Lipase producer and it could catalyze the transesterification of *Jatropha* and *Pongamia* oil biodiesel, the identification of organism was authenticated by investigating its nucleotide sequence. The results obtained were submitted to NCBI and the BLAST analysis revealed 98% similarity with the other strains of *Rhizopus oryzae* available in the NCBI database.

The cost effective ratio of biodiesel for production of lipase catalyzed biodiesel was worked out and found to be slightly higher than the petroleum diesel and it depends on the cost of vegetable oil.