- Energy resources

VIT researchers find alternative source of biofuel-making fungus

THIS NEW METHOD OF FUEL PRODUCTION COULD LOWER THE COST AND INCREASE THE ENERGY EFFICIENCY OF THE PRODUCTION PROCESS

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A common fungus found at contaminated sites could provide an alternative source of biofuel. Amid fossil fuel depletion concerns, scientists have been working to develop alternative fuel sources using lignocellulosic materials, and even algae.

A team lead by Prof Vijayalakshmi Shankar and Dr J Ranjitha of CO2 Research and Green Technologies Centre, Vellore Institute of Technology (VIT), Vellore, found a novel way to produce biodiesel using a fungus. The team found that Aspergillus niger — a fungus which causes black mould disease on fruits and vegetables — can be utilised to produce biofuel.

"A. niger possesses the metabolic machinery to produce a lipid that can be easily converted into hydrocarbons. This is virtually identical to the compounds in diesel obtained from crude oil," says Prof Vijayalakshmi Shankar of VIT, Vellore. She says the new method could lower the cost and increase the energy efficiency of fuel production. Their work has been accepted in Journal of Cleaner Production, this month.

Lignocellulosic materials such as crop residues, biomass, chaff and leaves along with this fungus can be grown with cheap agro-based raw materials such as orange peel, banana peel, sugarcane bagasse and rice bran, among others. The low cost and easy availability of such products can be exploited for commercial purpose, says Shankar, adding that it can also help in waste management by efficiently reducing air pollution due to burning of crop residues and problems associated with landfills. She also shares that the researchers are looking at genetic manipulation of A. niger's microbes to enhance the yield of production for hydrocarbons.

"We are decoding the genetic makeup of A. niger to manipulate its genes, to improve the yield. It needs to be tested in large-scale demonstration plants to solve any problems in scaling up to commercial production," she says, adding that the main value of this discovery may not be the organism itself, but the genetic manipulation of the microbe. "Unlike algae (another biofuel potential) which requires investment of large size ponds for algae production, A. niger requires less land. It can also be cultivated in a laboratory," she shares.

A. niger makes myco-diesel up to 70%, and new developments in fermentation technology and genetic manipulation could help improve the yield. If this achieves scalability, it is likely to provide new economic activity and employment opportunities, particularly in rural areas.

Dr Senthil Kumar Arumugam, director, CO2 Research and Green Technologies Centre, VIT, Vellore, says that many fungi produce ethanol. A promising aspect of this discovery is that Aspergillus produces myco-diesel directly from cellulose-rich products, skipping the fermentation step needed to produce ethanol. Concept wise, the discovery and its potential

applications are good and they are further working to determine the costs and benefits. The researchers have received funding from Department of Biotechnology and private industry has already shown interest in their research.

Globally, too, researchers have been looking at inexpensive ways for biofuel production. Traditionally, biodiesel production depends on vegetable oils and animal fats resulting in competition with the food industry. Single cell oil (SCO) from microbes is considered as an alternative oil source due to high productivity and low land requirement.

India launched the National Biofuel Policy (NBP) in 2008. A report by the International Energy Agency says that the Indian biofuel market is forecasted to grow 11% from 2019 to 2024.