



Environment

Science

## IBSD, NIIST, IIP scientists find way to save endangered Sangai deer using weed oils

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New Delhi: Unchecked growth of two perennial aquatic weeds – water hyacinth and para grass, in the famous freshwater lake of Loktak in Moirang in Manipur is posing a major threat to brow-antlered deer, Sangai, which are already on the verge of extinction. The overgrowth of these weeds has meant reduced space for indigenous plants around the lake on which Sangai feeds.

Researchers at Imphal-based Institute of Bioresources and Sustainable Development (IBSD) have sought to address the problem by exploring the possibility of using the weeds for production of valuable bio-oils and chemicals through the techniques of hydrothermal liquefaction and pyrolysis.

In hydrothermal liquefaction, biomass is converted into bio-oils and chemicals by processing it in water in an autogenous pressure environment for a specified time, causing the breakdown of solid biopolymeric structure to the liquid product and solid bio-char components.

Pyrolysis, in turn, helps to degrade biomass substances into its fragments when heated in the absence of oxygen. The major products of biomass pyrolysis include biochar (solid), bio-oil (liquid), and permanent gases such as methane, hydrogen, carbon monoxide, and carbon dioxide.

The researchers carried out hydrothermal liquefaction and pyrolysis of biomass mixture of water hyacinth and para grass at 260-280 degrees Celsius and 300-450 degrees Celsius to compare the products yield and chemical characteristics of the products. In the case of hydrothermal liquefaction, the maximum bio-oil yield of 13.34 wt.% was obtained at 280 degrees Celsius while for pyrolysis, the maximum bio-oil yield of 38.8 wt.% was observed at 350 degrees Celsius.

The gas chromatography-mass spectrometry (GC-MS) analysis of the bio-oils showed that the bio-oil from hydrothermal liquefaction majorly consisted of nitrogen-containing compounds whereas the bio-oil from pyrolysis largely consisted of phenolic compounds. Other compounds that were found in the bio-oil included ketones, alcohols and acids.

The thermogravimetric analysis (TGA) and proximate analysis of bio-char showed that higher devolatilization occurred during hydrothermal liquefaction compared to the pyrolysis process. The various characterization techniques revealed that the bio-oils produced from both the processes were rich in functionalities.

The resultant bio-oils and bio-chars were also analyzed with the help of FT-IR, NMR, TOC, and SEM for their functionalities.

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Scientists associated with the study noted that the conversion of the weeds into biochar and bio-oil would not only help release more space for the growth of indigenous plants which are favoured by Sangai deer but also help become a new source of income generation to the local communities through the transportation of this biomass for future biorefineries.

Besides researchers from IBSD, the study was conducted by scientists from Council of Scientific and Industrial Research (CSIR)-Indian Institute of Petroleum (IIP), Dehradun, and CSIR-National Institute for Interdisciplinary Science and Technology (NIIST), Thiruvananthapuram.

The team included Prof Dinabandhu Sahoo, Dr Sabeela Beevi Ummalyma from Indian Institute of Bioresources and Sustainable Development (IBSD); and Dr Thallada Bhaskar, Dr Sudhakara Reddy, Awasthi A, Dhyani V, Biswas B, Kumar J, from CSIR-IIP; and Dr Rajeev K Sukumaran, Adarsh VP, Anoop P, and Kiran Kumar M, from CSIR-NIIST.

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