

Saving the endangered Sangai deer of Manipur

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New Delhi, February 05: Unchecked growth of two perennial aquatic weeds- water hyacinth and para grass in the famous fresh water lake of Loktak in Moirang in Manipur is posing a major threat to brow-antlered deer, Sangai which is already on the verge of extinction. The over growth of the weeds has meant reduced space for indigenous plants of 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.



Sangai deer at Loktak lake in Manipur.

In Hydrothermal liquefaction, biomass is converted into bio-oils and chemicals by processing it in water in an autogeneous 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 bio-char (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 °C and 300-450 °C 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 °C while for pyrolysis, the maximum bio-oil yield of 38.8 wt.% was observed at 350 °C.

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

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 deers

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 Institute of Bioresources and Sustainable Development, the study was conducted by scientists from 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 IBSD, Dr. Thallada Bhaskar, Dr. Sudhakara Reddy, Awasthi A, Dhyani V, Biswas B, Kumar J, from CSIR-IIP, Dr. Rajeev. K. Sukumaran, Adarsh V.P, Anoop.P, Kiran Kumar M, from CSIR-NIIST.

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