DBT/ Centre of Innovative and Applied Bioprocessing (CIAB-DBT)

Industrial-grade solvents from agri-waste

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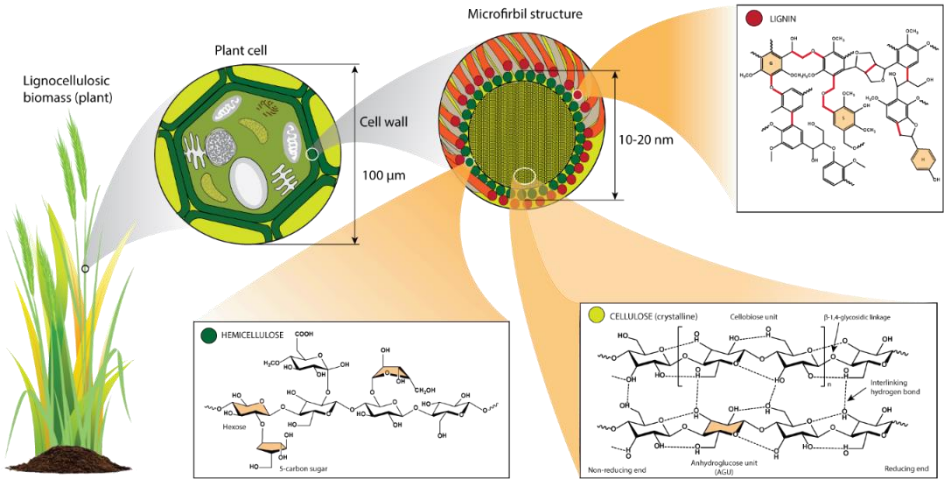
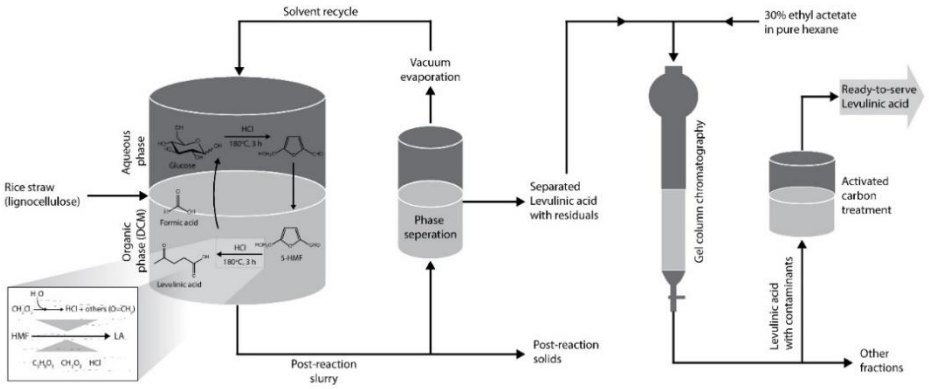
New Delhi: Crop residues are the most abundant and renewable resource on earth. However, the management of these residues is complicated due to its vast production every year. Its accumulation not only deteriorates the environment but also affects the cultivation. Unfortunately, the farmers prefer the open-field burning (stubble burning) of the residues because it is considered as the cheapest method of disposal from the field. This creates a harmful effect on the environment and to humans.



"Micromolecular architecture of agri-residue biomass"

Technically, these materials are referred to as lignocellulose due to its inherent composition. They are is composed of carbohydrates (more than 50% wt. in the form of cellulose and hemicellulose polymers), and the rest include aromatics (lignin) and ash (silica). Numerous varieties of chemical compounds can be prepared through chemical or biological digestion of these materials by utilizing the biogenic polymers.

In the same fashion, scientists from the Chemical Engineering Division at the Centre of Innovative and Applied Bioprocessing (CIAB), Mohali developed a scalable technology for the preparation of levulinic acid, a high-value platform molecule using rice straw (paddy residue). This compound is widely used as a precursor for pharmaceuticals, plasticizers, biofuels, and various other additives preparations. According to the global market survey report, the demand for this chemical is expected to grow at a CAGR of roughly 12.0% over the next 5 years and will reach 250 million US$ by 2024 from 130 million US$ in 2019.



"Agri-biomass processing to a high-value platform molecule through facile technique"

The processing technology is as follows. The native paddy (in raw form) is digested under hydrothermal conditions in a closed reactor with added solvents, which is a combination of dilute acid and organic solvent. The product is automatically carried to the solvent stream during the reaction, thereby enabling the improved recovery of levulinic acid.

Followed by a series of evaporation, activated carbon treatment procedures have been employed for the recovery of industrial-grade ready-to-serve levulinic acid. The process could achieve a decent yield. We already filed a patent on the technology (Indian Patent Appl. No. 201711010199), and the results have been published in the peer-reviewed journal. At present, it is at the technology readiness level-2 (a type of measurement system used to assess the maturity level of a particular technology), and soon, it will be tested for technology scale-up feasibility using the pilot-plant setup, which is being installed at the Institute along with cost economics.

The technology provides the solution to crop management as well as provides the monetary benefits to the farmers.

The research team includes Dr. SasikumarElumalai (Lead research scientist), Sandeep Kumar, Dr. Shelja Sharma, PranatiKundu, Dr.SenthilMuruganArumugam.

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