

Scientists at CIAB developed technology to remove of non-digestible silica and lignin from rice straw

The Department of Biotechnology's Center of Innovative and Applied Bioprocessing (CIAB) at Faridabad is currently developing a technology for the production of silica-removed rice straw in a one-pot process. The technology involves a one-pot protocol *via* chemical route for the removal of silica along with lignin from the rice straw using an ammonia-based solution to remove silica in the form of ammonium silicate. In this one-pot approach, rice straw is soaked in an aqueous solution containing ammonia and kept in a shaking bath or under static conditions at a requisite pre-treatment temperature and time (Figure).



Removal of silica from rice straw

After treatment, the silica-removed rice straw is filtered off, washed with plenty of water and dried. This study also reports the simultaneous removal of lignin which has limited digestion in cattle. The amount of silica removed from rice straw is calculated based on treating rice straw at high temperature, and lignin removal was calculated from a UV spectrophotometer. To this point, a maximum of 45% of silica along with most lignin has been removed and a patent has been filed for the technology (Provisional patent file. no. TEMP/E-1/23079/2019-DEL). The process needs to be optimised further for selective removal of silica and lignin.

These research findings have been accomplished by a team of researchers at DBT-CIAB including Dr. S. Saravanamurugan (Lead scientist) and Ms. Priyanka Pal.

Rice straw is one of the significant agricultural residues which are currently being underutilised and available in abundance in India. Due to its high silica content, rice straw is not favoured as fodder to feed cattle or other domestic animals as it has an adverse effect related to digestibility. More than 500 million tons of waste from biomass is being generated from various crops every year, of which 140 million tonnes is from rice straw. As a result, rice straw is being burnt on the field which is the general practice, especially in India and

other Asian countries, as an inexpensive way to dispose and also to make the field ready for farming the next crop (e.g. rice and wheat). The outdoor burning practice generates toxic air pollutants that affect human health. As an efficient process to remove silica from rice straw is seen as one of the imperative approaches to completely eradicate the stubble burning practice in India, as a consequence increasing the farmer's income to some extent.

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