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Biological wheat straw pre-treatment: Novel fungal co-cultures towards sustainable future in biofuel production

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Biological pre-treatment of lignocellulosic biomass has an advantage of low chemical and energy use. The feasibility of biological pretreatment of wheat straw with fungal co-cultures of *Trichoderma viride, Aspergillus niger* and *Fusarium oxysporum* for efficient biogas and methane production was investigated in the present study. Firstly, physicochemical characteristics of wheat straw in addition to analysis of cow dung, well known to contain methanogenic consortia. Pretreated wheat straw with the investigated fungal co-cultures for 7 days was conducted. Changes in TOC%, TKN%, C/N, pH, TDS, TP and TK further demonstrated that fungal pretreatment was effective. Subsequently, cumulative biogas production 51.8 l/KgVS compared to untreated substrate which produced 35.7 l/KgVS. Moreover, the maximum methane production was found to be 28.01 l/KgVS which was 0.9 l/KgVS in the wheat straw without pre-treatment. By using VIT® gene probe technology, the methanogenic bacteria were identified as members of the genus *Methanosarcina*. The present study suggested the potential role of using the investigated fungal co-cultures for wheat straw crop residues pre-treatment for high-yield methane and biogas. In this sense, the use of cheap digesting microflora starter for biofuel production might reduce the high cost of other pre-treatment methods.

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Guidelines for engineering of probiotics

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Probiotics are defined as live microorganisms that, when administered in adequate amounts, confer a health benefit on the host. Recent research has suggested that probiotics exert a wide range of effects through different mechanisms and sites of action, dependent on the host. Although the European Food Safety Agency has evaluated current probiotic strains insufficient characterized and clinical research ample for health claim approval, consumers (e.g., in the US) are interested in potential therapeutic and preventive health benefits. The Food and Agriculture Organization of the United Nations and the World Health Organization provide guidelines for probiotics: Proper identification to the level of strain of all probiotics in the product, with deposit of all strains in an international culture collection; Characterization of each strain for traits important to its safety and function; Validation of health benefits in human studies, including identification of the quantity of the microorganism required to provide the benefit and; Truthful and not misleading labeling of efficacy claims and content through the end of shelf life. Over the last years we have seen examples of genetically modified strains with adapted physiological properties compared to the parenteral strain and these provide a start for prosperous future developments. The genetic modifications can impact improved survival/retention in the gastrointestinal tract, cell cycle, cell wall, antibiotic resistance and biochemical/metabolic properties of the strains. The current guidelines that any strain of microorganism that would be assigned to a group would be freed from the need for further safety assessment is insufficient to guarantee any health impact in short and long term. It is therefore crucial that improved guidelines allow flexible developments to secure quality and safety, specifically when it concerns infants and premature infants or metabolically compromised individuals and when it concerns the possible long-term effects.

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