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Short Communication

Biotechnological Potential of Industrial Sugarcane Bagasse

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INTRODUCTION

Sugarcane bagasse pith is well-known for its usage as a solid substrate for fungi and microbial development, as well as a source of microorganisms that may be separated from it. Pith has also been utilised in soil bioremediation as a bulking agent. Bagasse pith has recently been used for bioethanol synthesis, which involves pretreatment, hydrolysis, fermentation, and dehydration. However, little is known about biomass valorization in the context of developing environmentally sound and creative sugarcane bagasse processing procedures from sugar mills. Incineration of sugarcane bagasse pith is a widely used and well-established waste disposal and energy producing process.

However, due to pollutant emissions, economic and labour expenditures, energy loss, and poor odour, this strategy may not be suitable for organic waste disposal. Furthermore, the decomposition process yields no value product. Recent study has focused on its use as a biofuel source rather than incineration. In this chapter, the energy ratio and emissions of using sugarcane bagasse pith as a waste material for incineration versus biomass to make bioethanol are explored, as well as the possibilities of sugarcane bagasse valorization for a more sustainable society [1].

Sugarcane is one of the most frequently produced crops in the world, with major producing countries such as Brazil, India, China, Thailand, Pakistan, and Mexico all located in the tropics. The extraction of sugar from this crop produces a number of residues, which are frequently disposed of incorrectly, particularly in sugar mills that use basic process technologies. Massive amounts of solid trash are frequently burnt or burned inefficiently, polluting the environment.

Bagasse and filter cake are examples of sugarcane solid leftovers. Bagasse is the solid residue left over after extracting juice from sugarcane stalks, and it contains the stalks' fibrous lignocellulosic components. The filter cake is the sludge slurry that forms after the sugarcane juice has been filtered [2].

Sugarcane is the world's most important source of sugar; hence the predicted increase in bagasse supply is driven by rising sugar demand. However, due to the created solid wastes, wastewater, and gaseous emissions of carbon monoxide, volatile organic compounds, and greenhouse gases during the crop cultivation phase, the sugar industry is one of the most polluting.

It could be an excellent substrate for microbial activities that produce value-added goods. Attempts have been undertaken to produce protein-enriched animal feed, enzymes, amino acids, organic acids, and pharmaceutically important chemicals, among other things, from bagasse substrate. A pre-treatment approach has frequently resulted in better substrate utilisation by microorganisms. The use of solid-state fermentation technology for such bioconversions could be an appealing option.

Pretreatment of the biomass, which has the primary goal of making the biomass accessible to enzymatic attack, is a critical process step that has a significant impact on all other steps in the process. Several pretreatment methods have been developed, including acid-based, medium-pH (without the inclusion of catalysts), and high-pH (with the addition of a base as catalyst) procedures. Many methods produce high sugar yields, exceeding 90% theoretical for agricultural leftovers, whereas more refractory materials, such as hardwood and especially softwood, necessitate dilute-acid pretreatment to achieve large sugar yields [3,4].

The majority of pretreatment experiments, on the other hand, have used enzymatic hydrolysis with low solids content and large enzyme dosages. The various pretreatment methods will need to be reevaluated in the future under more industrial-like settings, taking into account the entire integrated process and the impact on all process steps.

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