ABSTRACT

Ion Exchange Treatment of Dunder to Facilitate its Use as a Microbial Feedstock

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Distillery stillage (dunder) is a by-product of rum and industrial ethanol. It consists of various compounds from sugar production, as well as the fermentation process itself, including sugars, esters and other organic and inorganic compounds. Dunder is produced in a volume ratio of approximately 15:1 with respect to ethanol, and its primary means of disposal is irrigation of nearby cane crop which is insufficient in most cases to cope with the volume produced. Due to its composition, it considerably increases the Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) of water bodies into which it finds its way, posing environmental problems.

The chemical composition of distillery stillage has potential for supporting microbial growth. However, its constitution also bestows it with bacteriostatic and bactericidal properties thereby only allowing for the growth of certain fungi in its untreated state. Bacterial growth will therefore only be supported when diluted considerably. These properties might be caused by high concentrations of various ion species present in dunder, therefore ion exchange treatment with suitable resins should reduce this effect.

In experiments carried out with *Escherichia coli* and *Cryptococcus curvatus*, it was found that anion exchange treatment (which resulted in the reduction of sulfate concentrations by approximately 30%) resulted in growth similar to control levels, whereas cation exchange treatment (reducing potassium levels by as much as 99%) allowed growth, but to a significantly lesser extent than samples treated by the former method. For *Ralstonia eutropha*, neither approach allowed growth of the organism. Restoring both ion species to pre-treatment levels revealed that the sulfate ion was not a species responsible for the inhibition of growth of either *E. coli* or *C. curvatus* in dunder, however potassium was observed to be a species that contributed to the antimicrobial properties of untreated dunder.

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