Spent wash- creating an avenue towards waste-to-wealth

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Biorefinery concept with a complete utilization of waste residues such as sugarcane bagasse and vinasse (or spent wash) has become a prime component for a sustainable sugar-to-ethanol industry. During the process of ethanol distillation from the fermented molasses, a large amount of spent wash or vinasse is being produced. In a medium sized distillery processing 110,000–120,000 tons of molasses, about 70,000 tons of vinasse (60-65 °Brix) is being produced per year. Production of 1 m³ ethanol yields on average 10-15 m³ of vinasse. It is an acidic slurry (pH 3.5-5.0), dark brown slurry, with a high organic content (chemical oxygen demand 50–150 g/L), and an unpleasant odor, with high contents of potentially hazardous substances. In countries such as Brazil, that is producing 25 Mm³ of ethanol in 2012/2013, handling the huge volumes of vinasse (370 Mm³) pose severe challenges. Currently, vinasse is applied directly on the fields (fertirigation), during the sugarcane cultivation, to partially replace mineral fertilizers such as phosphorus. However, vinasse applied to farming lands as fertilizer, can cause serious water and soil pollution, such as leaching of metals to groundwater, changes in soil quality, increase of phytotoxicity, unpleasant odor, as well as leading to considerable methane emissions during temporary storage or transportation and also nitrous oxide emissions (after application of vinasse to the soil).

Recently, several researchers have used vinasse for the process of anaerobic digestion, which allows the recovery of part of its energy content owing to the production of biogas. However, high amounts of sulfate are found in vinasse, either due to the sulfating process (calcium sulfate precipitation) used in raw sugar production or the addition of sulfuric acid to lower the
pH of the yeast cream (contamination control) during the alcoholic fermentation. Sulfate, being a more favorable electron acceptor, results in the formation of sulfide by sulfate-reducing bacteria, leading to less methane production and failure of the anaerobic digestion process. Moreover, hydrogen sulfide (H$_2$S), a toxic and malodorous gas which can inhibit microbial activity and also lead to reactor corrosion, is also being produced in significant amounts. The difficulty in finding a suitable solution to these problems is what hinders from developing a promising approach to handling a large amount of vinasse produced from the sugar-to-ethanol industries. Through innovative research, we at Mycorena had developed a novel and first of its kind process, producing ethanol and protein-rich fungal biomass from the industrial sugar-to-ethanol process waste spent wash or vinasse, using edible filamentous fungi. To know more about our process, please send us an email- info@mycorena.com

For more reading-


De Oliveira, B.G., Carvalho, J.L.N., Cerri, C.E.P., Cerri, C.C., Feigl, B.J. 2013. Soil greenhouse gas fluxes from vinasse application in Brazilian sugarcane areas. Geoderma, 200-201, 77-84.