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Industrial and Technological Applications of Brewer's Spent Malt

Authors : Francielo Vendruscolo

Abstract : During industrial processing of raw materials of animal and vegetable origin, large amounts of solid, liquid and gaseous wastes are generated. Solid residues are usually materials rich in carbohydrates, protein, fiber and minerals. Brewer's spent grain (BSG) is the main waste generated in the brewing industry, representing 85% of the waste generated in this industry. It is estimated that world's BSG generation is approximately 38.6 x 106 t per year and represents 20-30% (w/w) of the initial mass of added malt, resulting in low commercial value by-product, however, does not have economic value, but it must be removed from the brewery, as its spontaneous fermentation can attract insects and rodents. For every 100 grams in dry basis, BSG has approximately 68 g total fiber, being divided into 3.5 g of soluble fiber and 64.3 g of insoluble fiber (cellulose, hemicellulose and lignin). In addition to dietary fibers, depending on the efficiency of the grinding process and mashing, BSG may also have starch, reducing sugars, lipids, phenolics and antioxidants, emphasizing that its composition will depend on the barley variety and cultivation conditions, malting and technology involved in the production of beer. BSG demands space for storage, but studies have proposed alternatives such as the use of drying, extrusion, pressing with superheated steam, and grinding to facilitate storage. Other important characteristics that enhance its applicability in bioremediation, effluent treatment and biotechnology, is the surface area (SBET) of 1.748 m2 g-1, total pore volume of 0.0053 cm3 g-1 and mean pore diameter of 121.784 Å, characterized as a macroporous and possess fewer adsorption properties but have great ability to trap suspended solids for separation from liquid solutions. It has low economic value; however, it has enormous potential for technological applications that can improve or add value to this agro-industrial waste. Due to its composition, this material has been used in several industrial applications such as in the production of food ingredients, fiber enrichment by its addition in foods such as breads and cookies in bioremediation processes, substrate for microorganism and production of biomolecules, bioenergy generation, and civil construction, among others. Therefore, the use of this waste or by-product becomes essential and aimed at reducing the amount of organic waste in different industrial processes, especially in breweries.

Keywords : brewer's spent malt, agro-industrial residue, lignocellulosic material, waste generation
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