Sugarcane Beyond the Sweetness – One Application in Green Chemistry

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Introduction: Sugarcane is a well known source or raw material to produce sugar, alcohol and bioethanol. Brazil is the world's largest producer of sugarcane (Saccharum sp.), followed by India, China, and Bangladesh, all of which generate significant amounts of bagasse as a by-product of their sugar and bioethanol mills in each of these countries.[1] The sugarcane bagasse (SCB) is a fibrous material remaining after the plant's stalk pressing process used to extract the sweet juice used for the industrial production of sugar and alcohol. SCB is one of the most economically viable and readily accessible agro-industrial residues in the world, particularly in tropical regions.[2] Recently SCB has taken attention in scientific community, manly in chemistry, because exhibits strong biosorption capabilities, which are defined as the passive sorption of organic and inorganic substances in soluble or insoluble forms from an aqueous solution utilizing decomposing biological materials. Sarker at al. published a comprehensive study of the SCB biosorption properties and their application.[3] The purpose of this work is to demonstrate the continued applicability of SCB as SPE biosorbent bed for extracting synthetic hormones (ethynylestradiol, drospirenone and levonogestrel) from pharmaceutical industrial effluent prior LC-MS/MS quantitative analysis. [4]

Methods: SPE: SCB 75 µm bed at a concentration of 50 mg was used to pack empty 1 cc (mL) SPE cartridges containing retained frits. To compare the outcomes of the recoveries, the following commercial (cSPE) were used: Oasis HLB 30 mg, 1 mL; Discovery DSC-18 50 mg, 1mL and Sulpeclean Envi-Carb, 100 mg, 1 mL. Conditioning: 1 mL of methanol and 1 mL of water; Load: 1 mL of sample; Wash: 2x 0.75 mL of water; Dry cartridge: under synthetic air flow; Elution: 2x 0.3 mL MeOH. Prior to **LC-APCI-MS/MS** analysis, the MeOH extracted sample residue was dried in 10 mL class assay tube under N2 gas flow at 40 ºC using and dissolved in 1 mL of 50% acetonitrile/50% water (v/v) solution.

Results: The sorption effectiveness of the SCB bed was evaluated using the following experimental parameters in comparison to existing and commercially available SPE (cSPE) cartridges: (i) SCB re-use (recycling); (ii) load concentration variation; (iii) breakthrough (mass/volume capacity); (iv) pH variation; (v) extraction solvents variation (vi) particle size; and (vii) suitability for use in industrial effluent. The SCB SPE results (accuracy data ranged from 99% to 120%) were significantly acceptable for all the synthetic hormones compounds tested and analyzed in industrial effluent samples and comparable to Oasis HLB (benzene copolymer) SPE material and the others.

Conclusion: Our overarching objective for developing SCB as SPE sorbent material for the analysis of synthetic hormones from industrial effluents has expanded the

research area and/or application of SCB, which the biomass is often burnt to generate energy in the sugar and alcohol mills.

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