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Value added products from fermentation of sugars derived from agro-food residues

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Abstract

Background: Globally, significant amounts of agro-food residues are generated, most of which are burned as waste disposal. Given the abundance of this biomass, it can be used as raw material for the production of biofuels and valuable chemicals through biochemical conversion. Research in this field has gained importance given concerns regarding limitation of fossil resources, environmental problems and sustainability and preference towards natural, biodegradable and environmentally friendly products. Furthermore, the accessibility of alternative substrate sources for fermentative production of these high-value products has been one of the primary goals of industrial biotechnology research in the past two decades.

Scope and approach: The present review is focused in the production of high value products through microbial fermentation of sugars from agro-food residues. Research in this field is interesting due to concerns regarding limitation of fossil resources. On the one hand, for the production of these bioproducts it is important the accessibility of alternative substrate and, on the other hand, the selection of the right microorganism to obtain the desired product. For this reason, the novelty of the present work is that details all different bioproducts which can be obtained through fermentation of sugars derived from agro-food residues, describing raw materials, pretreatments, mode of operation, conditions and microorganisms used, together with the production yields.

Key Findings and Conclusions: The use of renewable and environmentally sustainable agro-food residues as raw material for the production of bio-based products has gained interest recently. For this purpose, the application of a suitable pretreatment to improve biomass digestibility and the optimization of biomass hydrolysis for the production of fermentable sugars is crucial to make bio-based products competitive with petroleum-based ones. The combination of pretreatments together with the employment of microorganisms tolerant to inhibitors generated during the pretreatment or able to ferment pentose sugars in hydrolysates have turned out to be interesting approaches. Regarding hydrolysis and fermentation, SHF and SSF are the predominant strategies, although CBP and SSCF have gained recognition recently. The final bioproduct cost depends on the productivity, yield per quantity of substrate, cost of raw material and the recovery method. In this way, for the commercialization of these bioproducts, some technical challenges are still needed, including the reduction of the pretreatments and enzymes costs, the design of strains with tailored capabilities, downstream processes optimization, waste treatment, etc.

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