

Food waste hydrolysate as fermentation medium : Comparison of pre-treatment methods

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ABSTRACT

Value-adding food/kitchen wastes have become a trend in view of the urge of reducing environmental impact and better exploitation of resources for a sustainable circular economy. As the wastes are full of nutrition but exist in various complex and simple forms, pre-treatment is required. The choice of method greatly depends on the type and nature of the waste; thus, comparison study is necessary. The objective of this study is to compare the pretreatment methods that are effective to treat kitchen waste in order to turn it into rich fermentation medium for subsequent value added compounds production. Three pretreatment methods were examined, i.e., hydrothermal, alkaline and enzymatic. Food to water ratio, temperature and holding time effects were studied in the hydrothermal pretreatment. While the effect of types of alkaline, alkaline concentration and reaction temperature were investigated in alkaline pretreatment. In enzymatic pretreatment, the effect of enzyme amount, incubation temperature, reaction time and pH were explored. The amount of nutrients hydrolyzed were determined through phenol-sulphuric acid (carbohydrate), Bradford (protein) and Bligh & Dyer (lipid) methods. The rough energy and chemical costs involved in each method was also compared. The results revealed that hydrothermal pretreatment and enzymatic pretreatment were comparable in terms of the ability to solubilize nutrients from the complex food wastes. Alkaline pretreatment was the cheapest method, but poor in nutrients extraction. Hence, hydrothermal pretreatment is the best pretreatment method to prepare nutritive food waste hydrolysate at a lower cost with acceptable performance.

KEYWORDS

Chemical pre-treatment; Enzymatic pre-treatment; Fermentation medium; Food waste hydrolysate; Hydrothermal; Pre-treatment

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