

Abstract

The exploration of soil samples taken from the palmary of Tolga region (North West province of Biskra, Algeria) allowed the obtaining of nine yeast strains. One of the isolates (L5) was selected for its ability to produce ethanol from inulin as a sole carbon source. Preliminary identification of the isolate (L5) based on macroscopic, microscopic and biochemical study, using the API gallery API AUX 20, revealed its membership to *Pichia* genus. The molecular identification using *18S*- DNA and *ITS* analysis showed that L5 is closely related to *Pichia caribbica*, registered under accession number; KC977491. The degradation of inulin to produce ethanol by *P. caribbica* is performed in two steps, namely: the saccharification of inulin to fructose and fermentation this later to ethanol. Under optimal conditions of ethanol production, i.e., 40 g /L of inulin, pH 5 and 37 ° C, *P. caribbica* produced in flasks conditions, after 72 h of culture, 12.6 g / L ethanol, recording a yield of 0.31 g ethanol / g of inulin. However, this strain has the ability to produce 14 g / L of ethanol in a 20 liter fermentor, reaching a yield of 0.35 g ethanol / g inulin. The results of inulinase secretion kinetics (the enzyme that catalyzes the degradation of inulin) by *P. caribbica* revealed that this strain is able of producing important quantities of inulinase, reaching 54.27 IU / mL in flasks and 55.47 IU / mL in 20 L fermentor, this after 96 h of culture. The partial characterization of this enzyme revealed that its maximum activity of (108.72 IU / mL) is stored at 55 ° C and pH 3.4 and greater thermostability at the same temperature (55 ° C) after one hour of reaction. The use of artichoke as a sole source of carbon and nitrogen for the production of ethanol by *P. caribbica* allowed the obtaining of a considerable quantity of ethanol exceeding 14g / L, which opens now, the way to the industrial exploitation of this agricultural product. Mathematical models corresponding to biotechnological fermentation process have been implemented to simulate the fermentation phenomenon. Simulation results allow the understanding of substrate degradation, the growth and ethanol production. For an appropriate choice of model parameters, a good qualitative correspondence is noted for the model profiles obtained by our simulation compared to experimental results.

Keywords : Ethanol, *Pichia caribbica*, Inuline, Inulinase, Fructose, arid region soils