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High cell density fed-batch fermentation for the production of a microbial lipase

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ABSTRACT

Extracellular lipase of the yeast Candida rugosa was produced via high cell density fed-batch fermentations using palm oil as the sole source of carbon and energy. Feeding strategies consisted of a pH-stat operation, foaming-dependent control and specific growth rate control in different experiments. Compared to foaming-dependent feeding and the pH-stat operation, the specific growth rate control of feeding proved to be the most successful. At the specific growth rate control set at 0.05 h\(^{-1}\), the final lipase activity in the culture broth was the highest at \(\sim 700\) U L\(^{-1}\). This was 2.6-fold higher than the final enzyme activity obtained at a specific growth rate control set at 0.15 h\(^{-1}\). The peak enzyme concentration achieved using the best foaming-dependent control of feeding was around 28% of the peak activity attained using the specific growth rate control of feeding at 0.05 h\(^{-1}\). Similarly, the peak enzyme concentration attained using the pH-stat feeding operation was a mere 9% of the peak activity attained by specific growth rate control of feeding at a set-point of 0.05 h\(^{-1}\). Fed-batch fermentations were performed in a 2 L stirred-tank bioreactor (30 °C, pH 7) with the dissolved oxygen level controlled at 30% of air saturation.

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