Entrapment of glucose oxidase from Aspergillus niger ISL-09 in poly (acrylamide-co-acrylic acid) hydrogels for improved stability and catalytic efficiency towards industrial applications

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The present study highlights the true potential of *Aspergillus niger* ISL-09 to produce glucose oxidase (GOx) and focuses on improving the catalytic properties of GOx by entrapping it in poly acrylamide-co-acrylic acid (AAm-co-AAc) hydrogels, fabricated by free-radical polymerization method. For this purpose, the optimum conditions for GOx activity were found to be: 15 g soybean meal (SBM) substrate, 20 mL moisture content, 96 h incubation period, and 1.5 mL of fungal spore suspension. The purified extracellular GOx was observed to have 32.4% yield, with 0.02 U/mg specific activity and approximately 80kDa subunit molecular weight. The GOx was most active at pH 5.5 and 40 °C. The immobilization of GOx in poly (AAm-co-AAc) hydrogels led to improved stability and catalytic efficiency, resulting in a 21.7% increase in activity compared to free enzyme. The study also examined the potential of GOx in the pharmaceutical and textile industries as Ca-gluconate producer and bleaching agent, respectively. The study concludes that *A. niger* ISL-09 is a promising source for GOx production under optimal conditions. Furthermore, the immobilization of GOx in poly (AAm-co-AAc) hydrogels can significantly improve its catalytic properties, making it suitable for different industrial applications. However, further scaling up is required for the better implementation in industry.

Keywords

Poly (acrylamide-co-acrylic acid), glucose oxidase, entrapment, interpenetrating networks (IPN), free-radical polymerization.