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Production and characterization of non-specific immuno-stimulative polysaccharide for aquaculture

Jung-Ki Kwak, Jae-Guen Koo*, Sung-Woo Park*, Man-Gi Cho**, Rainer Buchholz and Peter Goetz

Institut for Biotechnology, Technical University of Berlin, 13355 Berlin, Germany
*College of Ocean Science & Technology, Gunsan University, 573701, Gunsan, Korea
**Engineering Research Center, Dongseo University, 617716, Busan, Korea

Abstract

Production and characterization of a fungal polysaccharide from *Schizophyllum commune* as an immune stimulating feed additive in aquaculture were investigated. For the production of the polysaccharide by process scale-up, the culture conditions were optimized in a 15 L bioreactor (7 L working volume) by changing the agitation rate and airflow rate. At first, in order to obtain the optimal culture conditions, agitation rate and airflow rate were regulated as 25, 50, 100 rpm and 0.3 *vvm*, respectively. The optimum for the production of the polysaccharide was at 50 rpm in 1.0% of a technical medium based on barley (0.91/day of maximum specific growth rate, 0.54 g/Lday of productivity). For the scale-up to a 150L bioreactor, 3 kinds of criteria were used while the gas throughput number was kept constant:

- Constant power input per volume, P/V (30 rpm, 13.2 L/min)
- Constant tip speed of stirrer, nd_s (22.5 rpm, 10 L/min)
- Constant Reynolds number, Re (10 rpm, 4.5 L/min).

In the 150L Bioreactor the highest values for the maximum specific growth rate (1.17/day) and productivity (0.63g/Lday) were achieved for the constant

power input per volume criterion. Therefore the constant power input per volume criterion will be used for further scale-up operations. In the economical outlook through upstream and cultivation, the efficiency with barley medium was 2-fold higher than that in glucose medium, even though higher amount of polysaccharide was produced in glucose medium.

Chemical analysis of the polysaccharide yielded the following results: the polysaccharide is predominantly composed of the monosaccharide glucose (gas chromatography), molecular weight is about 500,000 (HPLC). The monomer of the polysaccharide, D-glucose, is linked at the -(1,3) and -(1,6) position (methylation analysis with GC/MSD).