

Athipat Klangboonkrong 2007: Production of Yeast Beta-glucan by Cultivation in Air-lift Fermenter. Master of Science (Microbiology), Major Field: Microbiology, Department of Microbiology. Thesis Advisor: Associate Professor Savitree Limtong, Dr.Eng. 147 pages.

Saccharomyces cerevisiae TJ3 was selected for β -glucan production because its β -glucan content was higher than the other nine strains of *S. cerevisiae*. Cultivation of *S. cerevisiae* TJ3 in molasses medium containing 2% sugar, 0.1% urea, 0.03% KH_2PO_4 , no pH adjustment (pH 5.3), initial cells concentration as optical density 0.5 at 660 nm, and in a rotary shaker at 150 rpm, 30 °C, resulted in the maximal β -glucan production at 1,215.3 mg/l equivalent to 127.1 mg β -glucan/g cell dry weight and cell mass produced at 9.6 g cell dry weight/l. To select the fermenter type for scaling up of β -glucan production, *S. cerevisiae* TJ3 was cultivated in two fermenter types namely stirred tank and air-lift fermenter by using 3 litre of the same molasses medium and cultivation conditions as obtained by optimization in shaking flask cultivation. The result showed that β -glucan production in air-lift fermenter was higher than in stirred tank fermenter. Development of air-lift fermenter by adjustment ratio of height between draught tube and bottom of fermenter and diameter of fermenter, height of draught tube and height of medium and diameter of draught tube and diameter of fermenter for 4, 1.4 and 1.65 respectively, resulted in high β -glucan production at 1,004.6 mg/l (equivalent to 127.8 mg β -glucan/g cell dry weight) and cell mass production at 8.5 g cell dry weight/l. To scale up β -glucan production, 150 l, air-lift fermenter with 100 l working volume was developed. By batch cultivation in molasses medium containing 2% sugar, *S. cerevisiae* TJ3 produced β -glucan at 764.2 mg/l at 20 h cultivation with less than 0.2% sugar remained in the medium while in molasses medium containing 5% sugar, *S. cerevisiae* TJ3 produced β -glucan at 783.3 mg/l at 20 h with 2.1% sugar remained in the medium. Therefore, the molasses medium containing 5% sugar was used for fed-batch cultivation. In fed-batch cultivation with linear incremental feeding the highest production of β -glucan, 1,165.4 mg/l, with the highest cell mass production, 10 g cell dry weight/l at 20 h cultivation was obtained. In fed-batch cultivation with exponential incremental and sigmoidal incremental feeding, the production of β -glucan at 991.8 and 1,038.9 mg/l was obtained but with higher sugar consumption and longer cultivation time than with linear incremental feeding.

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