Abstract

Polyporus umbellatus is a medicinal fungi, its sclerotium has long been used as traditional Chinese herb. The polysaccharide, a constituent of the *P. umbellatus*, have been reported to have antitumor, immunological enhancement, antidiabetic and anti-HIV effect. The growing demands of neutraceutical fungi on the food and pharmaceutical markets would encourage the research on the cultivation of *P. umbellatus* by fermentations. The objective of this experiment was to evaluate the effects of growth condition and environmental factors on the formation of polysaccharides by *P. umbellatus* in submerged culture fermentation.

The results indicated that 3% glucose and 0.5% yeast extract in the culture medium were the most suitable carbon and nitrogen sources, respectively, for both mycelial biomass and polysaccharides production in the shake flask fermentation. It has 3.37 mg/ml mycelium dry weight, 1.43 mg/ml exo-polysaccharide(EPS) and 0.95 mg/ml intra-polysaccharide(IPS) in the broth.

In the fermentor studies, aeration with 1 vvm favors the production of the polysaccharides of *P. umbellatus* by batch fermentation both in the 5 liter bubble column fermentor(BCF) and stirred tank fermentor(STF). Production for the 5 liter BCF was 7.02 mg/ml mycelium dry weight, 1.62 mg/ml EPS and 1.04 mg/ml IPS in 7 days, and for the 5 liter STF was 10.85 mg/ml, 1.50 mg/ml and 0.99 mg/ml, respectively. Fed-batch fermentation in BCF was 8.31 mg/ml mycelium dry weight, 1.77 mg/ml and 1.24 mg/ml, and fed-batch in STF was 11.87 mg/ml, 1.65 mg/ml and 1.14 mg/ml, respectively. The fed-batch culture increased the yield of fermentation.

Molecule weight(MW) of the polysaccharide as analysed by gel permeation chromatography(GPC) was the highest in the STF with 0.5 vvm. The MW of the EPS and IPS was in the range of 1.8×10^5 to 2.1×10^6 Da and 3.5×10^6 to 1.5×10^7 Da, respectively. For STF at 1 vvm, the MW of EPS and IPS was in the range of 1.0×10^4 to 7.5×10^5 Da and 2.7×10^5 to 5.6×10^6 Da, respectively. The MW of the polysaccharide in STF 1 vvm is smaller than STF 0.5 vvm. The MW of all the IPS is larger than that of EPS.

Keywords: *Polyporus umbellatus*, stirred tank fermentor, bubble column fermentor, fed-batch culture, gel permeation chromatography.