Fed-batch fermentation of mycelia and polysaccharide by the local strain Ganoderma lucidum(CCRC36041)

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ABSTRACT

ABSTRACT The objective of this study was to investigate the production of cell mycelia and polysaccharide in shake flask and 5L fermenter. In flask batch study a various of initial pH the cell dry weight was not shown the significant different from initial 4 to initial pH 6 but the higher extracellular polysaccharide (EPS) was found in pH 5 of 937.18±38.58 mg/L. For the nutrients of fermentation the CSP as the nitrogen source has higher cell dry weight and polysaccharide production. As the carbon source the glucose and sucrose was found better than other tested carbon sources for the production of polysaccharide and cell dry weight, respectively. The intracellular polysaccharide (IPS) was found from 24.85 mg/g-cell to 29.95 mg/g-cell in different media. The molecular weight analyzed by HPLC-SEC was in the range of 35,300 ~169,200 Da. and 22,200~205,800 Da. for EPS and IPS, respectively. Increasing the additive of the basal salts, glucose, and nitrogen source were able to enhance the production of cell dry weight and ESP. In flask fed-batch study 10 ml of 35% glucose, 10 ml of 25% CSP, and 10 ml of 35% glucose plus 25% CSP were feed to 100 ml fermentation broth after 7 days cultivation. The cell was harvest after 13 days and the dell dry weight were 9.21 g/L, 8.67g/L, and 9.28 g/L, respectively. The control set of experiment was using water additive and the cell dry weight was 3.81 g/L, 5.94 g/L, and 7.66g/L after 7 days, 9 days, and 13 days. The 10 ml of 25% CSP feeding the polysaccharide was found 869.69 mg/L at day 7 and it decrease to 755.13 mg/L after 9 days and increase back to 845.83 mg/L at day 13. On the other hand, the feeding of 10 ml of 35% glucose and 10 ml of 35% glucose plus 25% CSP was found the polysaccharide increase to 1317.84 mg/L and 1339.96 mg/L, respectively. The P-limiting media has the cell dry weight close to the control and the EPS was found slightly lower than control. In the media of N-limiting the specific production of polysaccharide was increase from 107.28 mg/g cell to 177.86 mg/g cell. Experiment in 5L jar fermentor, the agitation speed was from 200rpm increase to 350rpm cell dry weight was from 11.61 g/L increase to 12.22 g/L, but the production of polysaccharide was from 2231.33 mg/L decrease to 1765.88mg/L. The fed-batch experiment was conducted by feeding 1L of 1% CSP at day 3 and 1L of 4% glucose at day 7, the specific polysaccharide production was from 144.51 mg/g cell increase to 200.78 mg/g cell. However, the feeding 2L of 1% CSP only at day 3 the specific polysaccharide production was decrease to 129.28 mg/g cell.

Keywords : Ganoderma lucidum ; fed-batch ; extracellular polysaccharide ; intracellular polysaccharide

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