Study on optimization of extra-cellular polysaccharides to Cordyceps sinensis by submerged fermentation

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ABSTRACT

Dongchongxiachao is for short chongchao; polysaccharide of chongchao is gaze at physiology activities of antitumor and dropping blood sugar, however crude chongchao is few and has strict growing condition, recently plenty research is displaced crude chongchao by fermenting Cordyceps sinensis. On this purpose of study is consist in cultivating Cordyceps sinensis by submerged culture and analyzing relationship between ingredients of medium and a yield of polysaccharide of chongchao, expected to obtain maximum yield using optimum compose of medium by response surface methodology. The result is discovered that fermentation of Cordyceps sinensis had maximum biomass and extra-cellular polysaccharides contents are 1.02 g/dL and 1.082 mg/mL at the sixth days, and also was analyzed molecular weight of extra-polysaccharides at the fermentation later stage and earlier stage, the result show that no matter what biomass and extra-cellular polysaccharides of Cordyceps sinensis using corn steep powder medium is better than yeast powder medium. At the aspect of compared fermentation Cordyceps sinensis by different carbon to nitrogen ratio, although more nitrogen ratio was added and more extra-cellular polysaccharides of Cordyceps sinensis measured, but biomass of Cordyceps sinensis was restrained by being added corn steep powder ratio over 3 % and then observed the trend of extra-cellular polysaccharides during the ten fermentation using as 3 % corn steep powder and 2.5 % glucose added at medium, it was discovered that the maximum extra-cellular polysaccharides contents was measured at the fourth days during the fermentation was 1.17 mg/mL, it seems that extra-cellular polysaccharides not increased direct proportion. When it was fixed the nitrogen ratio at 1 %, more carbon source added and more extra-cellular polysaccharides contents was on the rise. It was restrained the extra-cellular polysaccharides contents when nitrogen ratio was 3 % and carbon source was 5 %. At the conferred extra-cellular polysaccharides content during the earlier experiment of response surface methodology, five kind of carbon source was chose sucrose as the carbon source makes the content of extra-cellular polysaccharides obvious excellent than the other ones although biomass content was not the best. It used as different ratio of nitrogen source (between the 0.25 %-1.5 %), it was comparatively had much content of extra-cellular polysaccharides using 0.5 % corn steep powder. At the different initial pH value, it was comparatively had much content of extra-cellular polysaccharides at pH 4.5. It was depended on the result of the earlier experiment of response surface methodology, using the 24-1 portion factor experiment designed to confer interaction between the extra-cellular polysaccharides content and each factor, it discovered that sucrose, corn steep powder and salt had positive effect on content of extra-cellular polysaccharides, however the initial pH value had negative effect but in opposition to the other factor was not outstanding. It used as method of steepest ascent path to close in the range of maximum content of extra-cellular polysaccharides and discovered that used as 5.42 % sucrose, 0.564 % corn steep powder and 0.65 % salt to compose the medium had the maximum content of extra-cellular polysaccharides was 11.23 mg/mL, it was used method of central composite experiment design to get the most suitable medium composition, sucrose was 5.846 %, corn steep was 0.561 % and 0.5344 % (NH4)2HPO4 and 0.1336 % KH2PO4 as salt source, for this reason used the ratio of the most suitable medium composition to ferment the Cordyceps sinensis in the fermentor and had the maximum content of biomass at the fifth days during fermentation was 1.94 g/dL, and the maximum content of extra-cellular polysaccharides was 13.46 mg/mL, and seemed that did not control the pH in the fermentor was benefit to a yield of extra-cellular polysaccharides than did during the fermentation.

Keywords : Cordyceps sinensis ; analysis of extra-cellular polysaccharides ; response surface methodology

Table of Contents

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