Production of Gibberellin by Fungal Strains of Gibberella sp

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ABSTRACT

The research studied the production of gibberellin by filamentous fungal strains : Gibberella fujikuroi CCRC 32512 and CCRC 32513. By changing only one variable on each trial, it examined the effect on the production of gibberellin in relation to variables such as mycelium density, homogenization time, inoculum ratio, fermentation volume, shaker velocity and growth temperature, etc. In relation to mycelium density, the greatest production of 130.31 mg/L and 140.31 mg/L respectively occurs when 0.6 g each of Gibberella fujikuroi CCRC 32512 and CCRC 32513 were scraped and put into homogenization for 240 sec. As to the inoculum ratio, the gibberellin grew the most when 4% (v/v) of suspending filamentous fungal strain were cultivated in the 50 mL medium for fermentation. The production of gibberellin by both Gibberella fujikuroi CCRC 32512 and CCRC 32513 reached the respective optimum of 76 mg/L and 98 mg/L in the fermentation volume of 50 mL. Shaker velocity has a significance on the production of gibberellin too. For example, under 250 rpm, Gibberella fujikuroi CCRC 32512 and CCRC 32513 each produces 96 mg/L and 145 mg/L of gibberellin, 1.7 and 2.0 times of that under 100 rpm. In terms of growth temperature, the production of gibberellin was the most desirable under the temperature of 31 °C for both strains with respective yields of 74 mg/L and 118 mg/L. Through the result of the above experiments, we found G. fujikuroi CCRC 32513 performed more outstandingly than G. fujikuroi CCRC 32512 in respect of fermentation volume, shaker velocity and growth temperature. Thus, G. fujikuroi CCRC 32513 was selected to continue the studies of the effect on the production of gibberellin in relation to variables such as source and concentration of carbon and nitrogen and the amount of buffering agent, etc. The relevance between the production of gibberellin and buffering agents showed the addition of 0.5 g/L sodium dihydrophosphate and 1.0 g/L di-potassium hydrophosphate promoted the most the production of gibberellin, while sucrose served as the best carbon source at the amount of 40 g/L. In relation to nitrogen source, G. fujikuroi CCRC 32513 was able to generate the most gibberellin with peptone being its best nitrogen source at the amount of 12 g/L. In the optimal combination of culture media, the production of gibberellin by G. fujikuroi CCRC 32513 reached as high as 289 mg/L 7 days later, 3.1 times of that in the basal medium. By means of orthogonal array design L16(215), the research also examined the major effect of each factor and the interaction effect among the factors on the production of gibberellin by G. fujikuroi CCRC 32513. The first L16(215) matrix showed the major factors that affected the production of gibberellin included the concentration of carbon source, nitrogen source and the cultural time, Other factors did not have a significant influence on the production. The factors such as concentration of carbon source, nitrogen source and the cultural time in high levels were further set in the second L16(215) design, and the analysis showed more gibberellin was generated when G. fujikuroi CCRC 32513 was cultured in the media of 40 g/L sucrose, 12 g/L peptone for 4 days than in the media of 60 g/L sucrose and 18 g/L peptone for 8 days. At last, with the rest factors fixed at the optimal condition obtained from the tests in which only one factor was changed each time, the setting of the above mentioned factors in low levels in the third L16(215) matrix showed that the most favorable range of carbon and nitrogen concentration were 30 — 40 g/L and 9 —12 g/L respectively, and the optimal cultural time was 4 days. The experiment showed the combination led to a higher production of 348 mg/L, and the major effect of each factor and the interaction among factors have a significant influence on the production of gibberellin. Key words : filamentous fungal strains, gibberellins, orthogonal array design

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