

Assessment of Green Fluorescent Protein Signal for Effective Monitoring of Recombinant Fermentation Processes

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Abstract : This research has focused on the application of green fluorescent protein (GFP) as a new technique for direct monitoring of fermentation processes involving cultured bacteria. To use GFP as a sensor for pH and oxygen, percentage ratio of red fluorescence to green (% R/G) was evaluated. Assessing the magnitude of the % R/G ratio in relation to low or high pH and oxygen concentration, the bacterial strains were cultivated under aerobic and anaerobic conditions. SCC1 strains of *E. coli* were grown in a 5 L laboratory fermenter, and during the fermentation, the pH and temperature were controlled at 7.0 and 37°C respectively. Dissolved oxygen tension (DOT) was controlled between 15-100% by changing the agitation speed between 20-500 rpm respectively. Effect of reducing the DOT level from 100% to 15% was observed after 4.5 h fermentation. There was a growth arrest as indicated by the decrease in the OD₆₅₀ at this time (4.5-5 h). The relative fluorescence (green) intensity was decreased from about 460 to 420 RFU. However, %R/G ratio was significantly increased from about 0.1% to about 0.25% when the DOT level was decreased to 15%. But when the DOT was changed to 100%, a little increase in the RF and decrease in the %R/G ratio were observed. Therefore, GFP can effectively detect and indicate any change in pH and oxygen level during fermentation processes.

Keywords : Escherichia coli SCC1, fermentation process, green fluorescent protein, red fluorescence

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