3 - 36 Effect of Oxygen on the Cellulase Production of *Aspergillus niger*

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Lignocellulosic biomass is the most abundant organic raw material in the world. Due to its complexity, lignocellulose bioconversion requires the action of multiple enzymes. The complete hydrolysis of cellulose requires the action of the cellulase system containing cellobiohydrolase, endoglucanase and β-glucosidase[1]. *Aspergillus spp.* produce all three enzyme activities of the cellulase complex and exhibit strong hydrolytic activity towards cellulose, and *Aspergillus niger* has been mainly used for β-glucosidase production[2]. *Aspergillus niger* is a kind of aerobic microorganisms, but there is little oxygen when it is used to silage for degrading the feed cellulose and enhancing the feed's palatability. The aim of this study is to evaluate the influence of oxygen on the growth and cellulase production of *Aspergillus niger*.

A.niger H, H3-1 and H11-1 were used in this study which were screened out from the heavy ion irradiation and the strains were incubated in the primary seed culture for 12 h under the conditions of 30° and 200 rpm. Then the seed culture was inoculated in the fermentation medium contained cellulose by 5% (v/v). The fermentation flasks were cultivated under the same conditions with the seed culture for 72 h, and then we measured the concentration of the fungi and glucose.

Fig. 1 showed that A.niger H, H3-1 and H11-1 growed better under the aerobic conditions than the oxygen free conditions, but A.niger also growed under the oxygen free conditions by utilizing the little oxygen dissolved in the fermentation medium. A.niger H, H3-1 and H11-1 could transform the cellulose in the fermentation medium to glucose indicating that the strains could produce cellulase under those two conditions (Fig. 2), however, the concentration of glucose produced by those three strains under the aerobic were significantly higher than that under the oxygen free conditions.

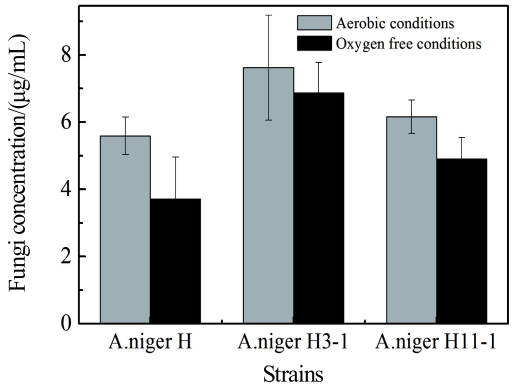

Fig. 1 Effect of oxygen on the fungi concentration.

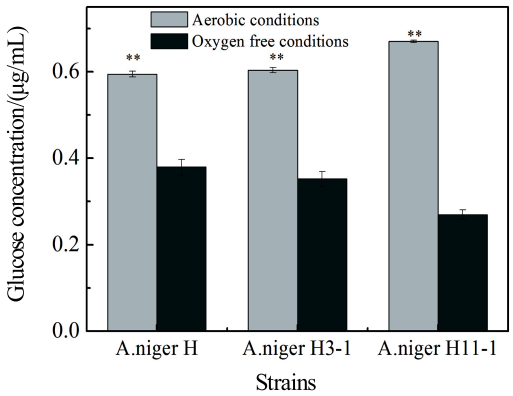

Fig. 2 Effect of oxygen on the glucose concentration.

The results demonstrated that oxygen had an important effect on the growth and cellulase production of *Aspergillus niger*, but *Aspergillus niger* could grow and produce a certain amount of cellulase by utilizing little oxygen dissolved in the fermentation medium. It shows that Aspergillus niger can produce cellulase when it is used for ensiling.

References

[1] M. Gutierrez-Correa, L. Portal, P. Moreno, et al., Bioresource Technology, 68(1999)173.

[2] F. Ernst, R. Dürichen, A. Schlaefe, et al., Phys. Med. Biol. 58(2013) 3911.