3 - 35 Influence of the Initial pH on Glutamic Acid Fermentation

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An important factor of the physical and chemical properties of solution, pH is the index of hydrogen ion concentration in solution. When the pH is higher or lower than the fitness value, the enzyme activity of bacteria growth and metabolism will decrease, and the metabolism of cell will be blocked, which could cause arrest of growth and affect the cell membrane potential, then the biological function of cell membrane would be changed, and also, the material in and out of cell would be influenced. When the pH of fermented liquid is lower in the produce acid fermentation period, the activity of glutamate dehydrogenase will reduce, and the metabolism of substance and energy will be in the direction of acetyl glutamine synthesis, which could cause the decline of glutamic acid productivity.

In this study, we used Corynebacterium glutamicum to conduct high glucose fermentation, and studied the influence of the initial pH on glutamic acid fermentation. The strains were activated in complete medium, then incubated in the primary seed culture medium for 8 h. After that, the strains were inoculated in fermentation medium, fermenting for 38 h, finally, we measured the content of glutamic acid and the concentration of bacteria. The ingredients of the fermentation medium were: glucose concentration 200 g/L, corn steep liquor 6 g/L, K_2HPO_4 1.7 g/L, $MgSO_4$ 0.9 g/L, urea 0.01 g/L (Separate add after sterilization). The initial pH of fermented liquid is 4.0, 4.5, 5.0, 5, 6.0, 6.5, 7.0, 7.5 and 8.0. We controlled the pH in a certain range of values by adding urea solution after 12 h fermentation. Fig. 1 shows the results of fermentation.

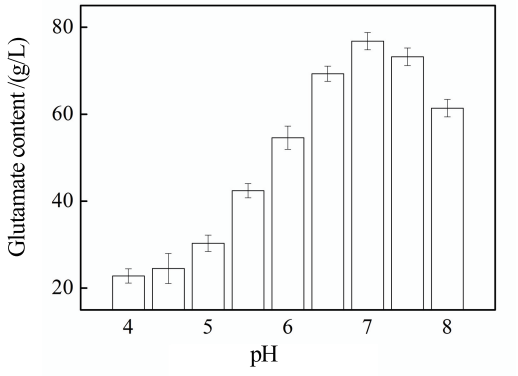

Fig. 1 The effect of pH on glutamic acid.

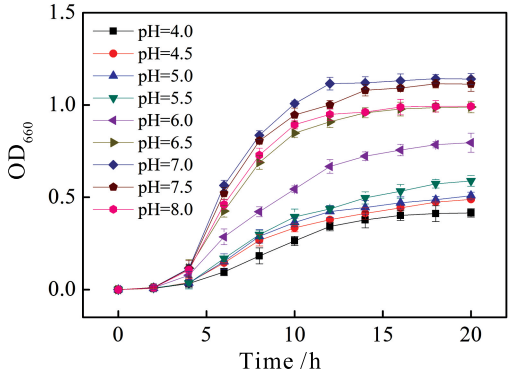

Fig. 2 (color online) The effect of pH on cell concentration.

Fig. 1 shows that when the initial pH is 7.0∼7.5, the fermentation is most optimal. It is disadvantaged to produce glutamate acid whether the pH is too lower or higher. When the pH is less than 6.0, it is hardly to produce glutamate acid, which may be the lower pH severely affects the enzyme activity of bacteria metabolism, and also affects bacteria growth, further influences the acidogenicity. As the results of glutamate produce with different initial pH of fermentation showed in Fig. 2. When the pH is lower than 6.5, the growth of bacteria was obviously inhibited. The bacteria grow best when the pH was between 7.0 and 7.5. Studies have shown that the optimal pH of glutamate dehydrogenase is 6.0 $\sim$ 9.0[2]. If the pH is below 7.0 or up 7.0, the glutamate dehydrogenase would be suppressed, and the activity of glutamate dehydrogenase was significantly decreased, which is not conducive to glutamic acid accumulation.

References

[1] C. Wang, H. Cai, Z. Zhou, et al., Advances in Applied Biotechnology.Springer Berlin Heidelberg, (2015)375.

[2] S. Guan, W. Wang, F. You, Control and Decision Conference (2014 CCDC), The 26th Chinese. IEEE, (2014)378.