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Phosphate limitation alleviates the inhibitory effect of manganese on itaconic acid production by *Aspergillus terreus*

Badal C. Saha, Gregory J. Kennedy

Bioenergy Research Unit, National Center for Agricultural Utilization Research, Agricultural Research Service, U. S. Department of Agriculture, Peoria, USA

Abstract:

Lignocellulosic biomass has the potential to serve as a low-cost source of sugars for production of itaconic acid (IA, a building block platform chemical) by fermentation with *Aspergillus terreus*. However, the IA production from biomass hydrolysate was severely inhibited. Mn^{2+} was found to inhibit the IA production strongly. The effect of Mn^{2+} on each medium component (KH_2PO_4 , NH_4NO_3 , $MgSO_4 \cdot 7H_2O$, $CaCl_2 \cdot 2H_2O$, $FeCl_3 \cdot 6H_2O$, $ZnSO_4 \cdot 7H_2O$, and $CuSO_4 \cdot 7H_2O$) was evaluated for sugar utilization and IA production by *A. terreus* NRRL 1972. Both K^+ and PO_4^{-3} were necessary for IA production. Low PO_4^{-3} in the medium greatly alleviated the inhibitory effect of Mn^{2+} on IA production. However, high PO_4^{-3} (K^+) was detrimental for IA production in the presence of Mn^{2+} . The inhibitory effect of Mn^{2+} on IA production was partly eliminated by increasing the $CuSO_4 \cdot 7H_2O$ level in the medium. This is the first report on the effect of phosphate limitation to alleviate the inhibition of IA production by Mn^{2+} and on the relationship of Mn^{2+} on the medium components for utilization of sugar and production of IA.

Keywords: itaconic acid, *Aspergillus terreus*, Mn^{2+} , fermentation, microtiter plate microbioreactor, shake flask with dissolve oxygen sensor spot