426i Integration of Relaxing Substrate Inhibition and Competitive Inhibition of Lipoxygenase by Dmf in Aerobic Catalysis

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Lipoxygenase (LOX) can catalyze the oxidation of polyunsaturated fatty acids containing cis, cis-1,4-pentadiene moiety to the corresponding hydroperoxides (HPOD) of conjugated (trans, cis)-dienes. Soybean lipoxygenase was chosen as a model in this paper, the reaction yield can be improved by dimethyl formamide (DMF), relaxing of substrate inhibition and product inhibition. The substrate inhibition was observed in the hydroperoxidation of linoleic acid catalyzed by soybean lipoxygenase at the substrate concentration higher than 0.075 mmol/L . DMF (lgP=-0.81) can enhance the substrate concentration to 232 mmol/L, and increase the hydroperoxide (HPOD) yield from 38.93% to 66.09% as well. Lyophilization test showed that DMF with substrate didn't affect LOX and the enzymatic activity. DMF was served as either an activator at low DMF level or an inhibitor at high DMF level, which was indicated by the activation constant K_a,the inhibition constant K_i and the effect of DMF with substrate on enzymatic activity. The substrate inhibition constant K_{ss} at high DMF level was increased by 1000~5600 folds compare to the control,which implied that the integration of relaxation of substrate inhibition and competitive inhibition of lipoxygenase in DMF mediated system released the substrate inhibition greatly together . The maximum K_{ss} and K_i obtained at 5% DMF means that the maximum relaxation of substrate inhibition and the minimum competitive inhibition of LOX in DMF is appeared simultaneously.