Effect of cassava pulp supplement on 1,3-propanediol production by *Clostridium butyricum*

The three-carbon diol 1,3-propanediol (1, 3-PD) is an important organic substrate for biopolymers such as polytrimethylene terephthalate. Glycerol, which is a by-product of biodiesel production, is the main substrate of 1,3-PD production by fermentation with microorganisms such as *Clostridium butyricum*. However, the yield and productivity of 1,3-PD on glycerol are low because the growth and energy production are hampered by the low assimilation rate. Supplementing the glycerol medium with glucose is expected to enhance the growth and increase of 1,3-PD production; however, it leads to catabolite repression in *C. butyricum*. Although *C. butyricum* can produce solvents from polysaccharides such as starch, the effects of polysaccharides on 1,3-PD production by this organism have not been reported. We report that supplementing the glycerol medium with small amounts of cassava pulp (CP) rather than starchy polysaccharides can improve the 1,3-PD productivity of *C. butyricum*. CP is a promising starchy-lignocellulosic biomass for biochemical production because both of its major components, namely, starch (50% dry basis) and cellulose fiber (approximately 30% dry basis), can be hydrolyzed to fermentable sugars. When the medium containing 30 g/L glycerol was supplemented with 2 g/L and 4 g/L CP (1 g/L and 2 g/L starch, respectively), the 1,3-PD concentrations were 9.5 g/L and 8.2 g/L, respectively, similar to that of glycerol alone. However, CP supplementation increased the rate of 1,3-PD production by *C. butyricum*. Specifically, in a medium containing 30 g/L of glycerol supplemented with 2 g/L of CP, the productivity of 1,3-PD (g/L/h) after 24 hours of fermentation was enhanced from 0.25 ± 0.01 (in 30 g/L of glycerol alone) to 0.43 ± 0.02. These results indicate that supplementation with small quantities of CP not only improves the poor growth of *C. butyricum* on glycerol medium but might also enhance 1,3-PD production by this organism.

(W. Apiwatanapiwat [Kasetsart University], P. Vaithanomsat [Kasetsart University], A. Kosugi)

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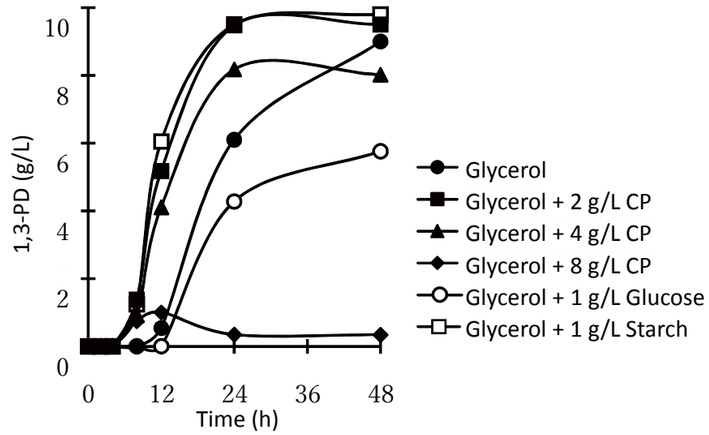

Fig. 1. Profiles of fermentative 1,3-PD production by *C. butyricum* I5-42 during batch fermentation on medium (containing 30 g/L glycerol) supplemented with CP at various concentrations.