GELLAN PRODUCTION IN CONDENSED CORN SOLUBLES BY SPHINGOMONAS PAUCIMOBILIS

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ABSTRACT

Currently, a bonded fiber matrix (BFM), consisting of a binding agent (guar), mixed with organic fibers, is used in the landscaping industry to revegetate roadway ditches, mining spoils, and lawns. The BFM protects the site from erosion while allowing grass seed to germinate and grow through the matrix. Our primary hypothesis is that an inexpensive medium can be formulated, using corn processing byproducts, to support gellan production by Sphingomonas paucimobilis for use in place of the current binding agent, guar.

Our research consisted of two main objectives. First, to complete medium development efforts in the condensed corn solubles (CCS) medium, we needed to identify the optimum initial glucose concentration. Second, the literature indicated that it might be possible to boost gellan production by controlling nitrogen levels.

Shake flask fermentation trials were conducted in 500 ml flasks containing 200 ml of broth and 5% inoculum. The flasks were shaken for 96 hours at 270 rpm and at 27 degrees Celsius. HPLC samples, pH samples, and viable counts were taken every 24 hours and gellan samples every 48 hours. The gellan was then processed through a gellan recovery method to obtain a pellet for measurement.

For the first objective, we tested glucose levels of 8 to 35 g/l. Based on the fermentation efficiency and glucose levels over time, we determined the optimum level to be 20 g/l. To further test this finding, another trial was done at glucose levels of 8 to 20 g/l. This again showed the optimum level to be 20 g/l based on fermentation efficiency and gellan levels.

Tentative conclusions are: CCS supports growth of Sphingomonas paucimobilis; less than or equal to 20 g/l initial glucose resulted in 60% fermentation efficiency; based on prior studies, we anticipate in bioreactor fermentors that gellan production would boost from 5 g/l to 8 to 10 g/l, productivity would increase from 0.09 g/l/h to 0.18 g/Vh and yield would increase from 0.25 g/g to 0.45 g/g. Upon completed replications of glucose trials, the effects of nitrogen supplementation will be conducted.