

Extraction of Lactic Acid from Corn Kernels using *Streptococcus thermophilus* and Method Optimization

A.P.S.M. Amaraweera, M.A.S.R. Senevirathna and I.D. Singhalage

Department of Science and Technology, Uva Wellassa University, Badulla, Sri Lanka

Lactic Acid (LA) has several applications in pharmaceutical, cosmetic and polymer industries. Nowadays, the polymer industries focus on polylactic acid (PLA), which is a biodegradable polymer. LA is the monomer of PLA and it is an alpha hydroxy acid which can be synthesized by the fermentation of glucose obtained from the hydrolysis of starch. Even though there are lots of starch sources in Sri Lanka, study on LA extraction from corn starch is lacking. In present study, glucose was obtained from powdered corn kernels via hydrolysis by α -amylase. The hydrolysis was optimized by varying the stirring time (0.5-2.0 hrs.), temperature (27-57 °C) and corn starch concentration (0.25-1% w v⁻¹). The glucose concentration after the hydrolysis was measured by 3, 5-Dinitrosalicylic acid method. The highest glucose concentration was obtained having 0.75% of corn starch solution at 47 °C and 1.5 hrs. stirring time. Then glucose was fermented (37 °C, 0.5-4.5 days) using *Streptococcus thermophilus* which is a LA bacterium. Samples taken from fermenter at different time intervals were analyzed for LA by UV visible spectrophotometer at 390 nm after developing the yellow color ferric lactate using FeCl₃. The highest concentration of LA was obtained after 4 days of fermentation. Fermentation broth was centrifuged, and crude LA was purified using fractional distillation. The purity of the samples was investigated by FTIR spectroscopy. FTIR results of the purified product were agreed well with that of commercial LA. The characteristic peaks of LA were observed at 1722 cm⁻¹ (C=O stretching), 2600–3200 cm⁻¹ (O–H stretching), 1200–950 cm⁻¹ (C–C and C–O stretching) and 1200 cm⁻¹ (C-H, C-O, and CH₃ vibrations). In conclusion, LA was successfully extracted from Sri Lankan grown corn starch and the present method can be developed to produce LA in bulk quantities ultimately converting the LA into PLA.

Keywords: Corn starch, α -amylase, *Streptococcus thermophilus*, Lactic acid