ALKALI PRETREATMENT AND ACID HYDROLYSIS OF BANANA MIDRIB AND BANANA PEEL

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ABSTRACT

This research studies the effect of alkali concentration and acid concentration during pretreatment and hydrolysis respectively in banana midrib and banana peel. In addition, this research also studies the effect of different temperatures during acid hydrolysis. The retention time fixed for 2 hours for both pretreatment and hydrolysis processes. The samples are pretreated at 70°C using 5, 10, 15 and 20% (w/v) of sodium hydroxide (NaOH) concentration. The degree of lignin breakdown in sample before and after pretreated is observed using Fourier Transform Infra-Red (FTIR). Pretreated samples of banana midrib and banana peel with the optimum alkali concentration is been used for hydrolysis process. Hydrolysis is done using 5, 10, 15 and 20% (v/v) of sulphuric acid (H₂SO₄) concentration at temperature of 30, 50, 70 and 90°C. The glucose concentration is measured using UV Spectrophotometer. Optimum alkali concentration for banana midrib and banana peel during alkali pretreatment is at 20% (v/v) sodium hydroxide. Higher glucose yield which is 0.223g/L is obtained at 70°C using 5% sulphuric acid (H₂SO₄) for banana midrib while for banana peel, highest glucose concentration (1.66g/L) is obtain at 50°C using 10% sulphuric acid (H₂SO₄).
ABSTRAK

Kajian ini mengkaji kesan kepekatan alkali dan kepekatan asid semasa prarawatan dan hidrolisis dalam batang pelepah pisang dan kulit pisang. Di samping itu, kajian ini juga mengkaji kesan suhu yang berbeza dalam asid hidrolisis. Masa tahanan tetap selama 2 jam untuk kedua-dua prarawatan dan proses hidrolisis. Sampel dirawat pada 70°C dengan menggunakan 5%, 10%, 15% dan 20% (w/v) kepekatan natrium hidroksida (NaOH). Tahap kerosakan lignin dalam sampel sebelum dan selepas rawatan diperhatikan menggunakan Fourier Transform Infra-Merah (FTIR). Sampel daripada pelepah pisang dan pisang kulit yang telah dirawat dengan kepekatan alkali yang optimum digunakan untuk proses hidrolisis. Hidrolisis dilakukan dengan menggunakan 5%, 10%, 15% dan 20% (v/v) kepekatan asid sulfurik (H₂SO₄) pada suhu 30°C, 50°C, 70°C dan 90°C. Kepekatan glukosa diukur menggunakan UV Spectrofotometer. Kepekatan optimum alkali untuk batang pelepah pisang dan kulit pisang semasa prarawatan alkali adalah 20% kepekatan natrium hidroksida. Kepekatan glukosa yang paling tinggi ialah 0.223 g/l diperolehi pada 70°C dengan menggunakan kepekatan asid sulfurik 5% (H₂SO₄) untuk batang daun pisang manakala untuk kulit pisang, kepekatan glukosa tertinggi (1.667 g/l) diperolehi pada 50°C menggunakan kepekatan asid sulfurik 10% (H₂SO₄).
REFERENCES


Carroll A and Somerville C., "Cellulosic Biofuels" Annual Review of Plant Biology 2009, 60, 165-182


Iroba, k.l., Tabil, l.g., Dumonceaux, t., Baik, o.d., 2013. Effect of alkaline pretreatment on chemical composition of lignocellulosic biomass using radio frequency heating. Biosystem engineering. 116,385-398


Mood, S.H., Golfeshan, A.H., Tabatabaei, M., Jouzani, G.S., Najafi, G.H., Gholami, M., Ardjmand, M., 2013. Lignocelluloses biomass to bioethanol, a comprehensive review with a focus on pretreatment. Renewable and sustainable energy review. 27, 77–93
Norhidayu, A., 2010. Production of glucose from banana stem waste by using strain B. Universiti Malaysia Pahang

Oberoi, H.S., Vadlani, P.V., Saída, L., Bansal, S., Hughes, J.D., 2011. Ethanol production from banana peels using statistically optimized simultaneous saccharification and fermentation process. Waste management. 31, 1576-1584. Kansas State University, Manhattan, USA.


