

Extraction And Characterization of Hemicellulose from Pineapple Peels

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Structured Abstract

Background: Pineapple has large production in agriculture, a huge amount of biomass will be generated from the peel of this fruit, which will end up as waste in production. Pineapple peels (PP) were discovered to be a high source of hemicellulose, capable of competing with another hemicellulose-rich biomass. Due to the strong interaction between hemicellulose and lignin, it is challenging to extract hemicellulose. Alkaline extraction is reported as the best treatment to extract hemicellulose. Hence, the objective of this study was to investigate the effect of NaOH concentration on the yield hemicellulose and to determine the physicochemical properties of hemicellulose.

Methods: The hemicellulose was extracted from PP using two different concentrations of NaOH (0.5M and 1.0M) and was designated as H_{0.5} and H_{1.0}. The PP was mixed to NaOH solution at a solid : liquid ratio of 1:25 % (w/v). The mixture was heated for two hours at 55°C while being constantly stirred at 400 rpm. After filtering the solution, 6M HCl was added to reduce the pH to 5.5. The mixtures were then kept at 4.0°C for 24 hours. The mixture was then centrifuged for 15 minutes at 3500 rpm and filtered. The 4 volumes of ethanol containing 10% acetic acid were added into the liquid fraction and let stand for 4 hours. The solution was filtered, dried at 40°C for 24 hours and weighed.

Results: The result shows the hemicellulose yield for H_{0.5} and H_{1.0} are 5.74% and 14.15%, respectively. The FTIR spectra showed similar features both H_{0.5} and H_{1.0}, with O-H and C=O vibrations representing bond types. The amorphous hemicellulose was identified by peaks at $2\theta = 15.2^\circ$, 18.0° , and 19.5° . The crystalline hemicellulose was characterized by a peak at $2\theta = 22.6^\circ$, which increased with increasing NaOH concentration. The H_{1.0} at 500°C showed significantly higher decomposition compared to H_{0.5} at 400°C, with weight loss increasing as temperature increases on the TGA curve.

Conclusion: The extraction hemicellulose with the higher concentration NaOH give the high yield of hemicellulose which is 14.15%. Using FTIR, SEM, XRD and TGA, the physicochemical properties of hemicellulose extracted from PP was successfully characterised.

Keywords: Hemicellulose, pineapple peels

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