

Characterization of Cellulose and Hemicellulose isolated from Guava Leaves using Alkali Treatment

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Structured Abstract

Background: Agricultural waste contributes significantly to environmental waste accumulation. Biomass contains a rich composition of bioactive compounds, including cellulose and hemicellulose. However, the extraction and utilization of cellulose and hemicellulose from Guava leaves remain underexplored. This study aims to address this gap by extracting cellulose and hemicellulose from guava leaves using an alkali treatment method and characterizing their physicochemical properties. By valorising Guava leaves, this study can contribute to sustainable waste management and provide insights into developing eco-friendly biomaterials from Guava leaves for future industrial and environmental applications.

Methods: Cellulose and hemicellulose were extracted from guava leaves using alkali treatment with sodium hydroxide (NaOH). For cellulose extraction, 100 g of guava leaves were soaked in 2.5 M NaOH to delignify the leaves. The sample was then bleached initially with 3–5% bleach, which was increased to 24% when no colour change was observed. Once a pale yellow colour was obtained, the sample was thoroughly dried for further analysis. For hemicellulose extraction, 100 g of guava leaves were soaked in 2% NaOH. The resulting filtrate was concentrated and precipitated using ethanol. The solid precipitate was filtered, washed, and freeze-dried. The alkali treatment was used in this study to evaluate its effectiveness in extracting and isolating cellulose and hemicellulose from guava leaves.

Results: This study demonstrated that cellulose and hemicellulose were successfully extracted from Guava leaves, with characterization carried out using FTIR, TGA, and SEM. The results indicate that the physicochemical properties of both cellulose and hemicellulose are consistent with findings from previous studies. Both samples showed promising results after alkali extraction. However, the study could be expanded by optimising extraction conditions, including different concentrations, and by focusing on achieving a higher yield.

Conclusion: The findings of this study indicate considerable potential for extracting cellulose and hemicellulose from Guava leaves, which can also offer long-term environmental advantages. The utilisation of guava leaf waste for biopolymer extraction can be extended to other biomaterials that can serve as alternative sources and contribute to waste valorisation in the agricultural industry.

Keywords: Cellulose, Hemicellulose, Guava leaves, Alkali treatment

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