

**EFFECT OF BANANA VARIETY AND DRYING METHOD ON BANANA PEEL
POWDER ADSORPTION OF METHYLENE BLUE**

By

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BACHELOR'S DEGREE
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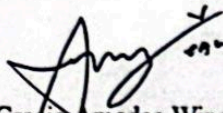


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STATEMENT BY THE AUTHOR

I hereby declare that this submission is my own work and to the best of my knowledge, it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at any educational institution, except where due acknowledgement is made in the thesis.


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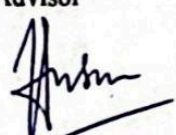
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ABSTRACT

EFFECT OF BANANA VARIETY AND DRYING METHOD ON BANANA PEEL POWDER ADSORPTION OF METHYLENE BLUE

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In this study, banana peel powder (BPP) is evaluated as a natural adsorbent for removal of methylene blue (MB). The study focuses on the effect of the drying method and the banana peel variety. The Cavendish banana peel was prepared using oven-dry and sun-dry while Kepok was prepared using sun-drying for comparison of banana varieties under the same drying conditions. Batch adsorption experiments were conducted using the MB solutions and the remaining dye concentration was measured using UV–Vis spectrophotometer at 664 nm. The evaluation of adsorption behaviour were used using Kinetic model, intraparticle diffusion, and isotherm models. The drying results revealed that oven-dried Cavendish reached a stable mass faster than the sun-dried samples which indicates a better drying efficiency. In the kinetic study, MB adsorption occurred rapidly during the early contact time before it reached equilibrium. The data obtained from the model provided the best fit of pseudo-first-order, showing that adsorption was mainly influenced by the availability of active adsorption sites. The drying method did not strongly affect the kinetic adsorption performance of Cavendish BPP due to oven-dried and sun-dried samples showing comparable adsorption capacities at 5 mg/L and 10 mg/L. For the isotherm performance, oven-dried Cavendish showed the highest predicted maximum adsorption capacity with Langmuir q_m of 222.3 mg/g at 35°C which makes it the best performing adsorbent overall. However, sun-dried Kepok also showed a promising result as the adsorption behavior and comparable performance under several conditions. Overall, banana peel powder showed a strong potential as a sustainable and low cost alternative for removal of methylene blue.

Keywords: Cavendish banana peel, Kepok banana peel, banana peel powder, sun-drying, oven-drying, kinetic model, isotherm model, methylene blue, natural adsorbent, intraparticle diffusion





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DEDICATION

To God, who has never left my side, who gave me strength in moments of doubt, peace in times of fear, and courage to keep moving forward even when the journey felt too heavy to bear.

To my parents, whose endless love, unwavering support, and constant prayers have carried me through every stage of this journey. Thank you for always believing in me, for standing beside me, and for reminding me that I am capable even in moments when I struggled to believe in myself.

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And finally, to myself, who at times felt exhausted, uncertain, and ready to give up, yet still chose to endure, to learn, and to keep going. This work is a reminder that perseverance, no matter how quiet, is still strength.

This work is also dedicated to those who continue to believe that research and innovation should serve not only progress, but also humanity. To those who believe that cleaner water and a healthier environment are not merely ideals, but necessities for a better future. May this work become a small contribution toward that purpose, and may it stand as a humble reflection of hope, responsibility, and perseverance.

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