

## Effects of Beeswax Coating on the Properties of Cocoa Bean Shell Based Papers

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**Abstract :** Cocoa bean shells, despite their antioxidant and antimicrobial properties, are still considered as an underutilized agricultural waste. The functional properties and their lignocelluloses content make cocoa bean shells a potential material for paper-based food packaging. In our previous research, we have successfully produced papers from cocoa bean shells that had antioxidant and antibacterial activities. However, the hydrophilic nature of the lignocelluloses of cocoa bean shells hinders the application of the paper to be used as a food packaging. In this research, we aimed to study the effects of beeswax coating on the wettability and mechanical properties of the paper. The coating was done by dipping the papers in beeswax solution several times and in three different beeswax concentrations. The number of dipping and beeswax concentration significantly ( $p < 0.05$ ) affected the water contact angle of the papers. Results show that the water contact angle increases dramatically due to the coating treatment. The control paper or uncoated paper had a contact angle of 40.50°, while the contact angle of the best-coated paper (D3B3: 3x dipping, 3g/10mL beeswax) reached 96.93°. Both tensile strength and percent elongation were not significantly ( $p > 0.05$ ) affected by the coating treatment. This showed that beeswax was a potential organic material to improve the hydrophobicity of paper from cocoa bean shells without any undesirable effects on the mechanical properties of the paper.

**Keywords :** cocoa bean shell, paper, beeswax, coating, contact angle

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