



# Bio coating as Alternate for Wax Coating for Food Grade Paper Board

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## Introduction



The use of petroleum-based derivatives as coatings, such as polyethylene, waxes, and/or flour derivatives, typically regulates the barrier resistance and wettability of sheets. Although using these polymers increases surface hydrophobicity, their unfavourable environmental effects, low recycling capabilities, and environmental worries over creating trash without biodegradation have caused them to lose favour. Alternatively, novel methods for entirely bio-based paper coatings can be developed using biopolymers such as polysaccharides, proteins, lipids, and polyesters. However, the majority of biopolymers may have processing issues because of hydrophilicity, crystallisation behaviour, brittleness, or melt instabilities that prevent complete commercial use. Therefore, it is preferable to blend with other biopolymers, plasticizers, and compatibilizers to enhance the coating performance. The production of bio-based polymers and their composites as paper coatings will be explored, as well as their barrier qualities. Specifically, there are three layers of coating that may act as stability to the paper board, and turmeric is being utilised because it has antibacterial properties. The first layer of paper may have some microorganisms, and the layer of turmeric coating can kill those microbes. Then, the creation of a gum Arabic coating and a hibiscus coating may come next. These layers have binding properties and contribute some waterproofing properties, and the board will also have increased stability and operate as a barrier control. This bio-coating is environmentally friendly, economical and gives excellent results [Piselli, 2014].

## Problem Description



1.45 million tons of paraffin wax-coated boxes of used products enter landfills every year, and 4.5 million metric tons of carbon dioxide is released during the recycling process. Therefore, the goal of the research is to find out an alternative to the synthetic wax coating seen on food product cartons.

## Methods



The aim is to replace the wax coating with bio coating [IFT, 2007] which is made from materials like turmeric extract, gum Arabic and hibiscus extract. Each material was selected for its physical and chemical properties. Turmeric with the molecular formula  $C_{21}H_{20}$ , contains the major curcuminoids from turmeric (*Curcuma longa*) of the Zingiberaceae family. It is used for its antimicrobial activity to destroy any microorganisms present in the sample. Then Gum Arabic was used to act as a binder. The high water holding capacity of the gum makes the surface of dry objects smooth. The solubility and low viscosity emulsion properties facilitate the use of GA as encapsulated articles for personal care. Hibiscus is used with a barrier coating that acts as a barrier [seas, 2014].

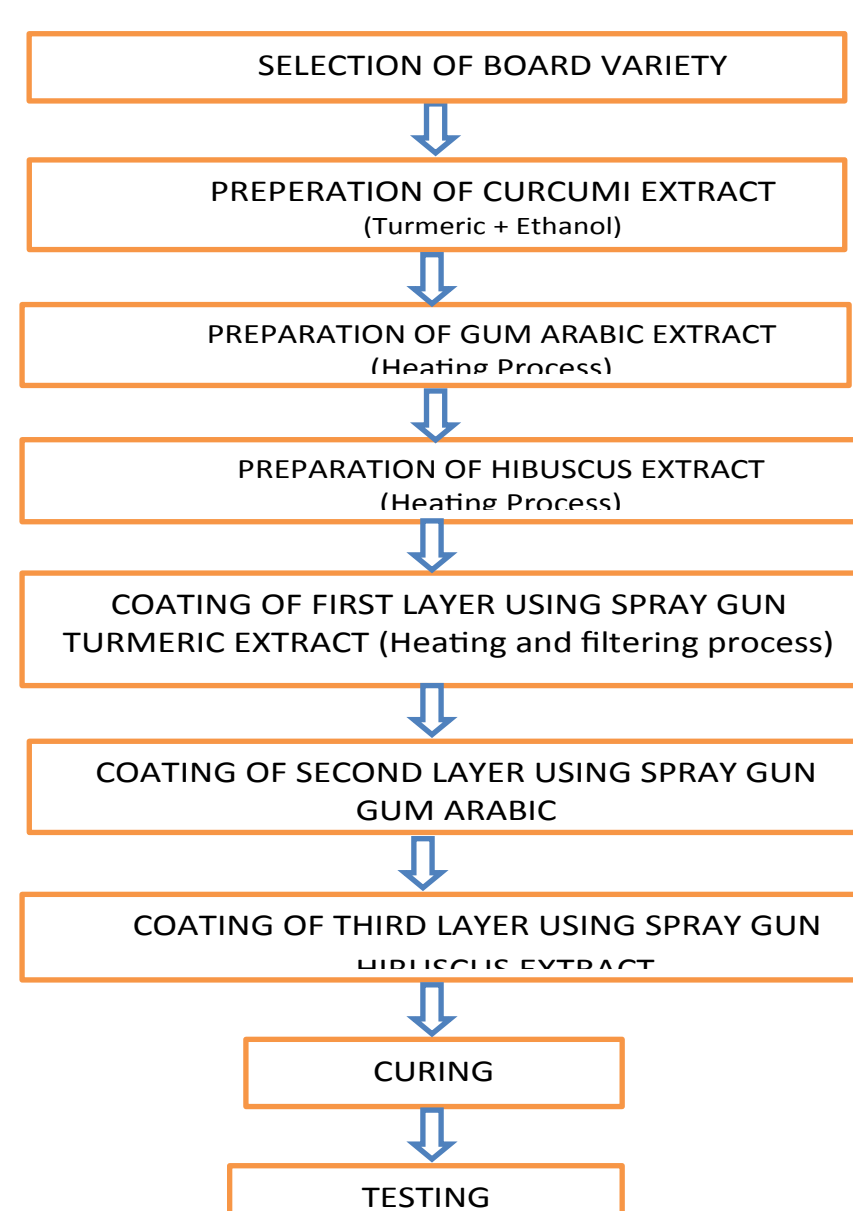


Figure 1 Work Flow of Coating Process



Figure 2 Layer Carton Layer

## Results



In this section properties of three types of Baker boards and Bio coated board are tested their results are given in table 1

S.NO.	TEST	RESULTS OF TESTING using 4 types of boards with 400GSM			
		BAKER BOARD 1	BAKER BOARD 2	BAKER BOARD 3	BIO COATED BOARD
1	BURST STRENGTH (Kg/cm <sup>2</sup> )	8	7.5	7.3	8.3
2	BURST FACTOR	20	18.75	18.25	20.29
3	MOISURE CONTENT (%)	4.1	3.9	3.5	4
4	SMOOTHNESS (seconds)	1600	1500	1300	1100
5	CALIPER THICKNESS (inches)	0.59	0.60	0.52	0.62
6	MICROSCOPIC ANALYSIS	Nano fine granules	Nano fine granules	Nano fine granules	Fine granules

Table 1 Testing Results

Burst Strength test : The burst strength test (kg/cm<sup>2</sup>) considers three baker's coated paperboard packages and a bio-coated paperboard sample. The burst strength of the bio-coated paperboard is a satisfactory improvement of 8.5 (kg/cm<sup>2</sup>) compared to others.

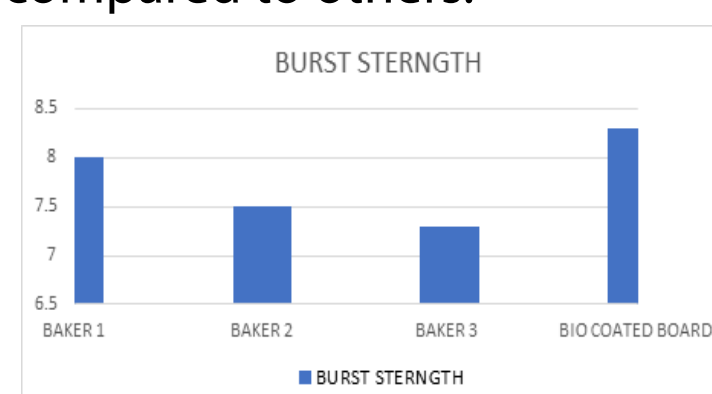


Figure 3 Burst Tester

Smoothness test: In a smoothness test compared to three bakers, the bio-coated board shows the smallest result as the wax-coated board contains a particle size of 3  $\mu\text{m}$ . Bio-coated cardboard contains hibiscus granules with a size of 10  $\mu\text{m}$  so it affects the smoothness of the board. But the coating no longer has peaks and valleys.

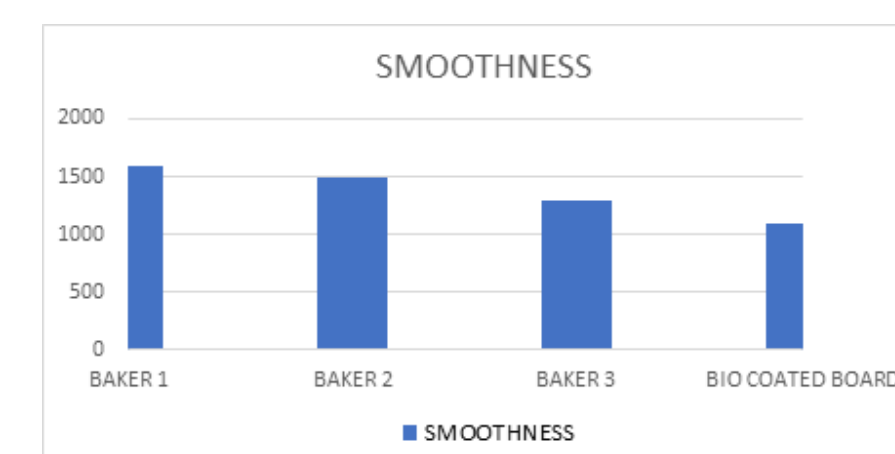


Figure 4 Smoothness Tester

Moisture Content Test: The moisture content of the board was tested at an ambient temperature of 39°C. Also, good results are obtained with bio-coated boards compared to

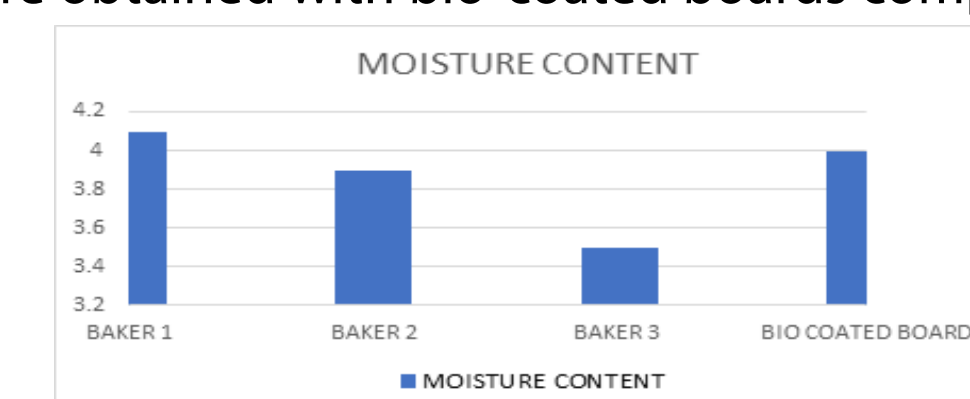


Figure 5 Moisture test

Electron microscopy (EM): In Electron microscope (EM) the granules of bio boards are fine granules when compare to wax coated boards.

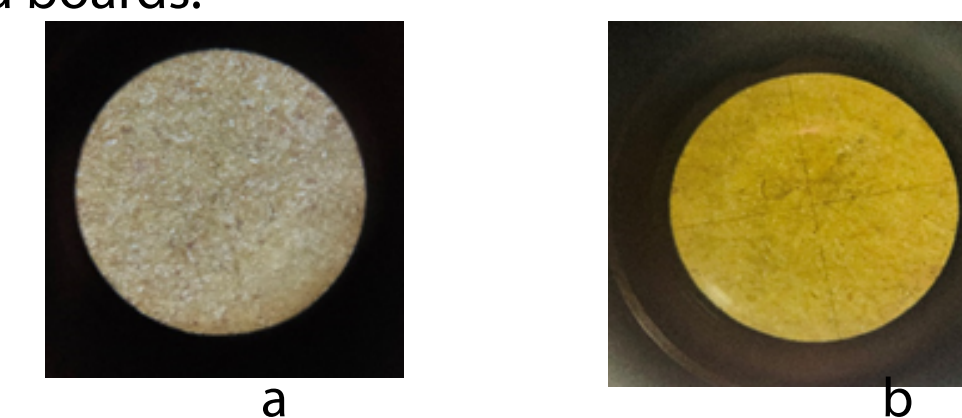


Figure 6 Microscopic analysis of the hibiscus granules after coating a) normal filtered coat b) finely filtered granules

## Discussion / Conclusion



Therefore, this paper concludes that bio-coated paperboard is more efficient in packaging solid food materials. These paperboards can be used in bakery, solid food packaging, pharmaceutical and grocery applications. The project has been pre-planned and implemented to ensure flexibility and economical operation. This revolutionary coating has made many things desirable and economical. This bio-coating is environmentally friendly and highly promising. This project helps us to understand the importance of natural materials and has great applicability in our daily lives. Compared to wax-coated cardboard used in bakeries, bio-coated cardboard has shown good results during testing.

## REFERENCES

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