

# PRODUCTION AND CHARACTERIZATION OF BIODEGRADABLE PACKAGING FILM INCORPORATED WITH MICRO CRYSTALLINE CELLULOSE EXTRACTED FROM PEANUT SHELL

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## ABSTRACT

Synthetic, petroleum-based products are commonly used for food packaging applications, resulting in pollution of the environment. This created a need to develop biodegradable polymers and polymer-based films to maintain the utility of packaged materials, such as providing protection, preventing moisture and oxygen transfers between food and the surrounding package material for a defined period, to overcome the problems of synthetic petroleum-based packaging materials. The peanut shell is a waste product from the peanut industry that consists of cellulose and microcrystalline cellulose. It can be utilized to produce a biodegradable packaging material. The study revealed the potential of agar bio-based films containing cellulose and microcrystalline cellulose extracted from peanut shells. The extraction of microcrystalline cellulose was carried out at specific optimum parameters. Cellulose and microcrystalline cellulose films were made using the solution casting method. Seven different packaging materials were prepared using peanut shell powder (1 and 2 percent), cellulose powder (1 and 2 percent), and microcrystalline powder (1 and 2 percent). As a control, packaging film prepared from agar and glycerine alone was used. Properties such as water solubility, swelling ratio, thickness and biodegradation rate were measured for these packaging films by standard methods. Among the seven different packaging materials, 2% of microcrystalline cellulose incorporated packaging material exhibited significantly ( $p < 0.05$ ) less water solubility ( $32.46\% \pm 1.95$ ), higher degradation rate ( $41.49\% \pm 2.29$ ) and less swelling ratio ( $34.21\% \pm 0.15$ ). The development of biodegradable packaging material with 2% of microcrystalline cellulose can be used as an alternative to synthetic plastic to reduce environmental pollution.

**Keywords** – Synthetic, Plastic, Waste utilization, Peanut shell, Biodegradation

