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ACRITICAL STUDY ON ACTIVE & ANTIMICROBIAL OF FOOD PACKAGING

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ABSTRACT

The research team wanted to find a way to extract micro crystalline cellulose (MCC) and nano cellulose (NC) that wouldn't break the bank and wouldn't harm the environment. Using a methodical strategy, namely Quality by Design (QbD), maize husks (CH) were subjected to a variety of acid treatments in order to extract the MCC necessary for the production of NC, which was then processed using High Pressure Homogenization (HPH) and Acid Hydrolysis (AH). Instrumental (FTIR, TGA, XRD, TEM, and particle size), and physicochemical (Powder flow) characterization of the resulting formulations was performed after the most critical factors identified during risk assessment were further optimized (using a 32 full factorial design). Based on the data, it is clear that AH-NC is superior to commercially available microcrystalline cellulose in terms of heat stability, crystallinity index, yield, particle size distribution, and flow property. The manufactured AH-NC and the model medicine glibenclamide (GLB) were used to construct three distinct dosage forms: tablets, pellets, and liquid solid powder.

Keywords: - Food Processing, Waste, Micro, Crystalline, Nano Cellulose (CU).

I. INTRODUCTION

Instead of dealing with the difficulties of dealing with organic waste from crop cultivation, rural communities and the environment might instead profit from the alternative development of value-added goods. The shift from a petroleum-based, troubled economy to a bio-based, prosperous one may be aided by making better use of renewable natural resources via value addition. Cellulose, a substance often extracted from wood and non-wood plants, is one example of such organic waste. Non-wood plant cellulose is gaining popularity as a feedstock because its lower lignin concentration makes the delignification, purification, and fibrillation processes simpler, safer, and more energy-efficient.

"Wood, sesame husk, cotton, rice husk, oil palm, groundnut shells, potato peel, jute, spruce bark, mango seed, sugarcane bagasse, corn, bamboo, straws, soy hulls, olive stones, miscanthusgiganteus, kapok,flaxfibers, pineapple leaf and coir, onion waste, citrus waste, and coconut are just some of the many sources of cellulose. "

In India, rice and wheat are the two most significant staple crops, although corn is third. One of the most widespread forms of agro-waste that presents a disposal challenge is maize husk. Adding value via its implementation into product development would, thus, result in monetary gain.

Corn husk (CH) is typically disposed of by open burning despite containing 39-42% cellulose, 20-32% hemicellulose, and 8-13% lignin. As a result, meeting the demands of the green energy market will be aided by the development of a suitable scientific and economic way of recycling maize husk. As can be seen in Fig. 1.1, India accounts for less than two percent of the world's total maize output in 2016–17.

India's maize harvest increased in 2016-17, totaling 26 million metric tons. If India were to grow 26 million metric tons of maize each year, it would create around 5 million metric tons of husks, which in turn might yield roughly 0.5 million metric tons of cellulose fibre.

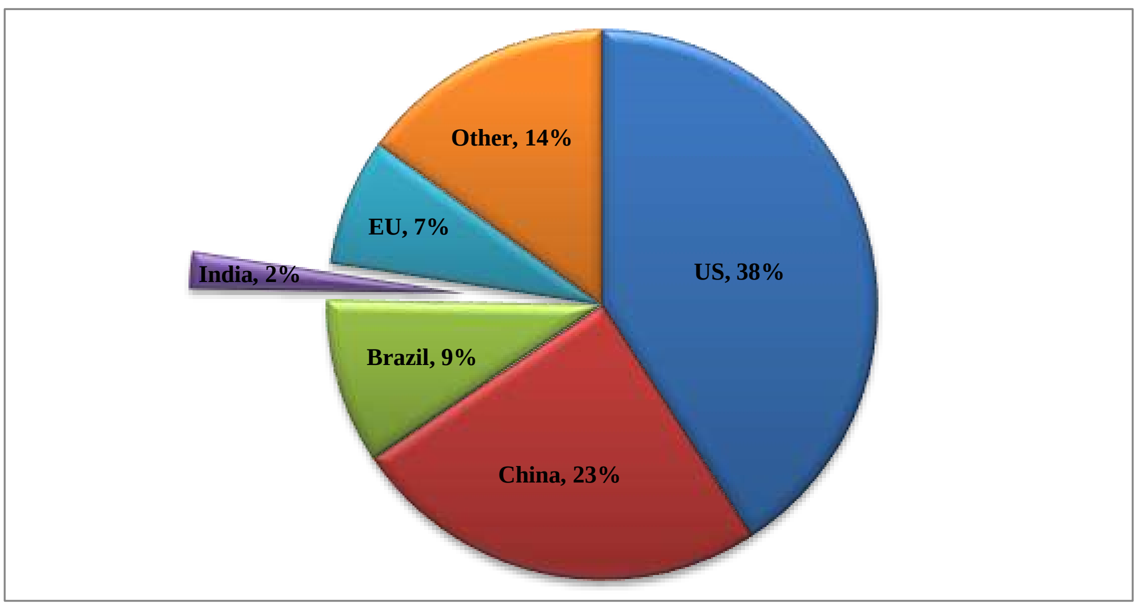

FIGURE 1. Global maize production in leading nations of world in the year 2016-2017

II. ACTIVE FOOD PACKAGING

The phrase "active packaging technology" is used to describe situations in which food packaging technologies perform functions beyond those of conventional packaging. Active packaging is a relatively new kind of packaging that results from the intersection of materials science and engineering. Its goal is to protect the standard of food production. The novel idea of "active packing" refers to the interaction between the packaging, the food, and the environment in order to improve the food's shelf life, safety, or sensory qualities. There are three distinct categories of active food packaging methods used to maintain and enhance food freshness, safety, and quality. Among these are (i) systems for dispensing the likes of antimicrobial agents, antioxidants, and flavors onto the food product; (ii) systems for sucking out O2, CO2, moisture, and odor; and (iii) systems for regulating things like temperature, ultraviolet light, and microwave power. The exact respiration rate in agricultural goods, delayed oxidation in meat meals, moisture migration, and microbiological development in dried food are just a few examples of how advancements in active packaging have improved the generally accepted quality of food items. In addition, it uses selectivity to alter the relative humidity and temperature within the packaging.

Particularly crucial for the efficacy of antimicrobial packaging systems are food packaging materials that may release active chemicals to improve the safety and quality of a wide range of foods during long-term storage.

III. ANTIMICROBIAL FOOD PACKAGING: AN OVERVIEW

Food deterioration is caused by bacteria growth on food's surface, which may be prevented by antimicrobials. The antimicrobial properties of food packaging delay the onset of spoilage. While inorganic antimicrobials are preferable for maintaining process stability and safety, organic antimicrobials are used in food packaging to inhibit microbial growth and improve food acceptance. However, some organic antibacterial treatments are made from synthetic materials that pose health risks to consumers and contribute an unpleasant taste. Antimicrobial food packaging methods are now under development to aid in the prevention of these issues.

There are a lot of things that need to be taken into account when designing an antibacterial food packaging system. Temperature and the features of foodstuffs such chemical nature and composition are just as important throughout the production process and its disseminated surroundings. Organoleptic qualities, toxicity, and microorganism resistance are all factors in choosing an antimicrobial agent. The physio-mechanical characteristics and permeation-evaporation of packaging films, as well as the techniques of incorporation within the packaging, are also important considerations.

The term "controlled release packaging" refers to a method of preserving the integrity of food by limiting its exposure to harmful conditions over extended periods of time. The pharmaceutical industry has always relied on controlled-release formulations for medication delivery. This, however, is the cutting-edge idea in food storage containers. The kinetics of microbial growth and the controlled release of an antimicrobial agent in the creation of antimicrobial food packaging films should be the same. If the antimicrobial agent's release rate is faster than a microbe's growth, the agent will lose its distinctive feature after a certain amount of time has been stored. Microbes multiply when the release rate is too low. Therefore, both should be considered in the regulation of new generations of antimicrobial films for packaging food.

IV. CONCLUSION

This research shows that QbD may be used to quickly and efficiently create NC with the necessary quality features utilizing the AH and HPH approach and corn husk. The study set out to create a new excipient NC derived from maize husk and compare its qualities to those of commercially available cellulose in order to create a solid oral dosage form. Tablets, pellets, and a liquisolid powder were developed as dosing options. Comparison of the powder flow characteristics of AH-NC generated from agricultural waste with MCC PH200 verifies its use as an efficient immediately compressible carrier in the formulation design and product development of glibenclamide tablets and pellets.

When more liquid (such as medicine solution) has to be absorbed than Avicel PH 200 can handle, NC is the way to go. The results of this study are very important to the pharmaceutical industry since almost no previous research has addressed the use of nanocellulose in dosage forms. In conclusion, nanocellulose is an excellent excipient for use in making tablets, pellets, and capsules.

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