

CONTROL OF *Aspergillus* SPECIES GROWTH ON STORED RICE USING MICROENCAPSULATED CINNAMON BARK OIL

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Improper storage conditions for rice often lead to fungal contamination, posing severe health risks to consumers. Among these fungi, *Aspergillus* spp. is a significant contributor, known for producing hepatotoxic aflatoxins in stored grains. This study evaluated the efficacy of cinnamon bark oil incorporated into chitosan microcapsules (CNBO-CS-MCs) as a natural fungicide to inhibit the growth of aflatoxin-producing *Aspergillus* species. Both CNBO and chitosan are non-toxic to humans and recognised as antimicrobials. However, the direct application of CNBO is limited due to its high volatility and potential to alter the colour and taste of food products. To overcome these drawbacks and enhance its effectiveness, CNBO was microencapsulated using chitosan via the ionotropic gelation method. Process parameters were optimized by varying the amounts of chitosan (1-3%), CNBO (1-3 g), and sodium tripolyphosphate (STPP) (0.5-1%) as a cross-linking agent. Light microscopic images showed that CNBO-CS-MCs were spherical, while SEM images indicated a crimped surface layer. Particle size analysis revealed a size range of 100-1000 nm. The optimum formulation was identified as 3% chitosan, 3 g CNBO, and 1% STPP, achieving an encapsulation efficiency of 85% and a loading capacity of 16.5%. GC-MS analysis of CNBO revealed cinnamaldehyde (74.6%) as the major compound. *Aspergillus* spp. was isolated from stored rice, cultured on potato dextrose agar (PDA) medium, and identified morphologically. To qualitatively determine aflatoxins in stored rice, a thin-layer chromatography (TLC) mobile phase solvent system was developed, identifying ethyl acetate (1:1 v/v) as the best solvent system. The TLC analysis confirmed aflatoxin contamination in the stored rice. To assess the effectiveness of CNBO-CS-MCs, rice grains were inoculated with an *Aspergillus* spore suspension (1 mL) and treated with CNBO-CS-MCs. The minimum inhibitory concentration (MIC) and minimum lethal concentration (MLC) of CNBO-CS-MCs against *Aspergillus* spp. were 6.0 mg (1.0 mg CNBO) and 14.0 mg (2.3 mg CNBO), respectively. This research highlights the potential of microencapsulated CNBO as a natural fungicide, providing an effective and safer alternative for managing fungal contamination in stored rice.

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