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**Evaluating the efficacy of cinnamon oil-chitosan microcapsules in inhibiting the growth of *Aspergillus* spp. in stored rice: A study on antifungal properties and storage stability**

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Understanding and controlling the growth of aflatoxigenic fungi is of paramount importance to ensure food safety. *Aspergillus* spp. are common storage fungi, which is responsible for producing aflatoxins in stored grains posing significant health risks. Cinnamon leaf oil (CNO) has gained attention as an antifungal agent due to its low toxicity to mammals, high effectiveness, and wide availability. However, the direct application of CNO presents challenges such as volatilization, degradation, of active compounds, and imparting unpleasant taste and odor to food products. Encapsulation is an effective technique to overcome these limitations and achieve controlled release thus increasing the bioavailability of the active compounds. In this study, a comprehensive investigation was conducted to assess the in vitro growth dynamics of colonies and spores of *Aspergillus* spp. (*A. flavus*, *A. niger*, and *A. parasiticus*) over a three- month period after treating with cinnamon leaf oil loaded chitosan microcapsules (CNO-CS-MCs). Microcapsules (MCs) containing cinnamon leaf oil were prepared by ionotropic gelation technique and crosslinking chitosan with sodium tripolyphosphate (STPP 1%). Previous studies have shown that the minimum lethal dose (MLD) of CNO-CS-MCs against *Aspergillus* spp. for spread method was 15 mg. Rice grains (BG-11-11) were packeted in polybags and treated (spread on rice) with the MLD of CNO-CS-MCs. The growth of *Aspergillus* spp. on treated rice was monitored monthly for 03 months by growing the fungal extracts of treated rice on potato dextrose agar (PDA) medium. Subsequent spore quantification was carried out using a hemocytometer. The results demonstrated a reduction of the fungal colony count and spore density throughout the three-month duration. Notably, the lowest mean colony count of 5.33 CFU mL<sup>-1</sup>(SD = 1.15 CFU mL<sup>-1</sup>) was observed in the third month, suggesting a significant reduction in fungal colonies after treating with CNO-CS-MCs. Additionally, the lowest average spore density of 1.26 × 10<sup>-4</sup> spores mL<sup>-1</sup> was observed in the third month, suggesting a significant reduction in fungal spores after treatment. These findings emphasize the promising potential of CNO-CS-MCs as a natural fungicide to control the growth of aflatoxigenic fungi on stored rice, enhancing food safety and quality during their storage.

**Keywords:** Chitosan, Cinnamon oil, Microcapsules, Stored rice

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