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***In-vivo* growth control of *Aspergillus flavus* on stored rice using microencapsulated cinnamon leaf oil**

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Poor storage conditions of rice lead to fungal infestation associated with severe health problems in humans. *Aspergillus flavus* is one of the significant storage fungus responsible for producing aflatoxins on stored grains. The use of cinnamon leaf oil (CNO) as an antifungal agent has gained great interest because of its low mammalian toxicity, high efficacy and availability. However, the direct application of CNO possesses many drawbacks, such as loss of bioactivity due to volatilization and degradation of active compounds and contribution to unpleasant taste and odour of foods. Microencapsulation is an efficient technique that can be used to overcome those drawbacks and obtain controlled release. This study aimed to determine the *in-vivo* growth control of *A. flavus* on rice by CNO-chitosan microcapsules (CNO-CS-MCs). CNO was encapsulated within biodegradable polymeric chitosan by ionotropic gelation method with sodium tripolyphosphate as the crosslinking agent. CNO was obtained from the local market and characterized using Gas Chromatography-Mass Spectrometry (GC-MS). Rice samples (Bg 11-11) were obtained from Rice Research Institute, Bathalagoda, Sri Lanka. *Aspergillus flavus* was isolated from stored rice and tentatively identified as *A. flavus* using morphological features and DNA sequencing. The minimum inhibitory dose and minimum lethal dose of free CNO and microencapsulated CNO against *A. flavus* were evaluated under *in-vivo* conditions. The GC-MS analysis of CNO showed the presence of eugenol (56.49 %),  $\beta$ -caryophyllene (9.03 %), benzyl benzoate (8.43 %) and linalool (6.0 %) as the major constituents. Free CNO mixed with rice grains showed 100 $\pm$ 0.00 % growth inhibition (visible) of *A. flavus* at 2 mg of oil (minimum inhibitory dose) and there was no revival of the growth of the fungus treated with  $\geq$  5 mg (minimum lethal dose) of oil, in PDA media. Both minimum inhibitory and minimum lethal doses of CNO-CS-MCs treated rice samples were higher than that of free CNO. The minimum inhibitory dose of CNO-CS-MCs mixed with rice grains was 5 mg and the minimum lethal dose was 12.5 mg, whereas those were 10 and 17.5 mg, respectively, in treatments with CNO-CS-MCs sachets. Both CNO and CNO-CS-MCs were fungistatic and fungicidal against *A. flavus*. This study indicated the potential of using microencapsulated CNO as a natural antifungal agent against the *A. flavus*.

**Keywords:** Antifungal activity, *Aspergillus flavus*, Chitosan, Cinnamon leaf oil, Microcapsules

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