

Evaluation of antifungal and anti-aflatoxigenic properties of non-aflatoxigenic *Aspergillus flavus* strains' crude extracts against aflatoxigenic *A. flavus* in peanut kernels

Mohd Azuar Hamizan Rahman¹, Nik Iskandar Putra Samsudin^{1,2*}, Maimunah Sanny^{1,2}, Khozirah Shaari³, Syahida Ahmad⁴, Jinap Selamat¹, Norlia Mahrer⁵, Lim Wei Ern¹, Visnupreya Anandan¹, Muhammad Alif Zainaldin¹

¹Department of Food Science, Faculty of Food Science and Technology, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia. E-mail: hamizanrahman91@gmail.com, nikiskandar@upm.edu.my, jinap@upm.edu.my, s_maimunah@upm.edu.my

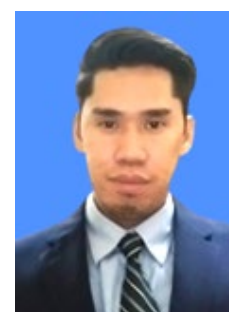
limweiern@gmail.com, gs68438@student.upm.edu.my, gs68238@student.upm.edu.my

²Laboratory of Food Safety and Food Integrity, Institute of Tropical Agriculture and Food Security, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia.

³Laboratory of Natural Medicines and Products, Institute of Bioscience, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia. E-mail: khozirah@upm.edu.my

⁴Department of Biochemistry, Faculty of Biotechnology and Biomolecular Sciences, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia. E-mail: syahida@upm.edu.my

⁵Food Technology Division, School of Industrial Technology, Universiti Sains Malaysia, 11800 Minden, Pulau Pinang, Malaysia. E-mail: norlia.mahrer@usm.my



Abstract:

Peanuts (*Arachis hypogaea* L.) are highly susceptible to *Aspergillus flavus* colonisation and aflatoxin contamination. As an alternative to chemically synthesised fungicides, biological control agent using non-aflatoxigenic *A. flavus* have been developed and commercialised on the basis of nutrient and habitat competition against its aflatoxigenic counterpart. At present, there are interests in harnessing the inhibitory metabolites from non-aflatoxigenic *A. flavus*. From our previous studies, the crude extract of ethyl acetate and hexane from non-aflatoxigenic *A. flavus* strain A121R inhibited 100% of aflatoxigenic *A. flavus* strain A8R growth and AFB₁ *in vitro* at 75 mg/mL. Therefore, the present work aimed to evaluate the antifungal properties of hexane and ethyl acetate crude extracts from non-aflatoxigenic *A. flavus* A121R against aflatoxigenic *A. flavus* A8R growth and AFB₁ production on peanut kernels. A total of ten concentrations were prepared (150 mg/mL, 75 mg/mL, 35 mg/mL, 18.75 mg/mL, 9.38 mg/mL, 4.69 mg/mL, 2.34 mg/mL, 1.17 mg/mL, 0.58 mg/mL, and 0.29 mg/mL). The antifungal properties of crude extracts were assessed by observing fungal growth on the treated peanut kernels for 7 d. On day 3, peanut kernels treated with 150 mg/mL of ethyl acetate crude extract showed aflatoxigenic *A. flavus* A8R growth, which sporulated on day 5. However, no sign of fungal growth was observed after 7 d of incubation on peanut kernels coated with 150 mg/mL of hexane crude extract. The anti-aflatoxigenic properties of the crude extracts were evaluated by HPLC against control (growth on untreated peanut kernels). The highest inhibition of ethyl acetate crude extract was 54% at 150 mg/mL, and the lowest was 41% at 2.34 mg/mL. No significant AFB₁ inhibition was observed at 1.17 mg/mL, 0.58 mg/mL, and 0.29 mg/mL of ethyl acetate crude extract. On the contrary, no AFB₁ was detected on peanut kernels treated with 150 mg/mL of hexane crude extract (100% inhibition). The hexane crude extract inhibited more than 90% of AFB₁ on peanut kernels treated with 75 mg/mL to 18 mg/mL, and 21% at 0.58 mg/mL. Therefore, hexane crude extract of non-aflatoxigenic *A. flavus* strain A121R showed promising bioactivity against aflatoxigenic *A. flavus* strain A8R growth and AFB₁ production.