Abstract

Photosensitization, a Green Treatment for the Inactivation of *Aspergillus Flavus* in Peanuts Mediated by Curcumin [†]

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Abstract: The aim of this study was to investigate the efficiency of curcumin-based photosensitization (CUR-PS) in inactivating *Aspergillus flavus* spores and in turn reducing the aflatoxin B1 production and extending the shelf-life of raw peanuts. The inoculated peanuts with *A. flavus* spores were illuminated for 15 min at 420 nm (Xenon Arc light source) using three different curcumin concentrations of 50, 75, and 100 µM. The highest reduction in *A. flavus* spores on peanuts (1.7 log CFU) was obtained by 50 µM curcumin ($p > 0.05$). Interestingly, shelf life of treated peanuts with 75 µM curcumin was extended by 7 days. In order to evaluate the influence of CUR-PS treatment on aflatoxin B1 generation, treated and untreated peanuts were analysed after 20 days of storage 25 °C. Results showed that the average level of aflatoxin B1 in untreated (control) peanuts was 800 mg/kg, while light treatment of peanuts reduced the aflatoxin production to the level of 296 mg/kg. A significant reduction in aflatoxin production was observed in curcumin (75 µM) treated peanuts, where 38.3 and 41.1 mg/kg aflatoxin were detected in illuminated and not-illuminated peanuts, respectively. Moreover, 59.2 and 58.1 mg/kg aflatoxin were detected in CUR-PS treated peanuts with 50 and 100 µM curcumin, respectively. However, not illuminating curcumin treated peanuts with 50 and 100 µM showed higher levels of aflatoxin, 108.8 and 105.3 mg/kg, respectively ($p > 0.05$). This study demonstrated the efficiency of CUR-PS treatment as a safe and green technology to control fungal growth and mycotoxin production in agro-food sector.

Keywords: photosensitization; curcumin; aflatoxin B1; peanuts; *Aspergillus flavus*

Author Contributions: The experimental design and procedures, objectives and data analysis were conducted by myself as a Masters student under the guidance and supervision of A/Professor Y.S. and the assistance of M.S.D. The design of the experiment, the scope and direction of the whole experiment came about through discussions with my supervisor, Y.S., and PhD student M.S.D. who also assisted in supervising the laboratory experiments. The experimental design and analysis of the aflatoxin levels in peanuts was mainly done by Dr H.T.H.

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