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### Prevention of toxin production during fermentation without impairing the microbial growth using benzimidazoles

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In the manufacturing of beer, wine, bread, kimchi, cheese and other foods by fermentation process, the microbial growth is necessary and steady with time. However, some microbes produce toxic secondary metabolites like aflatoxins (AF). Reports of the mycotoxin contamination in the fermented foods (Chilaka et al., 2016; Hymery, et al., 2014; Colak et al., 2012; Almeida et al., 2007; Kinoshita et al., 1968) accentuate the importance of controlling mycotoxin for the food safety and therefore, it is important to develop an inhibitor that control mycotoxin levels (Aiko and Mehta, 2013) without compromising the fungal growth. Interestingly, benzimidazole and its derivatives are biologically active heterocyclic compounds known for their fungicidal activity (Janeczko, 2016). 2-(2-Furyl) benzimidazole (FBD) completely inhibits the growth of *Aspergillus flavus* producing AFB1. In the present study, various derivatives of FBD were tested for their anti-fungal and anti-aflatoxigenic activity in Yeast Extract Sucrose (YES) culture medium as well as in rice. Unlike FBD, the polar

derivatives of FBD did not impair the fungal growth but effectively inhibited aflatoxin B1 biosynthesis. This may be due to their interaction through polar groups nitro (-NO<sub>2</sub>), carboxyl (-COOH) and carboxamidoxime (-C(=NOH)NH<sub>2</sub>) with enzymes involved in the biosynthesis of aflatoxins. Therefore, these benzimidazole derivatives also showed good anti-aflatoxigenic activity in rice, and the IC<sub>50</sub> concentrations of the inhibitor in rice were comparatively higher than those in YES medium due to surface factor like heterogeneous versus homogeneous, respectively. This study summarizes the most notable structure-activity relationship (SAR) of 2-(2-Furyl) benzimidazoles for anti-aflatoxigenic and anti-fungal activities and also highlights their applications in industrial fermentation processes vulnerable to mold growth and subsequent aflatoxin synthesis like beer, koji fermentation, cheese production, etc.

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