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Research article

Impact of bacterial biocontrol agents on aflatoxin biosynthetic genes, *aflD* and *aflR* expression, and phenotypic aflatoxin B_1 production by *Aspergillus flavus* under different environmental and nutritional regimes

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Highlights

- Efficacy of four bacterial antagonists for control of AFB_1 by *A. flavus* was examined.
- With 50:50 ratio of cells/conidia differential control was achieved, depending on nutrition and a_w.
- Bacteria species inhibited the relative gene expression of the AFB_1 biosynthetic genes *aflD* and *aflR*.
- AFB_1 inhibition was not consistent with effects on gene expression.

Abstract

The objectives of this study were to examine the efficacy of four bacterial antagonists against *Aspergillus flavus* using 50:50 ratio of bacterial cells/conidia for the control of aflatoxin B_1 (AFB_1) production on two different nutritional matrices, nutrient and maize-based media at different water availabilities (0.98, 0.94 water activity (a_w) on nutrient medium; 0.995, 0.98 a_w on maize meal agar medium) at 35 °C. The indicators of efficacy used were the relative expression of one structural and regulatory gene in the biosynthetic pathway (*aflD* and *aflR* respectively) and the production of AFB_1. These studies showed that some of the bacterial species could significantly inhibit the relative expression of the *aflD* and *aflR* genes at both 0.98 and 0.94 a_w on nutrient agar. On maize-based media some of the bacterial antagonists reduced the activity of both genes at 0.94 a_w and some at 0.995 a_w. However, the results for AFB_1 production were not consistent with the effects on gene expression. Some bacterial species stimulated AFB_1 production on both nutrient and maize-based media regardless of a_w. However, some bacterial treatments did inhibit AFB_1 production significantly when compared to the control. Overall, this study suggests that temporal studies are required on the biosynthetic genes under different environmental and nutritional conditions to evaluate the potential of antagonists to control AFB_1.

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Keywords

Aspergillus flavus; Aflatoxin B_1; *aflD*; *aflR*; Gene expression; Water activity; *Pseudomonas fluorescens*; *Bacillus subtilis*

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