Exploring the potential of tea polyphenols to reduce citrinin production during black tea fermentation with *Monascus purpureus*

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The use of *Monascus purpureus* in functional food development is well established due to its production of bioactive metabolites such as pigments and monacolins. However, its ability to produce citrinin, a nephrotoxic mycotoxin, has raised safety concerns, limiting its applications. It has been shown that polyphenols found in tea interfere with fungal secondary metabolite biosynthesis. This study investigates the suitability of black tea (*Camellia sinensis*) as a fermentation substrate for *M. purpureus* and explores the potential influence of tea polyphenols on citrinin production. Fermentations were carried out using sterilized black tea infusions and solid tea substrates under both submerged and solid-state conditions, inoculated with *M. purpureus* (ATCC 16362). Traditional rice and cereal based substrates were used as positive controls. Total polyphenol content was assessed using the Folin-Ciocalteu method, and citrinin was checked at days 3, 7, 14, and analyzed using thin layer chromatography (TLC) with a DCM: ethyl acetate: methanol (3:2:1) solvent system. Separated spots on TLC plates were visualized under UV light at 336 and 254 nm wavelengths and compared with the citrinin standard. TLC provided qualitative and semi-quantitative estimates. The results confirmed robust fungal growth and the characteristic red-orange pigment production of *M. purpureus* on black tea substrates, demonstrating capability of tea as a fermentation medium. Citrinin levels in rice-based controls ranged from approximately 90 to 120 µg/kg during the fermentation period. In contrast, citrinin in black tea-based samples were lower than 15 µg/kg or below the detection limit. Both submerged and solid-state fermentations showed an approximately 85% reduction in citrinin production. Although no correlation analysis between polyphenol content and citrinin level was conducted, the observed reduction suggests a possible inhibitory role of tea polyphenols. In conclusion, black tea provides a promising natural substrate for Monascus fermentation, with the added advantage of substantially lowering citrinin contamination. Further work, including polyphenol-depleted controls, pigment quantification, replication, and statistical correlation are underway to confirm the specific role of tea.

Keywords: *Monascus purpureus*, *Black tea, Polyphenols, Citrinin inhibition, Functional fermentation*

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