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Assessment of mycotoxin contamination in rice and rice bran from Kirinyaga, Kisumu, and Kwale counties, Kenya

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Abstract

Rice (*Oryza sativa*) is a staple food globally and a key economic and dietary component in Kenya, particularly in the coastal and northern regions. In areas like Kirinyaga, Kisumu, and Kwale, small-scale farmers produce approximately 150,000 MT of rice annually. While rice provides essential nutrients and economic benefits, it is susceptible to mycotoxin contamination, posing public health and economic risks. Although previous studies have detected mycotoxins in Kenyan rice, comprehensive data on fungal and mycotoxin contamination in rice and rice bran remain limited.

This study aimed to identify mycotoxin-producing fungi and determine mycotoxin levels in rice and rice bran from Kirinyaga, Kisumu, and Kwale counties. Findings will help farmers adopt better postharvest handling practices to reduce wastage and improve rice quality. Random and composite sampling methods were used to collect rice paddy samples, which were polished to separate the bran before laboratory analysis. Eighteen rice paddy samples (six per county) were cultured on Sabouraud's Dextrose Agar at 25°C and 37°C to assess fungal growth, and identified microscopically. Liquid chromatography-mass spectrometry (LC-MS/MS) was used to analyse Aflatoxins (B1, B2, G1, G2) and Fumonisins (B1, B2).

Results showed insignificant mycotoxin contamination across regions. No Aflatoxins were detected in rice grains, though Fumonisin B2 was found in one sample each from Kwale (174.5 ± 2.75 ppb) and Kirinyaga (166.8 ± 1.00 ppb), within East African Standards limits. Rice bran analysis revealed Aflatoxin B1 contamination in two Kwale samples (5.0 and 10.17 ppb). Fungal culture tests showed no growth, suggesting low contamination levels. The findings highlight improved postharvest handling and milling processes as key factors in minimising mycotoxin contamination.

This study provides crucial data on the safety of rice and rice bran, informing best practices for storage and processing. These results can enhance food safety, improve health outcomes, and support economic benefits for Kenyan rice farmers. Further research is recommended to assess the long-term effects of rice bran consumption on infant nutrition and explore its integration into local diets.

Keywords: Kenyan rice production, keywords: Mycotoxin contamination, Postharvest losses, Public health, Rice bran

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