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2022/2023 PhD Thesis Abstract

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RT: Assessment of Conventional and Improved Postharvest Practices on Fungal Diversity and Mycotoxins in Rice (*Oryza sativa* L.) Produced in South-West, Nigeria

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AB: Rice (*Oryza sativa* L.) is produced and processed in Nigeria through the conventional and improved postharvest process chains. Inadequate drying and poor storage, predispose rice to fungal and mycotoxin contamination. There is sparse data on fungal and mycotoxin contamination in the rice process chains in Nigeria. Providing such data will aid in identifying effective mycotoxin control approaches for rice processing in the country. This study comparatively assessed the impact of conventional and improved postharvest practices on fungal diversity and mycotoxin contamination in rice from South-West, Nigeria.

The study adopted an experimental design. A total of 100 rice samples (10 kg each) were collected at the winnowing, drying, milling, 30 and 60 days storage stages, between December 2020 and November 2021. Fifty of the samples were produced in Ogun State by conventional postharvest practices and stored in jute bags while the other 50 were produced in Ekiti State using improved postharvest practices and stored in GrainPro bags. Moisture content, mycological and mycotoxin analyses were conducted on the rice samples using the oven-drying method, the polyphasic approach and liquid chromatography tandem mass spectrometry, respectively. Descriptive statistics and t-test were computed for moisture content and viable fungal count, while data on mycotoxins in rice were subjected to F-test at $p < 0.05$.

Moisture levels were generally higher, but not significantly different, in rice processed and stored conventionally (5–33%) than in the improved (2–20%) process chain. The mean

viable fungal count was significantly higher in conventionally processed rice stored in jute bags after 60 days (2.6 Log₁₀ colony forming unit/gram) compared to rice from the improved process chain after 60 days storage in GrainPro bags (0.8 Log₁₀ colony forming unit/gram). A total of 301 fungal isolates were recovered from the two rice process chains and identified as 20 genera and 48 species. Conventionally processed rice contained more fungal species than rice from the improved process chain, and *Aspergillus chevalieri* (17.4%) and *A. flavus* (46.7%) dominated respectively. A unique chemotype strain of *A. niger* producing fumonisins B₂ and B₄ was found in rice from the improved process chain. *Penicillium ezekieli* sp. nov. from conventionally processed rice was described. Sixteen mycotoxins were detected in rice and zearalenone was the most prevalent in the conventional (92%) and the improved (90%) process chains. The mean concentrations of total aflatoxin, nivalenol and zearalenone were significantly higher ($p < 0.05$) in rice at different processing stages, from drying till 60 days storage, of the improved process chain compared to the conventional process chain. However, GrainPro bags reduced fumonisin B₁ and nivalenol concentrations in 60 days stored rice by 64% and 48% compared to 52% and 0% reductions by jute bags, respectively.

In conclusion, conventional postharvest practices are better at reducing mycotoxins during rice processing whereas improved postharvest practices using GrainPro bags are better at limiting viable fungal growth and mycotoxins in storage. The study recommended that local rice processors should incorporate hermetic storage such as GrainPro bags into conventional postharvest rice processing to minimize fungi and mycotoxin accumulation.

Keywords: GrainPro bags, Moulds, Mycotoxins, *Penicillium ezekieli*, Postharvest practices, Rice processing

Word Count: 500

Abbreviations: *RFN: Researcher's Full Name, RD: Researcher's Department, RS: Researcher's School, RE: Researcher's Email, RAE: Researcher's Alternate Email, RP: Researcher's Phone Contact, RT: Registered Title, MS: Main Supervisor, ME: Main Supervisor's E-mail Address, SP: Main Supervisor's Phone Contact, CS: Co-Supervisor, CE: Co-Supervisor's E-mail Address, CP: Co-Supervisor's Phone Contact, AB: Abstract*

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