



Tropentag, September 11-13, 2024, hybrid conference

“Exploring opportunities ...  
for managing natural resources and a better life for all”

## Mycotoxin concentrations in rice are affected by chalkiness, grain shape, processing type and grain origin

ERASMUS TANG<sup>1</sup>, SALI ATANGA NDINDENG<sup>1</sup>, GEOFFREY ONAGA<sup>1</sup>, ORTEGA-BELTRAN ALEJANDRO<sup>2</sup>, FALADE TITILAYO<sup>2</sup>, EMMANUEL DONKOR<sup>3</sup>, MICHAEL FREI<sup>3</sup>

<sup>1</sup>*Africa Rice Center (AfricaRice), Côte d'Ivoire*

<sup>2</sup>*International Institute of Tropical Agriculture, Nigeria*

<sup>3</sup>*Justus Liebig University Giessen, Inst. of Agronomy and Plant Breeding, Germany*

### Abstract

Mycotoxins, especially those with carcinogenic potency, such as aflatoxin, fumonisin and zearalenone, as well as those with antinutritional effects, such as deoxynivalenol, are public health hazards. These problems are accentuated where food management practices, food quality control and regulatory systems from farm to plate are weak. Information on the prevalence of these mycotoxins in rice commercialised in markets in sub-Saharan Africa (SSA) is limited. The present study examined aflatoxin concentrations in 527 rice samples collected from 54 markets in five SSA countries in relation to grain quality characteristics, processing methods, and the origin of samples. Overall, 72% of the samples had detectable aflatoxin levels ranging from 3.0 to 89.8 ppb. Approximately 47% of the samples had total aflatoxin concentrations above 4 ppb [maximum residual limit (MLR) based on the European Union Standards] and were evaluated for co-occurrence with fumonisin, zearalenone, and deoxynivalenol. Multivariate analysis revealed that length to width ratio ( $p < 0.0001$ ), mixed variety for width ( $p = 0.04$ ), and chalkiness ( $p = 0.009$ ) significantly influenced aflatoxin concentrations. Domestic rice had greater ( $p < 0.0001$ ) aflatoxin levels than did imported rice. The aflatoxin levels in white rice were greater than those in brown ( $p = 0.02$ ) and parboiled rice ( $p = 0.07$ ). Slender grains had greater aflatoxin concentrations than did bold and medium grains ( $p < 0.0001$ ). Total aflatoxin co-occurred with fumonisin and zearalenone in 18 and 40% of the samples respectively. None of the positive fumonisin samples exceeded 1 part per million (ppm) MRL while 30% of the positive zearalenone samples had concentrations exceeding the MRL of 75 ppb. These results revealed that almost 50% of domestic and imported rice traded in SSA is at risk of being contaminated with mycotoxins if nothing is done. Possible strategies to mitigate mycotoxin contamination in rice include improving grain quality traits that might positively affect mycotoxin levels, employing improved management practices, especially proper drying and hermetic storage before and after milling. These findings provide valuable insights for both domestic and international actors in establishing and reinforcing regulations and management systems to mitigate mycotoxin contamination of rice.

**Keywords:** Africa, commercial samples, mycotoxin, processing method, rice quality, storage