

Quantitative Determination of Aflatoxin B₁ Levels in Rice Grains Using Enzyme-Linked Immunosorbent Assay validated method in Kenya

Introduction

- ❖ Mycotoxins are the fungal toxins, most concern to public health, associated with severe health problems when ingested, inhaled or absorbed
- ❖ These severe health complications are acute toxic, carcinogenic, mutagenic teratogenic, and estrogenic effects [1]
- ❖ AFs are known as the most toxic with significant impact of economic burden to agriculture and consumers [2]
- ❖ Rice is important staple food consumed widely, there are few reports on the occurrence of the aflatoxin B₁ in rice grains compared to other cereals in Africa.
- ❖ In Sub-Saharan Africa (SSA), the mostly consumed food is rice and who's its demand is rapidly growing, mainly driven by urbanization
- ❖ AFs are produced by several species of *Aspergillus* belonging to sections *A. flavi*, *A. Ochraceorosei* and *A. Nidulantes* [3]
- ❖ Aflatoxin B₁ appears nearly with aflatoxin B₂, aflatoxin G₁, and aflatoxin G₂, and it is the analyte with the highest toxic significance
- ❖ The distribution of hepatocellular carcinoma attributable to aflatoxin exposure is highest in Africa with 40 % of liver cancer incidences

Statement of the Problem

- ❖ In SSA, 25,000 hepatocellular carcinoma related deaths happen frequently due to ingestion of aflatoxins through contaminated foods
- ❖ 215 recognized deaths among 317 persons who ingested maize with a high levels of aflatoxin infestation in Kenya
- ❖ Recently, acute aflatoxicosis due to ingestion of aflatoxin in Tanzania reported 14 fatalities
- ❖ The control of AFs is difficult due to their stability molecules and heat able in dried products
- ❖ AFs can withstand the foodstuffs processing and could remain alongside the food chain
- ❖ Therefore, AFs are considered as potential challenge and threat to human health and livestock

Objectives

Hence, the aim of this study was to investigate with emphasis of aflatoxin B₁ levels occurrence in rice samples sold in markets in order to ensure safety of this product for human and animal consumption as the flagship aflatoxin for being the most toxic and widespread

Conclusion

- ❑ 43.1 % of examined samples were positive in which 15.9 % for local rice and 27.2 % of imported rice, respectively, and 11.3 % of examined samples are above the maximum tolerable limits of aflatoxin B₁ in rice established by European Union particularly 2 µg/kg for AFB₁ in rice
- ❑ The concentration of aflatoxin B₁ in examined samples ranged from 0 µg/kg to 3.2 µg/kg
- ❑ These results are indicative of exposure of the population to aflatoxin and possible health hazard.

References

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Results

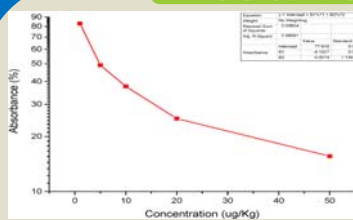


Figure 1. Standard curve of aflatoxin B₁ (R² = 0.96061).

Table 1: Occurrence and level of aflatoxin B₁ in rice grains

Source of Sample	No of Samples	Sample Status		Concentration of Aflatoxin B ₁ (µg/Kg)			Accepted levels <2µg/Kg (Commission Regulation No. 1881/2006)
		Positive	Negative	0	<1	>1	
Local	25 (56.8%)	07 (15.9%)	18 (40.9%)	17 (58.6%)	06 (13.6%)	02 (4.5%)	
Imported	19 (43.2%)	12 (27.2%)	07 (15.9%)	08 (28.2%)	08 (28.2%)	03 (6.8%)	
Total	44 (99.999%)	19 (43.2%)	25 (56.8%)	25 (56.8%)	14 (31.8%)	05 (11.3%)	

Methods

- 44 samples collected were analyzed using ELISA kit according to the Official Control of Mycotoxins in Food
- Preparation of samples and ELISA test was performed according to the method described by R-Biopharm GmbH
- Absorbance values of the standards, and samples tested were calculated in line with manufacture's instruction.

- Figure 1, presents the standard curve of aflatoxin B₁ generated from the absorbance values of the standards, and samples in the system
- 19 samples of rice examined were contaminated by aflatoxin B₁ as shown in table 1, 31.8 % are below accepted levels, however, 11.3 % are above accepted levels
- Concentration of aflatoxin B₁ in examined samples ranged from 0 µg/kg to 3.2 µg/kg
- More than 43.1 % of examined samples were positive in which 15.9 % for local rice and 27.2 % of imported rice
- Our results agree with those reported by Nurshad [4] who reported aflatoxins in rice worldwide occurrence, and public health perspectives during the period from 1990 to 2015

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