Global Journal of Science Frontier Research
Agriculture and Veterinary Sciences
Volume 12 Issue 10 Version 1.0 Year 2012
Type : Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4626 & Print ISSN: 0975-5896

Levels of Aflatoxins in Some Agricultural Commodities Sold at Baboko Market in Ilorin, Nigeria

By Arowora. K.A., Abiodun, A.A., Adetunji, C.O., Sanu, F.T., Afolayan, S.S, & Ogundele, B.A.

Nigerian Stored Products Research Institute, Ilorin

Abstract - This study was carried out to investigate the levels of aflatoxins in some agricultural commodities sold at Baboko market in Ilorin. The agricultural commodities were grains, root and tuber products, onions, cray-fish and stock-fish. Aflatoxin B1 (AFB1) in grains ranged between 2.57±0.61 in wheat and 21.72±2.92 ppb in sorghum, while AFB2 ranged between 0.46±0.23 and 6.66±2.11 ppb in all the samples investigated. Varying levels of AFB2, AFG1 and AFG2 were detected in grain samples. AFB1concentrations in root and tuber were: 5.66±1.69 ppb in yam chips and 4.20±0.90 ppb in cassava chips, whereas AFB2 was observed to be 2.97±1.69 and 1.58±0.30 ppb respectively. AFG1 concentration in yam chips was 3.52±0.24 ppb while that of cassava chips was 4.80±0.31ppb. Cumulative higher levels of aflatoxins B were observed for onion samples when compared to aflatoxin G. It was generally observed that stock-fish had higher levels of aflatoxins when compared to cray-fish with exception of AFG2 in cray-fish which was higher than that of stock-fish.

Keywords : *aflatoxins, agricultural commodities, levels, market.*

GJSFR-D Classification: *FOR Code: 070399*

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Strictly as per the compliance and regulations of :

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Arowora. K.A. α, Abiodun, A.A. σ, Adetunji, C.O. ρ, Sanu, F.T. Ѡ, Afolayan, S.S ¥, & Ogundele, B.A. §

Abstract - This study was carried out to investigate the levels of aflatoxins in some agricultural commodities sold at Baboko market in Ilorin. The agricultural commodities were grains, root and tuber products, onions, cray-fish and stock-fish. Aflatoxin B1 (AFB1) in grains ranged between 2.57±0.61 in wheat and 21.72±2.92 ppb in sorghum, while AFB2 ranged between 0.46±0.23 and 6.66±2.11 ppb in all the samples investigated. Varying levels of AFB2, AFG1 and AFG2 were detected in grain samples. AFB1concentrations in root and tuber were: 5.66±1.69 ppb in yam chips and 4.20±0.90 ppb in cassava chips, whereas AFB2 was observed to be 2.97±1.69 and 1.58±0.30 ppb respectively. AFG1 concentration in yam chips was 3.52±0.24 ppb while that of cassava chips was 4.80±0.31ppb. Cumulative higher levels of aflatoxins B were observed for onion samples when compared to aflatoxin G. It was generally observed that stock-fish had higher levels of aflatoxins when compared to cray-fish with exception of AFG2 in cray-fish which was higher than that of stock-fish.

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I. Introduction

Aflatoxins are secondary metabolites produced by some strains of Aspergillus flavus and Aspergillus parasiticus. Aflatoxin B1 is the most toxic of the aflatoxins. It causes a variety of adverse effects in different domestic animals. Effects on chickens include liver damage, impaired productivity and reproductive efficiency, decreased egg production in hens, inferior egg shell quality, carcass quality and most importantly from human perspective, increase susceptibility to diseases. Aflatoxin contamination of various food stuffs and agricultural commodities is a major problem in the tropics and sub-tropics where climatic conditions, agricultural and storage practices favour the growth and aflatoxin production by *Aspergillus flavus* and *Aspergillus parasiticus* – the main aflatoxin producers.

Aflatoxins are being consumed daily by the populace especially in developing and under-developed economies since most food stuffs are transported from the farm to the market without proper inspection of produce by the regulatory agencies and this puts everyone at risk of the dangers of aflatoxins.

Various researchers have reported high levels of aflatoxins (5000 µg/Kg) in groundnuts and maize (Kumar *et al.*, 2008), 15 µg/Kg of G_1 in Brazil nuts (Oslen *et al.*, 2008), 600µg/kg in shea – nuts (Stephen, 1982), 45 µg /Kg in sesame paste (Feng-Qin-Li *et al.,* 2009), 45 µg /Kg in sesame paste (Feng-Qin-Li *et al.*, 2009), 97.5 µg/Kg in red pepper (Marin et al., 2008).

This study is therefore targetted at getting information on the levels of aflatoxins in some selected produce sold at baboko market in order to create awareness for the populace on the levels of aflatoxins in some commodities sold in our markets.

II. Materials and Methods

Samples of maize, sorghum, wheat, yam chips, cassava chips, onions, stock fish and cray fish were bought from Baboko market, blended (waring commercial) to powder.

a) Extraction of aflatoxins from maize, sorghum and onions

Extraction and purificattion of total aflatoxins in these samples was done by the method described by Atehnkeng *et al.*, (2008) for maize. 20g sample was blended with 100 ml methanol/water (70: 30) at high speed for 3 minutes. This was shaken for 30 minutes and filtered through whatman no 1 filter paper. Purification of aflatoxin was done by partitioning the filtrate with 10 ml distilled water and finally into 25 ml dichlormethane. The extracts were concentrated and detection of aflatoxins was done by spotting on HP-TLC plates which was developed in diethyl ether /methanol/water (96:3:1). Total aflatoxins was quantified with a spectrodensitometer by CAMAG (Wincats software).

b) Extraction of aflatoxins from yam chips and cassava chips and wheat

Extraction and purification of total aflatoxins in samples was carried out by the method described by Adegoke et al., (1993) using high performance thin layer chromatography (HP-TLC). 20 g of samples was extracted with 100 ml methanol/water (85:15 v/v). The samples were blended at high speed for 3 minutes. This

Author α σ ρ Ѡ ¥ § : Nigerian Stored Products Research Institute, Ilorin, Kwara state, Nigeria. E-mails : charliguitar@yahoo.com, Arowora2001@yahoo.com, aaabiodun@yahoo.com, charliguitar@yahoo.com, sademii@yahoo.com, sunsteve01@yahoo.com, bukkyma200@yahoo.com

was shaken for 30 minutes and filtered through whatman no 1 filter paper. Purification of aflatoxins was done with 40 ml 10% NaCl, and 25 ml n-hexane and finally into 25 ml dichloromethane. The extracts were concentrated and detection of aflatoxins was done by spotting on HP-TLC plates which was developed in diethyl ether /methanol/water (96:3:1). Total aflatoxins was quantified with a spectrodensitometer by CAMAG (Wincats software).

c) Extraction of aflatoxins from stock fish and cray fish

Extraction and purification of total aflatoxins in samples were carried out by the method described by Hassan et al., (2011) using high performance thin layer chromatography (HP-TLC). 20 g of samples was extracted with 100 ml acetone/water (50:50 v/v). The samples were blended at high speed for 3 minutes. This was shaken for 30 minutes and filtered through whatman no 1 filter paper. Purification of aflatoxins was done with 40 ml 10% NaCl, and 25 ml n-hexane and finally into 25 ml dichloromethane. The extracts were concentrated and detection of aflatoxins was done by spotting on HP-TLC plates which was developed in diethyl ether /methanol/water (96:3:1). Total aflatoxins was quantified with a spectrodensitometer by CAMAG (Wincats software).

III. Results and Discussion

Table 1 : Levels of Aflatoxins in Agricultural Commodities.

Sample	AFB_1	AFB_2	AFG_1	AFG_2
Maize	9.67$\pm$ 1.67	4.41$\pm$ 0.19	3.67$\pm$ 1.26	0.61$\pm$ 0.30
Sorghum	21.72$\pm$ 2.92	1.77$\pm$0.49	6.21$\pm$1.83	2.10$\pm$ 0.82
Wheat	2.57$\pm$ 0.61	1.70$\pm$ 0.76	4.52$\pm$ 0.61	18.02$\pm$ 9.03
Stock fish	3.14$\pm$ 0.35	6.66$\pm$ 2.11	10.61$\pm$ 2.74	1.04$\pm$ 0.14
Cray fish	1.66$\pm$ 0.75	3.06$\pm$ 0.45	6.42$\pm$ 0.38	4.19$\pm$ 2.62
Onions	1.89$\pm$ 0.68	0.46$\pm$ 0.23	0.52$\pm$ 0.21	0.27$\pm$ 0.24
Yams chips	5.66$\pm$ 0.97	2.97$\pm$ 1.69	3.52$\pm$ 0.24	--
Cassava chips	4.20$\pm$ 0.90	1.58$\pm$ 0.30	4.80$\pm$ 0.31	7.48$\pm$ 2.26

(--) means not detected

Table 1 shows the levels of aflatoxins in commodities investigated. The cumulative total aflatoxins in this study were : 18.36 ppb in maize, 31.80 ppb in sorghum, 26.81 ppb in wheat, 21.45 ppb in stock fish, 15.33 ppb in cray fish, 3.14 ppb in onions, 12.15 ppb in yam chips and and 18.06 ppb in cassava chips. The values obtained for sorghum, wheat and stock fish were higher than the regulatory limits of 20 ppb recommended by USFDA for agricultural commodities, while the values obtained for other commodities were within the range recommended by USFDA. Although, slightly higher values were observed in this study for some agricultural commodities, such as sorghum, wheat and stockfish.These values were still lower than 5000ppm reported in groundnuts and maize by Kumar et. al.,(2007). With this observation, there is need to sensitize market women/commodity traders on good postharvest handling practices with the view of reducing the levels of aflatoxins in agricultural commodities sold in our markets. Maize is a major food crop in Nigeria and just like groundnut, it is highly susceptible to aflatoxin contamination. The total aflatoxins in maize in this study was18.36 ppb. This is similar to the work carried out by Opadokun and Ikeorah (1989) who found that 50% of the maize samples procured from Apomu market had values lower than 20 ppb.

IV. Conclusion

The results of this study revealed that some agricultural commodities sold in our markets have higher levels than 20 ppb recommended USFDA levels. Therefore, there is need to create awareness by sensitizing the commodity traders and the populace on the dangers associated with the consumption of high levels of aflatoxins in agricultural commodities.

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