AFLATOXIN CONTAMINATION ACROSS SOME SELECTED POULTRY FARMS AT MALUMFASHI LOCAL GOVERNMENT AREA OF KATSINA STATE

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ABSTRACT
This study was conducted to assess the level of Aflatoxin B_1(AFB1) contamination in poultry eggs, feeds and litters collected from six (6) randomly selected farms at Malumfashi Local Government Area of Katsina State. A total of number of 36 samples were analysed for AFB_1. This comprised of three (3) feeds samples and three (3) eggs samples were collected from each farm. The AFB_1concentrations (µg/kg) in all the samples was analysed using ELISA kits. The *Aspergillus flavus* was the most prevalent Fungus followed by *Aspergillus niger*. The mean concentration of AFB_1 in poultry feeds was 15.93±1.53 µg/kg and the least was 5.27±1.31 µg/kg. Approximately 83% of the feed samples were having AFB_1 contamination above 5.00 µg/kg as recommended by FAO for animal feeds. Thus, farmers should frequently test their livestock feeds for aflatoxins and eggs should also be properly screened before consumption.

Keywords: Fungi, Aflatoxin, Poultry eggs, Malumfashi

INTRODUCTION
Mycotoxins cause illness and mortality in domestic animals fed moldy feedstuffs. These acute intoxications can have devastating effects and are difficult to diagnose and treat because the suspect feed may be consumed before it can be tested (CAST, 2003). It has been estimated that more than five billion people in developing countries worldwide are at risk of chronic exposure to aflatoxins through contaminated foods (Strosnider *et al*., 2006). In many parts of Africa, the need to eat outweighs other considerations such as food safety, and as such, this has made food-borne intoxications to be a serious problem in many respects. It was reported that about 40% of the productivity in birds was lost to diseases in developing countries but was most likely due to diseases exacerbated by aflatoxins (Bennett, 2003). Darwish *et al*.(2014) reported that aflatoxins are the most common mycotoxins (43.75%) in Africa followed by fumonisin (21.87%), ochratoxins (12.5%), zearalenone (9.38%), deoxynevalenol (6.25%) and beauvericin (6.25%). Darwish *et al*.(2014) reported that there is high levels of aflatoxin in samples collected from several African countries including South Africa, Lesotho, Egypt, Tunisia, Morocco, Sudan, Tanzania, Zambia, Uganda, Kenya, Ethiopia, Nigeria, Ghana, Benin, Mali, Togo and Bourkina Faso. Aflatoxin B_1 have been given considerable attention because of their demonstrated carcinogenic potential and hepatotoxic effects in both humans and animals (Fouad *et al*., 2019; Negash, 2018; Daodu and Adebowale, 2016). There has not been sufficient report on aflatoxin contamination in poultry feeds and eggs at Malumfashi local government area of Katsina State. Thus, this study provided a baseline data on aflatoxin contamination in poultry feeds and eggs produced by poultry farmers in Malumfashi Local Government Area of Katsina State.

MATERIALS AND METHODS
Study location
Malumfashi is one of the notable Local Government Areas of Karadua Zone, Katsina State of Nigeria. It is located at 11°48′N 7°37′E11.800°N 7.617°E, with a total area of 674 km2 (260 and a population of 182,920 (NPC, 2006).

Sampling method

In this study 18 industrial eggs and 18 feeds samples from 6 different poultry farms (randomly selected out of 66 farms) with 3 replicates (in each replicate 3 eggs and 3 feed samples). Aflatoxin-B1 concentration in these samples was determined via ELISA techniques.

Aflatoxin b_1 determination procedures materials used

Microplate of 96 wells; Micropipette; Weighing balance; Incubator with in-build digital shaker; Laboratory Blender; Conical flasks; Beakers; pH meter; Measuring cylinder; Filter paper; Voxtex mixer; Pipette tips; ELISA Reader (BIO-RAD); Magnetic Stirrer; Orbit-Shaker

Aflatoxin B_1 quantification procedures

The quantification of aflatoxin B_1 was done using ELISA technique following the protocol.

RESULTS AND DISCUSSION

The distribution of the fungal isolated from the feed samples is presented in Table 1. The result showed that the feed samples were infected more with Aspergillus *flavus* with 94.4% followed by *Aspergillus niger with* 61.1% while the occurrence of *Penicillium* was found to be the least (33.3%). These findings are similar with those reported by D'Mello (2004) and Sivakumar *et al*. (2014). This might be due to the use of infected feed ingredients and feed storage system. *Aspergillus spp* are known to thrive better in high temperature and humidity (D'Mello, 2004).

Table 1: Distribution of isolated fungi from feed samples across the selected farms

Farms	No of samples	Fungi Isolated from feed samples				
		Aspergillus niger	***Aspergillus flavus***	***Fusarium***	***Penicillium***	***Rhizopus***
A	3	1	3	2	1	2
B	3	1	3	2	1	0
C	3	1	3	1	2	2
D	3	2	2	3	1	0
E	3	3	3	0	1	2
F	3	3	3	0	0	2
Total	18	11	17	8	6	8

Figure 1 above shows the level of AFB_1 contamination across the feed samples that were analysed. The highest mean concentration of AFB_1 was detected in Farm A with about 15.93µg/kg (±1.53 µg/kg) and followed by Farm C with a mean concentration of 15.47 µg/kg (±2.46 µg/kg). Farm F has the least AFB_1 concentration with a mean of 5.27 µg/kg (±1.31 µg/kg). These variations might be as a result of differences in the feed ingredients and their feed management systems. Similar levels of AFB_1 contamination in animal feeds have been reported from different parts of the world (Pereira *et al.*, 2019). Kana *et al*. (2013) also reported AFB_1 concentration of 2 – 23 µg/kg for layer feeds and 2 – 52 µg/kg for broiler feeds in Cameroun.

Figure 1: **shows the level of AFB_1 contamination across the feed samples**

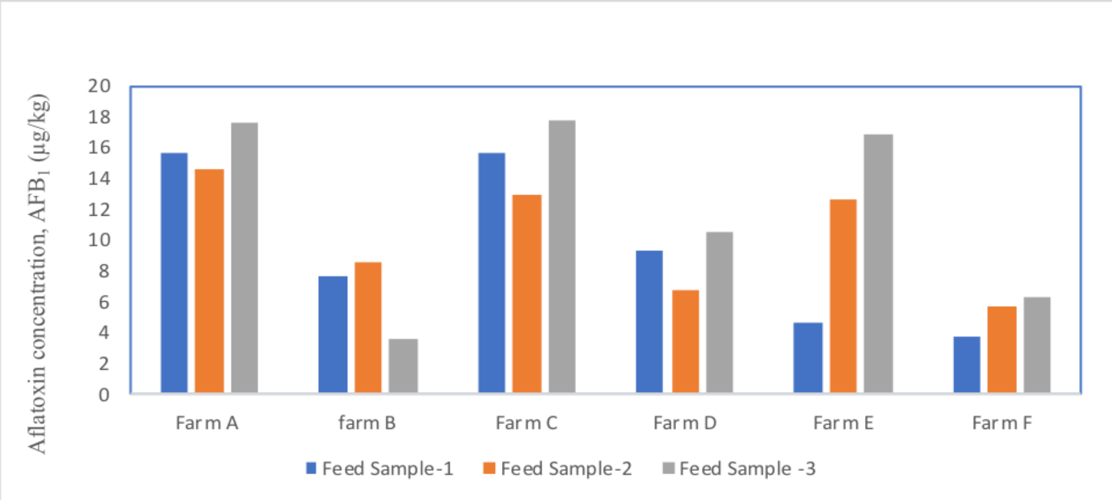

Table 2 shows the distribution of isolated fungi from egg shell swabs across the selected farms in Malumfashi. *Aspergillus flavus* had the highest occurrence (88.9%) in the egg shell while the least obtained was *Penicillium* with 16.7%. This contamination of the egg shells might be as a result of the contact between the eggs and feeds after laying. Similarly, Eggshell contamination may be initiated due to the conditions of egg acquisition, that is, the quality of straw and feed, the presence of dust, temperature and moisture (Lukasz *et al.*, 2018). We can suppose that the eggs produced in the deep litter indoor housing, free-range or even organic systems are at the highest risk of contamination with microscopic fungi

Table 2: Distribution of isolated fungi from egg shell swabs across the selected farms in Malumfashi

Farms	No of samples	Fungi Isolated from egg shell swabs				
		Aspergillus niger	**Aspergillus flavus**	**Fusarium**	**Penicillium**	**Rhizopus**
A	3	2	3	3	1	0
B	3	3	2	2	1	2
C	3	1	2	1	0	0
D	3	1	3	2	1	0
E	3	0	3	0	0	3
F	3	1	3	0	0	3
Total	18	8	16	8	3	8

CONCLUSION AND RECOMMENDATIONS

Aspergillus flavus was found to be the most predominant Fungus contaminating poultry feeds and commercial table eggs. The highest mean concentration of AFB_1 obtained in this study was 15.93µg/kg (±1.53 µg/kg) and the least was 5.27 µg/kg (±1.31 µg/kg) for the poultry feed samples. Poultry farmers should check their feeds for moulds before offering them to their livestock and eggs should be properly screened for aflatoxin contamination before selling them to consumers. More research is still needed to developed a general regulation template for an acceptable level of Aflatoxin in eggs and poultry feeds.

REFERENCES

Bennett, J.W. and Klich, M. (2003). Mycotoxins Clin. Microbiology Review, 16: 497–516, No. 30893-8512/03/$08.000 DOI: 10.1128/CMR.16.3.497–516.200.

CAST (2003). Mycotoxins: risks in plant, animal and human systems, Task Force Report No. 139 CAST, Ames, IA.

D'Mello, J.P.F. (2004). Microbiology of animal feeds. Retrieved December 6, 2019, from http://www.fao.org/tempref/docrep/fao/007/y5159e/y5159e03.pdf

Daodu, O. B., and Adebowale, T.K. (2016). Aflatoxin in Commercial Poultry Feeds and Clinico-Pathological Manifestation of Aflaxoxicosis in Poultry in Southwest, Nigeria. *Nigerian Veterinary Journal*, 37(2):109–116.

Darwish, W.S., Ikenaka, Y., Nakayama, S.M.M. and Ishizuka, M. (2014). An overview on mycotoxin contamination of foods in Africa. *Journal of Veterinary Medical Science*, 76(6):789–797. https://doi.org/10.1292/jvms.13-0563

Fouad, A.M., Ruan, D., El-senousey, H.K.., Chen, W., Jiang, S. and Zheng, C. (2019). Harmful Effects and Control Strategies of Aflatoxin B 1 Produced by Aspergillus flavus and Aspergillus parasiticus Strains on Poultry :Review 1,1–21. https://doi.org/10.3390/toxins11030176

Kana, J.R., Gbemenou, B., Gnonlonfin, J., Harvey, J., Wainaina, J., Wanjuki, I. and Teguia, A. (2013). Assessment of Aflatoxin Contamination of Maize, Peanut Meal and Poultry Feed Mixtures from Different Agroecological Zones in Cameroon. Pp.884–894. https://doi.org/10.3390/toxins5050884

Łukasz, T., Łukasz, S., Monika, U., Tomasz, S., Renata, C. and Kinga, S. (2018). Characterisation of the Mycobiota on the Shell Surface of Table Eggs Acquired from Different Egg-Laying Hen Breeding Systems. *Oxins Baseline*, 10(7): 293.

National Population Commission (NPC), *(2006). Population Census of the Federal Republic of* Nigeria (Abuja, Nigeria: NPC, 2006): 6.

Negash, D. (2018). Journal of Applied Microbiological Research A Review of Aflatoxin : Occurrence , Prevention , and Gaps in Both Food and Feed Safety, 1.

Pereira, C.S., Cunha, S.C. and Fernandes, J.O. (2019). Methods, Prevalent Mycotoxins in Animal Feed: Occurrence and Analytica. MDPI, 11(5):290. https://doi.org/doi:10.3390/toxins11050290

Sivakumar, V.K., Singaravelu, G. and Sivamani, P. (2014). Original Research Article Isolation , Characterization and Growth Optimization of Toxicogenic Molds from Different Animal Feeds in Tamilnadu. *International Journal of Current Microbiology and Applied Sciences*, 3(9):430–445.

Strosnider, H., Azziz-Baumgartner, E., Banziger, M., Bhat, R.V., Breiman, R., Brune, M., DeCock, K., Dilley, A., Groopman, J., Hell, K., Henry, S.H., Jeffers, D., Jolly, C., Jolly, P., Kibata, G.N., Lewis, L., Liu, X., Luber, G., McCoy, L., Mensah, P., Miraglia, M., Misore, A., Njapau, H., Ong, C., Onsongo, M.T.K., Page, S.W., Park, D., Patel, M,, Phillips, T., Pineiro, M., Pronczuk, J., Schurz Rogers, H., Rubin, C., Sabino, M., Schaafsma, A., Shephard, G., Stroka, J., Wild. C., Williams, J.T. and Wilson, D. (2006). Workgroup Report: Public health strategies for reducing aflatoxin exposure in developing countries. *Environmental Health Perspectives*, 114: 1903-1989.