AFLATOXIN LEVELS IN FISH FEEDS IN ABEOKUTA, OGUN STATE, NIGERIA

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ABSTRACT
Post harvest contamination can occur if drying of feed is delayed and when water is allowed to exceed critical values for mould to grow during storage. This study examined the aflatoxin levels in fish feeds surveyed in Abeokuta, Ogun State, Nigeria. Fifteen (15) fish farms were randomly selected for assessment of the aflatoxin levels in fish feeds in Abeokuta. After the estimation of the aflatoxin levels using Veratox quantitative aflatoxin test, the Aflatoxin concentrations in the samples ranged between 0-49 ppb with a mean value of 6.89 ppb. Results obtained from this study showed that aflatoxins were found to be associated with fish feeds in different fish farms in Abeokuta, but, a very high proportion of the feed samples were below the regulatory levels (maximum of 20 ppb) that may not be toxic to the health of the fish according to the regulatory levels for aflatoxins issued by the Food and Administration of the United States. Thus, feeds fed to the cultured fish species in farms in Abeokuta were fit for consumption, with very little or no threat of aflatoxicosis (a disease that can affect many species of fish, when feed contaminated with aflatoxin is consumed).
Keywords: Fish feeds, Aflatoxin, Aflatoxicosis, Aspergillus species

INTRODUCTION
Aflatoxin is a toxic compound produced by *Aspergillus flavus* and *A. parasiticus*. The molds can grow in improperly stored feeds and feeds with inferior quality of ingredients. These toxins have been incriminated as the cause of high mortality in livestock and in some cases of death in human beings. Aflatoxin B1 is known to be the most significant form that causes serious risk to animals and human health (Murjani, 2000). For long, fungi were regarded as causing only anesthetics spoilage of food. But during 1966, when the famous "Turkey X" diseases killed 10,000 turkey poultry in Great Britain. The cause of the disease was due to toxins in peanut meal infected with *Aspergillus flavus* (Wyllie *et al.*, 1978). Western world became aware that common spoilage molds could produce significant of toxigenic fungi and potentially toxic compounds have been discovered. Aflatoxins, a group of toxic metabolites produced by certain *Aspergillus species* have been found to be carcinogenic, tetratogenic and mutagenic to several species of experimental animals. Aflatoxicosis which is a disease that can affect many species of fish, results when feed contaminated with aflatoxins is eaten by fish. Initial findings associated with aflatoxicosis include pale gills, impaired blood clothing, anaemia, poor growth rates. Prolonged feeding of low concentration of AFB1 causes liver tumours, which appear as pale yellow lesions and can spread to the kidney. Increase in mortality may also be observed (Ashley., 1970). Aflatoxin occurs in a variety of crops and animal products, four major aflatoxins (AFB1, AFB2, AFG1, AFG2) are direct contaminants of grains and finished feeds. The conditions that contribute to fungal growth and production of aflatoxins are temperatures above 27°C and humidity levels greater than 62%, moisture content of 16% and above favourable substrate characteristics and factors that decrease the host's immunity such as insect damage. However, the Food and Drug Administration (FDA) of the United States regulatory levels for aflatoxin intake for humans and all animal species including fish is maximum of 20 ppb (Table 1). This study was therefore aimed at assessing aflatoxin levels in fish feeds in Abeokuta, Ogun state

Table 1: FDA Regulatory Levels for Aflatoxins

For	Level	Commodities
Humans	20 ppb	All foods such as meat, fish, except milk
All animal species	20 ppb	All feeds (exceptions below)
Exceptions:		
Breeding cattle Breeding swine Mature poultry	100 ppb	Corn
Finishing swine (>100lbs.)	200 ppb	Corn
Finishing beef cattle	300 ppb	Corn
Finishing beef cattle, swine, poultry	300 ppb	Cottonseed meal

Source: FDA (2011)

MATERIALS AND METHODS

Studies on Aflatoxin Levels in Fish feeds

A list of 450 farms was obtained from Ogun State Agricultural Development Programme (OGADEP), out of which Fifteen (15) farms were randomly selected for the assessment of the aflatoxin levels in the fish feeds in Abeokuta.

Sample Collection

Samples of fifteen (15) different fish feeds (pellet) were collected from the twelve different farms in Abeokuta and kept in sterile polythene bags. Each sample was tagged, after which they were taken to Zartech Veterinary laboratory, Ibadan for estimation of the levels of aflatoxin.

Aflatoxins Detection in Feed Samples

Veratox for Aflatoxin is a direct competitive ELISA in a microwell format which allows the user to obtain exact concentrations in part per billion (ppb). The collected samples (fish feeds) were ground into powdery form with the use of high-speed blender, thoroughly mixed together and made into composite, followed by weighing on an electronic scale. 5 grams of the representative sample was put into an extraction cup. 25ml of 70% methanol was added, the extraction cup was covered and shaked vigorously for 3 minutes, then the mixture was allowed to settle down. The extract was filtered by pouring 5ml through a Whatman #1 filter syringe, and filtrate was collected as a sample. The sample was now ready for testing. Free aflatoxin in the samples and controls are allowed to compete with enzyme-labelled aflatoxin (conjugate) for the antibody binding sites. After a wash step, substrate is added, which reacts with the bound conjugate to produce blue colour. More blue colour means less aflatoxin. The test was read in a microwell reader to yield optical densities of the controls from the standard curve, and the sample optical densities were plotted against the curve to calculate the exact concentration of aflatoxin.

Statistical Analysis

The result was read and calculated using Neogen's Veratox software, while Chi- Square test was used to

test for the significant level of the means.

RESULTS AND DISCUSSION

The result of the total aflatoxin concentrations expressed in part per billion (ppb) obtained from the fifteen fish feed samples collected from fifteen different fish farms in Abeokuta are shown in Figure 1. Aflatoxin concentrations of the fish feed samples ranged from 0 ppb to 49 ppb with a mean value of 6.89 ppb.

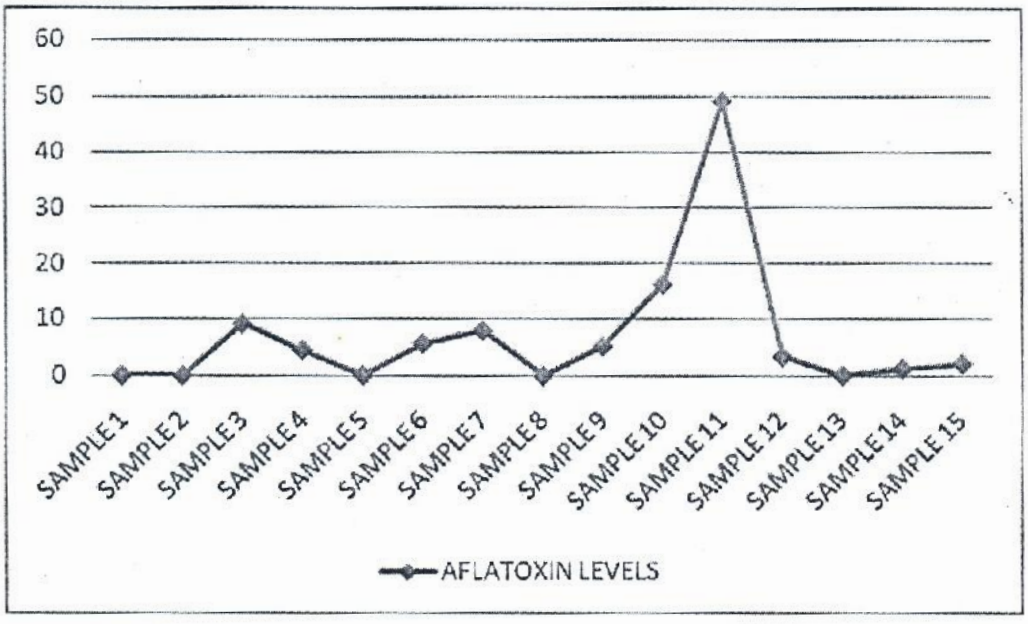

Figure 1: Aflatoxin Levels of the Fish Feed Samples

A high proportion of the feed were found to be below the regulatory levels for aflatoxins that may not be toxic to the health of the cultured fish species (The Food and Drug Administration (FDA) of the United States regulatory levels for aflatoxin intake for humans and all animal species including fish is maximum of 20 ppb) (FDA, 2011). The extracted fish feed samples produced bluish and greenish spots during laboratory analysis. Sharma (1992) reported that the two major metabolites of *Aspergillus sp.* called aflatoxins were designated B and G because they fluoresce blue (B) and green (G) when exposed to long-wave ultraviolet light. Aflatoxins have been reported in grapes in France (Sage *et al.*, 2002), edible nuts and nut products, milk and milk products (Prasad, 1992), bush mango seeds (Adebayo-Tayo *et al.*, 2006). Aflatoxins have been found to be one of the leading causes of high mortality of livestock, fish as well as poultry. Other clinical effects include suppression of immune system, reduced growth rate and reduction in feed efficiency. During storage of fish feeds and feed ingredients, good storage practices are not adhered to, hence stores are not well ventilated and pests can easily gain access into the stores. The environment in which fish feeds are kept for subsequent usage is not always ideal as a result of high moisture content. Since improper drying and storage of fish feeds may lead to insect infestation, fungal attack, fragmentation and degradation of the product, it is therefore advisable that feeds should not be stored for a very long time. When feeds are stored, they should be kept under good condition (in a cool and dry place) to avoid growth of fungi and pest infestation.

REFERENCES

Adebayo-Tayo, B.C., A.A. Onilude, C. Bukola, A. Abiodun and Ukpe, G.P. (2006). Mycofloral of Smoke-Dried Fishes Sold in Uyo, Eastern Nigeria. *World Journal of Agricultural Sciences*, 4 (3): 346-350.

Ashley, Laurence, M. (1970). Pathology of fish fed aflatoxins and other antimetabolites. Western Fish Nutrition

Laboratory. Bureau of Sport Fisheries and Wildlife, US Department of the Interior, cook, Washington.

FDA (Food and Drug Administration) (2011). Guidance for industry: Action levels for poisonous or Deleterious
Substances in Human food and Animal feed. http//www.fda.gov

Murgani, G. (2000). Aflatoxicosis in fish and its relevance to human health. Shaping the future, pp: 5668-5673.

Prasad, T. (1992). Detection of fungi in stored grains and estimation of mycotoxins in Seed pathology. In: Mathur,
S.B and Jorgensen, J. (Eds), Proceeding of the seminar. 20-25 June 1998, Copenhagen, Denmark, pp: 175-81.

Sage, L., S. Krivobok, E. Delbos, F. Scigle, and E.E. Creppy (2002). Fungal flora and ochratoxin Murands A
production in grapes and musts from France. *Journal of Agricultural and Food Chemistry*, 50: 1306.

Sharma, O.P. (1992). Textbook of fungi. Tata McGraw – Hill, New Delhi, India, pp: 160-161.

Wyllie, T. D. and Morchanse, L. G. (1978). Mycotoxin fungi, mycotoxins, mycotoxicosis. An Encyclopediea
Handbook. Vols. 1, 2 and 3. Marcel Dekker. Inc. New York.