International Journal of Agricultural Research and Food Production
ISSN: 2536-7331 (Print): 2536-734x (Online)
Volume 7, Number 2, September 2022
http://www.casirmediapublishing.com

Biosecurity for Agricultural Development: A Panacea for Preventing Aflatoxin from Predisposing Fish Feeds to Contaminants

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ABSTRACT
Aflatoxins is a causal organisms that causes a disease known as Aflatoxicosis. They are chemicals produced by some species of naturally occurring fungi (Aspergillus flavus and Aspergillus parasiticus) commonly known as moulds. Aflatoxin are common contaminants of oilseeds crops such as cottonseed, peanut meal, corn, wheat, sunflower, soybean, fish meal and nutritionally complete feeds can also be contaminated with fungal organism. The four major aflatoxin (AFB1, AFB2, AFG1 and AFG2) are direct contaminants of grains and finished feeds. It attacks FEEDS when stored in an environment with a temperature above 27^{0}C (80^{0}F), humidity levels greater than 62% and moisture levels in the feed above 14%. The researcher used fish feeds form 30 fish farmers inn Gboko Local Government Area of Benue State. The feeds were subjected to Afla Check test kit in order to ascertain the presence of aflatoxin. Temperature were determined using thermometer and the weight, length were also measured. Statistical analysis was used in order to determine the significance difference (p=0.05) at different levels of analysis.
Keywords: Biosecurity, aflatoxin, fugal organism, contaminants, Aspergillus parasaticus.

INTRODUCTION
Biosecurity: According to Wikipedia, Biosecurity are procedures or measures designed to protect the population against harmful biological or biochemical substances. In other words, Biosecurity refers to all the measures taken to minimize the risk of infectious diseases caused by viruses, bacterial or other micro-organism entering and establishing in the particular are and potentially harming the population, our food security and economy (Australian Biosecurity information; 2007). The increased use of plant origin ingredients in aqua feed formulation has intensified

the potential on set for Aflatoxicosis in fish farming system due to carry over of loads of contamination by vegetable sources.

Concentration of fish by fungi and their Mycotoxins poses major health concern to human and animals. Fungal diseases are the second most serious cause of losses in aquaculture. Several fungi affecting fish are considered opportunistic, i.e. to attack fish when they are stressed or immune-compromised because of unfavourable environmental conditions. Aflatoxi cause systemic disease with high mortality rates in fish, whereby their infections mostly occurs through contamination of fish feeds Urquhaut et al., (2016). Today, more than 400 different Mycotoxins are known. The common mycotoxins are Aflatoxins, which are highly carcinogenic,, causes hemorrhages, hepatotoxicity, nephrotoxicity, neurotoxicity, dermatitis, as well as immune suppressive effects e.g. decreased antibody and cytokine levels (Richard, 2007). New and safe antimicrobial agents are urgently needed to prevent ad overcome several fungal aquaculture losses. As a result of this many essential oils such as clove oil have antioxidant activity and anti-fungal properties (Pinto et al., 2009). In this study, the researcher investigated Aflatoxin infection in fish feeds.

Justification

The level of Bio-insecurity in our country in particular and the world at large predisposes most of grains or feeds substances to mycotoxicological attack such as Aflatoxin (AFB_1 AFB_2 AFG_1 and AFG_2). Going by the above fact, these researchers decided to embark on the study of the spread of the Aflatoxin in different fish farms this accrued as a result of high temperature due to poor ventilation in stores, and long term storage of fish feeds by some farmers. In light of the above fact there is need to define the right measures of storage conditions such as temperature range, moisture content and humidity. Again, the minimum level of Aflatoxin attack on feeds which is 20ppm should be notified.

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Study Area

Fidei Polytechnic Gboko, Aliede Road North. Its geographical coordinate are longitude 0.3004^{0}N and latitude 8.9465^{0}E.

Experimental Procedure

The data collected for this study was thirty three (33) farmers which were interview in Gboko North.

MATERIALS AND METHODS

A total number of 33 fish samples were obtained from individual fish farmers weighing 50g each. These samples were collected in sterile, clean and dry plastic bags and then transferred to Fidei Polytechnic Laboratory Gboko for the laboratory test such as moisture content and the present level of Aflatoxin. While temperature and moisture content was carried out with the aids of the thermometer and the laboratory chemical test for moisture (qualitative assessment). The Aflatoxin examination was carried out using RIDA SCREEN® fast Aflatoxin check test kit, which is a competitive enzyme immune assay for the quantitative analysis of Aflatoxin. The fish farmers were grouped into 3 i.e 11 fish farmers per group. The feed samples were grinded separately and packed into sterile clean, and dry plastic container. This experiment was conducted for the period of six weeks where the first group took 2 weeks, second group carried another 2 weeks and the third group 2 weeks respectively.

50g of each ground sample were transferred into an extraction mixing jar of 250ml and $\left(\frac{70}{30}\right)$ methanol/water extraction solvent were blended on high speed for 2min. filtrate were collected and divided with 1 ml of distilled water.

well	1	2	3	4	5	6	7	8
Sample	C_0	C_4	C_{10}	C_{20}	C_{50}	S_0	S_2	C_3

well	1	2	3	4	5	6	7	8
Sample	S_4	S_5	S_6	S_7	S_8	S_9	S_{10}	C_{11}

Where C_0, C_4, C_{10} C_{20} and C_{50} stands for 0ppb, 4ppb, 10ppb, 20ppb and 50ppb control respectively. While S_0 to S_{11} stands for sample 1 to 11. All the 33 feed samples were subjected to RIDA SCREEN® fast Aflatoxin test were multiplied by 2 to obtain the actual Aflatoxin concentration. Then true Aflatoxin values where obtained using the formula below;

The Aflatoxin value $= \frac{\text{Total Volume}}{\text{Initial Extract of Volume}} X$ Aflatoxin Result

Those values that were within the range of 1 to 20ppb read a negative result while those above 20 reads a positive result. Also, two fish were randomly selected from each farmer and the blood sample were collected with the aid of the syringe and introduced into the herperinized test tube for Heamatological analysis.

METHODOLOGY

The result obtained was analysed using statistical method (multiple bar chart) in order to interpret data.

Table 1: Showing the Effects of Aflatoxin on different group of Farmers

	Farmers in Group 1	Farmers in Group 2	Farmers in Group 3
1	20^N	28^P	17^P
2	18^N	21^P	26^P
3	15^P	33^P	24^P
4	21^P	42^P	18^N
5	28^P	26^P	38^P
6	26^P	20^N	31^P
7	12^N	18^N	20^N

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8	22P	15N	21P
9	26P	28P	19P
10	13N	38P	26P
11	26P	41P	35P

Key: P=Positive N=Negative

Table 2: Showing the Effect of Temperature ^{0}C on Fish Feeds

	Farmers in Group 1	Farmers in Group 2	Farmers in Group 3
1	28	31	26
2	27	28	27
3	30	32	28
4	28	27	29
5	25	29	27
6	23	28	26
7	29	32	28
8	34	34	31
9	29	29	27
10	27	36	26
11	36	33	33

Table 3: Showing the Humidity Level of the Feeds Store (%)

	Farmers in Group 1	Farmers in Group 2	Farmers in Group 3
1	64	61	72
2	62	68	75
3	82	63	55
4	48	66	75
5	68	72	62
6	80	76	65
7	75	63	68
8	54	70	82
9	48	65	74
10	68	48	56
11	72	58	48

Table 4: Showing the Effect of Moisture Content (%) on Fish Feeds

	Farmers in Group 1	Farmers in Group 2	Farmers in Group 3
1	18	16	22
2	15	24	18
3	21	24	23
4	17	19	14
5	12	15	19
6	21	23	23
7	21	24	22
8	15	14	12
9	8	16	18
10	13	15	12
11	14	17	10

RESULTS

The results I table 1 shows that the feeds sample collected from the 11th farmer had the highest level of Aflatoxin infection as 26^{P}, 41^{P} and 35^{P} for the first, second and third group of the experiment respectively. While the 7th farmer was having feed with Aflatoxin level of 12^{N} , 18^{N} and 20^{N} for first, second and third group respectively. There was no Aflatoxin infection in this farmer's feed sample. On the same table, the multiple bar charts shows that the fourth had the highest level of Aflatoxin of 42^{P} in the second group of the experiment. However, the result on table 2 shows that the 11th farmer had the highest temperature as 36^{0}C, 33^{0}C and 33^{0}C which coincides with the highest Aflatoxin infection on table 1 where farmer number 11 was having 26^{P}, 41^{P}, and 35^{P} respectively.

The above result has clearly indicated that, the higher the temperature the higher the level of Aflatoxin infection and vice versa.

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Table 5: Showing the Result of Haematological Analysis of the Blood Sample of the Cat Fish.

		Group 1	Group 2	Group 3
1.	PVC (Packed Cell Volume)	14.50	25.00	22.00
2.	Haemoglobin (g/d)	4.80	8.50	7.40
3.	Mean Corpuscular Haemoglobin (pictogram)	25.26	2.81	26.62
4.	Mean Corpuscular Haemoglobin Concentration	33.10	34.00	33.64
5.	Red Blood Cell Count (10^6mm^3)	1.90	3.02	2.78
6.	White Blood Cell Count (10^4mm^3)	3,400	6,020	4,750

Source: Fidei Polytechnic Biochemistry Laboratory (2018)

Furthermore Table 3 represents the level of humidity in the various stores of the farmers. In the table farmer number 3 was having the highest humidity in the store which shows that there was serious infection of Aflatoxin in his feed. That the more the humidity the infection of Aflatoxin in the feeds and vice versa. In the 4, the effect of the moisture content is more severe three (3) which is 21%, 24% and 23% respectively. It shows that the Aflatoxin attack was also greater on the feed of that same farmer. In table 5, the effect of Aflatoxin in the fish blood sample (that is the first farmer I group 2 is the highest, which means that Aflatoxin attack was wore severe in the feed of that farmer. Because, the more the effect of Aflatoxin in feeds the high the PVC of the blood sample, hence the slower the growth rate. Aflatoxin causes serious effects on the growth of fish (Urquhart K, 2016). On other hand the lower the level of Haemoglobin MCHC, Red Blood Cell and White Blood Cell in the higher the intensity of the Aflatoxin.

DISCUSSION

Effects of Aflatoxin in Aquaculture

According to Seher Dirican (2015), available data on the effect of Aflatoxin in aquaculture are very limited. Among all Aflatoxins, Aflatoxin B_1 (ABF_1) which is popularly known as Blue Aflatoxin is considered the most potent food-born hepatoxicant agent in unforeseen outbreaks of fish mortality attributed to Aflatoxicosis, well documented in freshwater species sine long time. Having studied the above result, the effect of Aflatoxin was seriously rested on the 11^{th} farmer in group in 1 of Table 1 with the Aflatoxin level of 26^{p} 41^{p} and 35^{p}. While farmer number 7 beared less risk of aflatoxin infection in his feed sample. In table 2, the 11^{th} farmer was having the most serious attack on his feed sample with the temperature range of (32%, 45% and 31%) While the 6^{th} farmer beared less effect. In group 3, the 1^{st}, 6^{th} and 10^{th} farmers beared less effect of Aflatoxin, While farmer number 8 and 11 beared the heaviest effects with the temperature range of $31^{o}C$ respectively.

CONCLUSION

Conclusion is very important natural sources both strategic and vital throughout the world. Aquaculture will continue to play an important role in the global supply of fish in the future. Though negative effects of waste from aflatoxin to aquatic environment are increasingly recognized in Aquaculture. To minimize the risk of aflatoxin exposure, close tripartite cooperation among the farmers, traders and the public with the support of the government is essential. Again, properly planned use of aquaculture waste alleviates water pollution problems and not only conserves valuable water resources but also take advantage of the nutrients contained in effluent. It is highly demanding to develop sustainable aquaculture which keeps stocking density and pollution be sustained by basic applied research and development in major fields such as nutrition, genetics, system management, product handling, and socio-

economics. Therefore monitoring of environmental effects of aflatoxin in aquaculture is very important for aquatic ecosystem conservation.

RECOMMENDATION

Having carried out the research successfully with the result shwing the high spread of Aflatoxin in so many farms, the researchers therefore recommended that, farmers should not store their fish feed above 27^{0}C temperature, 62% humidity and 14% moisture content. Better still proper handling of fish feeds should be ensured to avoid poor quality feeds.
Finally, farmers should ensure that they purchased recently prepared feeds and to crown it all, government should look for a way of curtailing the spread of Aflatoxin on grains and prepared feeds.

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