

AFLATOXIN CONTAMINATION OF POULTRY FEED AND ITS INGREDIENTS

Part IV. Animal Source of Protein and Pulses

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Three hundred and eighty one samples of fish meal, blood meal, meat meal, guar meal and matrie were collected and sixty four samples (16.79%) have been found positive for aflatoxin B₁. Highest contamination 22.84% was found in the fish meal samples with an average level of 49.11 µg/kg and highest amount detected was 259 µg/kg. The samples were analysed according to the method of Association of Official Analytical Chemist and quantification was made through comparison with standards and confirmation achieved by making derivatives by TFA and H₂SO₄ spray of TLC Plates.

Key words: Aflatoxins *Aspergillus flavus* Poultry feed ingredients.

INTRODUCTION

Fish meal and other products of fish, like dried fish, fermented shrimps and fish sauces have been known to be contaminated by aflatoxin and other toxic mould metabolites [1]. Aflatoxins appear to constitute a serious contamination problem in fish meal used as animal source of protein in poultry feed. In the process of sun drying the fish becomes contaminated by various toxin producing moulds which results in aflatoxin production. Fish is one of the major source of animal protein in preparation of poultry feed. Several studies have shown that aflatoxin can be produced in various kinds of meat by aflatoxigenic strain of *Aspergillus flavus* and *A. parastiticus* up to the levels of 630 µg/g [2,3]. Aflatoxin was produced by toxigenic strains of *A. flavus* in fish meal in the range of 0.1 mg/kg to 4 mg/kg [4]. Shrimps supported aflatoxin production upto 14.8 mg/kg by the *A. flavus* strains previously isolated from dry shrimps [5]. In a study five percent samples of dried shrimps were found contaminated by AFB₁ at 166 µg/kg [6].

About 55% samples of haricot beans and other pulses were found contaminated with aflatoxin in Sudan and the levels being 50 to 1000 µg/kg [7]. Mung bean (*Phaseolus aureus*) and other beans in Thailand and Hongkong were found positive for aflatoxin and the maximum amount found was 112 and 1620 µg/kg respectively [8]. Very little is known about the levels of contamination of fish meal and other meat meal by aflatoxins. As these ingredients are very important source of protein and amino acids for poultry

feed. Therefore the survey was started in the year 1978 to determine the levels of aflatoxin contamination.

MATERIAL AND METHODS

Sampling of meat, blood, and fish meal is very difficult as it is marketed in lumps and secondly the aflatoxin distribution is highly heterogeneous. Usually for these meals 7 to 8 kg of samples were taken and after grinding 2 to 3 kg sample was brought in the laboratory for analysis. These samples were passed through a sample divider and finally about 100g were taken for aflatoxin analysis. The samples were collected from different poultry feed mills in and around Karachi. Samples were analysed according to the first official action methods of Association of Official Analytical Chemist 26.014-26.410 [9]. Whenever the extracts were not clear, the two dimensional chromatography was performed for better results and confirmation. Additional confirmatory steps like forming derivatives with trifluoroacetic acid and H₂SO₄ spray of TLC plates were taken.

RESULTS AND DISCUSSION

During the period of study 197 samples of fish meal (Table 1) were collected and 45 samples 22.84% were found positive for Aflatoxin B₁ with an average content of 49.11 µg/kg and aflatoxin range being from 4µg/kg to 259 µg/kg. Nineteen samples 42.22% of the positive samples were found contaminated below the level of 20 µg/kg while 44.44% were found containing AFB₁

between 21 $\mu\text{g}/\text{kg}$ to 100 $\mu\text{g}/\text{kg}$ and only six samples 13.33% were found above 100 $\mu\text{g}/\text{kg}$. In case of blood meal 38 samples were collected among these only 2 samples were found positive for Aflatoxin B_1 with average content of 31 $\mu\text{g}/\text{kg}$. Among the sixty seven samples of meat meal, four samples were found positive for aflatoxin B_1 with an average content of 27.77 $\mu\text{g}/\text{kg}$. There are only two main pulses which are commonly used in the poultry feed one is guar meal and other is matricaria. Forty two samples of guar meal were collected and only 6 samples (14.23%) were found positive with an average levels of 54 $\mu\text{g}/\text{kg}$. In case of matricaria (*Lathyrus aphaca*) 37 samples were collected during the period under study and 7 samples (18.91%) were contaminated and average amount being 45.14 $\mu\text{g}/\text{kg}$.

Table 1. Presence of aflatoxin B_1 $\mu\text{g}/\text{kg}$ during the period 1978-1985

Commodity	No. of sample collected	No. of positive samples	Percent contamination	Average content	Range
Fish meal	197	45	22.84	49.11	4 - 259
Blood meal	38	2	5.26	31.00	4 - 49
Meat meal	67	4	5.97	27.77	5 - 38
Guar meal	42	6	14.28	54.00	8 - 126
Matricaria (<i>Lathyrus aphaca</i>)	37	7	18.91	45.14	6 - 96

Forty five samples 70.3% of the positive samples contained aflatoxin B_1 less than 20 $\mu\text{g}/\text{kg}$ and fifteen samples had this toxin between 21 to 100 $\mu\text{g}/\text{kg}$ while only four samples were found containing aflatoxin B_1 more than 101 $\mu\text{g}/\text{kg}$, with maximum level being 259 $\mu\text{g}/\text{kg}$. According to the survey carried out during the last eight years the problem of aflatoxin contamination appears mostly in the fish meal while there does not appear much problem of aflatoxin in meat meal and blood meal. However the meals prepared from the offal and meat in which aflatoxin is already present may contain detectable amount of toxin.

There is often adulteration of vegetable source of material in them that the aflatoxin B_2 , G_1 and G_2 could not be detected in these samples. *Aspergillus flavus* was isolated from 80% samples collected and about 48% strains were found aflatoxigenic. The samples of blood meal were found heavily infested with grubs and beetles of *Alphitobius sp.*

Fish meal and meat meal supported aflatoxin production at the levels of 7.3 mg/kg and 6.9 mg/kg respectively by few of the aflatoxigenic strain of *Aspergillus flavus* isolated from these commodities. This shows the great potential for supporting aflatoxin production by different meat and fish products. The sun drying of meat and fish meal leads to very quick aflatoxin production, hence poses a serious health hazards to the poultry flock.

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