ESTIMATION OF AFLATOXIN B1 IN FEED INGREDIENTS AND COMPOUND POULTRY FEEDS

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ABSTRACT

A total of 3230 samples of feed ingredients of vegetable and animal origin and commercially available compound poultry feed received over a period of 5 years at Feed Testing Laboratory of the Institute were tested for Aflatoxin B1 contents (ppb). In all feed ingredients and compound feed stuffs, minimum level of aflatoxin B1 was 13 ppb and maximum level was found to be 78 ppb. No correlation of aflatoxin levels with month of collection of the year which are subject to variation in temperature and humidity could be detected. Mean values of aflatoxin concentration In feed stuffs such as rice, rice polish, wheat bran, wheat bread, maize, fish meal, blood meal, bone meal, guar meal, corn gluten 30%, corn gluten 60%, sun flower meal, soyabean meal and cotton seed meal were found to be higher than safe level of 20 ppb recommended by FDA.

Key words: Feed ingredients, Aflatoxin B1, Poultry feed.

INTRODUCTION

Aflatoxins are compounds produced by certain kind of moulds. Aflatoxin produced by fungus. *Aspergillus flavus* is important from the point of view of toxicity caused in humans, animals and poultry. Economic losses caused by aflatoxins include not only decreased growth performance in animals but also there is increased susceptibility to carcase bruising leading to downgrading (Tung *et al.*, 1971). Estimation of Aflatoxins obtained from isolated cultures of *Aspergillus flavus* could be separated by chromatographic methods particularly thin layer chromatography. Lethal dose LD_{50} of aflatoxin B1 for one day-old ducklings is estimated to be 18.2 ug (Bartik and Piskac, 1981) which implies ducklings are more sensitive to aflatoxins. FDA revised action levels for aflatoxins to 20 ppb for all foods including animal foods. Action level for aflatoxin in cotton seed meal has been set at 300 ppb for beef cattle, swine and poultry (FDA, 1989). Corn containing more than 20 ppb aflatoxins was destined for food used by humans, immature animals (including immature poultry) and dairy animals (Wessel, 1989). Aflatoxin level of 20 ppb in lactating dairy cow diets resulted in 0.5 ppb of aflatoxin M1 in the milk (Frobish *et al.*, 1986).

The main objective of this study was to determine aflatoxin B1 levels in feed ingredients used in poultry rations and compound poultry feeds to determine the quality level of available/or normally consumed feed ingredients or compound poultry feeds and likely economic losses caused there from.

MATERIALS AND METHODS

In the Feed Testing Laboratory of Poultry Research Institute, Rawalpindi a total of 3230 feed samples were received during 1995-2000 for estimation of Aflatoxin B1 contents. The feed samples tested for aflatoxin B1 included individual feed ingredients of vegetable and animal origin and compound poultry feeds sold commercially in the market. The samples were sent by the poultry farmers themselves or in some cases these samples were collected by the feed samplers of laboratory. The feed samples were packed in polythene bags on collection and particulars of the farm and feed stuff were provided separately on proforma. In some cases feed samples were received by post. The feed samples so received consisted of 8 samples of rice,13 of rice broken,42 rice polish, 16 wheat, 7 wheat bran, 34 maize, 48 sunflower meal, 76 fish meal, 18 soyabean meal, 23 cottonseed meal, 15 feather meal, 12 blood meal, 27 canola meal, 12 bone meal, 38 corn gluten 30%, 45 corn gluten 60%, 701 chick starter, 98 grower mash, 1029 layer mash, 396 broiler starter, 396 broiler finisher and 104 breeder mash.

All feed samples were tested for aflatoxin B1 contents using velasco Flurometer and thin layer chromatography. The findings were interchangeably confirmed to note any error and deviations in the estimations. The laboratory testing for aflatoxin was done month wise immediately on receipt of feed

samples to ascertain any correlation with fluctuating season/environment. The standard calibration used to measure aflatoxin B1 contents in samples ranged from 13 ppb to 78 ppb (AOAC, 1990).The estimates (levels) of aflatoxins in feed stuffs were subjected to statistical analysis to find out range of concentration of aflatoxins, their mean value and standard deviation in each feed stuff (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

The analyses with regard to aflatoxin B1 contents have been given in Table 1 and 2 which illustrate aflatoxin B1 contents estimated in feed ingredients of vegetable and animal origin and their byproducts and compound feed stuffs commercially sold in the market by different feed mills. A close examination of tables reveals that minimum value of 13 ppb and maximum value of 78 ppb was observed in rice polish, maize, fish meal, guar meal, corn gluten 30%, corn gluten 60%, soyabean meal, cotton seed meal, chick starter, layer mash, broiler starter .and broiler finisher which coincided with calibration standard used with varying concentrations in individual items. Mean levels of aflatoxin B1 above safe levels of 20 ppb recommended by FDA was found to be 20.13 ± 08.84 in rice, 25.10 ± 18.83 in rice polish, 20.29 ± 9.53 in wheat bran, 21.63 ± 7.84 in wheat bread, 23.32 ± 18.15 in maize, 20.16 ± 10.88 in fish meal, 22.89 ± 12.72 in blood meal, 23.67 ± 10.20 in bone meal, 23.15 ± 14.28 in guar meal, 23.58 ± 16.4 in corn gluten 30%, 24.44 ± 16.66 corn gluten 60%, 23.13 ± 9.06 in sunflower meal, 26.11 ± 19.84 in soyabean meal and 30.30 ± 20.99 in cotton seed meal. An attempt was made to find out any correlation of values of aflatoxin B1 contents with months of the year when samples were received or collected but no positive or negative correlation could be ascertained despite the fact that there is marked fluctuation in environmental temperature and humidity during the course of a year. Presumably, the feed ingredients/compound feed stored in packed form is subject to lesser direct influence of temperature or humidity. However, increased production of aflatoxins in feed stuffs could be expected if there is storage for a longer period under unsatisfactory ventilation situation (Richard, 2000). The information regarding storage period or date of receipt of feed ingredients or compound feed by the consumers and environmental conditions in storage was not received or provided by the farmers and therefore this aspect remained

Table 1: Levels (ppb0 of Aflatoxins B_1 in different cereals and animal by products detected in feed testing laboratory during 1995-2000

Type of ingredient	No. of Samples tested	Levels of Aflatoxins B1 (ppb)		Mean ± S.D.	Period of year relating Min & Max levels	
		Minimum	Maximum		Minimum	Maximum
Rice	8	13	39	20.13 ±8.84	May & July	June
Rice Broken	13	13	56	19.77 ±12.23	Feb-April Aug. & Dec.	Mar
Rice Polish	42	13	78	25.10 ±18.83	Jan-June, Aug. Oct. & Dec.	Feb, Mar, Nov
Wheat	16	13	39	18.88 ±6.90	Feb. April, Aug. Sept.	Mar
Wheat Bran	7	13	39	20.29 ±9.53	July-Aug Dec	Aug
Wheat Bread	8	13	39	21.63 ±7.84	June	Aug
Maize	34	13	78	23.32 ±18.15	Jan-Mar June, Oct	Jan.Mar
Fish Meal	76	13	78	20.16 ±10.88	Jan-Dec Feb-April	June April
Feather Meal	15	13	39	18.87 ±7.14	Aug. Dec	
Blood Meal	28	13	52	22.89 ±12.72	Jan, Sept Nov. Dec	April-May Dec
Bone Meal	12	13	39	23.87 ±10.20	Jan-Feb Dec	Jan, July Aug

ppb= Parts per billion
± SD= Standard deviation

unassessed. The overall pattern of aflatoxin B1 contents in all feed samples suggests that status of toxin formation in the feed stuffs as such or prior to mixing of compound feed formulation is crucial. The environmental conditions during storage and processing of feed ingredients, manufacturing of compound feeds and subsequent storage under farm conditions are, therefore, equally important.

Table 2: Levels (ppb) of Aflatoxins B_1 in different cereals and animal by products and compound poultry feeds detected in feed testing laboratory during 1995-2000

Type of ingredient	No. of Samples tested	Levels of Aflatoxins B1 (ppb)		Mean ± S.D.	Period of year relating Min & Max levels	
		Minimum	Maximum		Minimum	Maximum
Canola Meal	27	13	39	19.78 ±8.83	January-May	March, June Nov
Guar Meal	20	13	78	23.15 ±14.28	Jan, Aug Nov.Dec	Feb
Rape Seed Meal	28	13	39	19.11 ±8.20	Feb.April June,Aug Aug-Dec	June Sept
Corn Gluten 30%	38	13	78	23.58 ±16.40	Jan,March May-June Aug-Dec	Mar Nov
Corn Gluten 60%	45	13	78	24.44 ±16.66	Jan,Mar Aug,Oct-Dec	Mar, Oct
Sunflower Meal	48	13	52	23.13 ±9.06	Jan,April June-July Nov-Dec	April
Soyabean Meal	18	13	78	26.11 ±19.84	Jan,June Nov-Dec,	May-June
Cotton Seed Meal	23	13	78	30.30 ±20.99	Nov-Dec	Mar-June
Chick Starter	701	13	78	19.29 ±9.74	Jan-Dec	Jan-Mar-July-Sept-Octo
Grower Mash	98	13	52	19.99 ±7.69	Feb, April June-Dec	Sept
Layer Mash	1029	13	78	18.79 ±7.76	Jan-Dec	June Sept, Nov
Broiler Starter	396	13	78	19.26 ±8.92	Jan-Dec	Feb, Sept Nov
Broiler Finisher	396	13	78	18.64 ±8.57	Jan-Dec	Mar,June
Breeder mash	104	13	52	17.92 ±6.54	Jan-Dec	Aug

ppb= Parts per billion
± SD= Standard deviation

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