INTERACTION OF ZINC WITH AFLATOXIN WITH REFERENCE TO SERUM BIOCHEMICAL PROFILE OF BROILER CHICKEN

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ABSTRACT

A biological experiment was conducted to evaluate the interactive effects of organic and inorganic zinc (Zn) supplementation with aflatoxin (AF) on serum biochemical parameters of broilers. The result indicated that the serum albumin, cholesterol, globulin, glucose and total protein were significantly decreased by dietary AF, whereas the level of SGOT and SGPT increased numerically due to dietary AF. The supplementation of Zn in chelated or inorganic form marginally improved the level of albumin, cholesterol level, glucose and total protein whereas significantly reduced the level of SGOT and SGPT.

KEY WORDS : Aflatoxin, zinc, serum biochemical profile, broiler.

INTRODUCTION

Aflatoxins have been demonstrated to be carcinogenic, mutagenic, teratogenic and toxic. The threat of aflatoxin is the common problem in poultry . Dietary manipulations with protein and α-tocopherol have received considerable attention for counteracting aflatoxicosis. However, studies on effect of trace minerals supplementation and its interaction with AF *in vivo* in poultry are very few and restricted to inorganic zinc. Several studies reports that the chelated minerals are more bioavailable to animals and poultry (Wedekind *et al.,* 1992) than its inorganic counterpart and hence one can expect more counteracting effect of this form of mineral against AF than inorganic form. But, studies regarding the effect of chelated minerals on AF and their interaction *in vivo* in poultry received very little attention. Hence, a study was designed to evaluate the interaction of chelated and inorganic zinc on serum biochemical parameters of broiler chicken.

MATERIALS AND METHODS

Production of aflatoxin

AF was produced from *Aspergillus parasiticus* NRRL 2999 in rice as per method of Shotwell *et al.* (1966) and in Yeast Extract Sucrose (YES) as per Tsai *et al.* (1984). The AF B_1 content was measured by preliminary extraction of AF (Pons *et al*., 1966) and subsequent analysis by TLC method.

Experiment

The feeding experiment was conducted in broiler chicken from day one to 42 day of age. Two hundred and seventy day-old synthetic dam line broiler chicks obtained from Experimental Broiler Farm, CARI belonging to single hatch were used. The birds were wing banded, weighed and randomly allotted into nine treatment groups. Each treatment had three replicates and containing ten chicks per replicate.

All the chicks were reared on wire floor, electrically heated, battery brooder under uniform and standard management practices. Feed and water were offered *ad libitum.* All birds were immunized against NewCastle Disease and Marek's Disease at day old by occulonasal route and against Infectious Bursal Disease at 14th day of age. The experimental protocol got approval of Animal Ethics Committee of the institution.

Preparation of experimental diets

Two standard basal diets were formulated separately for starter (0-21 days) and finisher phase (22-42 days) of growth to meet the requirement of all the essential nutrients for broilers.

The experimental design followed was 3 ´ 3 factorial and the experiment consisted of nine treatments as follows: T1 – Basal diet, T2 – Basal + 0.5 ppm AF B1 , T3 – Basal + 1 ppm AF B1 , T4 – Basal diet + 200 ppm Zn from organic source , T5 – Basal + 0.5 ppm AF B1 + 200 ppm Zn from organic source , T6 – Basal + 1 ppm AF B1 + 200 ppm Zn from organic source, T7 – Basal diet + 200 ppm Zn from inorganic source , T8 – Basal + 0.5 ppm AF B1 + 200 ppm Zn from inorganic source and T9 – Basal + 1 ppm AF B1 + 200 ppm Zn from inorganic source Zinc sulphate and zinc propionate were used as the source of inorganic and organic zinc, respectively.

Data collection

At the end of experiment on 42 day, the blood samples were collected from birds and the Serum was separated by centrifugation of blood samples at 2500 rpm for 10 minutes and stored in refrigerator at -20^{0}C for estimation of biochemical parameters. The serum total protein, albumin, glucose, total cholesterol, glutamate oxaloacetate transaminase (SGOT- now known as aspartate amino transferase,AST), Serum glutamate pyruvate transaminase (SGPT- now known as alanine amino transferase, ALT) were estimated by using kits manufactured by M/S. Span Diagnostics Ltd., Surat, India. The globulin was determined as the difference between total protein and albumin concentration in the serum.

Statistical analysis

The experimental design followed was 3 ´ 3 factorial design. The data obtained from the above experiments were subjected to statistical analysis as per standard procedure of Snedecor and Cochran, (1989) and Duncan's multiple range test (Duncan, 1955) for verifying significance of treatment means.

RESULTS AND DISCUSSION

The result (Table) indicated that the serum albumin, cholesterol, globulin, glucose and total protein were significantly decreased by dietary AF, whereas the level of SGOT and SGPT increased numerically due to dietary AF. A significant reduction of total protein in serum has been reported in broilers due to aflatoxicosis by many authors (Vasan *et al.,* 1998; Shukla and Pachuri, 1995). The decrease in serum protein was attributed to failure in digestion and absorption of protein in gastro intestinal tract (Voigt *et al.,* 1980) and inhibition of protein synthesis (Sarasin and Moule, 1973).

The supplementation of Zn in chelated or inorganic form marginally improved the level of albumin, cholesterol level, glucose and total protein whereas significantly reduced the level of SGOT and SGPT. Wyatt *et al.* (1985) reported that Zn partially reduced the increased level of alkaline phosphate and increasing glucose due to AF administration. Recent findings have demonstrated that oxidative damage is one of the underlying mechanisms for AF induced cytotoxicity and carcinogenicity. Eraslan *et al.* (2005) reported that long-term administration of AF at high doses (0.5-1 ppm) leads to oxidative damage in broilers and increase in the level of lipid peroxide and decrease in the activity of antioxidant enzyme superoxide dismutase (SOD) and glutathione

Table. Serum biochemical parameters in broiler chickens as influenced by different zinc supplementation and aflatoxin levels

[illegible]	[illegible]

Values bearing different superscripts within a column differ significantly (P<0.05), (P<0.01); NS- Non Significant

peroxidase. The oxidative damage to hepatocyte might lead to release of SGOT and SGPT during aflatoxicosis, which otherwise would not be released into circulation. The supplementation of Zn, might have increased the level of SOD enzyme which in turn might have protected the hepatocytes from oxidative damage of AF leading to decrease in level of SGOT and SGPT.

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