AMELIORATIVE EFFECT OF HERBOMINERAL TOXIN BINDER 'VILOCYM' ON MYCOTOXICOSIS IN BROILERS

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Received 8-7-2014 Accepted 12-8-2014

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ABSTRACT

A study was conducted in 75 day old Vencobb broiler chicks to evaluate toxic effects of aflatoxin B_1 and ochratoxin A and efficacy of herbomineral toxin binder product (Vilocym) in preventing co-mycotoxicosis. Supplementation of herbomineral toxin binder feed supplement (Vilocym) helps in amelioration of toxic effects produced during mixed mycotoxicosis in broilers.

KEY WORDS Aflatoxicosis, ochratoxicosis, broiler, performance, herbo-mineral toxin-binder

INTRODUCTION

Aflatoxins are secondary metabolites produced by fungi, namely *Aspergillus spp*. and *Penicillium spp* and are hepatotoxic in nature. High levels of aflatoxins have been recorded in ingredients of poultry feed like soybean, sunflower, polished rice, cotton seed, etc. (Jand *et al.,* 1995). Chronic aflatoxicosis due to prolonged intake of low levels of aflatoxins retards growth, reduces feed conversion ratio and increases susceptibility of chicks to infectious diseases which indicates impaired immune responses (Bakshi *et al.,* 2000).

Another important mycotoxin produced by *Aspergillus ochraceus* is ochratoxins (OTA) affecting mainly kidneys. Intoxication of birds by ochratoxins results in reduced weight gain, impaired feed efficiency, reduced egg production and quality .Use of adsorbents is of limited value in controlling ochratoxicosis in livestock (Santin *et al.,* 2002). Deleterious effects of aflatoxin could be overcome, or at least diminished by adsorbents in rats. Hence present investigation was carried out to study the ameliorative effect of herbomineral toxin binder (Vilocym) during combined induced aflatoxicosis and ochratoxicosis.

MATERIALS AND METHODS

Seventy five (75) day old broiler chicks were purchased and randomly divided into three identical groups (C, T_0 and T_1) each comprising of 25 chicks and reared upto 42 days. All the three groups were housed under identical managemental and environmental conditions. Standard poultry feed free from aflatoxin and ochratoxin was purchased for all the three groups. The required quantity of ration for feeding to control group C (negative control) was kept separately. The remaining feed was incorporated with 100 ppb each of aflatoxin B_1 and ochratoxin A for feeding the birds belonging to group T_0 and T_1 from 0-42 days. Chicks from group T_0 was offered feed which was incorporated with aflatoxin and ochratoxin without any mycotoxin binder product throughout the experiment. While chicks from treatment group T_1 was given aflatoxin B1 and ochratoxin A toxicated feed alongwith mycotoxin binder product Vilocym @ 1kg/ton of feed from 0-42 days. All the birds were vaccinated as per routine farm practices.

Aflatoxin B_1 and ochratoxin A were produced by following the method of Marquardt and Frohlich (1992) and semiquantified according to Tapia (1985) using thin layer chromatography.

Different parameters evaluated were growth performance, haemato-biochemical and gross pathology. Growth parameters included weekly average body weight, feed consumption and feed conversion ratio (FCR). Haematological parameters included Haemoglobin (Hb), Packed Cell Volume (PCV), Total Erythrocyte Count (TEC), Total Leucocyte Count (TLC) and biochemical parameters included SGOT, SGPT, serum total proteins, albumin, globulin, lipid profile, serum creatinine and uric acid for which blood samples were collected from five birds of each groups at the end of 3rd and 6th week. Standard methods in use were followed for estimation of haemato-biochemical parameters. All the parameters were statistically analyzed as per the method given by Snedecor and Cochran (1994).

RESULTS AND DISCUSSION

Growth and performance parameters: Weekly average body weight of broilers in various treatment groups is presented in Table 1. Significant (P<0.05) decrease in average body weight was observed in mycotoxin fed group T_0. Significant (P<0.05) improvement and higher average body weight (1904g) was observed in induced mycotoxicated group treated with Vilocym (T_1) in a comparison to mycotoxicated and untreated group T_0 (1753g), however could not regain body weight as that of healthy birds. Similar observations due to feeding of aflatoxin and ochratoxin were noticed earlier by Raju and Devegowda (2000) and Stoev *et al.,* (2000).

Table 1: Weekly average body weight (gm) of broilers from various treatment groups

	0 day	1st week	2nd week	3rd week	4th week	5th week	6th week
Group C	40.25 ±1.21	164.00 ±1.30[a]	377.60 ±1.44	648.40 ±1.86[a]	946.00 ±2.69[a]	1437.00 ±1.39[a]	1952.00 ±3.02[a]
Group T_0	41.00± 1.24	148.60 ±0.91[b]	356.00 ±0.98	592.20 ±1.99[b]	858.00 ±2.02[b]	1306.00 ±2.12[b]	1753.00 ±2.88[b]
Group T_1	41.00 ±1.08	158.00 ±1.37[a]	369.60 ±1.71	622.40 ±2.02[ab]	922.00 ±2.29[a]	1370.00 ±2.01[a]	1904.00 ±2.71[a]

Mean with different superscripts in a coloumn differ significantly (P< 0.05)

Weekly average FCR of broilers is presented in Table 2. Significantly (P<0.05) lower FCR was observed in prophylactically treated group T_1 (1.92) than mycotoxicated and untreated group T_0 (2.15) at the end of 6th week of experiment which was due to both low feed intake and higher weight gain and increased digestibility (Johri *et al,* 1996) and found nearer and well comparable to the FCR of healthy birds of control group C (1.91) indicating the efficacy of herbal toxin binder in ameliorating the toxic effects of mycotoxin in the broilers.

Table 2: Weekly average Feed Conversion Ratio (FCR) of broilers from various treatment groups

	1st week	2nd week	3rd week	4th week	5th week	6th week
Group C	1.02±0.08	1.29±0.12	1.49±0.22	1.62±0.27	1.75±0.05	1.91±0.21[a]
Group T_0	1.13±0.11	1.45±0.15	1.58±0.17	1.69±0.19	1.83±0.18	2.15±0.17[b]
Group T_1	1.08±0.09	1.33±0.09	1.52±0.11	1.63±0.14	1.76±0.14	1.92±0.19[a]

Mean with different superscripts in a coloumn differ significantly (P< 0.05)

Haematological parameters: Average haematological values of blood collected from treatment groups at 21st and 42nd day of experiment are presented in Table 3. Significant (P<0.05) reduction in values of Hb, PCV, TEC and TLC was observed in mycotoxin fed group (T0) as compared to control group C during both the intervals of experiment. Significant (P<0.05) improvement in the haemoatological values were recorded in treatment group (T_1) supplemented with Vilocym as compared to mycotoxin fed group (T0) during the experiment and the values were well comparable (but slightly lower) with healthy birds of control group C at both period of experiment. Significant reduction in Hb in the broilers fed mycotoxin is corroborated with various earlier workers (Ramadevi *et al*., 2000; Singh *et al*., 1992; Mohiuddin *et al.*, 1993 and Aved *et al*., 1991)). The reduction in Hb, TEC and PCV concentration observed during mycotoxicosis could be due to reduced protein synthesis, as observed in the present study. Supplementation of polyherbal toxin binder showed improvement in various haematological parameters during induced mycotoxicosis.

Table 3: Hematological observations of blood collected from birds on 21st and 42nd day of experiment

Parameters	21st Day			42nd Day		
	Group C	Group T_0	Group T_1	Group C	Group T_0	Group T_1
Hb (g %)	9.80±0.29^a	8.04±1.28^c	9.16±0.67^b	10.16±1.24^a	7.92±1.11^c	9.28±0.21^b
PCV (%)	31.20±1.04^a	25.40±1.63^b	29.20±0.81^a	33.00±1.69^a	26.00±0.24^c	30.00±1.22^b
TEC(million/µl)	3.74±0.71^a	2.96±1.41^b	3.28±1.72^{ab}	3.91±0.78^a	2.87±1.33^c	3.31±0.88^b
TLC(Thousand/µl)	20.80±1.02^a	17.45±1.33^b	19.80±1.61^a	22.15±0.31^a	17.00±1.20^b	20.55±0.97^a

Mean with different superscripts in a row differ significantly (P< 0.05

Biochemical parameters: Average serum biochemical values of experimental broilers observed at 21st and 42nd day of age are presented in Table 4. Significant (P<0.05) reduction in serum total protein, albumin and globulin was observed in mycotoxicated positive control group (T_0) when compared to negative control group C on both the intervals. The values of total protein, albumin and globulin in prophylactically treated group with Vilozym were significantly (P<0.05) higher than group T_0 but lower as compared to control healthy birds.

Liver enzymes SGOT and SGPT were found to be significantly (P<0.05) elevated in induced combined aflatoxicosis and ochratoxicosis (Group T0) when compared to negative control (Group C) at both the intervals. However, prophylactically treated group (T_1) supplemented with polyherbal toxin binder showed significant (P<0.05) reduction in SGOT and SGPT levels than group T0 and found well comparable to healthy birds of group C leading to normalization of liver during mycotoxicosis.

Reduction in serum total protein, serum albumin and elevation in values of liver marker enzymes (SGOT and SGPT) has been reported during mycotoxicois (Sawale *et al*., 2009). Reduction in serum protein profile could be due negative effect of mycotoxins by depressing DNA, RNA and protein synthesis as suggested by Marquardt and Frohlich (1992) and Kubena (1983). It is further speculated that, excessive renal filtration through glomeruli might have accounted for reduced serum protein profile in present experiment.

Significant (P<0.05) improvement in serum cholesterol and triglycerides and non significantly higher levels of serum HDL, LDL and VLDL on both intervals of experiment were found in prophylactically treated group with herbal toxin binder than mycotoxin fed group T0 and found well comparable to healthy birds of group C. Reduction in serum cholesterol were reported during aflatoxicosis (Mani

Table 4: Biochemical estimates of serum sample collected from broilers on 21st and 42nd day of experiment

Parameters	21st Day			42nd Day		
	Group C	Group T_0	Group T_1	Group C	Group T_0	Group T_1
SGOT (IU/L)	183.24±4.84^{c}	249.95±8.24^{a}	208.09±3.24^{b}	189.75±3.22^{c}	276.99±6.01^{a}	212.92±4.56^{b}
SGPT (IU/L)	12.74±2.20^{b}	20.47±1.24^{a}	14.60±1.18^{b}	14.58±1.93^{b}	25.48±0.91^{a}	16.44±1.51^{b}
T Protein (g/dl)	3.77±0.58^{a}	3.02±0.42^{b}	3.57±0.33^{a}	4.24±1.24^{a}	2.92±0.34^{c}	3.66±0.08^{b}
Albumin (g/dl)	1.66±0.22	1.31±0.18	1.52±0.11	1.93±0.43^{a}	1.28±0.04^{c}	1.65±0.11^{b}
Globulin (g/dl)	2.11±0.32^{a}	1.72±0.51^{b}	2.48±0.22^{a}	2.31±0.24^{a}	1.63±0.31^{c}	2.02±0.08^{b}
T Cholesterol (mg/dl)	130.34±2.25^{a}	109.93±3.47^{b}	127.74±5.21^{a}	116.98±3.24^{a}	84.85±2.27^{b}	106.42±5.01^{a}
Triglycerides (mg/dl)	105.14±2.54^{a}	96.13±2.88^{b}	104.57±4.29^{a}	85.18±1.88^{a}	70.95±1.28^{b}	80.86±1.24^{a}
HDL (mg/dl)	56.26±1.97	53.34±1.34	55.91±1.51	46.14±1.50	41.79±1.74	43.74±1.65
VLDL (mg/dl)	21.02±1.78	19.22±1.50	20.91±1.11	17.03±2.04	14.18±1.01	16.17±0.85
LDL (mg/dl)	27.84±1.81	23.55±1.24	27.75±1.18	21.99±1.77	14.96±1.21	20.94±1.53
Creatinine(mg/dl)	1.13±0.19^{b}	1.53±0.11^{a}	1.25±0.22^{b}	1.21±0.04^{b}	1.77±0.04^{a}	1.37±021^{b}
Uric acid (mg/dl)	5.02±1.44^{b}	6.67±1.04^{a}	5.64±1.01^{ab}	5.80±0.14^{b}	7.98±0.62^{a}	6.05±0.89^{b}

Mean with different superscripts in a row differ significantly (P< 0.05)

et al. 1993) and ochratoxicosis (Stoev *et al.* 2000). Reduction in serum cholesterol and triglyceride levels during induced mycotoxicosis reflects impaired liver metabolism, leading to reduced synthesis of cholesterol and triglyceride, as was also evident in the present study. Similarly, the findings of present study are in concomitance with those of Johri and Beura (2000) and Jindal *et al.,* (1993) Supplementation of polyherbal toxin binder during mycotoxicosis significantly (P<0.05) prevented a rise in values of serum creatinine and uric acid in treated group than group T0 and found well comparable with healthy birds of control group C during both intervals. These findings are in corroboration with Sakhare *et al*. (2007) who supplemented Toxiroak to broilers during induced mycotoxicosis. The increase in serum creatinine and uric acid may be attributed to the nephrotoxic effect of ochratoxin, as evident in the present study, leading to renal dysfunctions.

Gross Pathology: In co-mycotoxicated group (T_0), kidneys were enlarged, swollen along with prominent ureters. Liver was enlarged and yellowish in discoloration. Similar lesions in liver and kidney were also recorded earlier by Dwivedi and Burns (1984) and Sakhare (2001) during mycotoxicosis. Spleen, thymus and bursa of Fabricius of mycotoxin-fed group also appeared to be atrophied. Intensity of these gross pathological lesions was very less in Vilocym treated group.

CONCLUSIONS: Mycotoxins produces significant deleterious effect on growth performance, haematobiochemical parameters and various organs. Protective effect in broilers supplemented with Vilocym @ 1 kg/tonne of feed for 0-42 days was recorded in terms of improving growth and performance and normalizing the haematobiochemical profile and lesions in various organs during induced mycotoxicosis.

ACKNOWLEDGEMENT

Authors are thankful to Ayurvet Limited, Baddi for providing samples and financial assistance to conduct research experiment.

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