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Effect of dietary inclusion of the synbiotic Biomin IMBO on broilers' some blood metabolites

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Abstract

This study investigated the effect of symbiotic (Biomin IMBO) on some blood metabolites of Ross broilers. Two hundred Roosters were divided into five treatments: the first is the control group that fed the basal diet, the second group fed the basal diet + Biomin at the manufacturer's proposed level, the third group fed the basal diet + Biomin at the level 25% lower than the that proposed by the manufacturer, the fourth group fed the basal diet + Biomin at the level 25% higher than the company's proposed level and the fifth group fed the basal diet + Biomin at the level 50% higher than the manufacturer's proposed level. At the end of the experiment (42 days), blood samples were taken to measure the studied parameters. The results showed that the symbiotic Biomin inclusion in the diet had no significant effect on blood protein, albumin, high density lipoprotein (HDL), very low density lipoprotein (VLDL), triglyceride, cholesterol, uric acid and glucose. However, an improved effect on blood low density lipoprotein (LDL) and HDL to LDL ratio were observed in the group had the inclusion of 50% high level of Biomin. Given the scope and appropriate impact of symbiotic Biomin IMBO, the use of this supplement at higher dose appears to be effective on the biochemical composition of blood.

Keywords: Blood Parameters, Broilers, Cholesterol, Symbiotic, Triglyceride

Introduction

The use of feed additives in poultry diets can lead to improved performance. Probiotics were reported to improve lactose digestion, reduce intestinal yarn, prevent cancer, reduce cholesterol and blood pressure, increase the ability of the immune system, improve resistance to infection, reduce body inflammation and produce vitamins and some minerals Ashayerizadeh et al., 2010. However, all beneficial effects of probiotics without prebiotics are dependant on factors such as low pH, oxygen and very high temperatures, synbiotics are combination of useful probiotics and the prebiotics (Batavani, 2009). The main reason for the superiority of synbiotics is that probiotics without prebiotics can not survive in the gut environment because prebiotics are considered as food (Batavani, 2009).

Zaree et al. (2009) reported that the use of guar meal with and without synbiotics supplementation had no any negative impact on subtractive counting of white blood cells and blood biochemical parameters in laying hens. Mokhtari et al. (2009) and Ashayerizadeh et al. (2010) found improved serum cholesterol level in broiler chickens in response to synbiotics supplementation. Shams et al. (2008) and Sharifi et al. (2009) also reported better haematological and cholesterol picture in broiler chickens when synbiotics were given in the diet.

According to Awad et al. (2008), synbiotics can lead to better absorption of glucose in poultry. Liong and Shah (2006) concluded that the use of synbiotics consumption in broilers regulates the concentration of the organic acids and reduce cholesterol levels. Most investigators often suggest the usefulness of probiotics, prebiotics and synbiotics in broilers. Therefore, an experiment was conducted to investigate the effect of different levels of synbiotics (Biomin IMBO) on blood parameters of broilers.

Materials and Methods

This study examined the effect of symbiotic (Biomin IMBO) on the levels of some blood parameters

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of broilers in the poultry house of the Faculty of Agriculture, Islamic Azad University, Rasht Branch, Rasht, Iran. A total of 200 one-day broiler chicks (Ross 308) were divided into five treatments each of which composed of 10 replicates (of 4 chicks each) in a randomized complete design. The composition and chemical analysis of the basal diet are given in Tables 1 and 2. Throughout the experimental period, the birds had free access to clean drinking water. The diet treatments planned in this research project were as follows:

Treatment 1: the basal diet as described in Ross catalogue without synbiotics (control);

Table 1: Ingredients percentage of the basal diet

Ingredient (%)	Starter	Grower	Finisher
Corn	46.09	50.91	48.88
Soybean meal	40.00	35.00	39.97
Fish meal	3.00	3.00	-
Meat meal	3.00	3.00	-
Oil	4.56	5.45	7.38
DL-Methionine	0.29	0.23	0.17
L-lysine	0.04	-	-
L-Threonine	0.03	-	-
Ca22%, P18%	0.99	0.75	1.64
CaCO3	0.98	0.76	1.00
K-Bicarbonate	0.05	0.03	-
NaCl	0.37	0.37	0.45
Vitamin and Mineral Mixture[1]	0.60	0.50	0.50
Total	100	100	100

[1]Vitamin and mineral supplement (per kg): vitamin A, 10000 U; D3, 1000 U; E, 50 mg; K, 3 mg; riboflavin, 4 mg; Ca pantothenate, 10 mg; nicotinic acid, 40 mg; choline HCl, 150 mg; B12, 6 mg; B6, 4 mg; biotin, 0.10 mg; thiamine, 1 mg; Mn, 50 mg; Zn, 45 mg; Fe, 30 mg; Cu, 4 mg; I, 2 mg; Se, 1 mg.

Table 2: Chemical composition of the basal diet

Ingredient (%)	Starter	Grower	Finisher
Protein	24.9	23	22
Lysine	1.41	1.26	1.22
Methionine	0.67	0.59	0.50
Met+Cys	1.05	0.94	0.85
Threonine	1.98	0.87	0.85
Tryptophan	0.30	0.27	0.28
Arginine	1.68	1.54	1.51
Iso-Leucine	1.04	0.95	0.94
Valine	1.60	1.07	1.03
Leucine	1.99	1.87	1.82
Calcium	1.05	0.90	0.85
Available Phosphorus	0.50	0.45	0.42
Sodium	0.23	0.23	0.20
Potassium	1.00	0.90	0.93
Chloride	0.30	0.30	0.30
Linoleic Acid	1.21	1.27	1.24
Crude Fibre	3.78	3.52	3.73
Ether Extract	6.84	7.87	9.22
Dietary Cation-Anion Balance (DCAB) (mEq/kg)	272.12	244.55	242.77
Choline (g/kg)	1.48	1.37	1.37
Metabolizable energy (kcal/kg)	3025	3150	3200

Treatments 2: standard Ross diet based on the catalogue (base) + the levels recommended by Biomin IMBO manufacturer (for the starting period 1.0%, for growing period 0.05%, for finishing period 0.025%);

Treatment 3: standard Ross diet based on the catalogue (base) + a 25% reduction in the level of symbiotic Biomin IMBO recommended by the manufacturer (for the starting period 0.075%, for growing period 0.0375 percent, for finishing period 0.01875%);

Treatment 4: standard Ross diet based on the catalogue (base) + a 25% increase in the level of symbiotic Biomin IMBO recommended by the manufacturer (for the starting period 0.125%, for growing period 0.0625%, for finishing period 0.03125%);

Treatment 5: standard Ross diet based on the catalogue (base) + a 50% increase in the level of symbiotic Biomin IMBO recommended by the manufacturer (for the starting period 0.15%, for growing period 0.075%, for finishing period 0.0375%).

These applications were carried out from 1 to 42 days. It is worth noting that the probiotics part of Biomin IMBO is composed of *Enterococcus faecium* (5×10^{11} CFU/kg) and fructose oligosaccharides. Other compounds of this product are phycophytic (extracted from seaweed) carbohydrates. At the end of the experiment, blood samples from broilers were randomly taken from wing vein of chicks of each replicate using a sterile syringe. Serum was collected from each blood sample by centrifugation at 1500 rpm for 20 minutes.

The determination of the blood levels of the parameters under study (Glucose, uric acid, cholesterol, triglycerides, VLDL, HDL, LDL, HDL/ LDL, total protein and albumin) was conducted using specific kits (Pars testing-Iran) in the auto analyzer.

Statistical analysis

This experiment was conducted in a randomized complete design. Data were statistically tested by analysis of variance using the SPSS statistical software and the means were compared by Tukey test.

Results

The results of the studied parameters are given in Table 3. The group fed 50% high level of synbiotics showed the lowest low density lipoprotein (LDL) concentration; however, the difference was found significant with the group fed 25.0% decrement to the recommended level. The LDH to HDL ratio was significantly higher in the group fed 50% high level of synbiotics than the other groups, except the control. No significant change was observed in other parameters between control and treatment groups.

Table 3: Some biochemical parameters (mean ± SE) of the control and synbiotics treated broilers

Treatments	Glucose (mg/dl)	Uric Acid (mg/dl)	Total Cholesterol (mg/dl)	Trigly cerides (mg/dl)	VLDL (mg/dl)	HDL (mg/dl	LDL (mg/dl)	HDL/LDL (g/dl)	Total Albumin (g/dl)	Total Protein (g/dl)
Control	244.50 ±7.37^{a}	6.67 ±1.36^{a}	123.50 ±5.86^{a}	99.75 ±18.07^{a}	19.75 ±3.42^{a}	84.25 ±4.49^{a}	19.50 ±1.84^{ab}	4.48 ±0.27^{ab}	3.10 ±0.13^{a}	1.42 ±0.09^{a}
Recommended level of company	233.25 ±6.00^{a}	5.87 ±0.55^{a}	117.00 ±5.83^{a}	99.50 ±11.31^{a}	20.25 ±2.28^{a}	77.25 ±4.66^{a}	19.50 ±3.66^{ab}	4.50 ±0.373^{b}	2.65 ±0.06^{a}	1.10 ±0.04^{a}
25.0% decrement to recommended level of company	247.50 ±12.00^{a}	5.07 ±0.90^{a}	126.50 ±3.52^{a}	94.50 ±9.06^{a}	19.00 ±1.78^{a}	81.25 ±9.04^{a}	26.25 ±4.02^{a}	3.49 ±0.34^{b}	3.15 ±0.17^{a}	1.52 ±0.11^{a}
25.0% increment to recommended level of company	197.25 ±38.14^{a}	6.00 ±1.28^{a}	107.50 ±15.81^{a}	101.50 ±14.54^{a}	20.50 ±2.87^{a}	73.25 ±10.16^{a}	21.00 ±2.97^{ab}	3.59 ±0.35^{b}	2.82 ±0.27^{a}	1.22 ±0.16^{a}
50.0% increment to recommended level of company	246.00 ±8.36^{a}	5.60 ±8.36^{a}	113.25 ±6.52^{a}	102.75 ±6.03^{a}	20.50 ±1.32^{a}	81.00 ±4.30^{a}	11.75 ±1.93^{b}	7.31 ±7.37^{a}	2.77 ±0.11^{a}	1.25 ±0.02^{a}

VLDL: Very low density lipoprotein, HDL: High density lipoprotein, LDL: Low density lipoprotein; Means in the same column followed by the same letters are not significantly different (P<0.05)

Discussion

Ashayerizadeh et al. (2010) found the lowest serum cholesterol in birds that were fed diets containing synbiotics. Also, Khaksar Zareha et al. (2008) reported that prebiotics (Fermecto) in the diet significantly reduced triglycerides and total cholesterol in blood of broiler chicks. Furthermore, Santose et al. (1995) reported that adding probiotics to the diet of broilers reduced carcass fat and triglyceride concentration in the serum and liver. Liong and Shah (2006) reported that the use of synbiotics in broilers reduced serum cholesterol levels. Kos and Witner (1982) and Zobac and Kumperchove (2000) also reported positive effect of probiotics on the blood cholesterol level in broilers (. This contradiction with the current results may be due to the differences in the environmental conditions, management and dietary ingredients. Sahin et al. (2008) reported that adding a combination of probiotics and prebiotics supplements in the diet had a significant effect on blood parameters, including cholesterol and total serum protein.

The use of probiotics causes the sugar-degrading bacteria overcome the protein-degrading bacteria which in turn the rate of digestion of proteins is reduced (Haddian et al., 1996; Mohan and Andjames, 1998). Synbiotics Biomin may cause the establishment of gastrointestinal bacillus that reduces the digestibility of fat and in turn reduces the concentration of lipid parameters (Gibson and Roberfroid, 1995). As a result of lactic acid bacteria activity, the liver converts more fats into the bile which in turn reduces the amount of cholesterol in tissues and blood serum (Ros, 2000). Grunewald (1982) opined that reduced cholesterol may be the result of the breaking of bile acids which prevents the recreation of cholesterol.

Mokhtari et al. (2009) studied synbiotics effect on blood cholesterol parameters of broilers and they found that serum triglycerides and blood glucose did not change significantly. In another experiment, Sharifi et al (2009) investigated the effect of different prebiotics on performance and some blood parameters of broilers. At the end of the experiment they observed serum triglyceride levels to be reduced significantly by adding different levels of synbiotics supplements to the diet.

Conclusion

Dietary inclusion of Biomin IMBO at the level of 50% higher than company recommendation showed the greatest effect on the concentrations of blood biochemical parameters of broilers.

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