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Effects of Avilamycin, FormycinGold and FYTO-MIX on Serum Lipid Concentrations of Young Broilers

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Abstract: This experiment was conducted for comparison the effect of some feed growth promoter additives on serum lipid concentrations of 21 days old broiler chickens. Based a randomized completely design, 300 days old Ross 308 broilers were distributed into 20 floor pens and reared for 21 days. A basal diet was formulated according to NRC recommendations for starter (1-21 days) period. The basal diet was also supplemented with antibiotic (Avilamycin), a commercial composition (FormycinGold), herbal additive (FYTO-MIX) and mixture of FormycinGold plus FYTO-MIX, resulting 5 dietary treatments were prepared including control group. Each dietary treatment was fed *ad-libitum* to 4 replicates group of 15 birds at the beginning of rearing period. Serum cholesterol and Low Density Lipoprotein (LDL) levels of broiler were fed FYTO-MIX and FormycinGold plus FYTO-MIX was significantly lower than control group ($p<0.05$). The higher High Density Lipoprotein (HDL) concentration was recorded for birds fed diet supplemented with FormycinGold, FYTO-MIX and FormycinGold plus FYTO-MIX. None of the treatments had significant effect on triglycerides and Very Low Density Lipoprotein (VLDL) levels.

Key words: Broiler, avilamycin, herbal additive, cholesterol, HDL, LDL

INTRODUCTION

Antibiotics improve the production results of meat producing chicks and the utilization of energy particular is improved. However, the use of growth-promoting antibiotics is being placed under more and more pressure as consumers increasingly fear that their use in feed rations of productive live stocks leads to the formation of resistance against bacteria, which are pathogenic to humans (Langhout, 2000). Organic acids are an alternative to antibiotic to be used exclusively as a growth stimulant and for improvement of the feed conversion rate in farm animals (Esteive *et al*., 1997). Some organic acids reduce production of toxic components by bacteria and a chance in the morphology of the intestinal wall and reduces colonization of pathogens on the intestinal wall, thus preventing damage to the epithelial cells (Langhout, 2000). Also, herbs can be used as alternatives to antibiotic growth promoter in poultry nutrition due to their antimicrobial properties. Many herbs and their bioactive constituents posses a broad antimicrobial activity (Dorman and Deans, 2002; Kamel, 2001; Tucker, 2002; Cross *et al*., 2003; Lewis *et al*., 2003). Scientific evidence exits that herbs and plant extract stimulate the growth of beneficial bacteria and minimize pathogenic bacterial activity in gastrointestinal tract of poultry (Gill, 1999; Langhout, 2000; Varel, 2002). The objective of the present study was to evaluate the effects of the antibiotic (Avilamycin), a commercial composition (FormycinGold) and herbal additive (FYTO-MIX) on the serum lipid concentrations of broiler chickens during starting period.

MATERIALS AND METHODS

Experimental design: In this study, 300 broiler chickens of the commercial Ross 308 strain were used in a randomized completely design with 5 treatment and 4 replicates in each treatment and 15 birds/replicates and reared on the floor pens for 21 days. Before beginning this study, the dry matter, crude protein, ether extract, crude fiber and ash contents of main feed ingredients were determined in the laborabry to make sure of the presence of sufficient amounts of protein and crude fiber content of the ration (AOAC, 1984). A basal deit was formulated as control according to NRC (1994) recommendations for starter (1-21 days) period. Four tested diets were formulated by supplemented the basal control diet with antibiotic (Avilamycin, 150 g ton^{-1}), commercial composition (FormycinGold, 2000 g ton^{-1}), herbal additive (FYTO-MIX, 250 g ton^{-1}) and mixture of FormycinGold (2000 g ton^{-1}) plus FYTO-MIX (250 g ton^{-1}), respectively. Four replicates were used for each treatment (Table 1).

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FormycinGold is a commercial composition containing formaldehyde, sodium bentonite, propionic acid and ammoniac. FYTO-MIX produce are selective associations of different aromatic substances from vegetal origin, dry plants, dry roots and essential oils including essential oil of Cinnamon, essential oil of Thyme, essential oil of Oregano, essential oil of Tea tree (Melaleuca), essential oil of Eucalyptus, dry roots of ginger, dry fruits of Capsicum, Garlic powder, Cardus marianus, mother tincture of Echinacea and Yucca. During the experiment, water and feed were given to the birds *ad-libitum* and antibiotic or coccidiostat were not offered to them.

Sample collection: At 21st day of the experimental period, 3 mL of blood was collected from wing vein from 6 birds in each treatment. Blood samples were centrifuged (at 2,000x rpm for 10 min) and serum was separated and then stored at -20°C until assayed for measuring blood parameters (cholesterol, triglycerides and High Density Lipoprotein cholesterol (HDL)) using appropriate laboratory kits (Friedewald *et al*., 1972; Gordon *et al*., 1977; Gowenlock *et al*., 1988). Very Low Density Lipoprotein cholesterol (VLDL) was calculated from triglycerides by dividing the factor 5. The Low Density Lipoprotein cholesterol (LDL) was calculated by using the formula:

LDL cholesterol = Total cholesterol-HDL cholesterol-VLDL cholesterol

Statistical analysis: All data were analyzed using the one-way ANOVA procedure of SAS® (1998) for analysis of variance. Significant differences among treatments were identified at 5% level by Duncan (1955) multiple range tests.

Table 1: The experiment basal diets composition and calculated proximate analysis (on dry matter basis)

Ingredients	Starter (1-21 days)
Corn	58.07
Soybean meal	27.12
Cotton meal	10.00
Soybean oil	1.16
Ground limestone	1.17
DCP	1.34
Salt	0.40
Vitamin and mineral premix	0.50
Coccidiostat	-
Vitamin E	0.03
DL-methionine	0.11
L-lysine	0.10
Nutrient content	
ME (kcal kg^{-1})	2850.00
Crude protein (%)	20.48
Crude fiber (%)	4.37

Vitamin and mineral provided per kilogram of diet: Vitamin A, 360,000 IU; vitamin D3, 800,000 IU; vitamin E, 7200 IU; vitamin K3, 800 mg; vitamin B1, 720 mg; vitamin B9, 400 mg; vitamin H2, 40 mg; vitamin B2, 2640 mg, vitamin B3, 4000 mg; vitamin B5, 12,000 mg; vitamin B6, 1200 mg; vitamin B12, 6 mg; choline, 200,000 mg, manganese, 40,000 mg, Iron, 20,000 mg; zinc, 40,000 mg, copper, 4000 mg; Iodine, 400 mg; selenium, 80 mg

RESULTS AND DISCUSSION

Serum lipid concentrations: The effect of experimental treatments on blood parameters are given in Table 2. As table shown non of the treatments had significant effect on triglycerides and Very Low Density Lipoprotein (VLDL) levels. The serum cholesterol content and LDL of the birds under FYTO-MIX and FormycinGold plus FYTO-MIX treatments were lower as compared with other groups ($p<0.05$). Dietary supplementation of FormycinGold, FYTO-MIX and FormycinGold plus FYTO-MIX was found to cause a significant ($p<0.05$) increase in the mean values of HDL as compared with control birds. In agreement with the findings, it is reported that the herbal additives supplementation significantly reduces the serum cholesterol level and LDL of broiler chickens (Prasad *et al*., 2009; AL-Kassie, 2009). Emadi and Kermanshahi (2006) observed significant ($p<0.05$) increase in HDL cholesterol and decreased level of LDL cholesterol and non significant effect on total triglycerides in male broiler chickens fed with diet containing turmeric rhizome powder.

The changes in the mean values of serum cholesterol and HDL in the brid fed FYTO-MIX may be due to the possible mechanism of hypocholesterolaemic and hypolipidemic action of garlic products (such as Allicin), which depresses the hepatic activities of lipogenic and cholesterogenic enzymes such as malic enzyme, fatty

Table 2: The effect of treatments on serum lipid concentrations of broilers

Parameters	Cholesterol (g dL^{-1})	Triglycerides (g dL^{-1})	HDL (mg dL^{-1})	LDL (mg dL^{-1})	VLDL (mg dL^{-1})
Treatments					
Control	131.79±3.58^{a}	43.28±0.6	44.09±0.89^{b}	79.05±2.81^{a}	8.65±0.12
Avilamycin	127.89±6.27^{a}	42.95±0.77	47.7±0.89^{ab}	71.6±6.94^{a}	8.59±0.15
FormycinGold	125.15±3.29^{a}	41.27±1.25	50.2±0.91^{a}	66.7±4.03^{ab}	8.25±0.25
FYTO-MIX	105.37±1.33^{b}	40.97±0.93	52.9±3.39^{a}	44.28±4.55^{c}	8.19±0.18
FormycinGold plus	111.93±2.08^{b}	41.17±0.58	51.27±1.6^{a}	52.43±3.18^{bc}	8.23±0.11
FYTO-MIX					
p-value	0.0023	0.26	0.0463	0.0018	0.2601

^{a,b,c}Means in each column with different superscripts are significant different ($p<0.05$)

acid synthase, glucose-6-phosphatase dehydrogenase (Chi *et al*., 1982; Qureshi *et al*., 1983a) and 3 Hydroxyl 3 Methyl-Glutaryl-CoA (HMG-CoA) reductase (Qureshi *et al*., 1983b, 1987). Also, allicin is a specific inhibitor of the acetyl CoA synthetase enzyme necessary for fatty acid biosynthesis. Binding of allicin to the enzyme is non-covalent and reversible in nature (Focke *et al*., 1990). The effect of garlic in reduction of LDL level may probably be due to the possible mechanism of antioxidant and antiperoxide lowering action of garlic products i.e., S-Allyl Cysteine sulfoxide (SAC) on LDL or decrease in hepatic production of VLDL, which serves as the precursor of LDL in the blood circulation (Grundy, 1986). Synthesis of bile acids from cholesterol in the liver is a major route of cholesterol excretion (Wilson *et al*., 1998). Also, it may that the use of FYTO-MIX, due to lactic acid bacteria activity, can be effective in reducing the cholesterol level by producing enzymes disintegrating bile salts and making them unconjugated, as well as by reducing the pH in the intestinal lumen. The solubility of unconjugated bile acids is reduced at low pH levels and consequently, they are absorbed less by the intestine and are excreted more in the feces (Klaver and Van Der Meer, 1993). Therefore, the liver for resuming the hepatic cycle of bile acids, converts more cholesterol to the bile and the cholesterol content of tissues and the blood is reduced (Ros, 2000). However, the findings on serum lipid concentrations were in contrast to those of Mehala and Moorthy (2008) and Namagirilakshmi (2005).

CONCLUSION

Based on results of the present study, dietary FYTO-MIX have a clear positive effect on plasma lipids levels of broiler chickens. Therefore, the addition of this feed additive in this level can be acceptable.

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