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Performance and selected blood parameters of broiler chickens fed diets with skullcap (*Scutellaria baicalensis* Georgi) root

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ABSTRACT

One hundred and twenty one-day-old male broiler chickens were allocated into four groups, 5 replicates of 6 birds in each. Chickens were fed either a control diet or the same diet with the addition of 5, 10 or 15 g per kg of dried skullcap (*Scutellaria baicalensis* Georgi - SCR) root. The addition of 5 and 10 g SCR per kg diet had little effect on performance and blood parameters. In the group fed the diet with 15 g SCR, body weight gain, red blood cell count and haemoglobin level was higher ($P<0.05$), while the HDL, LDL, and total cholesterol levels in blood serum ($P<0.05$) were lower than in the control group. The glucose level in blood serum was variable, aspartate aminotransferase and alkaline phosphatase activities were similar, while alanine aminotransferase activity, higher ($P<0.05$) in all groups fed diets with SCR than in the control group.

KEY WORDS: skullcap root, blood, performance, broiler chickens

INTRODUCTION

In recent years, new additives of plant origin, considered to be natural products that consumers would accept, have been offered to livestock producers as an alternative for antibiotic growth promoters. For some of them, beneficial effects on health and productivity, including feed conversion ratio, have been reported (Hernández et al., 2004). Skullcap (*Scutellaria baicalensis* Georgi) root (SCR) is well known and widely applied in China and Japan. It has a particularly high content of flavonoids, which are modifiers of inflammatory processes, prevent bacterial infections and have antiviral, antitumor and antioxidative properties as well as hepatoprotecive effects (Gao et al., 1999; Chan et. al., 2000; Bochorakova

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et al., 2003). The objective of this study was to evaluate the effect of SCR on the performance of broiler chickens and selected blood parameters.

MATERIAL AND METHODS

One hundred and twenty one-day-old male Hubbard-ISA broiler chickens were randomly allocated into four groups, each group comprised 5 cages (replicates) with 6 birds. The birds were fed either a control basal diet (Table 1) or the basal diet with the addition of 5, 10 or 15 g of ground dried SCR per kg diet. Starter diets were fed from day 1 to 14 of life, grower diets from day 15 to 42 of life. Body weight and feed intake were measured at weekly intervals and body weight gain (BWG) and feed conversion ratio (FCR) were calculated. At the end of the experiment, blood samples were collected from the *v. jugularis* from 10 birds in each group. Glucose, total protein, triglycerides, HDL, LDL and total cholesterol contents were measured in serum using BioSystems kits. The activity of alanine aminotransferase (ALT), aspartate aminotransferase (AST) and alkaline phosphatase (AP) were determined with the use of Aqua Medica kits and a Pharmacia Biotech Ultrospec 2000 spectrophotometer. The effects of dietary treatments were compared by one-way ANOVA (Statistica, 1997).

TABLE 1

Composition of control basal diets, g/kg DM

Ingredients	Starter	Grower
Maize	375.0	510.0
Wheat	220.0	150.0
Soyabean meal	284.8	230.0
Meat meal	33.1	46.6
Plant oil	50.0	30.0
Calcium carbonate	2.0	3.0
Dicalcium phosphate	19.5	15.0
NaCl	3.0	3.0
DL-methionine	2.6	2.4
Vitamin-mineral premix	10.0	10.0

[1] vitamin-mineral premix provided per kg of diet: vit. A 10 000 IU, vit. D_3 2500 IU, mg: vit. E 35, pantothenic acid 10, B_1 3, B_2 7, B_6 4, B_{12} 0.01, niacin 25, folic acid 1.5, choline 950, K 1, biotin 0.15, and Mn 60, Zn 50, Fe 40, Cu 6, Se 0.15

RESULTS

In the groups fed diets with 5 and 10 g of added SCR, feed intake was significantly lower, but BWG was similar as in the control group, while in the group

fed the diet with 15 g of SCR, feed intake was similar and BWG was significantly higher ($P<0.05$) in comparison with the control group (Table 2). The addition of 5 and 10 g SCR per kg diet had little effect on the measured blood parameters, whereas in the group fed the diet with 15 g SCR, the red blood cell count and haemoglobin level were higher ($P<0.05$), HDL, LDL and total cholesterol levels in serum were lower ($P<0.05$) than in the control group. The glucose level was variable, ALT and AP activities were similar, while AST activity, higher than in the control group in all of the groups fed SCR diets.

TABLE 2

Performance of chickens, 1 to 42 days of age

Parameter	Dietary treatments				
	control	5 g SCR	10 g SCR	15 g SCR	SEM
Body weight gain, g	1741[a]	1744[b]	1733[a]	1816[c]	34.3
Feed intake, g	3055[a]	2942[b]	2986[b]	3138[a]	5.27
FCR, g feed/g BWG	1.79	1.68	1.72	1.72	0.01

[a,b] means in rows with different letters differ significantly at $P<0.05$

TABLE 3

Haematological and biochemical parameters in blood of chickens

Parameter	Dietary treatments				
	Control	5 g SCR	10 g SCR	15 g SCR	SEM
Red blood cell count, T/L	2.27[a]	2.19[a]	2.32[a]	2.40[b]	0.03
Haematocrit, L/L	0.28	0.28	0.27	0.29	0.01
Haemoglobin concentration, g/L	8.74[a]	9.21[a]	9.09[a]	9.69[b]	0.28
White blood cell count, g/L	41.5	38.6	30.9	36.7	2.34
Total cholesterol, mmol/L	3.13[a]	2.72[a]	2.98[a]	2.48[b]	0.06
HDL cholesterol, mmol/L	2.20[a]	1.72[a]	1.84[b]	1.75[b]	0.09
LDL cholesterol, mmol/L	0.90[a]	0.93[a]	1.10[a]	0.64[b]	0.16
Triglycerides, mmol/L	0.32	0.52	0.24	0.49	0.04
Total protein, g/L	331	3.09	2.94	3.28	0.23
Glucose, mmol/L	230.76[a]	191.7[b]	216.9[a]	194.4[b]	15.20
Aspartate aminotransferase, U/L	239.2	232.4	215.9	210.2	16.05
Alanine aminotransferase, U/L	16.02[a]	27.84[b]	40.69[b]	26.24[b]	4.09
Alkaline phosphatase, U/L	727.6	814.5	728.8	878.5	63.9

[a,b] means in rows with different letters differ significantly at $P< 0.05$

DISCUSSION

The decrease in the blood cholesterol level is in agreement with the results of Hamada et al. (1993), who reported that flavonoids lowered the quantity of cholesterol in blood and of Harborne et al. (1986), who reported that flavonoids lowered the LDL level in blood. Also, according to Tang and Eisenbrandt (1992) flavonoids from skullcap root can lower the total blood cholesterol content. A high

serum LDL level is associated with an increased risk of cardiovascular diseases, so lowering this fraction may lower broiler mortality. It seems that the amount of flavonoids in diets with 5 or 10 g SCR was too low to affect performance, but chickens fed the diet with highest amounts of SCR had a higher final body weight in comparison with the control group. There was no information in the available literature about the influence of *S. baicalensis* Georgi on the performance of chickens, but Hernandez et al. (2004) reported that the addition of vegetable extracts from the *Labiatae* family to broiler diets positively affected the growth rate.

The results of the study indicated that addition of 15 g of scullcap root to the diet may positively affect the growth rate and blood parameters of broiler chickens.

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STRESZCZENIE

Wyniki odchowu i wybrane wskaźniki krwi kurcząt brojlerów żywionych mieszankami z dodatkiem korzenia tarczycy bajkalskiej

Sto dwadzieścia jednodniowych kogutków brojlerów podzielono na cztery grupy, w każdej 5 powtórzeń po 6 ptaków. Kurczęta żywiono dietą kontrolną lub tą samą dietą z dodatkiem 5, 10 lub 15 g wysuszonego i zmielonego korzenia tarczycy bajkalskiej (SCR). Dodatek 5 i 10 g SCR na kg diety miał niewielki wpływ na wydajność odchowu i wskaźniki krwi. W grupie żywionej dietą z dodatkiem 15 g SCR przyrost masy ciała, liczba krwinek czerwonych i hemoglobiny były wyższe ($P<0,05$), a poziom cholesterolu całkowitego i jego frakcji LDL i HDL niższy ($P<0,05$) w porównaniu z grupą kontrolną. Poziom glukozy w osoczu krwi był zmienny, aktywność AST i AP podobna, natomiast aktywność aminotransferazy alaniny była wyższa ($P<0,05$) we wszystkich grupach żywionych dietami z SCR niż w grupie kontrolnej.