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Effect of different levels of Sumac Powder (*Rhus Coriaria L.*) on performance, carcass and blood parameters of broiler Chickens

Navid Hosseini Mansoub

Young Researchers Club, Maragheh branch, Islamic Azad University, Maragheh, Iran

ABSTRACT

Four feeding trials were conducted to investigate the effects of using different levels of sumac on carcass traits, blood biochemical and immunity parameters of broilers. In this study that started 1 day following until 42 days, at first 375 one day old broiler chicks were divided to 5 groups and five replicates of 15 chicks each. Experimental groups included T1, control group with no cinnamon supplementation, T2, T3, T4, and T5 received 0.75%, 1%, 1.5%, and 2% Sumac Powder respectively. The results showed that the highest percent of breast, thigh and HDL were observed in group 5 and the lowest percent of abdominal fat and LDL was observed in group 4. The results evidence that the using of sumac in broiler feeds have significantly effects on performance, carcass traits and blood biochemical without having any significantly effects on immunity parameters.

Keywords: carcass, Blood parameter, Broiler, sumac.

INTRODUCTION

Antibiotics are growth promoters with high rate of usage in the poultry industry, they improve growth and the yield of feed. But since the society concerns about antibiotal resistance and the possibility of transferring some of these antibiotics to the human by using these chicks, there are some banns in the usage of these growth promoters. Since then the scientists are trying to find alternatives, and one the best options is herbs and their drivens. There are a lot of advantages in using medicinal plants such as easy usage, non side effects, no waste particulars in the target body and etc. Several compounds like, enzymes, organic acids, probiotics, and phytoGENICS are used to improve the performance [1]. Recently, aromatic plants, and their associated essential oils or extracts are being concerned as potentially growth promoters. At present the scientists are working to improve feed efficiency and growth rate of livestock using useful herbs [2].

Organic poultry is a relatively new expression in western countries which is going to expand in other countries. In this kind of poultry method, farmers do not use chemical compounds at all or in a very low level for sake of costumers, instead they use alternatives like organic acids, probiotics, and medicinal plants, and despite of higher prize of this method, these products have more fans in the costumers [3]. There are a lot of reports indicating the positive effects of herbs like anti-coccidal, anti-oxidant, anti-fungi and etc. Some of medical effects of herbs are related to their secondary metabolites such as phenols, necessary oils, saponins and etc [3]. Herbs have been used for some disease since long time ago because of availability, easy usage, non side effects. Many herbs have a long history of use even prehistoric use, in preventing or treating human and animal diseases. Aromatic plants have been used traditionally in therapy of some diseases worldwide for a long time. Research on the use of herbal mixtures in broiler diets has produced inconsistent results [4]. Some authors state significant positive effects on broiler performance [5-7], whereas another group of authors established no influence on gain, feed intake or feed conversion [8]. Research indicated that sumac is effective against both gram positive and negative bacteria, but it is more effective on gram positive than gram negative microorganisms [9]. Research indicated that sumac is effective against both gram positive and negative bacteria, but it is more effective on gram positive than gram negative microorganisms [9]. The objective of this study was to investigate the effects of using different levels of sumac on performance, carcass traits, blood biochemical and immunity parameters of broilers.

MATERIALS AND METHODS

In this experiment that started 1 day following until 42 days that there are five treatments, at first 375 one day old broiler chicks were divided to 25 groups of 15 chicks each. Each 4 groups randomly assigned to one of the 4 treatments. control group with no cinnamon supplement, T2, T3, T4, and T5 received 0.75%, 1%, 1.5%, and 2% sumac powder respectively. There were similar partitions for male and female birds into treatment groups. The rations were similarly formulated in all treatment groups based on the NRC, 1994 Nutrients recommendations (tables 1).

Dried sumac was supplied from local market and after fine milling, mixed with other ingredients. The diets and water was provided *ad libitum*. The lighting program during the experiment period consisted of a period of 23 hours light and 1 hour of darkness. Environmental temperature was gradually decreased from 33°C to 25°C on day 21 and was then kept constant.

Performance parameters

During days 0-42, unbound water and dietary was in poultries' access. Dietary and chick weigh were going on weekly. Feed consumed was recorded daily, the uneaten discarded, and feed conversion ratio (FCR) was calculated (total feed : total gain). At the end of experiment, some analyses was done via SAS[10] (Statistical Analyses Software) in the statistical level of 5% according to data gathered from dietary, average of FCR.

Carcass traits

At 42 days of age, four birds per replicate were randomly chosen, slaughtered and carcass percent to live weight and percent of carcass parts to carcass weight were calculated.

Immunity system:

In the 35th day of experiment, three chicks were chosen from each group and inoculated from brachial vein by 0.1 ml (5 %). Heterophils to Lymphocytes ratio were determined and Globulin and Albumin proportion in blood were counted from blood samples which had been obtained from brachial vein of three randomly chosen chicks from each group in the 49th day of experiment.

Serum parameters:

Blood samples were obtained from brachial vein and centrifuged in order to getting serum, after 12 hours of fasting in the 49th day of experiment. Serums have been analyzed for glucose, Cholesterol, Low-density lipoprotein (LDL), High-density lipoprotein (HDL) and Triglyceride by ELISA set.

Statistical analysis:

After obtaining the data, they were analyzed by variance method (ANOVA) considering $P < 0.05$ using SPSS 18 software. The significant differences were taken to Duncan multiple range test to compare the means.

Table 1. Ingredients and chemical analyses composition of the starter and grower diets

Ingredients (g/kg)	1-2829-42	
Maize	557	300
Wheat	--	330
Soybean meal	370	300
Soybean oil	30	40
Fish meal	20	--
Limestone	10	--
Oyster shell	--	12
Dicalcium phosphate	5	15
Vitamin-mineral mix ²	5	5
dl-methionine	1	1
Sodium chloride	2	2
Vitamin E (mg/kg)	--	100
Zn	--	50
Analyzed chemical composition (g/kg)		
Dry matter	892.2	893.5
Crude protein	222.3	200.7
Fat	62.4	62.9
Fiber	36.1	35.6
Ash	61.7	57.0
Calcium	8.22	8.15
Phosphorus	5.48	5.57
Selenium (mg/kg)	0.53	0.58
ME by calculation (MJ/kg)	12.78	12.91

¹ starter diet fed to birds from 0 to 21 days. ² Provides per kilogram of diet: vitamin A, 9,000 IU; vitamin D3, 2,000 IU; vitamin E, 18 IU; vitamin B1, 1.8 mg; vitamin B2, 6.6 mg; vitamin B3, 10 mg; vitamin B5, 30 mg; vitamin B6, 3.0 mg; vitamin B9, 1 mg; vitamin B12, 1.5 mg; vitamin K3, 2 mg; vitamin H2, 0.01 mg; folic acid, 0.21 mg; nicotinic acid, 0.65 mg; biotin, 0.14 mg; choline chloride, 500 mg; Fe, 50 mg; Mn, 100 mg; Cu, 10 mg; Zn, 85 mg; I, 1 mg; Se, 0.2 mg.

RESULTS AND DISCUSSION

The effects of different levels of sumac on performance of broilers are showed in Table 2. Using different levels cinnamon have significant effects on food intake, weigh improvement, average of weight and feed conversion of broilers ($P > 0.05$). The improvement of body weight gain and feed conversion are due to the active materials (Cinnamaldehyde and ugenol) found in sumac, causing greater efficiency in the utilization of feed, resulting in enhanced growth. These results could be attributed to the effect of sumac powder on improving feed utilization probably due to its anti-bacterial effect on gut micro flora [9].

Table 2: Effects of treatments on performance of broilers.

Experiment Treatments ¹	Weigh Improvement	Food Intake (G)	Average of FCR	Average Of Weight
T1	41.1 ^a	86.3 ^a	1.70 ^a	1995.3 ^a
T2	41.3 ^a	86.3 ^a	1.72 ^a	1996.6 ^a
T3	41.1 ^a	86.9 ^a	1.62 ^a	1995.5 ^a
T4	42.4 ^{ab}	86.7 ^a	1.65 ^{ab}	2001.1 ^a
T5	42.6 ^{ab}	88.9 ^{ab}	1.61 ^{ab}	2010.5 ^{ab}
SEM	0.43	0.76	0.04	25.3
P-value	0.03	0.008	0.004	0.03

a-c Means with in columns with different superscript differ significantly

Table 3. The effect of different levels of sumac on carcass traits of broilers

Parameters	Treatments					SEM
	T1	T2	T3	T4	T5	
Abdominal Fat	3.76 ^a	3.85 ^a	3.69 ^a	3.19 ^{ab}	3.23 ^{ab}	0.40
Gizzard	3.31 ^a	3.30 ^a	3.33 ^a	3.39 ^a	3.34 ^a	0.33
Breast	32.18 ^b	32.12 ^b	33.09 ^{ab}	33.17 ^{ab}	33.22 ^{ab}	0.40
Thigh	26 ^a	26.08 ^a	26.46 ^a	27.33 ^{ab}	27.37 ^{ab}	0.45
Liver	3.07 ^a	2.99 ^a	3.10 ^a	3.11 ^{ab}	3.12 ^a	0.30

Means with different subscripts in the same column differ significantly ($P < 0.05$)

Table 4: Effect of treatments on immunity system of broilers

Parameters	T1	T2	T3	T4	T5	SEM
Heterophils to Lymphocytes ratio	0.23	0.25	0.23	0.21	0.24	0.04
Globulin	1.48	1.49	1.50	1.54	1.50	0.32
Albumin	1.23	1.35	1.42	1.44	1.53	0.26

Means with different subscripts in the same row differ significantly ($P < 0.05$)

Table 5. The effect of different levels of sumac on blood biochemical of broilers

Blood Parameters	Treatments					SEM
	T1	T2	T3	T4	T5	
Glucose (mg/dl)	179.22 ^a	179.52 ^a	180.40 ^a	180.13 ^a	181.33 ^a	18.09
Cholesterol (mg/dl)	133.62	132.10 ^a	132.45 ^a	130.15 ^b	130.12 ^b	29.41
Triglyceride (mg/dl)	40.15 ^a	39.89 ^a	39.20 ^a	39.05 ^a	38.50 ^b	11.77
LDL	32.05 ^a	31.88 ^a	31.98 ^a	29.15 ^b	29.19 ^b	2.45
HDL	78.34 ^a	78.61 ^a	78.84 ^a	79.11 ^{ab}	79.19 ^{ab}	1.56

Means with different subscripts in the same column differ significantly ($P < 0.05$)

The effects of different levels of sumac on carcass traits of broilers are in Table 3. Application of different levels of sumac significantly affected the carcass traits ($P < 0.05$). The highest percent of breast was observed in group 5. This result is in agreement with the finding of and Azadeganmeher *et. al.* [11] who reported decreasing in liver weight due to supplemental protexin in broilers. But these results are not consistent with work of Yazdankish *et. al.*, [12].* Langhout [13], who showed that herbal planet could stimulate the digestion system in poultry, improve the function of liver and increase the pancreatic digestive enzymes. Enhancement of the metabolism of herbal planet, carbohydrates and proteins in the major organs would increase growth rate of these organs [14-15]. Al-Kassie [16] who found that herbal planet effect on the live weight gain and the improvement of the health of poultry, in addition to other performance traits, feed conversion ratio and feed intake.

The present of antioxidants and phenolic substance in cinnamon may be the main cause of improvement in breast percent of broilers carcass. The presence of harmful bacterial populations in the gastrointestinal tract may cause breakdown of amino acids and thereby reduce their absorption as antimicrobial substances are present in cinnamon can reduce the harmful bacterial populations in the gastrointestinal tract and improve the levels of absorbed amino acids [17-18]. The carvacrol in cinnamon has stimulatory effects on pancreatic secretions by increasing the secretions of digestive enzymes more amounts of nutrients like amino acids can be digested and absorbed from the digestive tract and thereby improve carcass traits. Else increasing the percents of gizzard and liver by use of cinnamon can have positive effects via physically grinding and increasing bile secretion on nutrient digestion [17]. With increased amounts of absorbed amino acids, organs like breast and thigh drawn more growth. The effects of different levels of cinnamon in starter and grower feeds on blood biochemical and immunity parameters of broilers are summarized in Table 4 and 5. The use of different levels of cinnamon did not have any significant effects on immunity parameters of broilers. The mean values of serum constituents in broiler chicken fed different supplemented diets are shown in table 5. The serum total cholesterol, Triglycerides and LDL concentration were significantly reduced and the concentration of serum HDL was significantly induced in treatment groups compared to the control groups ($P < 0.05$).

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