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Comparison of Chemical and Biological Growth Promoter with Two Herbal Natural Feed Additives on Broiler Chicks Performance

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Abstract: The aim of the present study was to compare the growth promoter effect of 2 labiatae family herbal supplementation with antibiotic and probiotic on broiler chicks Performance. Seven hundred, 1 day-old broiler chicks were randomly divided into 5 treatment groups: Control, virginiamycin (0.1 g Kg^{-1}), probiotic (1 and 0.4 g Kg^{-1}), *zataria multiflora (ZM)* (15 g Kg^{-1}) and *ziziphora Clinopodioides (ZC)* (15 g Kg^{-1}). Each treatment group was further sub divided into 4 replicates of 35 birds per replicate. During experimental period, growth performance was evaluated by recording body weight, feed intake, Feed Conservation Ratio (FCR), mortality and Efficiency Productive Index (EPI) by the followed formula at 21 and 42 days. At 42 days, EPI differed significantly among treatments. The EPI of the treatment fed on the diet containing virginiamycin was the highest and those ZM was the lowest. Addition of ZC to broiler diet improved EPI, body weight compare with the control But this different was not significantly ($p>0.05$) but have similar effect to addition of probiotic ($p>0.05$). ZM had lower body weight and EPI and higher FCR compare with control and ZD groups ($p>0.05$). It was concluded that the supplementation of herbal additive to broiler diets had beneficial effect on their performance and 2 herbs from 1 family had different effects.

Key words: Herbal medicine, probiotic, virginiamycin, broiler, performance

INTRODUCTION

Recently the use of Antibiotic Growth Promoter (AGPs) in poultry industry has been seriously criticized by governmental policy makers and consumers because of the development of microbial resistance to these products and the potential harmful effects on human health (Botsoglou and Fletouris, 2001; Williams and Losa, 2001; McCarteney, 2002). At present and up till 2007 only 4 AGPs are permitted for use in poultry nutrition. On the other hand, there is increasing public and government pressure in several countries of EU and some non-EU to search for natural alternative to antibiotics (Williams and Losa, 2004; McCarenty, 2001). Since, the prohibition on AGPs in the EU, herbal additives have gained interest in alternative feed strategies for future. Other alternative feed additives are probiotic and herbal additives. Furthermore, it has been found that probiotics have growth promoting properties and can be used as alternatives to antibiotics (Vanbelle *et al*., 1990). Herbs can be used as alternatives to AGPs in poultry nutrition due to their antimicrobial properties. Many herbs and their bioactive constituents posses a broad antimicrobial activity (Dorman and Dean, 2000; 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; Wenk, 2002). The beneficial character of herbs due to their chemical compounds, especially essential oils. The main functions of essential oils cover pathogen control including antimicrobial activity (Cowan, 1999; Dorman and Deans, 2000), antioxidant activity (Botsoglou *et al*., 2002, 2004) digestion aid including stimulation of endogenous enzyme activity and nitrogen absorption (Gill, 2001) and inhibition of odor and ammonia control (Varel, 2002). Their anti microbial mode of action consist of interaction with cell membranes that change the permeability for cations such as H and K. Although, there is sufficient literature on growth promoting effects of probiotics and antibiotics, the number of published studies on the effects of herbal additives on broiler Chick performance is still limited.

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The objective of present study was to compare the effects of AGPs with probiotic and 2 herbal feed additives on broiler chicks performance and compare 2 herbs effect From 1 family.

MATERIALS AND METHODS

Seven-hundred day old ROSS male broiler chicks were obtained from a commercial hatchery and were divided to six treatment groups with 4 replicates using randomized completely block design. Feed and water were provided at libtum and all chicks reared in deep litter pen measure 1×2 m. The birds were subjected to continuous lighting program of 23L: 1D and the temperature was gradually reduced from 33°C at day 1-22°C by day 21. Prior, to the formulation of the experimental diet, the herbal additives were analyzed for the their crude protein and crude fiber according to the methods of AOAC (1984). All diets were formulated to meet minimum nutrient requirements. The chicks were fed on a basal commercial corn-soybean meal based diets as starter, grower and finisher rations from 1-14, 14-28 and 28-42 days, respectively. The ingredient and the calculated nutrient composition of the basal diet are presented in Table 1. The experimental diets were designed as:

T1: A corn-soybeen meal diet (the basal diet) as control treatment.
T2: The basal diet supplemented with an antibiotic growth promoter (0.1 g virginiamycin Kg^{-1}).
T3: The basal diet supplemented with probiotic (BIOPLUS-2 ®) at 2 levels: 1 g Kg^{-1} in starter and 0.4 g Kg^{-1} in grower and finisher ratio.
T4: The basal diet supplemented with *zataria multiflora boisis* (ZM) powder (leaf part) at 15 g Kg^{-1} level.
T5: The basal diet supplemented with *ziziphora clinopodioides* (ZC) powder (leaf part) at 15 g Kg^{-1} level.

In all treatment except T4 and T5, wheat barn added to diets for be uniform diets fiber because 2 herbal additives had high fiber. The 2 herbal additives were supplied by the CANDALOUS (Tehran, Iran) which company present herbal medicine drug. Virginiamycin was supply by ARASBAZR Co (Tehran, Iran). The probiotic (BIOPLUS-2®, Biochem) contained *Bacillus subtilis* 2.2×10^9 CFU and *Bacillus licheniformis* 2.6×10^9 CFU used as biological growth promoter. During experimental period, growth performance was evaluated by recording body weight, feed intake, Feed Conservation Ratio (FCR), mortality and Efficiency productive Index (EPI) by the followed formula at 21 and 42 days.

Table 1: The ingredients and the calculated nutrient composition of the basal diet (as fed basis)

	Composition of basal diet (g Kg^{-1})		
	Starter (1-14 d)	Grower (14-35 d)	Finisher (35-42 d)
Ingredients			
Corn	557.0	598.0	628.0
Soybean meal	356.0	316.0	267.0
Wheat barn	15.0	15.0	15.0
Vegetable oil	28.0	31.0	48.5
Di calcium phosphate	19.3	15.5	16.9
Carbonate calcium	11.6	12.1	12
Salt	2.8	3	3.4
DL-Methionine	2.7	2.4	2.4
Lysine	1.6	1.0	0.8
Minerals premix*	2.5	2.5	2.5
Vitamin premix**	2.5	2.5	2.5
Vitamin E	1.0	1.0	1.0
Total	1000.0	1000.0	1000.0
Calculated composition			
Metabolisable energy (Kcal Kg^{-1})	2.900	2.970	3.100
Crude protein (g Kg^{-1})	21.5	20	18
Crude fiber (g Kg^{-1})	4.05	3.87	3.61
Calcium (g Kg^{-1})	1	0.9	0.9
Available phosphorous (g Kg^{-1})	0.5	0.42	0.42
Methionine (g Kg^{-1})	0.58	0.53	0.5
Methionine+cystine (g Kg^{-1})	0.92	0.85	0.8
Lysine (g Kg^{-1})	1.3	1.15	1

*Vitamin premix Kg^{-1} diet: Vitamin A-12000 IU; Vitamin D3-1500 IU; Vitamin E-50 mg; Vitamin K3-5 mg; Vitamin B1- 3 mg; Vitamin B2-6 mg; Vitamin B6- 5 mg; Vitamin B12-0.03 mg; niacine-25 mg; B5-12 mg; Folic acid- 1 mg; D-biotin- 0.05 mg; choline chlorides-400 mg, **Mineral premix Kg^{-1} diet:Mn-80 mg; Fe-60 mg; Zn-60 mg; CU-5 mg; Co-0.20 mg; I-1 mg; Se-0.15 mg

$$EPI = [(Bodyweight\times liveability)/(rearing\ period\times FCR)]\times 100$$

The data were analyzed using SPSS WINN (1994) software and all results were subjected to one way ANOVA (Steel and Tarrie, 1980). Significant differences among means were Separated using Tukey´s test at 95% confidence level. Differences at or less than $p = 0.05$ were considered to be significant. All data were expressed as Mean±Standard Error (SE).

RESULTS AND DISCUSSION

The effect of supplementation of virginiamycin, probiotic and herbal additive on broiler chicks performance in Table 2. During the experiment, mortality rate was not significant ($p>0.05$) but in T4, was not mortality. At 42 days, EPI differed significantly among treatments. The EPI of the treatment fed on the diet containing virginiamycin was the highest and those ZM the lowest. At 42 days, there were differences ($p\leq0.05$) in FCR among treatments. The birds fed on the virginamycin containing diets gained the best FCR and those consuming ZM the highest. At end of experiment, the highest and lowest body weight was belong to T2 and T4. The result show that virginiamycin added to diet

Table 2: The effect of experimental diets on body weight, feed intake, feed conservation ratio and Efficiency Productive Index (EPI) on broiler chicks

	Experimental diets					
Performance parameter	T1	T2	T3	T4	T5	p-value
Body weight (g)						
21 d	669.9±7.9^{bc}	736.8±7.1^{a}	656.4±11.6^{c}	644.0±2.1^{c}	693.4±15^{b}	0.0001
42 d	2404.2±42.0^{b}	2595.4±40.5^{a}	2423.3±21.8^{b}	2269.0±56.7^{c}	2421.6±30.23^{b}	0.001
Feed intake (g)						
1-21 d	953.6±17.9^{b}	993±3.9^{a}	925.0±13.2^{b}	948.6±14.3^{b}	957.7±5.3^{ab}	0.020
1-42 d	4291.0±38.5^{a}	4376.3±59.5^{a}	4246.3±37.6^{ab}	4125.6±53.8^{b}	4291.8±22.4^{a}	0.017
Feed conservation ratio						
1-21 d	1.52±0.021^{ab}	1.43±0.013^{c}	1.50±0.030^{ab}	1.58±0.021^{a}	1.48±0.03^{bc}	0.008
1-42 d	1.78±0.026^{b}	1.71±0.009^{c}	1.78±0.025^{bc}	1.86±0.029^{a}	1.81±0.041^{ab}	0.005
EPI	309.6±6^{bc}	351.3±5.5^{a}	318.1±5.5^{b}	291.6±11.7^{c}	317.1±6.35^{b}	0.001

$^{a-c}$Means within the same row with common superscripts do not differ ($p>0.05$), T1-the basal diet (control group), T2-the basal diet supplemented with virginiamycin, T3-the basal diet supplemented with bioplus-2, T4-the basal diet supplemented with *zataria multiflora*, T5-the basal diet supplemented with *ziziphora clinopodioides*

increase significantly body weight (8%) and improved FCR (4.7%) compare with control group. These results agreed with results reported by Buresh *et al.* (1985), Cavazzoni *et al.* (1998) and March *et al.* (1978). The reasons of virginiamycin effect may be due to increasing feed intake (Buresh *et al*., 1985; Leeson, 1984), increasing gut absorption capacity (March *et al.*, 1967), improving nutrient and protein absorption` (Nelsonson *et al.*, 1963; Miles, 1982) and reduction in *clostridium perfringens* in ileum (Stutz and Lawton, 1984). In this experiment adding bioplus-2 in diet had not significant effect on body weight compare with control and ZC although had higher than two another groups in this treatment. Probiotic Improved FCR compare with control treatment (0.6%) that agreed with results reported by Cavazzoni *et al.* (1998), Jin *et al.* (1997), Owings *et al.* (1990), Yeo and Kim (1997) and Vanbelle *et al.* (1990). There are limited reports on effect of herbal additive on the performance of broiler. The addition of ZC to broiler diet improved EPI, body weight compare with the control But this different was not significantly ($p>0.05$) but have similar effect to addition of probiotic ($p>0.05$). On the other hand, significant differences in body weight, FCR and EPI were not found Between ZC and bioplus-2. The beneficial effect of the ZD in broiler nutrition may due to its effect on pathogenic bacteria (Cowan, 1999; Dorman and Deans, 2000), antioxidant effect (Botsoglou *et al.*, 2002, 2004), increasing feed consumption and the greater efficiency in the utilization of feed (Gill, 2001), resulting in enhanced growth. The improvement in body weight gain in this study agreed with results that been reported about.

Essential oils by Hertrampf (2001), McCarteney (2002), Tucker (2002), Alcicek *et al.* (2003 a,b), Demir *et al.* (2003). However contrary to these findings, Botsoglou *et al.* (2002, 2004) had been achieved. The result suggest that improved digestibility of nutrients leads to more balanced gut flora with potential to reduce the proportion of pathogenic bacteria. In this study, ZM had not beneficial effect on broiler chicks performance, perhaps due to Reduction in feed intake for it`s taste and different compounds compare with ZC. The ZM had lower body weight and EPI and higher FCR compare with control and ZD groups ($p\leq0.05$).

CONCLUSION

The results of present study showed that Virginiamycin, probiotic and ZD had improved body weight and EPI but ZM had not positive effect on broiler chicks performance. Interesting result from this study is 2 plants from one family had not similar effect. The broiler hicks in the present study kept in clean, disinfected and normal condition, which would possibly lead to a reduced efficacy of any dietary feed additives.

Therefore, herbal additive may be considered as a growth promoter, similar to antibiotics and probiotic with potential to achieve an environmental friendly broiler production system and reduction in antibiotic residue and resistant in poultry meat. However more and detailed research are required on essential oils derived from this herb to evaluated on broiler chicks performance as growth promoter.

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