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ORIGINAL ARTICLE

Effect of Different Natural Feed additives Compared to Antibiotic on Performance of Broiler Chicks under High Temperature

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ABSTRACT
The study was conducted to investigate the effects of feeding natural spices as growth promoters compared to antibiotic for broilers under high environmental temperature. Two hundred and forty day old chick (Cobb strain) was divided into six groups A, B, C, D, E, F in complete randomized design. A control group received broilers basal diet. For the other groups, the basal diet was supplemented with the antibiotic (Doxystin) at 0.5% in group B, cumin (Cuminum cyminum) at 2% in group C, fenugreek (Trigonella foenum-graecum) at 2% in group D, ginger Z. officinale at 2% in group E and cinnamon, C verum at 2% for the last group F. Growth performance traits and carcass characteristic were studied. There were significant differences among treatment groups for body weight gain in the first (growing) period. Group A showed the highest result (737.2g) while group F reported the lowest estimate (627.4 g). Group C and E on one side and group B, C and D were not significantly different for the trait. In the second (finisher) period weight gain was significantly (P<0.05) higher in group D (720.13g) compared with group B , A and F which reported low weight gain (528.4 -596.5 g). In the first period feed intake was significantly (P 0.05) high in group D, C and B while group E reported the lowest feed intake. In the second period the highest feed intake was reported by group D, and the lowest estimates were recorded by group E and C. Better feed conversion ratio in group E followed by D, C, and F. High dressing percentage recorded in group fed E and F with no difference from B group. Low abdominal fat in the group fed D, B. It is concluded that different spices used did not affect weight gain in the first period, but they exert different effects in the second period. Their effects on feed intake are dissimilar.
Key words: spices, antibiotic, performance, broiler

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INTRODUCTION

Feed stuff constitutes about 80% of the total productive meat cost in broilers. That is why current research was directed towards the search for natural growth promoters to enhance growth rate and to improve feed efficiency aiming to reduce the productive cost of the meat [1]. Antibiotics were routinely used in broiler diets at low than therapeutic doses as to improve birds performance [2]. This practice derives from observations made since 1946, that incorporation of antimicrobial growth promoters improved feed efficiency in intensive poultry production [3]. The use of antibiotics in poultry feed as growth promoter and for health maintenance can cause drug resistance bacteria and antibiotic residue effects [4]. Use of antibiotics in aviculture is considered as a risk factor to human health as their residues may be found in tissues and as they may cause cross-resistance for pathogenic bacteria in humans [5]. Most antibacterial performance promoters have been banned due to cross and multiple resistances [6].
Therefore, researches have been directed towards natural antimicrobial products as indispensable resources [7]. Natural products of plant origin like spices, herbs and many plant extract can be considered as alternative to antibiotics as growth promoters in improving broiler performance [8]. Spices and herbs of various plants extract have appetizing and digestion stimulating property and antimicrobial effects [9,10] concluded that herbs are valuable substitutes for health and nutrition in poultry industry. They can stimulate feed intake, the endogenous secretion, or may antibacterial, anticoccidial activities. A wide range of plant metabolites that belong to class isoprene derivatives, flavonoides and a large number of these compounds may act as antibiotics and antioxidants [11].
Now a days, recent nutritional strategies with ultimate goal of feed cost reduction led to production of fatty broiler carcasses [12]. Drugs used as feed additives e.g. chloretetracycline, tylosine and virginianmycins e.c.t plus the use of low protein diets increase fat content of broiler carcasses [13-15].

Medicinal herbs, e.g. garlic and ginger are well documented to have lipid reducing effects [16, 17]. Herbal extraction is a useful growth promoter of similar effects as antibiotics when used in broiler feeds [3]. It is well known that at highly environmental temperature, there is a decrease in feed intake and decrease in growth performance of broiler chicks, [18, 19]. Deeb and Cahanar [19] found that high ambient temperature reduced feed consumption and body weight in broiler chicks. In order to enhance feed consumption, body weight gain during heat stress the present study was under taken to evaluate the use of natural plants (spices) in Sudan (cumin (Cuminum cyminum) fenugreek (,Trigonella foenum-graecum), *ginger(Z. officinale) and cinnamon (*C.verum) as natural growth promoter for broiler performance at high environmental temperature.

MATERIAL AND METHODS

Experimental birds, housing and management

Two hundred and forty day-old unsexed broiler chicks of a commercial strain (Cobb – strain) were divided randomly into six treatment groups. Each treatment group was sub-divided into four replicates of ten birds per replicate. The birds were reared in an open sided poultry house during summer. The ambient temperature during the experiment ranged from 35 to 42ºC. In the first period (from days 1 to 21) the birds were fed a starter diet and a finisher diet in the second period (from days 22 to 42) as described in table 1. The experimental diets were as follows: basal diet, with no additives (Control, group A), basal diet + an antibiotic (doxystin, 5% diet), group B; basal diet + C.cyminum powder as 2% , group C; basal diet + T. foenum-graecum powder as 2%,group D, Basal diet + 2% Z. officinale ,group E and basal diet + 2% C verum, group F. The diets were isoenergetic and iso nitrogeneous. All the experimental diets were formulated to meet the minimum nutrient requirements of broilers [20]. The experimental diets and drinking water were provided ad libitum.

Chicks were vaccinated against Infectious Bursal Disease, New Castle Disease (HB1) at day 14 and day 21, respectively in the drinking water.

Experimental procedures

The growth performance of broilers was evaluated by recording body weight gain, feed intake, and feed conversion ratio. At the end of the experiment (at d 42), 3 birds from each of the replicate groups of each treatment were selected and were slaughtered to determine some measurements of carcass yield, selected internal organs, abdominal fat pad and bursa of fabricius. The weights of selected internal organs (liver, Gizzard, Heart, Abdominal fat), spleen, Thymus and bursa of fabricus were measured individually. The hot carcass yields were calculated as percentages of the pre slaughter live body weight of broiler chickens.

Data Analysis

The data were analyzed statistically using the General Linear Models procedure of SAS (1991). Significant differences between treatment means were separated using Duncan's multiple range tests with a 5% probability.

RESULTS AND DISCUSSION

The effect of feeding 2% level of different spices on the performance of broiler chicks for the first period (from 1-21 day of age) is shown in table (2). Results revealed the presence of significant differences (P< 0, 05) among treatment groups for body weight gain in the first (growing) period. Group A (control) showed the highest weight gain (737.2g) as compared with group F (Cinnamon) which gained the lowest weight (627.4 g). Group C and E on one side and group B (control+ antibiotic), C (Cumin) and were not significantly (P> 0,05) different for the trait. Weight gain in the first period is slightly lower than the results estimated by Al- Anbari et al [21] and Suriya et al [22] who reported 712.90 – 876.80g and 706.24- 833.00g, respectively. In the second period weight gain is significantly (P< 0.05) affected by treatment. Group D (Fenugreek) reported the highest weight gain (720.13 g) while the control group (A) showed the lowest weight gain (528.40 g). The high weight gain reported in the group fed fenugreek confirmed the results obtained by Alloui et al [23] who reported that supplementing Fenugreek to broiler diet resulted in an increased body weight. [8] suggested that the weight gain improvement can be attributed to the stimulating effect of fenugreek seeds on the digestive system of broilers. Group B (control+ antibiotic), C (Cumin) and F (C verum) on one side and group C and E (Ginger) on the other side were not significantly (P< 0.05) different.

In the present study there was an improvement in body weight gain and feed intake of group C which fed cumin. This result was in line with the result of Ali et al [24] who found that addition of 2% cuminum in the diet of heat stressed broiler can alleviate the negative effect of high temperature and improve the performance. Galib A.M. Al-Kassi. [25] also reported that birds fed diet supplemented with 1% *Cuminum cyminum* had significantly (p<0.05) higher weight and body weight gains compared to control group with

no supplementation. This improvement may be attributed to the biological functions of cumin that are essential for growth [26,27]. It may be due to its role as a stimulant, carminative, digestion, anti-microbial properties and the prevention of gastric toxicity [28,29].

In the first period feed intake was significantly (P< 0.05) high in group D (Fenugreek), C (Cumin) and B (control+ antibiotic) while group E (ginger group) reported the lowest feed intake. For feed conversion ratio in the first period there were no significant (P <0.05) differences among treatment and the lowest estimate was reported for group A (control). Feed intake in the first period was lower than the range reported by Suriya et al [22] who found 805.69-956.34g/bird.

In the second period feed intake also reported its maximum value in group D (Fenugreek) followed by group A (control), B (control+ antibiotic) and F(Cinnamon) while the lowest estimate was recorded by group C (Cumin). Fenugreek supplementation resulted in improvement in feed intake which could be attributed to the carbohydrates and their main component (galactomannan) which stimulated the appetizing and digestive process in animals as reported by [30].

Data presented in Table 3, showed the lowest (best) value for feed conversion ratio was recorded by group E (ginger) while the highest values were reported by group A(control), B (control+ antibiotic) and F(Cinnamon). This result agreed with results obtained by Herwati (2010) who found that feeding 2% of ginger resulted on lower feed conversion ratio,feed intake and weight gain. Feed i feed conversion in the second period is lower than the estimates depicted by Suriya et al [22].

For feed conversion ratio in the first period there were no significant (P <0.05) differences among treatment and the lowest estimate was reported for group A. In the second period feed conversion ratio was high in group A, B, F (3.38 – 3.68 kg feed/ kg weight) and more feed is consumed to produce the same amount of meat than that needed in group C, D and E where feed conversion ratio was in the range of 2.86- 3.04 kg feed/ kg weight. Feed conversion ratio in both periods were higher than the estimates reported by Suriya et al [22].

In table 3 the effects of treatments on carcass traits were shown. Treatment differences only affected dressing %, breast and abdominal fat. Chicken in group B (control+ antibiotic), F (Cinnamon) and E (Ginger) gave carcasses with the highest carcass percentages (72.05- 73.65 %) and group C reported the lowest value (64.00%). Breast cut reported high weights in group F(Cinnamon), D (Fenugreek), E(Ginger), B(control+ antibiotic) (97.4-152.65g) and reported the lowest weight in group A (78.85 g). For abdominal fat , only group B (control+ antibiotic) and D (Fenugreek) were significantly different from each other, while group A (control) ,C (Cumin), E(Ginger) and F (Cinnamon) were not different from group B (control+ antibiotic) or D(Fenugreek). These findings agreed with Zhang et al [31], Javed et al [32] who observed that dressing percentage, breast weight and leg weight increased significantly when certain spices were added to the ration. Estimated dressing percentages in this study were comparable with the results depicted by Zomrawi et al ([33] who found (71.10 – 73.70 %) is slightly lower than those reported by Zomrawi et al [34] who found (75.15 – 76.26%).

The effects of treatments on immunological organs were studied in table 4. The weight of the immunological organs (thymus and spleen) was not significantly (p>0.05) affected by the treatment differences, while the third organ, bursa weight was significantly (p>0.05) affected by treatment differences. Group C (Cumin) and E (ginger) showed the highest bursal weight (2.72 and 1.84 g), respectively, while group A (control), B (control+ antibiotic), D (Fenugreek), F (Cinnamon) were not significantly (p>0.05) different. These findings were lower than those reported by Safaei et al [35]. On the other hand, Bin et al [36] reported that the addition of Fenugreek to boiler feeds lead to increased bursal weight.

Table (1): Composition of the basal diet fed to the experimental birds.

Period→	First Period (1-3 weeks) Starter		Second Period (4-6weeks) Finisher	
Treatment → Ingredient % ↓	Control	Spices	Control	Spices
Sorghum	65.1	63.1	66.5	64.5
Groundnut meal	18.7	18.7	13.5	13.5
Sesame meal	10	10	12.7	12
Super concentrate*	5	5	5	5
Lime stone	0.90	0.90	0.90	0.90
Salt	0.25	0.25	0.25	0.25
Lys	0.04	0.04	0.06	0.06
Meth	0.01	0.01	0.01	0.01

Vegetable oil	0.00	0.00	1.08	1.08
Spices	0.00	2.00	0.00	2.00
Total 100%	100	100	100	100
Calculated Analysis				
Metabolizable energy (Kcal/Kg)	3153.00	3104.00	3269.00	3244.44
Crude protein	23.06	22.94	2200	21.01
lysine	1.11	1.11	1.09	1.08
methionine	0.464	0.460	0.460	0.64
calcium	1.18	1.18	1.21	1.19

Determined chemical analysis of the experimental diets

Crude protein	22.00	22.10	22.00	21.01
Ether extract	4.79	4.2	4.31	4.12
Ash	4.49	4.05	4.12	4.23
Nitrogen free extract	55.00	60.1	61.00	60.00
Crude fiber	4.00	4.50	4.25	4.20
Dry matter	95.20	95.21	95.31	95.15

*Broiler Super concentrate contains (%): CP 40, CF 1.5, ME 2122Kal/kg, fat 3,Lysine13.5, Methionine 5.9, Methionine+cystine6.25,P 4.6, Ca 6.8, Na 1.5.

Vitamins supplied per Kg of diet: Vit. A, 250 000 IU; Vit. D3, 60 000 IU; Vit. E, 800 mg; Vit. K3,60 mg; Vit. B1, 30mg; Vit. B2, 100 mg; Vit. B6, 50 mg; Vit. B12, 300 mg; Vit. C, 4000 mg; Niacin, 800mg; Folic acid,30mg; Biotin, 30mg;Choline chioride,3000mg; Copper, 30 mg; Iron, 100mg; Manganese, 160mg; Zinc,100mg; Iodine,1.3mg; Selenium, 5mg; Cobalt, 1.2mg; Fytase enzyme, 15000; Antioxidant.

Table2. Means and SE of Performance traits of broiler chicks fed 2%spices at high temperature in the starter (1-21d) and Finisher (21-42 d) (Treatment effects)

Period	First period (Starter 1-21days)			Second period (Finisher 21-42 days)		
Treatment	Weight gain	Feed intake	Feed conversion	Weight gain	Feed intake	Feed conversion
-ve control (A)	737.2^{a}	923.58^{bcd}	1.25	528.4^{d}	1900.00^{c}	3.50^{a}
+ve control (B)	693.63^{b}	975.13^{ab}	1.41	557.85^{cd}	2020.1^{b}	3.68^{a}
Cumin (C)	665.33^{bc}	959.08^{abc}	1.44	627.02^{bc}	1904.2^{c}	3.04^{bc}
Fenugreek (D)	674.67^{b}	997.26^{a}	1.48	720.13^{a}	2181.9^{a}	3.03^{bc}
Ginger (E)	631.76^{cd}	881.59^{d}	1.39	667.78^{ab}	1910.10^{c}	2.86^{c}
Cinnamon (F)	627.4^{d}	912.92^{cd}	1.45	596.5^{c}	2014.20^{b}	3.38^{ab}
Se	12.61	17.81	0.028	22.74	24.61	0.15

Means within same raw with different letters are significantly different (P< 0.05)

-ve control = no antibiotics or spices were added to the diet

+ve control= antibiotic was added to the diet

Table (3): Effect of treatments on carcass characteristics of broiler chicks

Spices	Dressing%	Breast(g)	Wing(g)	Thigh(g)	Wing(g)	Heart(g)	Liver(g)	Gizzard(g)	Abdominal fat (g)
-ve control (A)	67.85^{cd}	78.85^{c}	44.25	71.4	44.25	7.2	32.5	23.4	12.20^{ab}
+ve control (B)	72.65^{ab}	97.4^{abc}	48.05	76.1	48.05	8.4	33.25	23.2	28.20^{a}
Cumin (C)	64.00^{d}	85.6^{bc}	46.45	60.3	46.45	7.6	30.15	21.05	11.5^{ab}
Fenugreek (D)	69.00^{cd}	140.65^{ab}	45.0	61.75	45.0	8.10	29.8	16.6	8.3^{b}
Ginger (E)	73.65^{a}	98.85^{abc}	51.6	64.6	51.6	11.0	31.7	25.3	19.75^{ab}
Cinnamon (F)	72.05^{ab}	152.65^{a}	49.6	83.5	49.6	7.6	39.5	23.15	24.8^{ab}
SE	1.1382	16.746	2.7664	9.3754	2.7664	0.8208	3.3001	2.7291	5.5975

Means within same raw with different letters are significantly different (P< 0.05)

-ve control = no antibiotics or spices were added to the diet

+ve control= antibiotic was added to the diet

Table (4): Effect of feeding 2% spices on immunological organs weight of broiler chicks

Spices	Bursa	Thymus	Spleen
Control (A)	1.33[b]	4.4	1.33
Control+antive (B)	1.32[b]	3.1	1.69
Cumin (C)	2.72[a]	1.47	1.63
Fenugreek (D)	0.92[b]	1.85	1.08
Ginger (E)	1.84[ab]	1.74	0.95
Cinammon (F)	0.82[b]	2.04	1.35
SE	0.39	0.88	0.38

Means within same raw with different letters are significantly different (P< 0.05)

CONCLUSION

Different spices used did not affect weight gain in the first period, but thy exert different effects in the second period. Their effects on feed intake are dissimilar. As a substitute for antibiotics spices can be used as natural growth promoter but further studied are needed in this respect.

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