

## Metabolic Effects of Beneficial Bacterial, Herbal Plant and Antibiotic as Feed Additives on Production of Broiler Chicken

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### Abstract

The contribution of natural products as growth promoters as a major causative mechanism for limiting antibiotic growth promoter has been considered recently. It was found that this strategy contributed to the increase of the growth and development of poultry production , as a result, to an increase in the growth efficiency and reduction of the antibiotic as growth promoters. The aim of our study was to analyze whether the use natural growth promoters as antibiotic replacement can increase the broiler's growth.

We analyzed the effect of probiotic, Spearmint leaves powder as replacement to Antibiotic in diet of broiler chicks on growth production. Total 240 female broiler chicks at one day old were housed ,designed into four experimental treatments with 3 replicated pens (20chicks per replicated pen) according to a completely randomized design. The experimental treatments were named G1: either basal feed only, G2: basal feed plus 2 % probiotic ( “Lactobacillus spp kkp 529/p<sup>®</sup> (“probiotic containing on Lactobacillus plantarum, 1.0 × 10<sup>6</sup> cfu/g”), G3: Basal feed plus 0.4 g/kg oxytetracycline, G4: basal feed plus Spearmint leaves powder 2g /kg feed for 6 weeks.

There were no statistically significant differences between the treatments on the body weight (BW), final feed consumption(FI), final feed conversion ratio(FCR), and body weight gain(BWG). The ratio of dressings and the relative weight of some organs were not affected with all treatments, but the weight of the gizzard and the weight of Proventriculus in the Spearmint treatment were significantly increased (P< 0.05) compared with other treatments. In conclusion, the effect of probiotics and Spearmint powder in broiler's feed were similar to antibiotic growth promoter effect, so that they could be significantly administrated as growth promoters.

**Keyword :** Antibiotic , broilers, herbal plant , growth

### Introduction

Poultry production depends on two primary management programs, namely vaccination and antibiotic growth promoters [1]. These two programs applied to prevent and control the poultry diseases [2]. It was found that these programs increased the production, enhancement of meat quality, and reduction of the antibiotic as growth promoters [3]. These programs focused on the use of herbaceous plants or beneficial bacteria in animal feed [4]. The ban of Antibiotic as growth promoters in the animal feed had a negative effect on the growth performance and intestinal health [5]. Nowadays, the concept of using natural products to prevent intestinal diseases and the spread of resistant bacteria is increasing. Although natural

growth promoters are commonly added in feed as alternative promoters, but not much is known about their possible impression on the health and growth production

## **Materials and Methods**

### ***Animals***

Female 260 a day old broiler chicks Ross 308 weighing 60g were taken from local hatchery and allocated randomly into four groups of (60) chicks with 3 replicated pens according a complete randomized design in the farm. The initial weight of broiler chicks were recorded, and allotted randomly to 12-floor pens (1.5 m<sup>2</sup>), bedding with wood dust, the chicks were fed a standard diet and water freely and exposed to a 23 hr light/1 dark cycle during 42 days. The feeding program consisted of start feed starting from 1 to 21 days and grower feed that starting from 22 - 42 days basing to nutritional requirements of (NRC 1994) National Research Council, Table (1).

All experiments were conducted as base to Institutional Ethics Committee and to standard procedures outlined by veterinary public health committee, Al-qasim green University.

The treatments were :-

G1: either basal feed only, (control).

G2: The basal feed plus 2 % probiotic ("Lactobacillus spp KKP 529/p<sup>®</sup>)("probiotic containing on Lactobacillus plantarum, 1.0 × 10<sup>6</sup> cfu/g"),

G3: The basal feed plus 0.4 g/kg oxytetracycline (Interchemie Werken "De Adelaar, Metaalweg 8 Venray, Holland")

G4: The basal feed plus Spearmint leaves powder 2g /kg feed (purchased from local bazar).

These levels were selected according the optimum recommended levels in some researches [6-7]. The house temperature of first week was 32°C and gradually reduced 3 °C per week until 26 °C in the third week of life. Each pen was equipped with feeder and waterer.

### **Growth performance tests**

The Feed consumption and average body weight, weight gain, and feed conversion ratio (FCV) per pen were measured weekly, The birds in each pen were vaccinated via eye drops against Gumboro disease (infectious bursa disease, Nobilis<sup>®</sup> Ma5+Clone 30, Intervet, Boxmeer Co, Netherlands) at 7 d, and Newcastle disease(Nobilis<sup>®</sup> ND LaSota, Intervet CO.) on d 10 and 20 of life according to Rose broiler recommendation.

### **Internal organs and dressing percentage**

At the end of experimental period (42 days of age), five birds per replicated pen were prevented from feed for 6 hours. The chickens were weighed, slaughtered, bled, eviscerated, scalding, plucking, and washing. Before slaughtering the birds were weighed and again weighed after evisceration (removing edible gobbets included heart, liver and Gizzard) to calculate the dressing percentage.

The goblots organs included heart, gizzard , cecum , liver , and Bursa of fabracius were picked and recorded separately to measure the relative weight of these internal organs as a percentage of live body weight .

### Statistics

complete randomly design (CRD) was applied to analyze the experimental data. The significant differences were measured using LSD (least significant difference tests) at level (  $P < 0.05$  ), the SPSS program (SPSS , 2001)(8) was used .

**Table (1) :- The chemical composition (g/kg) of Basal diets (on an as-fed basis)**

Ingredients (%)	Starter 1-21 days	Finisher 22-42 days
corn	69.50	65.5
Soy bean meal (48%pr)	38.0	32.0
Vegetable oil (8900kcal /kg)	1.0	1.0
Food Salt (Nacl)	0.3	0.3
Methionine	0.1	0.1
Lysine	0.1	0.1
Premix*	1.0	1.0
Total	100	100
chemical analysis		
ME (kcal/kg)	2850	2900
Crude protein ( %)	22.4	20.2
Calaum %	0.1	0.2
phosphorus. %	0.2	0.1
Methionine + cystein	0.8	0.8
Lysine	1.2	1.2

Premix : ( per kg of complete diets ) : . pantothenic acid 6.46 mg; pyridoxine 2.29 mg; biotin 0.05 mg; folic acid 0.56 mg; cyanocobalamin 0.05mg; vit A 12000 IU; thiamine 1.43 mg; VIT D3 3500 IU;; vit B6 (riboflavin )3.44 mg; menadione 2.29 mg; Niacin 40.17 mg; vit E ( $\alpha$ -tocopherol) 44.7 IU, Iron 120 mg; Zinc 120 mg; copper 15 mg; manganese 150 mg; cobalt 0.4 mg; selenium 0.3 mg; iodine 1.5 mg

NRC ,1994 was applied to meet Nutrition Requirements of these broilers [9]

### Result:-

#### growth performance

The average body weight, cumulative weight gain, the final feed consumption and feed conversion ratio are presented in Table (2 and 3) .

The average body weight , accumulative weight gain , weight at the end of experimental period were not different ( $P \geq 0.05$ ) between the control group and the probiotic, Spearmint plant and antibiotic. The experimental treatments did not affect significantly on the final feed

consumption at the starter and finisher phases ( $P > 0.05$ ). The feed conversion ratio was not influenced ( $P > 0.05$ ) by experimental diets during experimental period. The dressing percentage, was not affected ( $P > 0.05$ ) by the dietary treatments (Table 2).

In table (4) The relative weight of internal organs to live weight included heart, liver, and Bursa fabracia did not differ significantly between different groups ( $P < 0.05$ ), but the Gizzard and true stomach (proventriculus) of the Spearmint group were higher when compared with other experimental groups.

**Table (2):- live weight(g /bird) with addition of probiotic, antibiotic and Spearmint as feed additives**

weeks treatments	1	2	3	4	5	6
Control	73.5 ± 1.50	115.3 ± 0.25	359.5 ± 22.2	534.7 ± 1.40	742 ± 74	1082.7 ± 102.3
Probiotic	63.6 ± 3.5	604.5 ± 0.50	291 ± 22.1	420.4 ± 7.3	735.8 ± 99.7	993.0 ± 26.5
Antibiotic	59.0 ± 1.0	106.0 ± 1.0	324.7 ± 25.3	404.1 ± 95.8	797.2 ± 36.6	906.8 ± 1.25
Spearmint	68.5 ± 3.5	115 ± 1.50	332.2 ± 2.8	541.7 ± 13.7	863.5 ± 0.05	1077 ± 41.5

The statistical differences ( $p < 0.05$ ) between experimental groups in each column are revealed in small different letters

All Values are measured as mean values ± SEM (N=4).

**Table (3):- Growth performance and dressing percent in broiler in broiler chickens fed on diet contained probiotic, antibiotic and Spearmint**

items Group	Final feed conversion ratio (g/g)	Accumulative body weigh gain g/bird	Final feed consumption (g/bird)	Dressing parent(%)
Control	1.7 ± 0.20	1038.7 ± 102.3	1765.6 ± 15.0	70 ± 0.01
Prebiotic	2.0 ± 0.01	948.2 ± 26.9	1915 ± 35.0	72.0 ± 0.01
Antibiotic	1.97 ± 0.030	862.7 ± 1.70	1705.5 ± 29.5	71.5 ± 0.5
Spearmint	1.60 ± 0.10	1034.0 ± 41.0	1636 ± 15.0	67.5 ± 2.5

The statistical differences ( $p < 0.05$ ) between experimental groups in each column are revealed in small different letters

All Values are measured as mean values ± SEM (N=4)

**Table (4) :- relative weights for some visceral organs of broiler fed on diet containing probiotic , antibiotic and Spearmint as feed additive**

items	Heart(%)	Liver(%)	Gizzard(%)	cecum(%)	Proventriculus (%)	Bursa (%)
Group						
Control	0.012 ± 0.003	0.041 ± 0.0008	0.03 b ± 0.0072	0.008 ± 0.003	0.00 b ± 0.005	0.0014 ± 0.0004
Probiotic	0.115 ± 0.029	0.053 ± 0.0023	0.047a ± 0.0021	0.0073 ± 0.0010	0.0103 b ± 0.0016	0.0020 ± 0.00041
Antibiotic	0.0095 ± 0.00096	0.045 ± 0.005	0.36 ab ± 0.047	0.0078 ± 0.0013	0.008 b ± 0.0011	0.0014 ± 0.00021
Spearmint	0.010 ± 0.0014	0.049 ± 0.0074	0.045 a ± 0.003	0.0073 ± 0.0098	0.025 a ± 0.0092	0.018 ± 0.00030

The statistical differences ( $p < 0.05$ ) between experimental groups in each column are revealed in small different letters.

All Values are measured as mean values ± SEM (N=4)

### Discussion:

The contribution of natural products as growth promoters as a major causative mechanism for limiting antibiotic growth promoter has been considered recently. The three natural products affected on some growth performances but they did not reach the ambition. The basic mechanisms of growth promotion are to increase the growth performance of broiler chickens with poor conditions. This data may be due to controlled conditions and standards or to a similar environment during the trial period. Similarly, [10 ; 11] who said that the live weight, feed consumption were not improved by The probiotic alone or antibiotics as feed additives. Other researchers also point out that no significant effects of growth promoters may be attributed to differences in gut microbiota and environmental status. [12]. In the text of herbal plants, the authors found that the supplementation of 1, 1.5 , 2 % Spearmint as feed additive had no significant effect on feed intake and feed conversion ratio [13;14;15]. Studies by other authors have claimed that, the phenolic compounds and alkaloids enhance a feed digestion and absorption by secreting digestive enzymes [16 , 17]. In the present study, there was no change in the mean heart liver and spleen weight of the broiler chicken. Also, the mean weight of dressing percentage in broiler that received antibiotic, probiotic and spearmint were not different from the control group. These observations concur with [18;19] who found no improvement of probiotic, herbal plant and antibiotic on the relative weight of dressing carcass. Moreover [20] referred no improvement of herbal , oxtetracycline and control group on dressing percentage and internal organs. Many reported explained that dry spearmint

supplement did not influence significantly on relative weights of whole intestine, pancreas and edible organs, at 42 days of age of broilers [21-22]. Similarly, [23] stated that no significant effect was seen among the groups in carcass, liver, heart weights except the dramatic increase in liver weights at levels 2% and 4% Spearmint was. The increased liver weights could be due to the dilatation of liver veins. On the other hand, (24) found that spearmint as feed additives significantly reduced ( $P>0.05$ ) the abdominal fat percentage for broiler chicks as compared to the control and antibiotic groups. Furthermore our findings confirmed by [25; 20] who reported that the probiotic, herbal plant and antibiotic (oxytetracycline) as feed additives didn't change the internal organs compared with control. The experimental treatments did not affect the relative weight of heart, liver, gizzard and cecum and it was similar to the normal for Ross 308 Broiler chicken. The increase of the proventriculus and Gizzard weight in the Spearmint treatment compared with other groups may be resulted from the increase in mucosal thickness or the increase in epithelial cells by the oligosaccharide of this herbal plant [26, 27]. [20] who reported that the addition of a herbal plants as feed additive did not impact on the internal organs.

### **Conclusion**

The broiler chickens fed a diet contained probiotics and Spearmint powder had similar growth performance to antibiotic growth promoters, so that they could largely be administered as growth promoters. Also this study stimulates the searchers for seeking on other natural products as an alternative to antibiotic growth promoters.

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### **Authors' Contribution**

Study procedures and planning : Yahya sabah Abdulameer

Statistical analysis and interpretation of data: Wesam Mohammad Mahdy Najy Alameedee, Mohamad. K. Ulsagheer

### **Ethics**

The study was conducted according to the Animal Care committee of Al-Qasim Green University in Iraq, from April to June 2020.

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