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USE OF *CICHORIUM INTYBUS* LEAF AS GROWTH PROMOTER AND HEPATOPROTECTANT IN BROILER CHICKS

By

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ABSTRACT

The objective of this study was to determine the effect of different levels of chicory leaf on performance and biochemical serum profile of broiler chicks. The feeding trial was carried out using 180, day-old Cobb broiler chicks. The birds were randomly assigned into three different groups; each group was subdivided into three replicates (20 birds each). The treatments were 1) served as control, and fed the basal diet only, 2) basal diet + 0.5% chicory leaves and 3) basal diet+1% chicory leaves. At day thirty-five, three birds per replicate (pen) were randomly selected and slaughtered for some blood parameter measurements. The results showed that a significant improvement ($P < 0.05$) in body weight gain, (1871.38 ± 39.22, 1973.18 ± 26.37 and 1999.08±6.03) FCR, (1.90±0.013, 1.80 ±0.01 and 1.79±0.01) respectively with no significant difference in total feed consumption. In addition, blood indices showed a significant decrease ($P \leq 0.05$) in liver enzymes activity as (ALT and AST),total cholesterol, triglycerides, LDL and VLDL with no significant difference in High density Lipoproteins (HDL) and kidney function indicators (serum uric acid and serum creatinine) between different inclusion rate of chicory (0.5% ,1%) and control. But total proteins and globulin fraction showed a significant increase in treated group with chicory by different levels compared to control with no significant difference in albumin fraction. It was concluded that chicory leaf can be used as an inexpensive, efficient and safe growth promoter and hepatoprotectant in broiler production.

Key words:

Broiler, Chicory leaf, Performance, hepatoprotectant.

INTRODUCTION

Feeding cost represents about 70% of poultry industry. So, the feed efficiency is of great importance, and now the aim of poultry nutrition is not only to optimize the productivity but

also enhance the immune function, improve feed utilization, feed conversion ratio and intestinal health. The use of antimicrobial growth promoters (AGP) has been shown without doubt beneficial improvement in performance parameters as well as prevention of diseases, **(Frost, 1991)**. Because of concern that, the use of antibiotics as feed additives might contribute to an increase of bacterial antibiotic resistance, the European Union (EU) has decided to ban antibiotics as feed additives from 1st January 2006 onwards, **(Kumar *et al.*, 2005).** Increased awareness of the potential problems associated with the use of antibiotics has stimulated research efforts to identify alternatives to AGP. The herbal plants as natural feed additives are being used in poultry rations to enhance production performance **(Abaza *et al.*, 2008)**. Different parts of these plants such as moringa **(Ayssiwede *et al.*, 2011),** chicory **(Sarwar, 2013)** have been used in poultry as growth promoters. Cichorium intybus (Chicory) is an herbal medicinal plant having mucus and resin as active ingredients. Cichorium intybus is known to have antibacterial, anti-inflammatory, digestive, bitter tonic, diuretic, and anti-hypercholesteremic and laxative properties without presenting any side effects **(Saeed *et al.*, 2017)**. Hence in this study we aimed to use the leaf of Cichorium intybus (Chicory) plant as growth promoter, and hepatoprotectant in broilers.

MATERIAL AND METHODS

The feeding trial was carried out to investigate the impact of dietary fortification of chicory leaf feed on the growth performance and blood serum indices of broiler chickens.

Chickens, management and experimental design:

180, One day- old Cobb® broiler chicks were randomly weighed and divided into three different groups; each group was 60 chicks and sub-divided into 3 replicates, each replicate was 20 birds, thus providing the following three experimental groups:

1st group was served as control and fed only the basal diet (Corn-Soya based diet) without any dietary treatments.

2nd group was fed basal diet fortified with 0.5% chicory leaves.

3rd group was fed basal diet fortified with 1% chicory leaves.

Physical composition and calculated analysis of the basal diets are shown in **(**Table 1). The diets were formulated according to the Cobb™ Manual for recommended nutrient requirements, 2015. Chicory leaves were collected from local fields in Egypt (Sadat city) and identified then dried by air under shelter and grinded by grinder according to stage of feeding from fine grinding in starter diet to coarse grinding in grower and finisher diet. All diets were

offered to the birds in the form of mash. Starter diets was fed up to 10 day of bird's age and then grower diet till 21d then finisher diet till the end of the experiment at 5 wks. Of age. Birds were provided with feed and water on an *ad libitum* basis during the entire experimental period. Clean wood shavings were used as litter and pens were equipped with an electrically heating system with continuous lighting maintained throughout the course of the experiment. All birds were vaccinated against Newcastle, Gumboro, IB and avian influenza following procedures recommended by the vaccine manufactures. Animal care was in compliance with applicable guidelines from Cairo University Policy on Animal Care and Use.

Data collection:

Growth performance responses.

The growth performance of broiler chickens was evaluated in terms of body weight gain (BWG), feed consumption (FC) and feed conversion ratio (FCR). Individual BWG of the birds were recorded at the beginning of the experiment and on a weekly basis thereafter. Weekly records of FC for each treatment were also maintained in order to calculate FCR (Feed: Gain).

Serum biochemical indices:

At 35 days of age, blood samples were individually collected from the wing vein of three birds per replicate. Serum was separated and frozen at - 20^{o}c until assayed. Determination of Serum total Protein **(Kaplan, and Szablo, 1983),** Serum Albumin **(Tietz and Saunders, 1990),** Serum Globulin **(Tietz and Saunders, 1990**), Serum total cholesterol **(Ellefson and Caraway, 1976),** Serum Triglycerides **(Young *et al.,* 1975)**, Serum High Density Lipoproteins (HDL) **(Lopes Virella *et al*., 1975)**, Serum Low Density Lipoproteins (LDL) **(Lopes-Virella *et al.,* 1975)** and Serum Very Low Density Lipoproteins (VLDL) **(Sharma *et al.*, 1987)** were carried out using photometric methods and diagnostic kits (SPECTRUM, Germany), kidney function was determined by evaluation of Serum creatinine **(Bartles *et al.,* 1972),** serum Uric acid **(Barham and Tinder 1972),**Liver function was evaluated by determination of Aspartate Transaminas (GOT/AST**) (Reitman and Frankel, 1957)** and Alanine transaminase (GPT/ALT) **(Reitman and Frankel, 1957)** were carried out using photometric methods and diagnostic kits (SPECTRUM, Germany).

Statistical analyses:

All data collected were statistically analyzed using SPSS® version 18 software PC (2008).

Means are compared by one-way ANOVA (P<0.05) according to **(Snedecor and Cochran, 1980).**

RESULTS AND DISCUSSION

Growth performance indices:

Results of growth performance (body weight development, body weight gain, feed intake, FCR and cumulative growth performance during experimental period) between control group which fed on basal diet without any treatment and treated group which fed on different dose of chicory leaves are illustrated in (Table 2). Results revealed that, the final body weight 1909.77±17.10, 1973.50± 15.52 and 2038± 17.02 for control and 0.5% chicory leaves and l% chicory leaves respectively while the average weight gain were 1871.38 ± 39.22, 1973.18 ± 26.37 and 1999.08±6.03 respectively and the FCR were 1.90±0.013, 1.80 ±0.01 and 1.79±0.01, respectively. It was noticed that, the birds that received 0.5% and 1% chicory leaves on the top of the diet showed a significant (P ≤0.05) improvement on final body weight development, body weight gain and FCR with no significant difference in feed consumption. But group received the 1% chicory leaves showed a better final body weighs development and there was a significant difference (P ≤0.05) than control and group fed on 0.5% chicory leaves. This improvement in body weight development appeared in W3 but in w4 in group fed on 0.5% chicory leaves with no significant difference in total FCR between two treated groups. The significant positive impact of chicory leaves on growth performance criteria could be explained that, the fresh chicory contains about 68% inulin and dried contain approximately 98% inuline. Leaves consider as a good source of active compounds as phenol and flavnoids. so the improvement on growth performance of chicory leaves may be related to prebiotic effect of inulin and complex carbohydrates as oligo furctones and oligosaccharides by stimulation and regulation of intestinal microflora balance which enhance beneficial bacteria and suppress the pathogenic one by they act as a preferable substrate for beneficial bacteria so increase chance of beneficial bacteria to bind with mucosa and flash the pathogenic which lead to better mucosal growth villi hight led to increased absorption of nutrient ultimately increase in body weight and better FCR as reported by **(Awad *et al.*, 2011) and (Zyl *et al.*,2010)** In addition to the above, the chicory enhance food digestion and absorption by enhancing endogenous enzyme stimulation due to phenol and terpens. Theses finding confirm most of current available studies reported by **Faramarzzadeh *et al.*, (2017)** who found that chicory powder at Ross 308 diet by rate 45g/kg significantly increase body weight

gain and improve FCR with no significant difference in feed intake than control group. Due to prebiotics maintained a better microbial environment in digestive tract of birds by reducing the number of pathogenic microbes and dietary inulin altered the fermentation patterns of cercal content as evidenced by the significant increase in the concentration of n-butyric acid and the n-butyric acid: acetic acid molar ratio in parallel with the increase in the concentration of d-lactic acid. Also our results are compatible with **(Chen *et al.,* 2005**) who reported that addition of 1% chicory improved (P<0.05) the feed conversion ratio. Our findings in agree with **Saeed *et al.,* 2015)** who showed that supplementation of chicory leaf extract in drinking water of poultry exhibited a significantly (P< 0.05) improved weight gain and efficiency of feed utilization and not show any significant (P>0.05) effect on feed consumption of broilers. More or less similar finding were also reported by **(Safamehr *et al.,* 2013**) who reported that addition of chicory leaves with or without enzyme in diet of broiler chickens. Body weight (BW) did not differ between the control and chicory diets during 1-21d but during 21 to 42 d of age, birds fed the diets containing chicory had greater weight gains (P<0.05) than birds fed control diet. However, no effect of supplemented diets was detected for feed intake (g) at whole periods and no significant differences in FCR between the different concentrations of Chicory and control group.

Serum biochemical indices:

The effects of dietary fortification of 0.5% and 1%chicory leaves on liver function enzymes as Alanine Aminotransferase enzyme activity (ALT), Aspartate Amino transferase enzyme activity (AST), renal function indicators (serum uric acid and serum creatinine), total cholesterol, triglycerides, High density Lipoproteins (HDL), Low density Lipoproteins (LDL), Very Low Density Lipoproteins (VLDL),Total Proteins, Albumin and Globulin are illustrated in **(**Table 3). Results showed a significant decrease (P ≤0.05) in liver enzymes activity as (ALT and AST),total cholesterol,triglycerides ,LDL and VLDL with no significant difference in High density Lipoproteins (HDL) and kidney function indicators (serum uric acid and serum creatinine) between different inclusion rate of chicory (0.5% ,1%) and control. But total proteins and Globulin fraction showed a significant increase in treated group with chicory by different levels than control with no significant difference in Albumin fraction. The decrease in blood cholesterol level might be due to the properties of Chicory extract to stimulate lactic acid producing bacteria and secreting the hydrolase enzyme **(Hinton *et al.,***

2000) that converts bile salts into DE conjugated bile acids and reduced serum cholesterol level **(Safamehr *et al.,* 2013)**. Chicory inulin reduces serum triglycerides and lipoprotein levels by reducing fatty acid synthesis **(Williams, 1999)** or due to effect of short chain fatty acids which generated from inulin fermentation which decrease de novo fatty acid, inhibit entire lipogenic enzymes gene expression and decrease cholesterol also because SCFA inhibit the biosynthesis of cholesterol in the liver, prop ionic acids influence its colonic absorption path and modulation of carbohydrates and lipid metabolism. Addition to the above the cholesterol level decrease by addition of chicory which contain inulin by inhibition of liver's cholesterol synthesis through both the increased excretion of bile acids and inhibition of activity of HMG-CoA reductase restriction enzyme associated with cholesterol synthesis as reported by **(Park and park, 2012**) or due to iso flavones in this plant (chicory) which may reduce intestinal absorption of cholesterol by competition for absorption sites and consequently higher concentration of un absorbable cholesterol excreted. Decreased level of ALT and AST activity indicated the hepatoprotictive effect of chicory as reviewed by **(Saeed *et al.,* 2017**). Results agree with **(Mirza *et al.,* 2015**) who stated that feeding 4.5% chicory powder decreased significantly triglyceride (TG) and very low-density lipoprotein (VLDL) cholesterol levels also our finding in agree with that, the results obtained by **(Nady *et al.,* 2016**) who showed a significant decrease in serum ALT, AST, alkaline phosphatase, bilirubin, total cholesterol, triglycerides, with significant increases in serum total protein. The chicory leaves showed -increased in globulin fraction which lead to improvement of immune status of bird may be due to chicory rich with chichoric acids which stimulate immune system and prevent inflammation and bacterial infection to a limited extent as reported by **(Nayeemunnisa, 2009)**.In conclusion, dietary fortification with *Chicoruim intybus* (chicory) leaves at rate 0.5% or 1% to broiler diet have a positive impact on growth performance and blood constituent.

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Table (1): Physical and chemical composition of the basal diet.

Feed ingredient %	Starter	Grower	Finisher
Yellow corn	55.6	60.8	62.9
SBM 44%(Soy bean bean)	33.3	27.8	24.4
CGM 60% (corn gluten meal)	3	3.2	4.2
Methionine	0.24	0.24	0.2
Lysine	0.18	0.24	0.16
Soya oil	3.63	3.81	4.32
MCP (mono calcium phosphate)	1.64	1.55	1.48
Lime stone	1.66	1.61	1.59
Sodium Chloride	0.35	0.35	0.35
*Premix	0.3	0.3	0.3
Toxin binder	0.1	0.1	0.1
Total	100.00	100.00	100.00
Chemical &Calculated analysis			
ME(Kcal/kg)	3033	3108	3180
Crude protein%	21.5	19.5	18.7
Crude fat%	2.65	2.70	2.77
Crude fiber%	3.02	2.94	2.80
Calcium%	1	1	1
Non-phytate phosphorus%	0.50	0.48	0.45

***per Kg premix: 1200000 IU vit A, 350000 IU vit.D3, 4000 mg vit. E, 250 mg vit.B1, 800 mg vit. B2, 600 mg vit. B6, 3.2 mg vit. B12, 450 mg vit. K3, 4.5 g nicotinic acid, 1.5 g Ca pantothenate, 120 mg folic acid, 5 mg biotin, 55 g choline chloride, 3 g Fe, 2 g Cu, 10 g Mn, 8g Zn, 120 mg I, 40mg Co .**

Table (2): Growth performance of broiler chickens fed diets fortified with chicory leaves during experimental period.

Item	Control	0.5% Chicory L	1% Chicory L
Initial body weight	38.38 ± 0.18 [a]	38.32± 0.37 [a]	38.92 ± 0.3[a]
Final body weight	1909.77±17.10 [c]	1973.50± 15.52 [b]	2038 ±17.02 [a]
Total body gain	1871.38±39.22[b]	1935.18± 26.37 [a]	1999.08 ± 6.03 [a]
Total feed consumed (g)/bird	3560.60±52.15 [a]	3491.31± 39.50 [a]	3586.68±29.15 [a]
Overall FCR	1.90 ± 0.013 [a]	1.80 ± 0.010 [b]	1.79 ± 0.010 [b]

1-Values are means ±SE.

2-Values in the same row with different superscripts are significantly different at P ≤0.05.

Table (3): Blood serum biochemical parameters of broiler chickens fed diets fortified with chicory leaves during experimental period.

Parameter	Control	0.5% Chicory leaves	1% Chicory leaves
ALT	**97.77 ±4.177 [a]**	**74.79 ± 7.714 [b]**	**81.59 ±1.07 [b]**
AST	**12.22 ±1.88 [a]**	**7.010 ± 1.16 [b]**	**6.32 ± 0.57 [b]**
Uric acid	**7.07 ± 0.933 [a]**	**6.51 ± 0.692 [a]**	**7.99 ± 0.471 [a]**
Creatinine	**1.023 ± 0.295 [a]**	**0.90 ± 0.462 [a]**	**1.04 ±0.295 [a]**
Total cholesterol	**137.73 ± 4.84 [a]**	**111.49 ± 8.29 [b]**	**110 ±8.95 [b]**
Triglycerides	**58.95 ± 3.21[a]**	**37.52 ± 7.06 [b]**	**34.00 ±5.35 [b]**
HDL	**49.78 ± 20.66 [a]**	**72.02 ± 12.82 [a]**	**76.10±10.68 [a]**
LDL	**76.14 ± 5.84 [a]**	**47.20 ± 6.13 [b]**	**51.33 ±9.45 [b]**
VLDL	**12.79 ± 2.24 [a]**	**5.50 ±1.88 [b]**	**5.46 ±2.32 [b]**
Total protein	**0.36 ± 0,09 [b]**	**0.91 ±0.19 [a]**	**0.98 ± 0.15 [a]**
Albumin	**0.286 ± 0.09 [a]**	**0.36 ± 0.04 [a]**	**0.37 ± 0.03 [a]**
Globulin	**0.089± 0.02 [b]**	**0.56 ± 0.18 [a]**	**0.61 ± 0.14 [a]**

1-Values are means ±SE.

2-Values in the same row with different superscripts are significantly different at P ≤0.05.