

# Performance of Broilers Supplemented with Natural Herb Extract

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## Abstract

The objective of this research was to investigate the effects of a natural herb extract on the general performance, carcass parameters and mortality of broiler chicks. A total of 720 one-day old chicks (Cobb 500) were used in the experiment and randomly partitioned into nine pens (80 chicks per pen). Three experimental diets (C: regular starter feed; CC plus: regular starter feed supplemented with chicken plus herbal extract; AFC plus: antibiotic-free diet supplemented with chicken plus) were assigned each to three randomly selected pens. The herbal extract was supplemented in drinking water at rate of 300 ml/cubic meter. Results showed that weights, feed conversion ratios (FCR) and dressing percentages (DP) increased ( $P < 0.05$ ) in birds supplemented with herb extract compared to control birds. Mortalities and sudden deaths were minimized via herbal supplementation. However, herbal supplementation had no significant effects on carcass cuts and some visceral organs. The relative economic efficiency (REE) was up to 13% improved by the herb supplementation. It can be concluded that feeding the herbal extract has significant positive effects on broilers general performance as feed efficiency is increased by 11% and on mortality and sudden death cases.

## Keywords

Herb Extract, Broilers, Feed Conversion Ratio (FCR), Performance, Carcass Cuts

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## 1. Introduction

Since long time, antibiotics (growth promoters) in animal feeds under intensive farming had positive impact on

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feed conversion efficiency. The use of antibiotics in broilers feeds has been limited in the European Union and many other regions of the world. A manipulation of gut function and microbial habitat of domestic animal with feed additives has been recognized as an important tool for improving growth performance and feed efficiency [1]. Approximately 80% of domestic animals have been fed synthetic compounds for the purpose of either medication or growth promotion [2]. The banning of the use of antibiotics as feed additives has accelerated and led to find nontraditional feed additives to be used in animal feeds. Herbal extracts are being used as feed additives to improve animal performance especially under the intensive management systems [3]. Both health status and general performance can be supported by plant extracts [4]-[9]. The positive impact on animals health and performance could be achieved through the stimulation of appetite and feed intake, the improvement of endogenous digestive enzyme secretion, activation of immune response and, antiviral, antioxidant and antihelminthic actions. It was found that Fenugreek seeds are rich in protein, fat, total carbohydrates and minerals such as calcium, phosphorus, iron, zinc and magnesium [10]. Moreover Fenugreek benefits the digestive system [11].

Chamomile flowers inhibit the excessive growth of intestinal harmful microorganism, thus counteracting inflammation, [12]. Nettle (*Urtica dioica*) has been used to promote health. Numerous analyses of nettle have revealed the presence of more than fifty different chemical constituents. It has been extensively studied and found to contain starch, gum, albumen, sugar, and two resins. Histamine, acetylcholine, choline, and serotonin are also present. Thyme (*Thymus vulgaris*) with the main components of Phenols, thymol (40%) and carvacrol (15%) [13]. This herb is also used traditionally for medicinal purposes [13].

*Mentha* species—of the family *labiatae*—are being valued especially for its antiseptic properties and its beneficial effects on the digestion [14].

The pharmacological action of active plant substances or herbal extracts in humans is well known, but in animal nutrition the number of precise experiments is relatively low. The objective of this research was to investigate effects of a blended natural herb extract when supplemented to regular broiler and an antibiotic free broiler feed.

## 2. Materials and Methods

### 2.1. Experimental Animals and Design

A total of 720 one-day old chicks (Cobb 500) were purchased from a local hatchery. On arrival, chicks were weighed and randomly housed in wood shavings covered floor pens (80 chicks per pen). Continuous lighting was provided throughout the experiment. The ambient temperature was gradually decreased from 32°C on day 1 to 7°C to 24°C on day 21 and was then kept constant. A complete random design was used involving three dietary treatments and three replicates for each.

The formulas and calculated nutrient of the basal diet are presented in **Table 1**. The starter diets were fed for the first three weeks and the grower diet was fed for the remainder of the trial (33 days). Chicken-plus<sup>1</sup> was added at rate of 300 ml/m<sup>3</sup> to drinking water starting from day 1 till termination of the feeding trial (33 d). Chicks were assigned to the basal diet (control, C) which is similar to regular broiler starter diets. While in treatment 2, birds were fed the diets as in control but was supplemented with the chicken plus (CC Plus). The third treatment chicks were fed an antibiotic free starter feed and supplemented with chicken plus (AFC plus). Broiler diets were formulated to meet the NRC [15] recommendations.

Feed consumption was recorded at weekly basis, by monitoring the feed offered and amounts remained at feeders at end of the week. Individual bird weight was also recorded weekly. Birds dying within the five days were replaced, afterwards, mortality was recorded as it occurred and dead chick weights were determined where possible.

Body weight, feed intake and feed conversion were assessed on days 21 and 33 or during the age ranges of 1 - 21 and 22 - 33 days. FCR was calculated as the following: FCR = average feed consumed/average live weight.

### 2.2. Carcass Cuts

At 33 days of age, five birds from each replicate were randomly chosen, slaughtered and carcass and some viscera organs percent to live weight and percent of carcass parts to carcass weight were calculated.

<sup>1</sup>Chicken-plus: a mixture of pure honey with an extract of several medicinal plants: fenugreek (*Tigonella foenum graecum*), chamomile (*Anthemis ecutita*), nettle (*Urtica dioica*), thyme (*Thymus vulgaris*), mint (*Menthola*), black seed (*Nigella sativa*).

**Table 1.** Basal formula and calculated analysis of diets fed to broilers.

Ingredient	Starter (%)	Grower (%)
Yellow corn	36	41
Wheat	20	21
Soybean meal	36	30.3
Oil	4	4
DCP <sup>1</sup>	1.5	1.2
Limestone	1.5	1.5
Salt	0.35	0.35
Premix <sup>2</sup>	0.5	0.5
DL-methionine	0.1	0.1
L-lysine	0.05	0.05
Total	100	100
Calculated analysis:		
Crude protein	22	20
Lysine	11	11
Methionine	5.5	5.6
Calcium	10	11
Available P <sup>3</sup>	4.6	4.7
ME, MJ/kg diet	704.5	718

<sup>1</sup>Dicalcium phosphate. <sup>2</sup>Vitamin premix/kg diet: vitamin A—12,000 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; niacin—25 mg; Ca-D-pantothenate—12 mg; folic acid—1 mg; D-biotin—0.05 mg; apo-carotenoic acid ester—2.5 mg; holine chloride—400 mg;

<sup>3</sup>The chemical analysis of GP (%): Energy (cal/100 g), 332; protein, 16.8; moisture, 5.61; fat, 0.76; total ash, 3.18. Antibiotic was included in the ration in the control and CC plus groups, but was excluded from the ration fed to AFCplus birds. <sup>3</sup>Phosphorus.

### 2.3. Statistical Analysis

Analysis of variance was used to test the significance of treatment effects. Differences among treatment means were tested using Tukey's HSD test with a significance level of 0.05. Carcass and visceral organ variables were expressed as percentages of live weights. These analyses were performed using SAS statistical analysis software [16]. Pearson correlation was used to test the relationship between pairs of continuous variables (*i.e.*, feed conversion ratios, carcass and visceral organ variables). The basic unit of analysis was the average of broiler chicks comprising each replicate (except carcass traits where averages were obtained on 5 randomly selected chicks).

### 3. Results

The data which obtained from performance of broiler chickens fed by herbs and their combination are shown in **Table 2**. There were a significant effect on food intake of treated chicks ( $P < 0.05$ ). The highest amount of food intake were in birds consuming the chicken plus compared to the control birds consuming the regular broiler diets. At age of 33 d birds supplemented with the herb extract ate 10 and 12% more feed compared to the control birds. However, birds supplemented with the extract gained more ( $P < 0.05$ ) weight compared to birds consuming the regular broiler diet. At time of termination of the feeding trial (day 33) birds supplemented with the herb extract had 18 and 22% increase in the average weights. Similar trend was observed in the FCR where it was higher ( $P < 0.05$ ) in birds supplemented with the herb extract.

Carcass and visceral organ variables were expressed as percentages of live weights. **Table 3** shows the effect of extract on carcass and its parameters. According to the data, there were no significant differences in the carcass characters. However, there was a numerical differences among the tested parameters. The lowest per-

**Table 2.** The effects on body weight, feed intake, feed conversion ratios (FCR) in broilers fed the herb extract (chicken plus) with two feed formulas.

Parameter	C <sup>1</sup>	CC plus	AFC plus
Number of birds	80	80	80
Initial weight	48	48	48
Body weight at 21 d	925 <sup>b,2</sup>	1039 <sup>a</sup>	1101 <sup>a</sup>
Body weight at 33 d	1660 <sup>b</sup>	2019 <sup>a</sup>	2110 <sup>a</sup>
Feed intake at 21 d	1258 <sup>b</sup>	1326 <sup>a</sup>	1387 <sup>a</sup>
Feed intake at 33 d	2904 <sup>b</sup>	3218 <sup>a</sup>	3267 <sup>a</sup>
FCR at 21 d	1.36 <sup>a</sup>	1.27 <sup>b</sup>	1.26 <sup>b</sup>
FCR at 33 d	1.73 <sup>a</sup>	1.59 <sup>b</sup>	1.54 <sup>b</sup>

<sup>1</sup>C = control basal diet, CC plus = control basal diets supplemented with chicken plus (300 ml/m<sup>3</sup>), AFC plus = antibiotic free diet supplemented with chicken plus (300 ml/m<sup>3</sup>). <sup>2</sup>Means in the same raw with different superscripts are significantly different (P < 0.05) using Tukey's HSD test.

**Table 3.** Effects of the herb extract (chicken plus) when fed with tow feed formulas on the relative weights (% of body weight) of some internal organs of broilers.

Parameter	C <sup>1</sup>	CC plus	AFC plus
Number of birds	5	5	5
Liver	2.56	1.54	2.00
Heart	0.45	0.48	0.37
Spleen	0.11	0.11	0.07
Gizzard	2.51	2.40	1.82
Fat pad	1.57	1.30	1.24
Bursa	0.16	0.12	0.10
Viscera	7.12	6.60	5.37

<sup>1</sup>C = control basal diet, CC plus = control basal diets supplemented with chicken plus (300 ml/m<sup>3</sup>), AFC plus = antibiotic free diet supplemented with chicken plus (300 ml/m<sup>3</sup>).

tage of gizzard, bursa and spleen were in birds supplemented with the herb extract, especially when associated with feeds lacking growth promoters. Bursa relative weight was numerically the lowest in the control birds compared to the other two treatments (0.10, 0.12, 0.16). Similar trend was observed for spleen where relative weights were 0.07, 0.11 and 0.11 for the control, birds fed regular or growth promoter deficient feeds, respectively.

Carcass cuts relative weights were not affected by type of treatment (**Table 4**). Feeds supplemented by the herb extract resulted in higher dressing proportions compared to control birds. The dressing proportions were 70.5%, 77.0% and 75% for the control, birds fed regular or growth promoter deficient feeds, respectively.

Mortality percent was around 3% and cases of sudden death were minimal (only 2 cases).

The results of economical efficiency (EF) and relative economical efficiency (REF) estimated for the experimental diets used during the experiment are shown in **Table 5**. According to the input–output analysis, the best R.E.E were recorded by the birds fed CC plus followed by birds fed AFC plus compared to the control birds.

#### 4. Discussion

The initial live body weight of chicks at one-day old showed similar values with no significant differences among treatment groups. There were a significant effect on food intake of treated chicks. The highest amount of food intake were in birds consuming the C plus and AFC plus diets compared to the control birds consuming the

**Table 4.** Effects of the herb extract (chicken plus) when fed with two feed formulas on the relative weights (% of body weight) of some carcass cuts of broilers.

Parameter	C <sup>1</sup>	CC plus	AFC plus
Number of birds	5	5	5
Neck	3.79	4.41	3.16
Thye	28.21	28.10	27.10
Breast	28.40	30.5	31.0
Wings	6.92	6.88	6.74
Dressing proportion, %	70.5 <sup>b,2</sup>	77.0 <sup>a</sup>	75.0 <sup>a</sup>

<sup>1</sup>C = control basal diet, CC plus = control basal diets supplemented with chicken plus (300 ml/m<sup>3</sup>), AFC plus = antibiotic free diet supplemented with chicken plus (300 ml/m<sup>3</sup>). <sup>2</sup>Means in the same raw with different superscripts are significantly different (P < 0.05) using Tukey's HSD test.

**Table 5.** The economic evaluation of broilers fed herb extracts.

Parameter	C <sup>1</sup>	CC plus	AFC plus
Feed cost/bird	6.67	7.40	7.84
Selling revenue	19.92	24.22	25.32
Net revenue	13.25 <sup>b</sup>	16.82 <sup>a</sup>	17.48 <sup>a</sup>
Economic efficiency (EE)	2.98 <sup>b,2</sup>	3.27 <sup>a</sup>	3.22 <sup>a</sup>
Relative economic efficiency (REE)	100 <sup>b</sup>	110 <sup>a</sup>	109 <sup>a</sup>

<sup>1</sup>C = control basal diet, CC plus = control basal diets supplemented with chicken plus (300 ml/m<sup>3</sup>), AFC plus = antibiotic free diet supplemented with chicken plus (300 ml/m<sup>3</sup>). <sup>2</sup>Means in the same raw with different superscripts are significantly different (P < 0.05) using Tukey's HSD test.

regular broiler diets (C). The positive effects of herbs on body weight and general performance may be due to the presence of a mixture of essential fatty acids including linolenic and linoleic acids presented in some herbs, especially the black seeds which are essential for growth [17]. Toghyani *et al.* [18] reported that the low dosage (5 g/Kg) of Thyme have significant effect on broiler body weight and their feed conversion ratio. Najafi *et al.* [19] reported that the group which fed by thyme-included diet had significantly better body weight and feed conversion ratio, But Tekeli *et al.* [20] and Demir *et al.* [21] reported opposite results; they found that thyme has no influence on broilers performance.

Our findings showed that there was 8 to 11% improvement in FCR of birds supplemented with the herb extract. The improvement in protein utilization, absorption and suppression of gram negative bacteria and Cholostridium that cause growth depression might be the reason for the improvement in body weight and feed conversion ratios [22] [23]. El-Gendy *et al.* [24] reported that the improvement in feed conversion ratio with feeding herbal extract could be associated with improving the digestibility of dietary protein in the small intestine. The action of herbal extracts as antioxidants, anti bacterial, anti fungal and anti protozoa also add to the positive improvement in birds performance [25].

Several metabolites play the role in the physiological, chemical function of digestive tract and the microbial population in animals gut among these are the isoprene derivatives, flavonoids, glucosinolates and other plant metabolites may affect the physiological and chemical function of the digestive tract [5] [26] [27].

Our findings are in agreement with what was reported by [28]. Elbushra *et al.* [28] reported that live body weight at 6 weeks old, body weight gain, feed conversion ratio and protein efficiency ratio were significantly improved for chicks fed diets supplemented with fenugreek at rate of 0.5% or 1.5% as compared to control diet. Supplementation of fenugreek had significant effect for broiler chicks in live body weight, body weight gain, feed conversion ratio, protein efficiency ratio, feed consumption and efficiency of energy utilization [28]. Similarly, supplementation of chamomile flowers at level of 2.5 kg/ton of broiler diet improved growth performance and feed conversion [29]. Chamomile (*Matricaria Chamomilla* L.) contains chemicals as flavones opigenin, essential oil such as bisaboloxide B,  $\alpha$ -bisabolol, chamazulene and bisababoloxide A [30].

According to our data, there were no significant differences in the carcass characters and visceral organ relative weights. However, there was a numerical differences among the tested parameters. However, the debate on the real effects of nettle on broilers performance can be explained by the nettle variety or chickens used, farm management and operations used in the rearing of broiler chickens. The carvacrol in nettle has stimulatory effects on pancreatic secretions [31] 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.

The results of economical efficiency (EF) and relative economical efficiency (REF) estimated for the experimental diets used during the experiment are shown in **Table 5**. According to the input-output analysis, the best R.E.E were recorded by the birds fed CC plus followed by birds fed AFC plus compared to the control birds.

These results indicated that the diets containing herbal extract were more economical than the control diet. This improvement could be due to improving the feed conversion or reducing the amount of feed required to produce one unit of meat. These findings are in agreement with previous research where herbal extracts improved the economic evaluation [29] [32]-[34].

The recorded mortalities were 3% in average compared to that in commercial operations which is 5% - 7%. This reduction in broilers' mortalities could be explained by improvement in birds general performance and better build up of the immunity caused by the supplement.

## 5. Conclusion

The herb extract had several advantages when supplemented to broilers. Significant improvement in body weights, FCR and dressing percentages. The relative economic efficiency was up to 10% improved by the herb supplement. Our results were comparable to Cobb 500 standards and more.

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