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Research Article

The Effect of chamomile flower (*Matricaria chamomilla* L.*)* extract and powder as growth promoter on growth performance and digestive organs of broiler chickens

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Abstract

The experiment was conducted to evaluate the effect of chamomile flower (*Matricaria chamomilla* L.*)* in the extract and powder form in comparison to antibiotic growth promoter on growth performance of broiler chickens. In this experiment, 420-day-old broiler chickens (Ross 308) were assigned to 6 treatments and 5 replicates of 14 chickens. Dietary treatments included: control, flavopho-spholipol (as a growth promoter), 2 and 4 g/kg chamomile flower powder and 1.8 and 3.6 ml/l chamomile flower extract in water. Chickens were fed by dietary treatments from day 1 to 42 d. The performance parameters (feed intake, body weight gain and feed conversion ratio) were measured in different periods and overall growth period. Carcass traits (carcass yield and abdominal fat) and digestive organs (proventriculus, gizzard, pancreas, duodenum, jejunum, ileum and ceca) were measured at 42 day of age. In summary, these results showed that chamomile extract and powder had no significant effect on growth performance parameters. Feeding diets supplemented with chamomile extract and powder significantly influenced digestive organs such as proventriculus and pancreas relative weights and also the length of duodenum, ileum and ceca ($P<0.05$). Carcass traits were not affected significantly by dietary treatments ($P>0.05$). In conclusion, chamomile extract and powder at the used levels in this study have not potential to be used as a growth promoter in broiler chicks.

Keywords: Broiler chick; Chamomile; antibiotic; performance; digestive organ

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Introduction

Antibiotics in sub-therapeutic doses can be used as growth promoter in poultry diet but they may promote resistance to antibiotic bacteria (Hertampf, 2001), because of this matter European Union banned utilization of antibiotic in poultry diets since January 2006. Thus, new proper alternatives have been suggested in poultry industry including phytogenic and herbal products as possible feed antibiotics substitutions (Ponte and Rosado, 2002).

Chamamile flower (*Matricaria chamomilla* L.) has been a subject of considerable interest as a medicine and therapeutic agent throughout the world since ancient times (Abaza et al., 2003). Flavonoids, sezekoitrepens a-bisabolol, chamazulene, farnesene and also sis and trans isomers of N-in dicyclotera are some prominent components of chamomile (Ganzera et al.,

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2006). Flavonoids are also encompassing of achi jinin, loteolin, koerestin, coumarin, ciranoz and patoliterin (Newall et al., 1996). This plant has aromatic flora with bitter taste. Its aroma is related to the camazolen essence and the bitter taste is attributed to some glycosides like apigenin and trithdroxy flavon. Chamomile is also containing phytoesterol and flavonoids like cyranosid and patulitrin (Trease, 1983; Newall et al., 1996; Gosztola, 2006; Saberi et al., 2014). Abaza et al. (2003) suggested that addition of 2.5 g/kg chamomile flower powder to broiler diet improved growth performance. Mahmmod (2013) reported increased live body weight, weight gain and feed conversion ratio in broilers fed 1 g/kg chamomile flower in comparison to control and 0.5 or 1.5 g/kg chamomile flower at day 42 of age. Improvement in weight gain and feed conversion ratio of broilers fed 1 g/kg chamomile flower powder were observed by Galib et al. (2011).

However, in the literature, few results about chamomile powder have been reported and no studies have compared chamomile flower powder and extract together. Therefore this experiment was conducted to evaluate the effect of chamomile flower extract or powder as a growth promoter on performance and weight of digestive organs of broiler chickens.

Materials and Methods

Animals, diet and experimental design

In this experiment, 420 day-old broiler chickens of mixed sex (Ross 308) were allocated to 6 treatments and 5 replicates of 14 chickens in completely randomized design for 42 days. From day 1, chickens were fed dietary treatments: A) basal diet as a control group; B) basal diet + flavophospholipol (antibiotic growth promoter); C) basal diet + 2 g/kg chamomile powder; D) basal diet + 4 g/kg chamomile powder E) basal diet + 1.8 ml chamomile aqueous extract in drinking water; F) basal diet + 3.6 ml chamomile extract in drinking water. Water and feed were *ad libitum*. The ambient temperature was 32^{o}C which was decreased by 3^{o}C in second and third week of experiment, finally maintained at 22^{o}C till the end of the trial. The lighting program was provided as 23 h of light and 1 h of darkness. The composition of the basal diets and the calculated contents of nutrients are presented in Table 1.

Table 1: Ingredients and composition of the basal diets

Ingredients (%)	Starter (1-14 d)	Grower (14-28 d)	Finisher (28-42 d)
Corn	53.8	56.6	58.9
Soybean meal	40	36.7	34.7
Soybean oil	1.84	3	3
Dicalcium phosphate	1.9	1.67	1.52
Calcium carbonate	1.14	0.93	0.9
DL-Methionine	0.32	0.24	0.16
L-lysine	1.18	0.6	0
Vitamin premix[a]	0.2	0.2	0.2
Mineral premix[b]	0.2	0.2	0.2
Salt	0.3	0.3	0.3
Choline chloride	0.07	0.07	0.07
Calculated composition			
ME (kcal/kg)	2870	3000	3035
Crude protein (%)	21.91	20.7	20
Lysine (%)	1.36	1.18	1.08
Met + Cys (%)	1.01	0.9	0.82
Calcium (%)	1	0.86	0.8
Available phosphorous (%)	0.47	0.43	0.4

[a]itamin premix per kg of diet: vitamin A (retinol), 2.7 mg; vitamin D3 (cholecalciferol), 0.05 mg; vitamin E (tocopherol acetate), 18 mg; vitamin K3, 2 mg; thiamine 1.8 mg; riboflavin, 6.6 mg; panthothenic acid, 10 mg; pyridoxine, 3 mg; cyanocobalamin, 0.015 mg; niacin, 30 mg; biotin, 0.1 mg; folic acid, 1 mg; choline chloride, 250 mg; antioxidant 100 mg; [b]Mineral premix per kg of diet: Fe ($FeSO_4.7H_2O$, 20.09% Fe), 50 mg; Mn ($MnSO_4.H_2O$, 32.49% Mn), 100 mg; Zn (ZnO, 80.35% Zn), 100 mg;Cu ($CuSO_4.5H_2O$), 10 mg; I (KI, 58% I), 1 mg; Se ($NaSeO_3$, 45.56% Se), 0.2 mg.

Performance, digestive organs and carcass related parameters

Weight gain (WG) and feed intake (FI) of each pen were recorded at different phases of the experiment. The FCR (feed intake/weight gain) was also calculated. At the end of the experiment, two birds per pen were slaughtered and carcass, abdominal fat pad, bursa of fabricius, spleen, intestines, and liver were weighed and calculated as a percentage of live weight. Additionally, the length of different intestinal segments was also determined.

Statistical analysis

Data were analyzed by SAS software (2008) based on completely randomized design. Means were compared using Duncan's multiple range test and were considered to be significant at $P<0.05$.

Results

Performance, digestive organs and carcass related parameters

The results of performance parameters, digestive organs and carcass related parameters are listed in Tables 2, 3 and 4. Among all the performance parameters, the BW was affected by dietary treatments and no impact of dietary treatments was observed on DWG, FI and FCR. The 1.8 g/kg addition of chamomile flower extract in water significantly decreased BW compared to control and flavophospholipol ($P<0.05$).

There was no influential impact of dietary treatments on carcass related parameters was observed,

Table 2: Effect of dietary treatments on growth performance of the broiler chickens in overall growth period

Parameters	Treatment					
	Control	PPL	Chamomile powder		Chamomile extract	
			0.2%	0.4%	1.8 ml	3.6 ml
DWG (g/d)						
0-42	54.00±0.34	53.8±0.55	52.3±1.02	52.9±0.53	53.8±1.17	53.3±1.63
BW (g)						
0-42	2470^{a}±33.88	2484^{a}±31.95	2400^{ab}±49.05	2447^{ab}±43.64	2343^{b}±31.79	2454^{ab}±37.84
FI (g/d/bird)						
0-42	111.8±2.73	110.1±1.02	108.4±0.83	112±1.49	108±0.6	111±1.8
FCR						
0-42	1.82±0.03	1.83±0.03	1.86±0.03	1.88±0.02	1.84±0.02	1.84±0.06

a-b; Values in the same row not sharing a common superscript differ significantly (P<0.05); PPL; Flavophospholipol; DWG, daily weight gain; BW; body weight; FI, feed intake; FCR, feed conversion ratio

Table 3: Effect of dietary treatments on carcass traits of broiler chicks

Parameters (%LBW)	Treatment					
	Control	PPL	Chamomile powder		Chamomile extract	
			0.2%	0.4%	1.8 ml	3.6 ml
Carcass	68.40±0.67	69.55±0.45	68.32±0.58	68.98±0.62	69.10±0.39	68.10±0.49
Abdominal fat	0.94±0.11	0.76±0.07	0.92±0.14	0.80±0.10	1.05±0.10	1.01±0.12
Liver	2.24±0.06	2.20±0.07	2.33±0.10	2.15±0.08	2.23±0.08	2.23±0.05

a-b; Values in the same row not sharing a common superscript differ significantly (P<0.05); LBW: Live body weight ; PPL; Flavophospholipol

Table 4: Effect of dietary treatments on digestive organs of broiler chicks

Digestive organs (%LBW)	Treatment					
	Control	PPL	Chamomile powder		Chamomile extract	
			0.2%	0.4%	1.8 ml	3.6 ml
Gizzard	1.43±0.05	1.36±0.03	1.34±0.07	1.31±0.05	1.40±0.04	1.41±0.04
Pancreas	0.26^{ab}±0.01	0.26^{ab}±0.01	0.23^{b}±0.007	0.27^{a}±0.01	0.25^{ab}±0.01	0.25^{ab}±0.01
Proventriculus	0.42^{a}±0.02	0.39^{ab}±0.01	0.37^{b}±0.01	0.42^{ab}±0.01	0.37^{b}±0.01	0.38^{b}±0.01
Duodenum	0.60±0.02	0.57±0.2	0.61±0.04	0.60±0.03	0.61±0.03	0.58±0.02
Jejunum	1.90±0.14	1.99±0.13	2.05±0.18	2.12±0.13	2.05±0.08	2.12±0.13
Ileum	1.44±0.11	1.69±0.10	1.70±0.12	1.63±0.1	1.62±0.08	1.49±0.09
Cecum	0.49±0.07	0.52±0.03	0.54±0.04	0.58±0.03	0.56±0.02	0.50±0.02
Intestinal length (cm)						
Duodenum	34^{ab}±1.16	34^{ab}±0.57	35^{b}±1.30	36^{a}±1.38	34^{ab}±0.80	32^{ab}±0.97
Jejunum	84±3.00	83±3.03	81±3.40	89±3.21	83±3.15	83±3.44
Ileum	85b±3.07	88ab±1.20	88ab±2.46	92a±3.14	83b±2.53	83b±2.11
Cecum	40^{ab}±1.89	40^{ab}±1.72	41^{ab}±1.72	43^{a}±1.69	38^{b}±1.18	38^{b}±1.04

a-b; Values in the same row not sharing a common superscript differ significantly (P<0.05); LBW: Live body weight ; PPL; Flavophospholipol

though the greatest carcass relative weight was found in group fed 1.8 ml chamomile extract in water.

Consumption of 2 g/kg chamomile flower powder and two different levels of chamomile flower extract (1.8 and 3.6 ml) substantially reduced the proventriculus relative weight compared to control group (P<0.05). The highest proventriculus relative weight related to control (0.42) and the lowest associated to 2 g/kg powder (0.37) and two different levels of 1.8 and 36 g/kg chamomile flower extract (0.37 and 0.38). The 4 g/kg chamomile flower powder significantly increased the ileum length compared to control. The other digestive organs were not affected by dietary treatments, although gizzard values insignificantly had lower relative weight by inclusion of chamomile flower powder and extract. The greatest gizzard weight was found in control (1.43) and the lowest in 4 g/kg flower powder (1.31). The 4 g/kg addition of chamomile flower powder increased the ileum length compared to control group (P<0.05) but deudenum, jujenum and cecum increased insignificantly.

Discussion

Using 1.8 ml chamomile flower extract significantly decreased BW which might be attributed to the anti-nutritional components of chamomile like

tannin. Tanin leads to lack of sufficient nutritional absorption in the intestine. Tohidi (2008) reported that chickens BW was not affected by Yarrow inclusion in the diet but insignificantly decreased. Najafi et al. (2007) also suggested that using thyme, cinnamon and clove essential oils in chicken's diet had no influential impact on their performance. These results are in consistent with the results of the current experiment. In contrast, dietary addition of chamomile flower powder at the levels of 6 and 9 g/kg have been reported to increase BW and DWG (Butris, 2007). Abaza et al. (2003) reported that chickens fed by 2 g/kg chamomile flower powder significantly improved BW and DWG which might be due to different experimental conditions. The insignificant increase of carcass relative weight in antibiotic and 1.8 ml addition of flower extract compared to control might be attributed to the antimicrobial properties of medical plants. Detrimental effects of harmful microbes in the gastrointestinal tract are exerted trough increased protein and amino acid degradation of the digesta due to the deamination of consumed protein and amino acids by produced urease. In this regard, medical plants contribute to decrease the harmful bacteria of digestive tract and consequently decrease the protein and amino acid degradation which help the absorption and accretion in the body and improve the carcass weight (Lee et al., 2003). Besides beneficial impacts of these substances in the gastrointestinal tract, they also protect the chickens against environmental stress and help in the absorption of nutrient which increase the growth and promote carcass traits. The significant reduction in proventriculus relative weight by using 2 g/kg chamomile flower powder may be due to the decreased FI caused by the bitter taste of chamomile and also its anti-nutritional substances. Addition of 4 g/kg chamomile flower powder insignificantly added to the jujenum, ileum and cecum weights and also marginally increased duodenum, jujenum and cecum length. Furthermore, it significantly increased the cecum length. These improved parameters might be related to the active components of chamomile. Mccrea et al. (2005) reported that active components of chamomile (flavonoids, kamasolen and bisaboldaxid essential oils) have the same role as probiotics and thus improve natural intestinal microflora and augment the absorption of nutrients. These results are in consistent with the results of this study.

Conclusion

In conclusion, chamomile extract and powder at the used levels in this study have not the potential to be applied as a growth promoter in broiler chicks. Additionally, more experiments should be conducted to evaluate higher levels of chamomile and also other aspects of broiler chickens nutrition to increase the accuracy of determining the chamomile consuming levels.

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