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The Effect of Chamomile Plant (*Matericaria chamomile L.*) As Feed Additives on Productive Performance, Carcass Characteristics and Immunity Response of Broiler

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Abstract: This experiment was conducted to evaluate the effects of adding different levels of dried milled of chamomile flowers to broiler diets on productive performance, carcass characteristics and immune response of broiler. Two hundred forty (Cobb) one day old chicks were used in this study. Chicks were weighted and randomly divided in to 4 treatments, with sixty birds/ treatment with 3 replicates 20 chicks of each. Chicks were fed the following diets. First group T₁ control fed a basal diet while the T₂, T₃ and T₄ groups were fed same diet as in the 1st group plus addition of 0.50, 1.00, 1.5 kg of chamomile flowers powder to (100kg) of diet. The experiment was lasted for 42 days. Birds were provided a three phase-feeding program (starter 3 weeks, grower 2 weeks and finisher one week). Birds and feed were weighed on 21, 35 and 42 day of age for growth performance, weight gain (WG), feed intake (FI), feed conversion ratio (FCR) and mortality rate were measured, at the end of experiment carcass quality (dressing %, breast% and giblets%) was measured and samples of blood were taken for measured immune response. Results showed that adding of Chamomile flowers at a level of 1 kg/100kg diet, T₃ increased significantly (p<0.05). Live body weight (LBW), WG and FCR as compared with the control group and T₂, and T₄ groups at the 42 days of age, adding of chamomile flowers powder as a feed supplement with 0.5, 1.00, 1.5kg/100kg diet levels were significantly (p<0.05) decreased mortality as compared with control group. On the other hand all treatments revealed no significant differences on dressing percentage and giblets weight except thighs drumsticks, and heart weight increased significantly (p<0.05) in treatment T₂. Adding of chamomile flowers with the above levels had no significant enhancement effect on antibody titers against Newcastle Disease Virus (NDV) and Infectious Bursal Disease (IBD) at 42 days of age.

Key words: Chamomile flowers, broiler performance, immune response

INTRODUCTION

A number of additives are often used in poultry diets and most of these do not contribute any nutrients per se. Most additives are used to improve physical diet characteristics, feed acceptability or bird health (Leeson *et al.*, 2008). There is no doubt that the antibiotics play an important and essential role in the production and animal health but at the same time may affect negatively the health of consumers. The use of antibiotics as growth promoter has led to the development of bacterial resistance, in other side it may also result in residual problems in the tissues of birds and animals. The dangers posed by the development of resistance in poultry livestock and human beings have been documented (Mmereole, 2010; Sarker *et al.*, 2010). As a result of banning Growth-promoting antibiotics in European Union and many other countries by 2006, livestock producers need alternatives be found to improve the healthiness and safety of poultry products in order to minimize the loss of productivity and performance and negative impact on economic terms and for that several kinds of antibiotics alternative developed and used. currently, it has been found that

natural additives such as herb and medical plants have some properties as growth enhance to replace synthetic drugs, the antimicrobial effect of the medical plants is well documented (Abdulla *et al.*, 2011; Cowan, 1999), Some examples of medicinal plants are chamomile flower, green tea, Lemmon grass ...etc. (Sarker *et al.*, 2010).

Chamomile flower is one of the most widely used and well-documented medicinal plants in the world. The use of chamomile as a medicinal plant dates back to ancient Greece and Rome. The name "chamomile" comes from two Greek words meaning "ground apple" for its apple-like smell. The ancient Egyptians considered the herb a sacred gift from the sun god and used it to Alleviate fever and sun stroke. In the sixth century, it was used to treat insomnia, back pain, Neuralgia, rheumatism, skin conditions, indigestion, flatulence, headaches and gout. The German Commission has approved chamomile for external use for inflammation of the skin, mucous membranes and ano-genital area, skin diseases including those of the oral cavity and gums and respiratory tract inflammation Chamomile is also extensively consumed as a tea or tonic. It is used

internally to treat anxiety, hysteria, insomnia and other sleep problems; one of chamomile's main roles is as a multi purpose digestive aid to treat gastrointestinal spasms and inflammatory diseases of the gastrointestinal tract (Gardiner, 1999). Chamomile (*Chamomile Matricaria L.*) is classified under a plant family composites. It contain up to one per cent of an essential oil with azulene that turns blue on distillation and bisabolo and farnesene also flavonoid and coumarin glycosides and fatty acids these substance give anti-inflammatory, antiseptic, carminative, diaphoretic, sedative properties (Panda, 2005). Chamomile flowers inhibit the harmful intestinal Micro organisms, thus counter acting excessive growth (Kolacz *et al.*, 1997; Galib A.M.AI-Kaissie *et al.*, 2011) it was reported that the addition of chamomile flowers at level (0.25%) to broiler diets improved performance and (FCR). Abaza *et al.* (2003). Others reported that addition of chamomile flowers to layer diets increased egg number 0.5% as compared with control group. (FCR) and (F1) decreased significantly ($p < 0.05$) as compared with control group (Abaza *et al.*, 2004). Recently, the use of growth promoters from herbal sources (medical plants) substances is very limited and there is little information about these sources and active substances (Sabra and Mehta, 1990). Practically, reports showed that supplementing poultry diets with various herbs had appropriate effects on the performance and health of reared bird (Cross *et al.*, 2007).

The aim of this study is to investigate the effect of adding different level of chamomile flowers (*Matericaria chamomilla L.*) as feed additives in broiler diet on productivity, carcass characteristics and immune response of broiler.

MATERIALS AND METHODS

The experiment was carried out at the poultry farm of Agriculture College, Salahadden University in Erbil/Iraq. The experiment lasted for 42 days, two hundred forty (240) one day old chicks (Cobb 500) were divided randomly into 4 treatments groups (60 bird) per each group with 3 replicate (20 bird/pen). The experiment conducted to study the effect of Chamomile flower (*Matericaria chamomilla L.*) as Feed additives on Productive Performance and carcass characteristics and immunity response of Broiler.

The experimental diets were as follows, Control group (T1) was fed normal basal diet free from any additions of plants. Groups (T2, T3 and T4) were fed with addition of Chamomile flowers powder, 0.50, 1.00 and 1.5kg mixed with 100 kg basal diet. The experimental diet was formulated to be isocaloric and isonitrogenic according to National Research Council, NRC (1994) the ingredient and chemical composition of the diet is presented in (Table 1).

The feeding program were induced, Starter from 0-21 days, Grower from 22-35 days and Finisher from 36-42 days. Feed and water was provided ad libitum during the experiment. Chicks were vaccinated against Newcastle

Table 1: Percentage of composition and calculated analysis of the experimental diets

Ingredients	Starter % (1-21) days	Grower (22-35) days	Finisher % (35-42) days
Corn	30	30	30
Wheat	27.5	29	35
Soybean meal	28	26.5	20
Protein concentrate ¹	10	10	10
Oil	3	3	3.5
Lysine	0.15	0.15	0.15
Methionine	0.05	0.05	0.05
Enzyme ²	0.1	0.1	0.1
Limestone	0.4	0.35	0.35
Dicalcium phosphate	0.35	0.35	0.35
Salt	0.3	0.3	0.3
Mineral and Vitamin premix ³	0.1	0.15	0.15
Choline chloride	0.05	0.05	0.05
	Calculated values	Calculated values	
ME, Kcal/kg	3000	3044	3125
CP, %	23	21.8	19.9
Calcium, %	0.85	0.75	0.75
Available Phosphorus, %	0.75	0.72	0.72
Lysine, %	1.45	1.29	1.18
Methionine, %	0.71	0.66	0.6

¹Protein concentration using for experiment produced by Holland Company, WAFI Holland contain 40% CP, 210000 kg NE, 5% Fat, 2% CF, 6.5% Ca, 2.5% P, 3.85% Lys., 3.7 Meth. And 4% cys.

²beta-glucanase, xylanase, protease.

³B12, B2, B1, K, E, D3, A, Niasin, Pantothenic acid, Folic acid, Biotin, Choline, Ca, P, Na, Mn, Fe, Zn, Cu, I, Co, Se.

Table 2: Effect of adding chamomile flower in diet on live body weight and weight gain during feeding program (Starter, Grower, Finisher) broiler chickens

Period days	Treatments (live body weight/gm)			
	T1	T2	T3	T4
Starter (0-21) days	20.2±741.7 C	7.1±763.2 B	21.3±787.5 A	14.6±763.4 B
Grower (22-35) days	69.0±1857.5 BC	74.2±1742.0 C	71.1±2210.2 A	87.7±1934.4 B
Finisher (36-42) days	50.4±2551 B	31.1±2500 B	25.4±2733.3 A	40.1±2491.7 B

Period days	Treatments (live body weight/gm)			
	T1	T2	T3	T4
Starter (0-21) days	21.28±703.25 A	17.39±725.20 A	22.38±747.5 A	19.18±724.4 A
Grower (22-35) days	49.46±1116.58 B	50.87±978.87 B	97.5±1420.71 A	85.37±1171.02 B
Finisher (36-42) days	97.84±693.24 AB	87.50±757.93 A	85.55±523.31 B	90.18±557.28 B
Total weight gain 1-42 days	50.23±2513.07 B	41.24±2462.00 B	60.46±2693.30 A	49.73±2452.7 B

Means with different superscripts in the same row differ significantly (p<0.05). Means±Standard error.

T1: 0.00 Chamomile flower. T2: 0.5kg Chamomile flower. T3: 1.00kg Chamomile flower. T4: 1.5kg Chamomile flower.

Table 3: Effect of adding chamomile flower in diet on feed intake and feed conversion Ratio/21, 35 and at 42 day in broiler chickens

Period days	Treatments/Feed intake(gm)			
	T1	T2	T3	T4
Starter (0-21)days	18.27±1224.17AB	42.93±1267.54 A	22.27±1246.87 AB	14.55±1171.43 B
Grower (22-35)days	28.90±2380.95 A	35.15±2410.16 A	78.03±2367.92 AB	13.75±2222.38 B
Finisher (36-42)days	22.62±1385.35 A	34.69±1434.58 A	36.47±1433.33 A	18.53±1348.44 A
Feed conversion ratio 1-42 day	69.21±4990.5 AB	109.87±5112.3 A	129.51±5048.10 AB	124.33±4742.3 B

Period days	Treatments/Feed conversion ratio(gm feed/gm body weight gain)			
	T1	T2	T3	T4
Starter (0-21)days	0.07±1.74 B	0.07±741. B	0.017±1.66 AB	0.02±1.61 A
Grower (22-35)days	0.12±2.13 B	0.50±2.46 C	0.36±1.89 A	0.04±1.90 A
Finisher (36-42)days	0.31±1.99 A	0.74±1.89 A	0.21±2.7 C	0.15±2.4 B
Feed conversion ratio 1-42 day	0.023±1.98 A	0.06±2.7 B	0.23±1.8 A	0.04±1.93 A

¹Means with different superscripts within the same column differ significantly (P<0.05). ²Means±Standard error.

Disease (ND) and Gambaro according to their age. Live body weight, weight gain, feed intake and feed conversion ratio (g.feed/g.gain) were measured through the period of starter, grower and finisher. At the end of the experiment, two chicks from each replicate were randomly selected and weighted to obtain live body weight. Birds were slaughtered using knife for complete bleeding and feathers were plucked.

Dressing percentage was calculated without edible giblets (Heart, Gizzard, liver) that weighted separately and calculated as percentage of the carcass weight.

Blood samples were collected from the jugular vein during slathering for Detection of antibodies against Newcastle Disease Virus (NDV) and Infectious Bursal Disease Virus (IBD) in serum of immunized chickens was performed by enzyme linked immunosorbent assay (ELISA).

The Pro FLOK* PLUS IBD ELISA kit is a rapid serologic test for the detection of Infectious Bursal Disease (IBD) and Newcastle Disease Virus (NDV) antibody in the chicken serum samples. The procedure has been widely adapted for Infectious Bursal Disease (IBD) serology and Newcastle Disease Virus (NDV) provides a rapid quantifiable, sensitive and reproducible test. The assay was carried out as described by the manufacturer.

All data were analyzed using the CRD (Completely Randomized Design) of SAS

SAS Institute (1998) Duncan's multiple range tests were used to compare differences among treatment means (Duncan, 1955).

RESULTS AND DISCUSSION

Effect of chamomile on the growth performance traits (live Body Weight (BW), Body Weight Gain (BWG) presented in Table 2. Results showed that chicks fed 1kg chamomile/100kg diet had significantly (p<0.05) higher values (BW, BWG) for during growth periods 21, 35 and 42 days of age (787.5g, 2210.2g, 2733.3g) in T₃ treatments as compared with that of the treatment T₁, T₂, T₄. This may be due to active compounds that are presented in chamomile flowers. It could be inhibit the excessive growth of a harmful intestinal microorganism, with the result may positively affect poultry health and productivity. This is in support with results obtained by Galib A.M.AL-Kaisse *et al.*, 2011; Kolacz *et al.*, 1997. Results showed the improvement of Body Weight (BW) and Body Weight Gain (BWG) due to the main constituents of the herbs and essential oils which are responsible for the bulk of the antimicrobial activity (Cross *et al.*, 2007; Mmereole, 2010). The chamomile

Table 4: Effect of adding chamomile flower in diet on dressing percentage, Edible part percentage, carcass cut ratio and eatable visceral ratio in broiler chicks at 42 day-old

	Treatments/feed intake(gm)				Significant level
	T1	T2	T3	T4	
Dressing percentage	0.27±76.88	0.15±76.82	0.21±77.03	0.41±77.02	N.S.
Abdominal fat percentage	0.43±3.84	0.21±3.89	0.21±3.99	0.10±4.10	N.S.
Percentage of carcass cuts					
Breast	01.1±41.24 a	1.29±38.58 b	0.91±42.34 a	0.46±41.61 a	
Back	0.50±14.04	0.71±13.68	0.47±14.04	0.45±12.58	N.S.
Wings	0.27±10.01	0.31±10.98	0.53±10.34	0.24±10.58	N.S.
Thighs+drumsticks	1.10±24.46 ab	0.71±27.06 a	0.56±25.32 ab	1.93±22.55 b	.
Neck	0.11±4.59	0.14±4.28	0.10±4.70	0.52±4.62	N.S.
Giblets					
Heart	0.49±0.57	0.05±0.60	0.05±0.69	0.04±0.63	N.S.
Liver	0.35±3.35	0.16±3.06	0.24±3.32	0.13±3.15	N.S.
Gizzard	0.03±1.73	0.10±1.99	0.1±1.89	0.08±1.86	N.S.

*Means with different superscripts within the same row differ significantly (P<0.05).

Table 5: Effect of adding chamomile flower in diet on immune response and Total Mortality ratio in broiler chicks at 42 day-old

	Chamomile supplementation (0.00, 0.5, 1.00, 1.5 Kg/100kg diet)			
	T1	T2	T3	T4
Newcastle disease (NDV)	6944±2857 A	2976±1960 A	6919±2728 A	4985±2186 A
Infectious Bursal Disease(IBD)	8431±93.38 A	7152±223 A	6539±959A	5975±1749 A
Total Mortality Ratio%	8.99±0.95 C	5.82±1.06 B	0.00±0.00 A	3.17±1.59B

Means with different superscripts in the same row differ significantly (p<0.05). Means±Standard error.

T1: 0.00 Chamomile flower. T2: 0.5kg Chamomile flower. T3: 1.00kgChamomile flower. T4: 1.5kg Chamomile flower.

flowers play role to enhance the activity of thyroxin hormone that accelerates the nutrients metabolites and biochemical reaction. A significant ($P \leq 0.05$) increase in body weight was noted by feeding diets supplemented level (1.00kg/100kg diet) respectively than those fed the same feed additives at the lower level of 0.5kg/100kg and upper level of 1.5kg/100kg diet and the control group. These results are supported by Mona Osman *et al.* (2010) who reported that supplementing diets with Rosemary (R), Marjoram (M) or Sweet Basil (SB) as natural feed additives at 0.5 or 1.0 g/kg diet, would improve productivity and immunological performance and carcass characteristics as well.

It is evident from Table 2 that supplemental broiler basal diets with medical herbs resulted in a positive effect when compared with that of the control diet. During the Starter and Grower period feeding dietary treatments at levels 1.00kg/100kg Chamomile flower to diet resulted in a significant increase in weight gain ($P \leq 0.05$) over that of the control group and other treatment group. This is in agreement with the results obtained by Hazim J. Al-Daragh *et al.* (2006) Sarker *et al.* (2010). However, the enhancement in body weight gain owed to supplementation of the Chamomile flower 1.00kg/100kg as compared with those of the other treatments respectively. During the 1-42 days period, (T3) 1.00kg/100kg continued to have superior weight gains 2693.3 gm as compared with all other treatment groups T1, T2, and T4 (2513.07, 2462.0, 2452.7) which causes an increase in body weight. Results showed that

productive performance (body weight gain, mortality rate, feed consumption and feed conversion) improved ($P < 0.05$) with the addition of aromatic herbal (Tollba *et al.*, 2010). In T4 (1.5kg/100kg) level of chamomile had less live body weight and body weight gain as compared to all experiment group that was due to high level of chamomile, the birds were less active and results showed that significant ($P < 0.05$) reduction in body weight and body weight gain, it was due to chemical compound of chamomile flower.

It contains sedative, anxiolytic and antispasmodic compound, it uses as a treatment for sleeplessness (Gardiner, 1999).

Feed consumption and feed conversion: Feed consumption was significantly ($P < 0.05$) increased (T2, T3) for all phases (starter, grower and finisher) and Increased feed consumption may be attributed to flavoring effects which improve the palatability of feed due to the chemical components and flavor of the chamomile flower as compared to T1, (control group) and T4, (1.5% Chamomile flower). These results are in accordance with those of Bassett (2000); Langhout (2000); Kamel (2001); Williams and Losa (2001) and Hernandez *et al.* (2004) who found that feed intake was increased with addition of essential oils derived from spices and herbs whereas, feed: Gain ratio was lower as compared to the control when chickens are subjected to suboptimal conditions. Hernandez *et al.* (2004) showed that a blend of the essential oils of cinnamon,

capsicum and oregano improved some aspects of digestibility in broilers.

Feed conversion was improved significantly ($P < 0.05$) with the addition of different levels of chamomile flower herb and when it compared to control diets feed conversion, calculated value for starter phase 1-21 days was 1.66-1.74 and there was significant differences ($p < 0.05$) among treatments. The improvement in feed conversion obtained from chicks fed 1.00, 1.50kg/100kg diet for T3, and T4 were showed the same result also in the second growth phase. In finisher phase their was significant reduction ($p > 0.05$) in feed conversion ratio in group T3 when chamomile flower added at a level 1kg/100kg diet and for whole experiment (1-42 d) The improvement in feed conversion obtained from chicks fed 1kg/100kg chamomile flower powder The improvement of body weight gain and feed conversion are due to the effect of some active compounds included in chamomile flowers which had different effects against microorganism antimicrobial, antifungal and antioxidant and anti-inflammatory effects (Santurio *et al.*, 2007; Gardiner, 1999).

Table 4 shows the effect of adding Chamomile flower in diet on the carcass and cut yields of broiler chickens at 42 day-old. There were no significant ($p < 0.05$) differences among of all treatment in dressing percentage, abdominal fat and eatable visceral ratio in broiler chickens, similarly results were reported by Ayad *et al.* (2007). Result showed that there was significant ($P < 0.05$) differences among carcass cut ratio, The addition of 1Kg/100kg (T2) showed there were significant increase in weight of thighs and drumsticks (%27.06) comperd with other treatment group and there were significant increase in weight of breast in treatments T3, T4 and T1 (control group). It is suggested that such promoters might be used in broiler diets, since they do interfere positively on the yield of the most commercialized edible cuts (breast, legs and wings).

Concerning immune response to Newcastle Disease Virus (NDV) and Infectious Bursal Disease (IBD) the Chamomile supplementation had no significant ($p < 0.05$) enhancement effect on antibody titers against NDV and IBD at 42 days of age. This was indicated by comparison between samples of Chamomile-supplemented chickens and control ones (at 42 days of age). Sunbul J. Hamodi *et al.* (2010); Farah K. Al-Jaff (2011) reported that the noticeable improvement of antibody titer against ND might be due to the effects of active components of coriander seed. As a medical plant, coriander had antimicrobial effects. This could be one more reason for improving the immune status of the chicks.

(Table 5) demonstrate that Chamomile had significant ($P < 0.05$) enhancement effect on mortality ratio, It can be observed that significant ($p < 0.05$) differences exist between the birds fed control diet and those fed diets

containing chamomile flowers at the end of the experiment(42 days), the mortality for the birds on control group was 8.99% which was significant ($p < 0.05$) higher than those fed diet containing chamomile flowers and there was significant ($p < 0.05$) differences occurred in group fed chamomile flowers, mortality rates for the birds on group T3 was (0.00%) and decrease mortality in group T2, T4 (5.82-3.17%) as compared to T1, control fed birds.

These results are in agreement with those obtained by Mmereole (2010) who reported that when birds fed diets with Lemmon Grass Leaf Meal mortality rate were reduced as compared with those birds fed control diet. Kumar *et al.* (2003) also reported that when herbal supplements used in broiler diet, mortality rates were reduced in treated groups as compared to the birds on control group.

Conclusion: Addition of chamomile flowers at level (1.00kg/100kg) diet may be suitable for improving growth performance, might be acceptable for achieving optimum broilers performance and internal organ development of broilers and decreasing mortality rate. More research studies are needed to conduct for drawing a rigid conclusion.

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