

STUDY THE EFFECTS OF FEEDING DIFFERENT LEVELS OF SWEET BASIL SEEDS ON GROWTH, IMMUNE RESPONSE AND MEAT COMPOSITION OF BROILERS

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ABSTRACT

This study was conducted to evaluate the effect of sweet basil seeds supplementation of a commercial broiler diet on the performance, meat composition and immune response. Three dietary treatments (50 birds treatment⁻¹) with two replicates (25 birds replicate⁻¹) one day old straight run broilers chicks (Ross 308). G1 (as control group) birds fed basal diet without any additive, while G2 and G3 fed diet supplemented daily with 0.3 and 0.6% sweet basil seeds respectively to the end of the experiment (42 days) to investigate the antibody titer against Newcastle disease virus (NDV) and infectious bronchitis (IB) and broiler performance as well as meat composition included amino acids in meat. Results showed that the two levels of sweet basil seeds supplementation (0.3 and 0.6%) had a beneficial effect on the antibody titer against (NDV) and (IB) and the high level (0.6%) was more significant against (NDV) while the low level (0.3%) was more significant against (IB). The high levels of antibodies titers were considered as the indicative of antiviral activity of *Ocimum basilicum* seeds. In addition, the results revealed less feed intake with significant ($p \leq 0.05$) improvement of feed conversion ratio in treatment groups compared with control group. Meat amino acids Isoleucine, Leucine, Lycine and Theronine were increased significantly ($p \leq 0.05$) in treatment groups compared with control group attributed to add of sweet basil seeds in diets. In conclusion, *Ocimum basilicum* seeds supplementation in commercial broiler diets was beneficial to broiler performance and enhance immune traits and change in meat composition.

Key words: *Ocimum basilicum*, basil, broiler, amino acids.

INTRODUCTION

Basil (*Ocimum basilicum*) is an important crop worldwide grown for its fresh and dry herb, and the essential oil which is used as a food additive and in

cosmetics (Prakesh, 1990). The basil essential oil could be replace the antibiotics, which have been banned to use as growth promoter in animal feeds (Riyazi *et al.*, 2015).

Nworgu (2016) reported increase in the weight of liver when he used basil supplement in diet of growing Pullets. The different level of basil had were non-significant effect in carcass weight and carcass yield at the final day of age (Gurbuz and Ismael, 2016).

Basil seeds are not only good source of fiber and protein but they provide appreciable amount of minerals and phenolic compounds and could be supplemented in different food products for the preparation of value added, healthy and nutritious diets (Munir *et al.*, 2017).

Basil seeds were used as thickening and stabilizing agent because of their high polysaccharide contents or these were usually processed into essential oil products in many studies (Rafe *et al.*, 2012) while information about phenolic profile of basil seeds is limited. So phenolic content estimation of basil seeds is necessary to find relation of basil seed with health promoting functions, as antioxidant capacity of phenolic compounds protect the cell from free radicals which cause damage (Zhang *et al.*, 2013). The herbal natural feed additives such as basil may be used as alternatives to an antibiotic growth promoter without any adverse effects on broiler production (Riyazi *et al.*, 2015). Basil seeds at a level 0.3% and 0.6% led to enhance the blood biochemical parameters and health status of broilers (Kadhun, 2016).

Ocimum basilicum seeds are proven to have good antimicrobial, antioxidant and anticancer activities. On other hand bioactivity of *O. basilicum* seeds has projected the great importance of functional foods (Gajendiran *et al.*, 2016).

MATERIALS AND METHODS

One hundred and fifty day-old straight run broilers chicks (Ross-308) were bought from a commercial hatchery and divided randomly and equally into three treated groups of 50 birds, each treated group was subdivided into 2 replicates of 25 birds per replicate. The first group (T1) was fed daily on diet without sweet basil seeds additive as a control group, while second and third groups were fed daily on diet with added 0.3 and 0.6% sweet basil seeds respectively. Birds were management according to (Aviagen, 2009) guide for management and nutrition requirement (21.5% protein and 3020 kcal kg⁻¹ energy). Feed and water were provided *ad libitum*. One type of diets was used over the period of experiment (42 days). The chicks were weighted individually on day 42 for each pen by using digital balance then calculated average body weights and FCR for each

treatment. Feed intake in each pen was calculated and used to calculate the feed into gain ratio.

At eight days of age, the birds of all groups were injected intramuscularly with 0.1 ml of killed Newcastle disease (ND) and (IB) vaccines. Blood samples were collected at 35 days of age. Ten chickens of each group were bled randomly and antibody titer against Newcastle and IB vaccine virus was determined by Enzyme-linked immune sorbent assay (ELISA) systems. All the blood samples obtained from wing vein and serums were separated, identified and frozen at -20 °C until the tests were performed.

Amino acids determination

At the end of the experimental period, ten birds randomly were selected from each group then weighed and slaughtered in the early morning to estimate meat chemical composition and amino acids by using Diode Array 7200 NIR Analysis System.

Statistical analysis

Statistical analysis was applied by using Statistical program SPSS and Analysis of Variance (ANOVA) and used Least significant difference (L.S.D) for detect the significant differences between means of treatments (Steel and Tarries, 1980). The significant difference statements were based on the possibility ($P \leq 0.05$).

RESULTS AND DISCUSSION

Mean final live body weights of the birds in the different treatments are presented in table 1. Second group (0.3% sweet basil) recorded a significant ($P \leq 0.05$) improvement of feed conversion ratio as compared with control group. This significant through the whole experimental period may be due to the health properties of this product including antioxidant (Vichi *et al.*, 2001 ; Lee *et al.*, 2004), antimicrobial (Hammer *et al.*, 1999), stimulating endogenous digestive enzymes (Lee *et al.*, 2004) and increasing digestibility (Mitsch *et al.*, 2004 ; Kroismayr *et al.*, 2008). Body weight was similar among all treatments at the end of study which agreed with the finding by Nweze and Ekwe (2012), who found no difference in the performance of broilers when basil extract was supplemented in diets. Additionally, the different level of basil had were non-significant effect in carcass weight and carcass yield at the final day of age (Gurbuz and Ismael, 2016).

In contrast to our result, Abbas (2010), Osman *et al.*, (2010) and Onwurah *et al.*, (2011) reported that addition of basil leaf and seed to the diet had a beneficial effect on feed intake, body weight gain and feed conversion ratio.

Plants like basil which include many different bioactive ingredients such as alkaloids, bitters, flavinoids, glucosoids, mucilage, saponines and tannins. As well as the results of the growth performance and feed efficiency confirm the finding of Abbas *et al.*, (2010), Alloui *et al.*, (2012), Feizi *et al.*, (2013), Khan *et al.*, (2012) and Mamoun *et al.*, (2014) whom reported that, broilers fed basil diet had significantly the heaviest body weight. While the natural medicinal plant was considered alternative to antibiotics growth promoters. Also, the results are disagreement with Sharifi *et al.*, (2013) who suggested that herbs and various plants have appetizing and antimicrobial properties.

Table 1. Effect of different levels of sweet basil seeds on performance of broiler (mean±SE)

Items	Treatments		
	G1 control	G2 0.3% basil seeds	G3 0.6% basil seeds
Feed intake /bird, kg	4.059 ± 0.011 a	3.642 ± 0.09 b	3.764 ± 0.012 ab
Final body weight, kg	2.192 ± 0.05	2.271.88 ± 0.083	2.217 ± 0.046
Feed Conversion Ratio %	2.05 ± 0.22 a	1.82 ± 0.14 b	1.92 ± 0.23 ab

Means in the same row with different superscripts are significantly different ($p \leq 0.05$).

Averages of serum haemagglutinin antibody (Ab) titers against ND and IB viruses of broiler at 6 weeks of age are listed in table 2. The results of the present study are in contrast to Ezz El-Arab (2008) who stated that, feeding experimental diets inclusive either Rosemary, Marjoram or Basil improved the immune status as reflected by ELISA titer compared with that of the control. The results of our study are very supporting the use of basil seeds as feed additive to enhance immunity of birds against viruses like ND and IB. Moreover, in the present study both concentrations of basil seeds lead to increase in Ab titers significantly (Table 2). Thus the dose of 0.3 and 0.6% concentration of basil seeds can be used to get protection against ND virus. The role of basil seeds as immunomodulatory has been thoroughly studied and established (Bhartiya *et al.*, 2006 ; Mahima *et al.*, 2012) along with activity as antibacterial against bacterial pathogens of animals (Kumar *et al.*, 2011 and Kumar *et al.*, 2013) thus it can be a multiple activity in poultry feed.

Table 2. Effect of different levels of basil seeds on antibody titers (unit ml⁻¹) against ND and IB viruses of broiler (mean ± SE)

Ab Titers	Treatments		
	G1 control	G2 0.3% basil seeds	G3 0.6% basil seeds
IBD Titers	6339.00±1744.68 b	11262.79±1164.47 a	10137.15±1013.41 a
ND Titers	1129.91±125.14 c	2164.07±372.53 b	3448.64±288.17 a

Means in the same row with different superscripts are significantly different ($p \leq 0.05$).

Table 3 indicated that there was a significant increase ($P \leq 0.05$) in the protein and ash (%) values of meat for the 0.3% basil seeds treated group (G3) in comparison with control group with mean values were (43.96±0.08) and (23.44 ±0.41) respectively. On the other hand birds fed 0.3% basil seeds also revealed insignificant lower fat (%) value compared with other groups.

Table 3. Effect of bypass protein on meat composition in broiler

Items	treatments		
	G1 control	G2 0.3% basil seeds	G3 0.6% basil seeds
Moisture	20.76 ±0.50 b	21.86 ±0.13 b	23.30 ±0.37 a
Protein	42.80 ± 0.15 b	43.96 ±0.08 a	41.73 ± 0.26 b
Fat	6.76 ± 0.08	6.70 ± 0.25	7.83 ± 0.22
Ash	21.48 ± 0.31 b	23.44 ± 0.41 a	24.54 ± 0.28 a

Means in the same row with different superscripts are significantly different ($p \leq 0.05$).

The amino acid which the most abundant in the meat from both groups was Arginine acid ($C_6H_{14}N_4O_2$) and there are differences between groups but non-significant statistically. The overall the Isoleucine ($C_6H_{13}NO_2$) Leucine, Lysine and Threonine acids were significantly ($P \leq 0.05$) higher in meat of chicks fed 0.6% sweet basil seeds compared with meat from control group. There was an insignificant differences in Tryptophan acid ($C_{11}H_{12}N_2O_2$) and Valine acid ($C_5H_{11}NO_2$) contents. The birds of the control group showed the highest levels ($P \leq 0.05$) of the Cysteine acid ($C_3H_7NO_2S$) compared to the birds of sweet basil seeds group. Treated group with 0.6% sweet basil get the better of amino acids compared with groups of control and (0.3%) sweet basil (Table 4).

Table 4. Effect of different levels of basil seeds on meat amino acids in broiler

Items	Treatments		
	G1 control	G2 0.3% basil seeds	G3 0.6% basil seeds
Arginine	6.29 ± 0.04	6.37 ± 0.02	6.48 ± 0.09
Cysteine	2.03 ± 0.16 a	1.75 ± 0.03 ab	1.57 ± 0.02 b
Isoleucine	3.78 ± 0.09 c	4.43 ± 0.12 b	4.79 ± 0.05 a
Leucine	3.55 ± 0.17 b	4.50 ± 0.19 ab	4.61 ± 0.13 a
Lycine	0.40 ± 0.05 b	0.85 ± 0.06 ab	0.86 ± 0.07 a
Theronine	2.23 ± 0.15 b	2.73 ± 0.12 a	2.90 ± 0.10 a
Tryptophan	0.54 ± 0.02	0.68 ± 0.07	0.67 ± 0.09
Valine	3.36 ± 0.06	3.52 ± 0.13	3.66 ± 0.01

Means in the same row with different superscripts are significantly different ($p \leq 0.05$).

Antimicrobial properties of basil essential oil ingredients such as methyl chavicol and α -pinene have been shown in various papers (Sokovic and Van Griensven, 2006 and Hanif *et al.*, 2011), given that most of the components of basil seed used in this study are comprised of methyl chavicol and α -pinene, therefore, we can attribute the differences in meat composition to the antibacterial effect of basil essential oil. Studies have shown that reducing the population of harmful bacteria prevents the breakdown of feed amino acids and proteins in the gut, and with better absorption, amino acids used in the synthesis of proteins, and with their accumulation in the breast and thigh, improve their weights (Lee *et al.*, 2003).

CONCLUSIONS

The results of the present study showed that using the sweet basil seed in broiler diets have beneficial effects on the growth performance of broilers, also, dietary supplementation with basil effect on meat composition. Therefore, future research efforts should continue to evaluate the effectiveness of the dietary herbal growth promoters and their specific effects on performance and blood parameters.

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تأثير تغذية مستويات مختلفة من بذور الريحان الحلو في الأداء الانتاجي والصفات المناعية ومكونات اللحم للدجاج اللاحم

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المستخلص

أجريت هذه الدراسة لتقييم تأثير اضافة بذور الريحان في العليقة على الأداء الانتاجي ومكونات اللحم والاستجابة المناعية للدجاج اللاحم. ثلاثة معاملات غذائية (100 طائر معاملة¹) مع اثنين من المكر ارت لكل معاملة (25 طائر من فروج اللحم (Ross 308). بعمر يوم واحد)، غذيت الافراخ في المجموعة الاولى عليقة أساسية بدون أي إضافات (واعتبرت مجموعة سيطرة) في حين غذيت المعاملة الثانية والثالثة العليقة الأساسية مضافا اليها (0.3 و0.6%) بذور الريحان على التوالي حتى نهاية التجربة (42 يوما) لدراسة الأداء الانتاجي للدجاج اللاحم ومستويات الأجسام المضادة ضد فايروسات مرض ND والتهاب الشعب الهوائية المعدي (IB).

وأظهرت النتائج أن مستويين من مكملات بذور الريحان الحلو (0.3 و0.6%) كان لهما تأثير مفيد على مستوى الاجسام المضادة مقابل (NDV) و (IB) وكان المستوى العالي (0.6%) أكثر أهمية ضد (NDV) بينما كان مستوى منخفض (0.3%) أكثر أهمية ضد (IB). واعتبرت المستويات العالية من الأجسام المضادة دلالة على نشاط بذور الريحان المضاد للفيروسات. بالإضافة إلى ذلك، أظهرت النتائج تحسنا معنويا ($p \leq 0.05$) في معامل التحويل الغذائي في المجاميع المعاملة بالريحان مقارنة مع مجموعة السيطرة كما زادت الأحماض الأمينية Isoleucine و Leucine و Lysine و Threonine في اللحم بشكل معنوي ($p \leq 0.05$) في مجموعات الريحان مقارنة بمجموعة السيطرة. نستنتج من ذلك، بان استخدام بذور الريحان كمكملات في علائق الدجاج اللاحم يحسن من الأداء الانتاجي والوظيفة المناعية.

الكلمات المفتاحية: الريحان، الدجاج اللاحم، الأجسام المضادة.