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EFFECT OF DIFFERENT LEVELS OF *NIGELLA SATIVA* MEAL ON GROWTH PERFORMANCE, SOME BLOOD BIOCHEMICAL AND IMMUNE-RESPONSIVENESS OF BROILER CHICKS

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ABSTRACT: This experiment was conducted to evaluate the effect of different levels of *Nigella sativa* meal (NSM) on performance, immunity and some blood biochemical and hematological parameters of broiler chicks. A total of 120, one day-old broiler chicks (Hubbard) were divided into four treatment groups, with three replicates per treatment and 10 chicks per replicate. Chicks in control group were fed basal diet. Birds in treatment groups were fed on diets supplemented with 3, 6 and 9% NSM. Body weights of broilers were measured at one, 21 and 42 days, feed intake was measured at the same periods and feed conversion was calculated, accordingly. Blood samples of three birds per replicate were collected at 30 and 42 days of age from wing vein were taken for biochemical and hematological analysis. At ages 30 and 42 days, two chicks (one male and one female) were taken randomly from each replicate and slaughtered and the spleen, thymus and bursa were separated and weighted. Results of this experiment showed that, supplementing 3 and 6% of NSM improved body weight gain (BWG) and feed conversion ratio (FCR) of broilers at starter and grower periods ($P<0.05$), and also increased serum albumin levels ($P \leq 0.05$). Total protein and glucose levels were not statistically ($P \geq 0.05$) influenced. Supplementing 3 and 6% *N. sativa* meal decreased serum triglyceride and plasma cholesterol had lower level in all treatments compared with control. In addition, HDL fraction was increased and LDL fraction was decreased in all treatments compared to control group. Birds fed NSM except 9% insignificantly improved spleen percentage and improved significantly bursa and thymus percentages compared with control group. Plasma AST and ALT decreased with all levels of NSM and could suggest that has properties to enhance liver health.

In conclusion, results of this study showed that addition of 3 and 6% of NSM seem to have a positive influence on growth performance, blood biochemical, immune-responsiveness and economic efficiency and it could be considered growth promoter for broiler chicks.

Key words:*Nigella sativa*, black seed, broiler chicks, performance, immune-responsiveness.

INTRODUCTION

Since the ban on the use of antibiotics in animal and poultry feed in Europe in 2006, there has been an increase in the use of medicinal plants and plant additives in animal feeding and the feed industry, as it is considered a good and effective alternative applicable due to its impact on the different physiological systems of animals because it has a range of activities on the immune system, endocrine system, digestive system and other various body systems, in addition to the fact that these plants possess many active substances, antioxidants, anti-inflammatory and anti-microbial activities *(Nasir and Grashorn, 2010).* One of these plants is the black seed also known as black cumin (*Nigella sativa* L.), which belongs to the Ranunculaceae family. It is one of these alternatives that can be used as feed additives and the spread of its cultivation in Asian and Mediterranean countries. The N. sativa seed has also been used in medicine in the Middle East, North Africa, the Far East and Asia *(El-Daly, 1998).*Some studies showed that black seed has antibacterial activity *(El-Kamali et al., 1998; Mouhajir et al., 1999; Nair et al., 2005),* where the black seed and its various extracts is working on gram-positive and gram-negative bacteria, and they caused inhibition of aflatoxin production *(Nasir and Grashorn, 2006),* and have many biological properties including antiparasitic *(Mahmoud et al.,2002),* In addition to containing alkaloids, fixed and volatile oils and a variety of pharmacologically active componands like dithymoquinone, thymol, thymoquinone, alpha-hedrin, carvacrol, nigellidine and nigellicine-N-oxide*(Al-Homidan et al., 2002; Nasir et al., 2005).*

The effects of dietary *Nigella sativa* meal or oils on the performance of poultry were studied and it was determined that positively affected feed intake and body weight in the broilers *(Halle et al., 1999; Tollbaand and Hassan, 2003; Guler et al., 2006; Ziad et al., 2008; AL-Beitawi et al., 2009; Erener et al., 2010; Toghyani et al., 2010).* Some studies showed that diets contained 10% of NSM had no effects on growth performance *(Al-Homidan et al., 2002).* On the other side, the addition of ground black seeds at levels less than 0.25 up to 2% of the diet had unwanted effects on performance and carcass characteristics *(Abbas and Ahmed, 2010; Majeed et al., 2010; Nasir and Grashorn, 2010).*

Therefore, this study was conducted to determine the effect of different levels of *Nigella sativa* meal on performance, immunity and some blood biochemical and hematological parameters of broiler chicks.

MATERIALS AND METHODS

Study area:

This study was carried out at the farm of the Department of Animal and Poultry Production, Faculty of Environmental Agricultural Sciences, Arish University, El Arish, North Sinai, Egypt.

Experimental birds and design:

One hundred and twenty, one day-old Hubbard chicks obtained from a local hatchery were used for the study after being left on the experimental site for a period of one week to acclimatize. The chicks were randomly assigned to four dietary treatments, such that there were 30 birds per treatment and each treatment had three replicated with 10 chicks per replicate. Birds were brooded at 33^{o} C during the first week with the brooding temperature being reduced to 3^{o}C/week until it reached approximately 24^{o}C by week four of age. Light was provided continually using artificial light. The chicks were subjected to similar conditions of management and sanitary conditions throughout the period of the experiment.

Experimental diets:

Black seeds were obtained from a local herb store in Mansoura, Egypt, and used in the diets after grinding, at the rate of 0, 3, 6 and 9 % of the diet. During the starter period (1

– 21 days) birds received starter diets containing 23 % CP and 3000 Kcal ME/ Kg, and during grower period (22 – 42 days) they received grower diets containing 20 % CP and 3100 Kcal ME/ Kg. Feed and clean water were provided daily and *ad-libitum*. The diets were formulated to meet the nutrients requirements of broilers as recommended by the Hubbard Broiler Management Guide. Table 1 showed the ingredients composition of the experimental diets.

Nutrient composition of *Nigella sativa* seed meal:

Nigella sativa seed meal are composed of 9.1% moisture, 27.2% crude protein (CP), 6.8% crude fiber (CF), 28.7% ether extract (EE), 4.9% total ash, 30.2% nitrogen-free extract, 1.12% Lysine, 0.53% Dl-Methionine, 0.25% calcium and 0.34% phosphorus.

Measurements:

Body weight was determined at 1, 7, 14, 21, 28, 35 and 42 days of age and the average daily gain was calculated, the average daily feed intake and feed conversion ratio were determined weekly and during the period of 1– 42 days. Mortality was recorded daily during the experiment.

Blood samples of three birds per replicate (selected randomly) were collected in the morning at 30 and 42 days from wing vein. Blood samples were collected in EDTA containing tubes for determination of
blood profile, while whole blood samples for determination of serum proteins were collected without anticoagulant. Serum was separated after centrifugation of clotted blood at 3,500 rpm for 20 min. Serum and EDTA blood were kept at 4°C. Blood samples were analyzed to determine the contents of cholesterol, triglyceride, total protein, albumin and globulin.

At ages 30 and 42 days, two chicks (one male and one female) were taken randomly from each replicate (six birds/ treatment) and slaughtered and the spleen, thymus and bursa were separated and weighted.

Economical evaluation:

The prevailing market prices of ingredients and *Nigella sativa* seed meal used during the period of the study were used for the economic appraisal of the feeds. Economic efficiency is *defined as the net revenue per unit feed cost calculated from input output analysis as described by Asar et al. (2010).*

The economic efficiency was calculated by the following:

- Feed cost = number of kg feed per bird × price of kg feed.
- Selling revenue = body weight per bird × price of kg for live body weight.
- Net revenue = difference between selling revenue and feed cost.
- E.EF (Economic efficiency) = (net revenue/feed cost) × 100.
- R.E.E (Relative economic efficiency), assuming control treatment = 100%.

Statistical Analysis:

The obtained data was statistically analyzed using Analysis of Variance (ANOVA), applying the General Liner Model (GLM) Procedure, described in SAS User's Guide (SAS., 2004). Differences among means were tested using Duncan's multiple range test (Duncan, 1955).

Result and Discussion:

Productive performance:

The results in Tables 2 and 3 showed the effect of used *Nigella sativa* meal (NSM) on live body weight and body weight gain for broiler chicks. The results indicated that birds fed diet contained 3% of NSM had significantly ($P \leq 0.05$) achieved the highest final live body weight and body weight gain compared with the control and other treatment groups. The lowest final live body weight and body weight gain were observed in birds fed high level of NSM (9%).

Tables 4 and 5 illustrate the effect of different levels of *Nigella sativa* meal (NSM) on feed consumption and feed conversion ratio. The results showed that the feed intake was increased significant effect ($P \leq 0.05$) on groups fed NSM compared with control group except group fed diet contain 9% of NSM. However, feed conversion ratio showed significant

differences ($P \leq 0.05$) between all groups fed on black cumin-diets and control group.

This results agreement with El-Bagir et al. (2006) who showed that the black cumin supplementation at level of 1% or 3% significantly increased final body weight of laying hens. The same trend showed by Saber et al. (2018) when study effect of Nigella sativa at level of 0.5, 1 and 1.5% on broiler chicks. Also, the same improved were showed with Demirci et al. (2019) who studied the effect of black cumin seed oil on performance of broiler chickens by rate 0.5 and 1%. This study confirms previous findings that indicated Nigella sativa seed meal promoted good growth and productivity in poultry is attributed to its nutrients and phytochemicals, anti-oxidant and antimicrobial properties (Fahey et al.,2001; Salem. 2005; Padmaa. 2010; Bakathir and Abbas 2011;Awadalla, 2012), that contributed to the stability of feed hygiene and modifying the intestinal system in a beneficial way by controlling possible pathogens which led to stimulation of the secretion of digestive enzymes (lipase and amylase) and intestinal mucus in chicken, to stimulate feed digestion, weakening the adhesion of pathogens and stabilizing the microbial balance in the intestine (Lee et al., 2003). Also, the presence of active and phenolic compounds can reduce the numbers of intestinal pathogens, and thus reduce nutrient loss (Nasser and Grashorn, 2010), which has resulted in increased feed consumption rates and consequently an increase in feed conversion rates. On other side, other studies showed that addition of black cumin seeds into the diet significantly decreased body weight and weight gain of the chickens (El-Sheikh et al., 1998; Akhtar et al., 2003; Majeed et al., 2010; Ghasemi et al., 2014).

Carcass characteristics:

Statistical analyses of carcass yield in different groups are illustrated in Table 6. The dietary replacement of NSM did significantly affect the relative weights of heart and giblets. Some studies have reported similar results in poultry fed diets contain Nigella sativa (Durrani et al., 2007; Saeid and Al-Nasry, 2010; Kumar et al., 2018). On the contrary, several studies reported that there was not significantly affect for dressing and other organ compared with control group(Jahan et al., 2015; Naeemasa et al., 2015; Karadağoğlu et al., 2019) On the other hand, liver was significantly increased by increasing levels of NSM to 9%. Also, gizzard% significantly ($P \leq 0.05$) increased by using all levels of NSM compared with control group. Results in Table 6, showed significantly increased of bursa % on all levels of NSM compared with control group except 9% of NSM. The results also explained that 3% NSM significantly improved the thymus compared with the control and other treatments. The results explained that 3% and 6% NSM improved the percentage of spleen without significant differences compared to the control group (Shewita and Taha 2011;Al-Mufarrej 2014; Saber et al., 2018). This important production of the immune cells may be due to anti-oxidant activities of some components of Nigella sativa seed meal (Rocha et al.,2010; Azeem et al., 2014; Ghasemi et al., 2014; Kooti et al.,2016; Kumar et al., 2017)and to the capacity of plants polysaccharides to modulate the immune system (Salem, 2005; Dong et al., 2007).

Blood constituents:

Results in Table 7 showed that the diets containing different levels of NSM decreased ($P \leq 0.05$) serum total cholesterol. In addition, HDL fraction was increased and LDL fraction was decreased in all treatments compared with control group except the group fed 9% of NSM. In addition to, increased ($P \leq 0.05$) albumin levels. The results agree with those obtained by Hassan et al., (2007) and AL-Beitawi et al. (2009)who recorded that *Nigella sativa* significantly decreased the levels of total cholesterol and triglyceride. The decrease in

plasma cholesterol levels may be attributed to the high content of black seeds from unsaturated fatty acids which may stimulate the cholesterol excretions into the intestine and the oxidation. On other side used NSM lead to significant decreased in the plasma glucose as compared to control and 9% of NSM. This may be due to contain anti-diabetic activity that works to reduce the level of sugar in the blood and this may be due to the presence of essential oil *(Kooti et al., 2016).* It is thought that the anti-diabetic properties of *N. sativa* are induced by activation of adenosine monophosphate kinase (AMPK), affecting cellular uptake of proteins with hypolipidemic and anti-diabetic properties *(Haddad et al., 2003; Sanz , 2008; Tayarani et al., 2009)*

Also, results showed that total protein was significantly increased in group 3 and 6% NSM as compared with those treated with 9% NSM or control group and higher albumin level was recorded in group that received 3% and 6% NSM. The same results were recorded by *Hassan et al., (2007)* who found increase in serum albumin. Plasma AST and ALT decreased with all levels of NSM except 9%. Since liver is reported to contain enzymes like ALT and AST, it releases these enzymes to the blood when damaged *(Kaplan et al., 2003).* Hence, the absence of significant differences among treatment diets in plasma AST in the present study may reflect normal liver function of the birds fed diets containing NSM. Although the decrease in ALT activity observed in birds on diet contained 3% and 6% NSM could suggest that has properties that can enhance liver health. On other side the results showed different significant between all treatments compared to control group for WBCs and RBCs level.

According to the results of analyzing blood samples from different treatments, the chicks fed on the black seed except 9% of NSM showed higher blood globulin and white blood cells count compared with the control group. This indicates that the black seed raised the level of globulin in the blood, which serves as an indicator of the immune response and the source of antibodies ***(****Abdel Fattah et al., 2008)* and the production of immunoglobulin. Therefore, the observed effect may be due to increase immunoglobulin concentration and improved immunity *(Fararh et al., 2004; Işık et al., 2010; Ghasemi et al., 2014).*

Economical evaluation:

Result in Table 8 showed the highest value for economic efficiency, net revenue and relative economic efficiency were achieved with the diets contain NSM except 9% of NSM compared to control group. Where the economic study showed that the use of *Nigella* seeds meal by rate 3 and 6% in chicken diets led to a decrease in the cost of the feed and also led to an increase in body weight led to an increase the price from selling birds, this in turn contributed to the improvement of net revenue, economic efficiency and relative economic efficiency.

CONCLUSION

It could be concluded that *Nigella sativa* meal improved performance, immune organs and blood constituents of broiler chicks up to 6%. The best level occurred by 3% *Nigella sativa* meal in broiler chicks diets.

Table (1): The composition and calculated analysis of starter and grower diets.

Ingredients %	**Starter period (1 – 21 days-old)**				**Grower period (22 – 42 days-old)**			
	***Nigella Sativa* seed meal %**				***Nigella Sativa* seed meal %**			
	0	**3**	**6**	**9**	**0**	**3**	**6**	**9**
Yellow corn, (8.8%).	58.76	57.32	55.87	54.43	68.5	66.13	64.36	62.58
Soybean meal, (44%).	30.25	28.77	27.29	25.81	18.97	18.15	17.3	16.44
Vegetable oil.	0	0	0	0	0	0.29	0.4	0.51
Corn gluten meal,(60%).	7.08	6.99	6.9	6.81	8.69	8.26	7.78	7.31
Di-calcium phosphate.	1.57	1.59	1.6	1.62	1.52	1.81	1.82	1.82
Salt.	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Limestone.	1.32	1.3	1.29	1.27	1.22	1.24	1.22	1.22
L. Lysine.	0.14	0.15	0.17	0.18	0.29	0.3	0.3	0.3
DL. Methionine.	0.18	0.18	0.18	0.18	0.11	0.12	0.12	0.12
(V&M.)Premix*.	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Anti-oxidant.	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
NSM, (27.2%).	0	3	6	9	0	3	6	9
Total	100	100	100	100	100	100	100	100
Calculated analysis (%):								
Crude protein	23	23	23	23	20	20	20	20
ME Kcal/ Kg.	3000	3000	3000	3000	3100	3100	3100	3100
Calcium	1	1	1	1	1	1.01	1	1.01
AV. Phosphorus	0.51	0.54	0.5	0.51	0.45	0.47	0.45	0.45
L. Lysine	1.23	1.23	1.23	1.23	1.1	1.1	1.1	1.1
DL. Methionine	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5
Price/ Ton (L.E).	6510	6460	6419	6369	6174	6120	6066	6012

* Each kg of vitamin mineral premix: contains: vitamin A, 1200000; vitamin D3, 300000IU; vitamin E, 700 mg; vitamin K_3, 500 mg; vitamin B_1, 500 mg; vitamin B_2, 200 mg; vitamin B_6, 600 mg; vitamin B_{12}, 3 mg; folic acid, 300mg; choline chloride, 1000 mg; Niacin, 3000 mg; Biotin, 6 mg; panathonic acid, 670 mg; manganese sulphate, 3000 mg; iron sulphate, 10000 mg; zinc sulphate, 1800 mg; copper sulphate, 3000 mg; iodine, 1.868 mg; cobalt sulphate, 300 mg; selenium, 108 mg.

Table (2): Effect of dietary treatments on broiler body weight (g).

Items	Control	*Nigella Sativa* seed meal, %		
		3	6	9
Initial weight at 7 day-old	149[a]	150[a]	150[a]	148[a]
14 day-old	450[c]	510[a]	485[b]	440[d]
21 day-old	785[c]	855[a]	840[b]	683[d]
28 day-old	1200[b]	1280[a]	1285[a]	1024[c]
35 day-old	1655[b]	1755[a]	1755[a]	1415[c]
Final weight at 42 day-old	1990[b]	2150[a]	2140[a]	1730[c]

a,b,c Means in the same row with different superscripts are significantly different ($P \leq 0.05$).

Table (3): Effect of dietary treatments on broiler body weight gain (g).

Items	Control	*Nigella Sativa* seed meal, %		
		3	6	9
7 – 14 day-old	301[c]	360[a]	335[b]	292[c]
14 – 21 day-old	335[b]	345[ab]	355[a]	243[c]
21 – 28 day-old	415[b]	425[b]	445[a]	341[c]
28 – 35 day-old	455[a]	475[a]	470[a]	391[b]
35 – 42 day-old	335[b]	395[a]	385[a]	315[b]
Total (WG) 7-42 day	1841[b]	2000[a]	1990[a]	1582[c]

a,b,c Means in the same row with different superscripts are significantly different ($P \leq 0.05$).

Table (4): Effect of dietary treatments on broiler feed intake (g).

Items	Control	*Nigella Sativa* seed meal, %		
		3	6	9
7 – 14 day-old	320[a]	372[a]	347[a]	322[a]
14 – 21 day-old	550[ab]	567[a]	581[a]	544[b]
21 – 28 day-old	715[ab]	732[a]	744[a]	702[b]
28 – 35 day-old	837[ab]	865[a]	875[a]	795[b]
35 – 42 day-old	943[b]	977[a]	975[a]	801[c]
Total (FI) 7-42 day	3365[b]	3513[a]	3522[a]	3164[c]

a,b,c Means in the same row with different superscripts are significantly different ($P \leq 0.05$).

Table (5) : Effect of dietary treatments on broiler feed conversion ratio (g feed/ g gain).

Items	Control	*Nigella Sativa* seed meal, %		
		3	6	9
7 – 14 day-old	1.06[a]	1.03[a]	1.04[a]	1.11[a]
14 – 21 day-old	1.64[b]	1.64[b]	1.63[b]	2.24[a]
21 – 28 day-old	1.75[b]	1.73[b]	1.67[c]	2.15[a]
28 – 35 day-old	1.87[b]	1.85[b]	1.87[b]	2.04[a]
35 – 42 day-old	2.89[a]	2.58[a]	2.78[a]	2.62[a]
Total (FCR) 7-42 day	1.83[b]	1.76[c]	1.77[c]	2.00[a]

a,b,c Means in the same row with different superscripts are significantly different ($P \leq 0.05$).

Table (6): Effect of dietary treatments on carcass characteristics and lymphoid organs of broiler chicks at 42 days old.

Items	Control	*Nigella Sativa* seed meal, %		
		3	6	9
Live weight(g)	1990[b]	2150[a]	2140[a]	1730[c]
Carcass characteristics (%)				
Dressed	67.15[b]	74.75[a]	74.77[a]	65.26[b]
Gizzard	1.73[c]	1.92[b]	1.93[b]	2.07[a]
Liver	1.75[a]	1.51[b]	1.53[b]	1.69[a]
Heart	0.50[a]	0.50[a]	0.49[a]	0.51[a]
Giblets*	3.98[a]	3.93[a]	3.95[a]	4.27[a]
Total edible parts**	71.13[b]	78.69[a]	78.73[a]	69.54[b]
Lymphoid organs (%)				
Spleen	0.10[ab]	0.12[a]	0.12[a]	0.09[b]
Bursa	0.15[b]	0.20[a]	0.21[a]	0.16[b]
Thymus	0.31[a]	0.23[b]	0.23[b]	0.31[a]

a,b,c Means in the same row with different superscripts are significantly different ($P \leq 0.05$).

*Giblets = gizzard+ liver + heart.

** Total edible parts = dressing + giblets

Table (7): Effect of dietary treatments on some blood biochemical and hematological parameters of broiler chicks.

Items	Control	*Nigella Sativa* seed meal, %		
		3	6	9
T. protein(g/dl)	3.54^{ab}	4.05^{a}	4.10^{a}	3.39^{b}
Albumin (A) (g/dl)	1.47^{b}	1.78^{a}	1.79^{a}	1.41^{b}
Globulin (G) (g/dl)	2.07^{b}	2.27^{a}	2.31^{a}	1.98^{b}
A/G ratio	0.72^{a}	0.79^{a}	0.78^{a}	0.72^{a}
Glucose (mg/dl)	223.70^{a}	193.75^{b}	174.21^{c}	98.39^{d}
Cholesterol (mg/dl)	187.33^{a}	145.67^{b}	142.33^{b}	151.33^{b}
HDL- Cholesterol (mg/dl)	59.25^{b}	86.72^{a}	78.16^{a}	60.34^{b}
LDL- Cholesterol (mg/dl)	128.08^{a}	58.94^{c}	64.17^{c}	90.99^{b}
T. lipids (mg/dl)	401.10^{b}	418.09^{ab}	420.81^{ab}	427.36^{a}
ALT (U/L)	48.33^{ab}	42.71^{b}	42.69^{b}	49.25^{a}
AST (U/L)	13.27^{ab}	11.50^{b}	11.54^{b}	14.51^{a}
RBCs (10^{6})	1.47^{ab}	1.58^{a}	1.60^{a}	1.39^{b}
WBCs (10^{3})	21.30^{b}	24.97^{a}	25.18^{a}	20.06^{b}

a,b,c Means in the same row with different superscripts are significantly different ($P \leq 0.05$).
RBCs, Red blood cells
WBCs, white blood cells.

Table (8): Effect of dietary treatments on the economic efficiency at 42 days of age.

Items	Control	*Nigella Sativa* seed meal, %		
		3	6	9
Feed intake/bird (k.g)	3.37	3.51	3.52	3.16
Price/k.g feed (L.E)	6.26	6.22	6.16	6.11
Cost of feed (L.E)	21.07	21.82	21.69	19.33
Fixed cost (L.E)	10.00	10.00	10.00	10.00
Total cost (L.E)	31.07	31.82	31.69	29.33
Total weight/bird (K.g)	1.99	2.15	2.14	1.73
Price 1 K.g/ bird (L.E)	24.00	24.00	24.00	24.00
Price of bird (L.E)	47.76	51.60	51.36	41.52
Net revenue	16.69	19.78	19.67	12.19
Economic efficiency *	53.73	62.18	62.07	41.56
Relative Economic efficiency **	100.00	115.72	115.51	77.34

Net revenue = difference between selling revenue and feed cost.
E.EF (Economic efficiency) = (net revenue/feed cost) x 100.
R.E.E (Relative economic efficiency), assuming control treatment = 100%.

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الملخص العربي

تأثير المستويات المختلفة من كسب حبة البركة على الأداء الإنتاجي وبعض الخصائص البيوكيميائية في الدم والاستجابة المناعية لدجاج التسمين

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أجريت هذه التجربة لتقييم تأثير استخدام مستويات مختلفة من كسب حبة البركة على الأداء الإنتاجي والمناعة وبعض العوامل البيوكيميائية في دجاج التسمين. تم استخدام 120 كتكوت هابرد عمر يوم واحد وتم تقسيمهم إلى أربع مجموعات، داخل كل مجموعه ثلاث مكررات (10 كتاكيت فى كل مكررة). تم تغذية الكتاكيت خلال الأسبوع الأول على عليقة كنترول بدون أي إضافات. تم تغذية الطيور في المجموعات على علائق تحتوي على 0، 3، 6 و9% من كسب حبة البركة. تم قياس أوزان الطيور عند عمر يوم وحتى عمر 42 يوم بشكل دوري أسبوعيا، وتم قياس استهلاك العلف في نفس الفترات، وتم حساب معدل تحويل العلف وفقًا لذلك. تم أخذ عينات الدم من وريد الجناح عند عمر30 و42 يوما من 3 طيورمن كل مكررة لتحليلها معملياً ، تم أخذ طائرين (ذكر وأنثى) بشكل عشوائي من كل مكررة وذبحها وتم فصل الطحال والغدة الصنوبرية وغدة فابريشيوس ووزنها. وأظهرت نتائج هذه التجربة أن استخدام كسب حبة البركة بنسبة 3 و6٪ أدى إلى تحسن وزن الجسم الحي ومعدل التحويل الغذائي لدجاج التسمين في فترتي البادئ والنمو بشكل معنوي، وكذلك زيادة مستويات الألبيومين في الدم. وكذلك تركيزات البروتين والجلوكوز الكلية. كما أدى استخدام كسب حبة البركة بنسبة 3 و6 ٪ إلى انخفاض الدهون الثلاثية في الدم وكان مستوى الكوليسترول في البلازما أقل في جميع المعاملات مقارنة بالكنترول. بالإضافة إلى ذلك لوحظ زيادة نسبة الدهون عالية الكثافة وانخفضت نسبة الدهون منخفضة الكثافة في جميع المعاملات مقارنة بمجموعه الكنترول. كما لوحظ تحسن ملحوظ في نسبة الطحال وغدة فابريشيوس والغدة الصنوبرية فى الطيور التي غذيت على علائق تحتوي على كسب حبة البركة باستثناء المعاملة التي احتوت على 9٪ مقارنة بالكنترول. كما انخفضت إنزيمات الكبد مع جميع مستويات حبة البركة مما يشير إلى أن حبة البركة لها خصائص لتحسين صحة الكبد.

من خلال نتائج هذه الدراسة يمكن استنتاج أن إضافة 3 % أو 6 % من مسحوق كسب حبة البركة في علائق كتاكيت اللحم يبدو أن لها تأثيرًا إيجابيًا على أداء النمو، مكونات الدم، الاستجابة المناعية والكفاءة الاقتصادية، ويمكن اعتبارها محفزًا للنمو لدجاج التسمين.

الكلمات المرشدة:حبة البركة ، الحبة سوداء ، دجاج التسمين ، الأداء الإنتاجي ، الاستجابة المناعية.