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EFFECT OF DIETARY HUMIC ACID SUPPLEMENTATION ON EGG PRODUCTION, EGG QUALITY AND FERTILITY OF TURKEY HENS.

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ABSTRACT

This study was conducted to evaluate the effects of dietary supplementation of humic acid (HA) on reproductive performance, egg production, some blood parameters and carcass traits of turkey hens. A total of 160 turkey hens from White Holland strain were employed in a completely randomized block design with one control group and three treatment groups. Each group was divided into four replicates (10 hens in each). Diets of the 1st, 2nd, 3rd and 4th groups were supplemented with 0, 200, 300 and 400 mg HA/kg diet, respectively. Results showed that all HA levels increased (P<0.05) live body weight, feed conversion, egg production and egg quality in terms of increasing (P<0.05) egg yolk index, Haugh units and shell thickness, while albumen, yolk and shell percentages, shape index and yolk color score of eggs were not affected by HA. Fertility and hatchability rates were improved (P<0.05) by all HA levels. Count of red and white blood cells in whole blood and albumin concentration in blood plasma increased (P<0.05) by all HA levels as compared to control, being the highest for HA at a level of 300 mg/kg at all age intervals. Activity of AST and ALT and concentration of thyroid hormone (T_3) in blood plasma were not affected by HA. Carcass traits showed in terms of weight of carcass, liver, gizzard, spleen and oviducts relative to live body weight were the highest (P<0.05) in hens fed HA diets at levels of 300 and 400 mg/kg diet.

Based on the obtained results, it could be concluded that dietary humic acid supplementation in turkey diet markedly improved reproductive performance, egg quality and carcass traits without adverse effects on healthy status of laying hens.

Keywords: *Humic acid, turkeys, reproductive performance, egg traits, blood, carcass.*

INTRODUCTION

One of the most important problem facing researchers in turkey field is reducing egg production in consequence of turkey hens have a short period of egg production. In this respect, many approaches used to tackle this problem, one of these approaches is using feed additives to improve egg production in turkey breeder hens.

Humic acid defined as a class of compounds resulting from decomposition of organic matter, particularly plants are natural constituents of drinking water, soil and lignite. Various research trials were conducted worldwide have showed positive results concerning the use of humic acids as an organic feed ingredient to increase live body weight, growth rates, feed intake, feed conversion ratio and egg production. On the other hand, humic acid has a healthy side, by improving immune function of poultry, especially at early stage of age, through inhibiting bacterial and fungal growth, thus decrease levels of mycotoxins in feed. Also, humic acids reduce the incidence of enteric disease and diarrhea (Kuhnert *et al*., 1989; 1991).

Humic acid is one of feed additives that have been used in poultry diets for years to improve growth and productivity.In this context, many researchers observed that humates included in the feed of poultry promote growth (Bailkey *et al*., 1996; Parks *et al*., 1986; Eren *et al*., 2000; Kocabagli *et al*., 2002; Karaoglu *et al*., 2004).

Many authors showed that dietary supplementation of humate at levels of 0.1 and 0.2% during the late laying period increased egg production, improved feed efficiency and reduced mortality (Yorük *et al*., 2004). Also, addition of humate into layer diets at levels of 30 and 60 mg/kg (Kucukersan *et al*., 2005), up to 0.3 g/kg (Hayirli *et al*., 2005) or 2 g/kg (Kucukersan *et al*., 2005) can improve egg yield, egg weight and feed efficiency. However, other studies (Yoruk *et al*., 2004; Hayirli *et al*., 2005) showed that egg shell quality parameters were not affected by dietary inclusion of humate in layer diets.

There are few reports focused on the effects of dietary humic acid supplementation on reproductive performance in turkey breeder hens.Therefore, this study was conducted to determine the effects of dietary humic acid supplementation on egg production and quality, fertility, hatchability, blood parameters and some carcass traits of turkey hens during an experimental period from 34 to 52 wk of age.

MATERIALS AND METHODS

The present study was carried out at Mehalet Mousa Turkeys Research Station, Kafrelsheikh governorate, belonging to the Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture, Egypt.

Birds:

A total of 160 turkey hens from the White Holland strain aged 34 weeks was used in this study. Hens were employed in a completely randomized block design with one control group and three treatment groups, each contained 40 hens. Each group was sub-divided into four replicates, 10 hens each. Hens were housed in cages and fed *ad libitum* on mash diet containing 17.72% crude protein and 2920 Kcal/kg as ME and supplemented with the required vitamins as recommended by NRC (1994). Water was available all the times, and lighting program of 16 hours a day was

applied.The experiment was run for 18 weeks. Composition of the basal diet during the experimental period is presented in Table (1). Diets of the first, second, third and fourth treatment groups were supplemented with 0, 200,300 and 400 mg humic acid/kg diet, respectively.

Experimental procedures:

Throughout the experimental period from 34 to 52 wk of age, individual live body weight and feed intake were weekly recorded, while yield and weight of eggs were daily recorded for each group. Then, feed conversion ratio (FCR) expressed as kg of feed consumed per kg of egg produced was calculated at age intervals from 34-40, >40-46 and >46-52 wk.

Table (1): Composition and calculated analysis of the basal diet.

Ingredient	%
Yellow corn (%)	70.00
Soybean meal (44 % CP)	11.50
Fish meal (64 % CP)	10.00
Di-Calcium phosphate	2.00
Limestone	6.00
DL-methionine	0.05
L-Lysine	0.15
Salt (sodium chloride)	0.30
Total	100
Calculated analysis:	
Crude protein	17.72
ME, Kcal/kg diet	2920

*** Each 3 kilograms of premix contains the vitamin premix and trace minerals. The vitamin premix contributed the following: vit. A, 12.000.000 IU; vit. D3, 2.200.000 IU; vit. E, 10000 mg; vit. K, 2000 mg; vit. B1, 1000 mg; vit. B2, 4000 mg; vit. B12, 10 mg; vit. B6, 1000 mg; niacin, 20000 mg; pantothenic acid, 10000 mg; folic acid, 1000 mg and biotin, 50 mg. The trace mineral premix contributed the following: copper sulfate, 10000 mg; potassium iodide, 1000 mg; manganese oxide, 55000 mg; zinc oxide, 50000 mg; selenium, 100 mg; iron, 30000 mg.**

Egg quality:

At the mid-interval of the experimental period (peak of egg production) from 40-46 wk of age, egg quality traits includingpercentages of albumen, yolk, and shell, as well as shape, yolk index, haugh units, shell thickness and yolk color were determined for16 eggs randomly taken from each group (4 eggs from each replicate).

Fertility and hatchability:

Three hatches of eggs were made to determine fertility and hatchability rates. Fertility was calculated as the number of fertile eggs relative to total number of egg set into the incubator, while hatchability was calculated as the number of healthy hatched poults relative to number of fertile eggs.

Blood parameters:

Blood samples were drawn in heparinized tubes from the brachial vein from two hens in each replicate of each group at 34, 40, 46 and 52 weeks of age (as a total of 128 samples). Each sample was divided into two parts,the first was taken in immediately to count white blood cells (WBCs)and red blood cells (RBCs), while, the second part was centrifuged at 3000 rpm for 10 min to separate blood plasma, which was stored at -20°C till analysis of albumin concentration (Weichselaum, 1946), and activity of alanine (ALT) and aspartate (AST) aminotransferases (Reitman and Frankel, 1957) in blood plasmas. While, triiodothyronine (T3) concentration was determined in blood plasma according to methods described by Darras *et al*. (1992).

Carcass traits:

At the end of experimental period (52 wk of age), four random hens from each group were randomly taken, slaughtered and eviscerated to calculate weight of carcass, liver, gizzard, heart, spleen, ovaries and oviducts relative to live body weight and oviduct length.

Statistical analysis:

Data were subjected to analysis of variance using one way ANOVA procedures of SAS (2004) at each age interval. Differences between means were ranked by Duncan's multiple range testaccording to Duncan (1955).

RESULTS AND DISCUSSION

Live body weight:

Data presented in table (2)regard to the effect of different dietary levels of humic acid supplementation on live body weight, feed intake, feed conversion of turkey hens at various age intervals revealed that hens fed humic acid at a level 300mg /kg diet (T3) were significantly ($P<0.05$) the heaviest at 40 and 46 wk of age as compared to control group, but did not differ significantly from other treatment groups. However, hens in all treatment groups were significantly ($P<0.05$) heavier than the controls, being the heaviest in T3 at 52 wk of age.

Table (2): Effect of dietary humic acid supplementation on live body weight, feed intake, feed conversion and egg production of turkey hens at various age intervals.

Age (wk)	T1 (Control)	T2 (200 mg/kg)	T3 (300 mg/kg)	T4 (400 mg/kg)	±SEM
Body weight (g):					
34	5275.00	5340.00	5320.00	5357.50	29.07
40	5378.75^{b}	5445.00^{ab}	5541.25^{a}	5478.75^{ab}	34.71
46	5475.00^{b}	5556.25^{ab}	5643.75^{a}	5606.25^{a}	32.50
52	5538.75^{c}	5665.00^{b}	5782.50^{a}	5735.00^{ab}	29.66
Feed intake (g/hen):					
34-40	145.00	145.33	146.66	146.33	0.91
40-46	149.66	149.66	148.66	150.00	0.70
46-52	155.00	154.33	155.33	155.00	0.79
Feed conversion (kg feed/kg egg):					
34-40	3.93^{a}	3.94^{a}	4.00^{a}	3.37^{b}	0.12
40-46	3.99^{a}	3.95^{a}	3.28^{b}	2.60^{c}	0.06
46-52	5.78^{a}	5.49^{a}	4.38^{b}	4.05^{b}	0.20
Egg weight (g):					
34-40	84.43	83.08	83.42	84.06	0.71
40-46	82.98^{bc}	82.83^{c}	84.59^{ab}	85.30^{a}	0.50
46-52	83.99^{b}	84.87^{ab}	85.34^{ab}	86.72^{a}	0.56
Egg production (%):					
34-40	43.67^{b}	44.53^{b}	44.01^{b}	51.54^{a}	1.27
40-46	45.21^{c}	45.72^{c}	53.58^{b}	67.52^{a}	0.90
46-52	32.13^{b}	33.16^{b}	41.53^{a}	44.10^{a}	1.13

Means denoted within the same row with different superscripts are significantly different at P<0.05).

These results are in agreement with those reported by Hanafy and El-Sheikh (2008), who indicated that live body weight was significantly (P≤0.05) increased by age of laying hens as affected by humic acid supplementation.In this respect, several authors indicated that humic acid had a positive effect on live body weight of laying hens (Shermer *et al.*, 1998), broilers (Ozturk *et al.*, 2012; Taklimi *et al.*, 2012; Mirnawati and Marlida, 2013) and Japanese quail (Abdel-Mageed, 2012).

The positive impact of humic acid on body weight maybedue toits effect on stabilizing the intestinal microflora and thus ensures an improved utilization of nutrients in animal feed, this leads to an increase in the live body weight of laying hens (Shermer *et al.*, 1998). In addition, HuminTech, 2004 mentioned that diet digestibility as a result of maintaining optimum pH in the gut increases, resulting in lower levels of nitrogen excretion and less odour. Moreover, humic acid is said to improve protein digestion as well as calcium and trace element utilization.

In contrast to the present results, other authors found insignificant effect of humate on body weight of broiler chickens (Kocabagli *et al*., 2002; Karaoglu *et al.*, 2004; Hanafy and El-Sheikh, 2008; Sahin *et al.*, 2011)

Feed intake, feed conversion and egg production:

Data presented in table (2) revealed that insignificant effect of humic acid supplementation on feed intake during all age intervals.

Similar results were reported by Hanafy and El-Sheikh (2008); Sahin *et al.* (2011) and Taklimi *et al.* (2012), who found that feed consumption was not affected significantly by humic acid supplementation.

Regarding the effect of humic acid on feed conversion.resultspresented in table (2) revealed that turkey hens in T4 showed significantly (P<0.05) the best feed conversion during all age intervals compared with control group and other treatment groups. In this respect, Mirnawati and Marlida (2013) reported that humic acid at a level of 100 ppm in water can improve feed conversion ratio.

These results indicated that feed conversion ratio of turkey hens was improved by feeding the highest level from humic acid.On the other hand, Sahin *et al.* (2011) reported that feed conversion ratio was not significantly affected by humic acid supplementation.

Percentage of egg production and egg weight:

Results shown in table (2) revealed that hens in T4 (400 mg humic acid/kg diet) had significantly (P<0.05) the highest egg production percentage and the heaviest egg weight as compared to control and other groups during all age intervals.

These results are in agreement with those obtained by Ozturk *et al.* (2012), who indicated that the addition of 90 ppm dietary humic acid to layer diet after peak production increased the egg production compared to control. Also, Hanafy and El-Sheikh (2008) indicated that addition of humic acid to the laying hen diet caused significant increase in egg weight and egg production percentage compared with the control group. Kucukersan *et al.* (2005) showed that the dietary humic acid at doses of 30 and 60 g/ton feed can be used to improve egg weight and egg production. Yorük *et al*. (2004) found that supplementation of humate in layer diets at 0.1 and 0.2 % for 75 days during the late laying period increased egg production as compared to control

group without significant effect on egg weight. On the other hand, Wang *et al*. (2007) indicated that the dietary humic substances decreased egg production, but egg weight was improved.

Egg quality traits:

Results of egg quality traits in table (3) indicated insignificant effect of humic acid on egg quality traits in terms of egg albumen, egg yolk and egg shell percentages, and egg shape index and yolk color score.However, egg yolk index, Haugh units and shell thickness were significantly (P<0.05) the highest in T3 and T4 as compared to control group and T2.

The present results are in agreement with those reported by Yorük *et al.* (2004); Kucukersan *et al*. (2005) and Wang *et al.* (2007), who found insignificant effects of humic acid supplementation on egg quality traits. Also, Ozturk *et al.* (2012) found that addition of 30 ppm dietary humic acid to layer diet after peak production increased egg shell thickness as compared to the control. However, the supplementation of humic acid at a level of 90 ppm decreased egg shell thickness as compared to the 30 ppm humic acid.

Table (3): Effect of dietary humic acid supplementation on eggquality of turkey hens during theexperimental period.

Egg trait	T_1 (Control)	T_2 (200mg/kg)	T_3 (300mg/kg)	T_4 (400mg/kg)	±SEM
Egg components (%):					
Albumen	55.64	56.06	55.32	55.95	1.30
Yolk	32.58	32.06	32.51	31.57	0.99
Shell	11.77	11.87	12.15	12.46	0.49
Egg quality:					
Shape index (%)	70.52	71.47	71.97	72.81	0.94
Yolk index (%)	47.87^{c}	48.84^{b}	49.96^{a}	49.93^{a}	0.21
Haugh units	74.76^{b}	82.23^{a}	84.69^{a}	82.63^{a}	2.14
Shell thickness (mm)	0.378^{b}	0.395^{b}	0.434^{a}	0.442^{a}	0.008
Yolk color (score)	7.00	7.00	7.20	7.40	0.35

Means denoted within the same row with different superscripts are significantly different at P<0.05).

Fertility and hatchability rates:

Results of fertility and hatchability rates presented in table (4) revealed that the addition of all levels of humic acid to turkey hens diet significantly (P<0.05) increased fertility and hatchability rates of eggs compared with controls, being the highest in T3, followed by T4 and T2, while controls showed the lowest rates.

Table (4): Fertility and hatchability rates as affected by humic acid supplementation.

Trait	T1 (Control)	T2 (200 mg/kg)	T3 (300 mg/kg)	T4 (400 mg/kg)
Fertility rate (%)	87.44 ± 2.20^{c}	91.20 ± 1.61^{b}	94.72 ± 1.07^{a}	94.61 ± 1.40^{a}
Hatchability rate (%)	68.25 ± 0.93^{c}	72.26 ± 0.59^{b}	79.85 ± 0.71^{a}	78.06 ± 1.40^{a}

Means denoted within the same row with different superscripts are significantly different at P<0.05).

Blood parameters:

Data presented in table (5) revealed significant (P<0.05) improvement in RBCs and WBCs counts in whole blood and albumin concentration in blood plasma in all treatment groups as compared to control, being the highest in T3 at all age intervals.

On the other hand, activity of AST and ALT and concentration of thyroid hormone (T_3) in blood plasma were not affected significantly by humic acid supplementation, reflecting normal liver and thyroid functionin consequence of additive humic acid in turkey hen diet.

Carcass traits:

Effect of the experimental treatment on carcass traits presented in table (6) revealed that hens in T3 showed significantly (P≤0.05) the highest weights of carcass, liver, gizzard, spleen and oviducts relative to live body weight, while hens in T3 and T4 significantly increased relative weight of the ovaries and oviduct length (cm) compared with other treatment groups. Only, hens in T4 significantly (P<0.05) increased relative weight of heart as compared to controls.

In accordance with the present results, Hanafy and El-Sheikh (2008) found significant positive effect of HA at a level of 200 mg/kg diet on relative weight of ovary and spleen as well as oviduct length of laying hens. However, an insignificant effect of HA up to 200 mg/kg on relative weight of carcass, liver, gizzard, heart and oviduct. In our study, increasing level of HA above 200 mg/kg caused significant (P<0.05) increase in all the previous parameters, which may indicate that the observed improving in carcass traits was obtained by increasing HA level more than 200 mg/kg. Contrary, in chickens or Japanese quails Eren *et al*. (2000); Kocabagli *et al*. (2002) and Avci *et al.* (2007) reported insignificant differences in slaughter characteristics of birds fed humate diet or HA compared with control broilers. Increase of the relative weight of ovary and oviduct length in the current study may reflect and contributes in the increment of egg production for hens fed HA compared with controls which support the previous findings by Hanafy and El-Sheikh (2008).

Table (5): Effect of dietary humic acid supplementation on some blood parameters of turkey hens at different age intervals.

Age (weeks)	T1 (Control)	T2 (200mg/kg)	T3 (300mg/kg)	T4 (400mg/kg)	SEM
RBCs (10^6/ µl):					
34	1.69^{c}	2.04^{b}	2.68^{a}	2.51^{a}	0.10
40	1.78^{c}	2.24^{b}	2.74^{a}	2.58^{ab}	0.11
46	2.11^{c}	2.43^{b}	2.90^{a}	2.68^{ab}	0.09
52	2.01^{b}	2.15^{ab}	2.42^{a}	2.22^{ab}	0.09
WBCs (10^3/µl):					
34	14.35^{d}	19.35^{c}	22.65^{a}	20.41^{b}	0.05
40	16.29^{d}	21.14^{c}	29.22^{a}	26.36^{b}	0.13
46	18.73^{d}	26.13^{c}	34.16^{a}	30.23^{b}	0.18
52	19.16^{d}	29.12^{c}	36.75^{a}	32.28^{b}	0.29
Albumin (g/dl):					
34	2.11^{d}	2.25^{c}	2.92^{a}	2.65^{b}	0.04
40	2.16^{d}	2.31^{c}	2.95^{a}	2.65^{b}	0.01
46	2.22^{d}	2.34^{c}	2.97^{a}	2.68^{b}	0.01
52	2.24^{d}	2.36^{c}	2.98^{a}	2.71^{b}	0.009
AST activity (IU/l):					
34	136.6	137.0	136.4	136.8	2.53
40	144.4	143.8	144.6	143.6	6.44
46	170.6	171.2	169.6	168.8	9.30
52	188.6	187.4	187.2	188.2	6.88
ALT activity (IU/l):					
34	9.76	9.66	10.1	9.68	0.72
40	10.9	10.6	10.5	10.4	0.67
46	10.6	10.2	10.5	10.7	0.53
52	11.2	11.2	11.3	11.3	0.62
Thyroid hormone (T_3, ng/dl):					
34	154.2	152.7	152.6	154.0	2.24
40	143.5	144.0	143.2	144.3	1.58
46	139.7	138.2	139.2	140.2	1.36
52	133.8	133.1	134.0	134.7	1.29

Means denoted within the same row with different superscripts are significantly different at P<0.05).

Also, the observed increase in relative weight of spleen was associated with the results obtained from the increase of red blood cell count as result of HA supplementation, which could play a role in improving the health status. In addition, Klocking *et al*. (2002); Joone *et al*. (2003) and Schepetkin *et al*. (2003) reported immune-stimulatory, anti-inflammatory and antiviral effects of HA.

Table (6): Effect of dietary humic acid supplementation on carcass traits of turkey hens at the end of the experimental period.

Carcass traits	T1 (Control)	T2 (200mg/kg)	T3 (300mg/kg)	T4 (400mg/kg)	±SEM
Carcass (%)	65.69^{c}	67.52^{b}	70.42^{a}	70.11^{a}	0.43
Liver (%)	1.24^{c}	1.39^{b}	1.57^{a}	1.46^{b}	0.02
Gizzard (%)	1.99^{d}	2.11^{c}	2.46^{a}	2.21^{b}	0.01
Heart (%)	0.32^{b}	0.42^{ab}	0.42^{ab}	0.48^{a}	0.03
Spleen (%)	0.03^{d}	0.05^{b}	0.07^{a}	0.04^{c}	0.002
Ovary (%)	1.29^{b}	1.25^{b}	1.55^{a}	1.56^{a}	0.05
Oviduct (%)	1.36^{c}	1.54^{b}	1.68^{a}	1.42^{c}	0.01
Oviduct length (cm)	71.93^{c}	84.60^{b}	91.00^{a}	93.80^{a}	1.15

Means denoted within the same row with different superscripts are significantly different at P<0.05).

CONCLUSION

These results showed that the supplementation of humic acid at a level of 300 ppm into layer diet after peak laying period can increase production and quality of egg and improve feed conversion of hens, fertility and hatchability rates of incubated eggs without adversely effects on healthy status of layer hens. Further studies of the underlying mechanisms of humic substance involved in egg production and egg shell quality after peak laying period are required.

REFERENCES

Abdel-Mageed (2012). Effect of dietary humic substances supplementation on performance and immunity of Japanese quail. Egyptian Poultry Science Journal. 32(3):645-660.

Avci, M.; N. Denek and O. Kaplan (2007). Effects of humic acid at different levels on growth performance, carcass yields and some biochemical parameters of quails. J. Anim. Vet. Adv. 6:1-4.

Bailkey, C. A.; K. E. White and S. L. Donke (1996). Evaluation of Menefee HumateTM on the performance of broilers. Poult. Sci., 75(1): 84.

Darras, V.M.; T.J. Visser; L.R. Berghman and E.R. Kuhn (1992). Ontogeny of type I and III deiodinase activities in embryonic and posthach chick: relationship with changes in plasma triiodothyronine and growth hormone level. Comparative Biochemistry and Physiology, 103 A: 131-136.

Duncan, D. B. (1955). Multiple range and multiple F tests. Biometrics, 11: 1-42.

Eren, M.; G. Deniz, S. S. Gezen and İ. İ. Turkmen (2000). Effects of humates supplemented to the broiler feeds on fattening performance, serum mineral concentration and bone ash. Ankara Üniv. Veteriner Fakültesi Dergisi. 47: 255- 263, Turkish with english summary.

Hanafy, M. Maysa and A.M.H. El-Sheikh (2008). The effect of dietary humic acid supplementation on some productive and physiological traits of laying hens.

Hayirli, A.; N. Esenbuga; M. Macit; E. Lacin; M. Karaoglu; H. Karaca and L. Yildiz (2005). Nutrition practice to alleviate the adverse effects of stress on laying performance, metabolic profile, and egg quality in peak producing hens: I. the humate supplementation. Asian-Australian Journal of Animal Sci.;18:1310-1319.

HuminTech. (2004). Huminfeed-Tierfutterzusätze und veterinär medizin und huminsäure basierende produkte. humintech®humintech gmbh, heerdter landstr. 189/d, d-40549 düsseldorf, germany in the global environment and implication for human health. Elsevier Science B.V., Amsterdam. 1368.

Joone, G. K.; J. Dekker and C. E. Van Rensburg (2003). Investigation of the immunostimulatory properties of oxihumate. Z. Naturforsch. [C] 58:263–267.

Karaoglu, M.; M. Macit; N. Esenbuga; H. Durdag; L. Turgut and Ö. C. Bilgin (2004). Effect of supplemental humate at different levels on the growth performance, slaughter and carcass traits of broilers. Int. J. Poult. Sci. 3: 406-410.

Klocking, R.; B. Helbig; G. Schotz; M. Schacke and P. Wutzler (2002). Anti-HSV-1 activity of synthetic humic acid-like polymers derived from p-diphenolic starting compounds. Antivi. Chem. Chemother. 13:241–249.

Kocabagli, N.; M. Alp; N. Acar and R. Kahraman (2002). The effects of dietary humate supplementation on broiler growth and carcass yield. Poult. Sci. 81: 227-230.

Kocabagli, N.; M. Alp; N. Acar and R. Kahraman (2002). The effects of dietary humate supplementation on broiler growth and carcass yield. Poult. Sci. 81: 227-230.

Kucukersan, S.; K. Kucukersan; I. Colpan; E. Goncuoglu; Z. Reisli and D. Yesilbag (2005). The effects of humic acid on egg production and egg traits of laying hen. Vet. Med. Czech. 50: 406–410.

Kuhnert, V.M.; Bartels, K.P.; S. Kroll and N. Lange (1991). Huminsäurehaltige tierarzneimittel in therapie and prophylaxe bei gastrointestinalen erkrankungen von hund und katze. Monatshefte fur Veterinarmedizin;46:4-8.

Kuhnert, V.M.; V. Fuchs and S. Golbs (1989). Pharmakologish-toxikologische eigenshaften huminsäuren und ihre wirkungsprofile für eine veterinarmedizinische therapie. Deutsche Tierärtzliche Wochenschrift;96:3-10.

Mirnawati, Y. R. and Y. Marlida (2013). Effects of humic acid addition via drinking water on the performance of broilers fed diets containing fermented and non-fermented palm kernel cake. Archiva Zootechnica; 16(1):41-53.

NRC (1994). National Research Council, Nutrient requirements of poultry. 9th Ed, National Academic of Science. Washington, DC. USA.

Ozturk, E.; N. Ocak; A. Turan; G. Erener; A. Altop and S. Cankaya (2012). Performance, carcass, gastrointestinal tract and meat quality traits, and selected blood parameters of broilers fed diets supplemented with humic substances. Journal of the Science of Food and Agriculture. 92(1):59-65.

Parks C.; P. R. Ferket; L. N. Thomas and J. L. Grimes (1986). Growth performance and immunity of turkey fed high and low crude protein diets supplemented with Menefee humate. Poult. Sci., 75:138–14.

Reitman, S. and S. Frankel (1957). A colorimetric method for the determination of serum glutamic oxaloacetic transaminase and serum glutamic pyruvic transaminase. Am. J. Clin. Pathol. 28:56–63.

Sahin, T.; D. A. Elmal; I. Kaya; M. Sar and O. Kaya (2011). The effect of single and combined use of probiotic and humate in quail (Coturnix coturnix japonica) diet on fattening performance and carcass parameters. Kafkas Universitesi Veteriner Fakultesi Dergisi. 17(1):1-5.

SAS Institute (2004). SAS/STAT user's guide: version 9.1.3. SAS Inst., Cary, NC.

Schepetkin, I. A.; A. I. Khlebnikov; S. Y. Ah; S. B. Woo; C. S. Jeong; O. N. Klubachuk and B. S. Kwon (2003). Characterization and biological activities of humic substances from mumie. J. Agric. Food Chem. 51:5245–5254.

Shermer, C. L.; K. G. Maciorowski; C. A. Bailey; F. M. Byers and S. Ricke (1998). Caecal metabolites and microbial populations in chickens consuming diets containing a mined humate compound. J. Sci. Food Agri. 77: 479-486.

Taklimi, S. M. S. M.; H. Ghahri and M. A. Isakan (2012). Influence of different levels of humic acid and esterified glucomannan on growth performance and intestinal morphology of broiler chickens. Agricultural Sci., 3(5):663-668.

Wang, Q.; H. J. Kim; J. H. Cho; Y. J. Chen; J. S. Yoo and I.H. Kim (2007). Effects of supplemental humic substances on egg production and quality in laying hens.Poult.Sci. 86:519-526.

Weichselaum, T.E. (1946). Method for determination of albumin in serum blood. American J. Clin. Pathol., 16: 40.

Yorük, M. A.; M. Guul; A. Hayırlı and M. Macit (2004). The effects of supplementation of humate and probiotic on egg production and quality parameters during the late laying period in hens. Poult. Sci. 83:84–88.

تأثير إضافة حمض الهيوميك فى علائق الرومى على إنتاج البيض وجودة البيض والخصوبة لدجاجات الرومى.

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أجريت هذة الدراسة لتقييم تأثيرات إضافة حمض الهيوميك فى علائق الرومى على الكفاءة التناسيلة ومواصفات البيضة وبعض قياسات الدم ومواصفات الذبيحة. تم إستخدام عدد ١٦٠ دجاجة رومى بياضة من سلالة الهولندى الأبيض تم تقسيمها فى قطاعات كاملة العشوائية إلى مجموعة كنترول وثلاث معاملات تجريبية وكل معاملة قسمت إلى أربعة مكررات (١٠ دجاجات/مكررة). العلائق فى المعاملات الأولى والثانية والثالثة والرابعة تم إضافة الهيوميك لها بمعدل . , ٢٠٠ , ٣٠٠ , ٤٠٠ مجم/كجم عليقة على التوالى. أظهرت النتائج أن جميع المستويات من حمض الهيوميك أدت إلى زيادة معنوية فى وزن الجسم الحى ومعامل التحويل الغذائى وإنتاج البيض وجودة البيض من خلال زيادة معنوية لدليل صفار البيض ووحدات هاو وسمك القشرة, بينما النسب المئوية لكل من البياض والصفار والقشرة ودليل الشكل ولون الصفار للبيض لم يتأثر معنويا بإضافة حمض الهيوميك. معدلات الخصوبة والفقس تحسنت معنويا فى جميع مستويات حمض الهيوميك. عدد كرات الدم الحمراء والبيضاء وتركيز الألبيومين إزداد معنويا فى جميع مستويات الهيوميك مقارنة بالكنترول بداية من المستوى الأعلى للهيوميك عند مستوى ٣٠٠مجم/كجم خلال جميع الأعمار. نشاط إنزيمات ALT و AST وتركيز هرمون T3 فى بلازما الدم لم يتأثر بحمض الهيوميك. أظهرت صفات الذبيحة (وزن الذبيحة, الكبد, القونصة, الطحال وقنوات البيض) زيادة معنوية بالنسبة لوزن الجسم الحى حيث كانت الأعلى معنويا للدجاجات التى تغذت على المستويات العالية من حمض الهيوميك (٣٠٠ و ٤٠٠ مجم/كجم عليقة).

بناء على النتائج المتحصل عليها يمكن تلخيص أن إضافة حامض الهيوميك إلى علائق الرومى أدى إلى تحسين أداء التناسل وجودة البيض وصفات الذبيحة بدون أى تأثيرات ضارة على الحالة الصحية لدجاجات الرومى البياضة.