Kafkas Univ Vet Fak Derg
17 (1): 1-5, 2011

RESEARCH ARTICLE

The Effect of Single and Combined Use of Probiotic and Humate in Quail *(Coturnix coturnix Japonica)* Diet on Fatttening Performance and Carcass Parameters

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Makale Kodu (Article Code): KVFD-2010-640

Summary

This experiment was carried out to determine the both single and combined effects of humates (Farmagulator XP™) and probiotics (Biosacc™) in quail diets on fattening performance and carcass yields. A total of 300 one-day old Japanese Quails *(Coturnix coturnix japonica)* were used in this experiment. Animals were divided into one control group and three treatment groups containing 75 birds each. Each group was further divided into three replicates containing 25 birds each. The experimental period lasted for 35 days. The control group was fed with unsupplemented basal diets. The rations of treatment groups were supplemented with 1 g/kg Farmagulator XP™ (Group H), 0.5 g/kg Biosacc™ (Group B) and 1 g/kg Farmagulator XP™ + 0.5 g/kg Biosacc™ combination (Group H+B), respectively. At the end of the study there were no statistically significant differences among the groups in terms of body weight gain, feed consumption, feed conversion ratio and carcass yield ($P>0.05$). But, body weight scores were found higher at the 4th and 5th weeks in the group H ($P<0.05$). It is concluded that the use of probiotic and humic acid alone and combination has no additional effect on quail performance.

Keywords: *Quail, Humic acide, Probiotic, Performance, Carcass*

Bıldırcın Rasyonlarına Propiyotik ve Humik Asitin Yalnı z ve Kombine Katılmasının Besi Performansı ve Karkas Kalitesine Etkisi

Özet

Bu araştırma, bıldırcın rasyonlarına ilave edilen humik asid (Farmagulator XP™) ve probiyotik (Biosacc™)'ın, yalnız veya kombine kullanımının besi performansı ve karkas kalitesine etkilerini belirlemek amacıyla yapılmıştır. Araştırmada toplam 300 adet günlük Japon bıldırcın *(Coturnix coturnix japonica)* civcivi kullanılmıştır. Her grupta 75 civciv bulunan bir kontrol ve 3 deneme grubu oluşturulmuştur. Gruplar kendi aralarında 3'erli alt gruba ayrılmıştır. Deneme beş hafta sürdürülmüştür. Kontrol grubu basal rasyonla beslenmiştir. Deneme grubu rasyonlarına sırasıyla 1 g/kg Farmagulator XP™ (Grup H), 0.5 g/kg Biosacc™ (Grup B) ve 1 g/kg Farmagulator XP™ + 0.5 g/kg Biosacc™ (Grup H+B) kombinasyonu ilave edilmiştir. Araştırma sonunda, canlı ağırlık artışı, yem tüketimi, yemden yararlanma oranı ve karkas verimleri bakımından istatistik açıdan önemli bir fark görülmemiştir ($P>0.05$). Bununla beraber canlı ağırlık değişimleri 4 ve 5. haftalarda Grup H' de daha yüksek bulunmuştur ($P<0.05$). Sonuç olarak, probiyotik ile humik asitin yalnız ve birlikte kullanılmasının performansta ilave bir artışa yol açmadığı görülmüştür.

Anahtar sözcükler: *Bıldırcın, Humik asit, Probiyotik, Performans, Karkas*

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INTRODUCTION

Humates, originated from decomposed plants in the soil, have a very complex structure with molecular weight ranging from 5.000 to 200.000. Humates are composed of humic, ulmic and fulvic acids. Humic acids have ingredients of carbohydrates, aminoacids and fenolic compounds [1-3]. They are also long chain heavy molecules which are able to transfer electrons. By this way they can play important roles in excreting toxic compounds from the body [1,4].

To enhance nutrient utilization, improve feed conversion efficiency, and maintain health status, inclusion of probiotics and humates in rations is preferable to antibiotics primerly, because they cause no harmful effects on consumers [5,6]. Because of this reason, the effects of humic acids on fattening performance and some carcass parameters are investigated [7-10].

Probiotic is a generic term, and these products can contain yeast cells, bacterial cultures, or both that stimulate microorganisms capable of modifying the gastrointestinal environment to favour health status and improve feed efficiency [11]. Therefore, the major outcomes from using probiotics include improvement in growth and feed conversion ratio [12].

Although the exact mechanisms of probiotics are not clearly identified, their effects varies in terms of the microorganism species, dose, animal species and environment [7,13]. Studies with broilers [14], laying hens [15], market turkeys [16], and turkey breeder hens [17-19] have shown that the incorporation of a yeast culture into the feeds resulted in enhanced performance.

This experiment was carried out to determine the effect of both single and combination of humates (Farmagulator XP™) and probiotics (Biosacc™) in Japanese Quails diets on body weight (BW), body weight gain (BWG), feed consumption (FC), feed conversion ratio (FCR) and carcass yield.

MATERIAL and METHODS

A total of 300 one-day old Japanese quail chicks (Coturnix coturnix japonica) of both gender were randomly divided into 4 experimental groups of 75 birds in each group with 3 replicates following measurement of body weighing. The chicks were housed in electrically heated battery cages and exposed to light for 24 h from hatching to 5 weeks of age. The experimental period lasted for 35 days. The control and experimental groups were fed with a basal diet of including 21.50% CP and 3050 kcal/kg ME. Diets were formulated to meet NRC [20] nutrient requirements. The experimental design consisted of four dietary treatments: 1) Control group was fed with unsupplemented basal diets; 2) 1 g/kg Farmagulator XP in diet (Grup H); 3) 0.5 g/kg Biosacc in diet (Grup B); 4) 1 g/kg Farmagulator XP + 0.5 g/kg Biosacc combination in diet (Grup H+B). Quails consumed the diets and water ad libitum.

Farmagulator XP used in this study contained humic, ulmic and fulvic acids, and organic minerals. Biosacc's ingredient was Saccharomyces cerevisiae (2.5 x 109 cfu/g). The compositions of diets are shown in *Table 1*. Chemical compositions of feeds were analyzed by the methods of AOAC [21]. The metabolisable energy levels of rations were calculated according to TSE [22].

The body weight and body weight gain of the quails were determined at the beginning (0) and 7, 14, 21, 28 and 35th days of the study. At the same time all the replicates feed residues were weekly weighed to define the feed consumption levels and feed conversion ratios. Following measurement of individual body weights, a total of 40 chicks, 5 male and 5 female birds from each group, were randomly chosen and slaughtered for determining the carcass yield at the end of the study. Hot carcass weights were determined after slaughter and cold carcass weight was determined after storage at

Table 1. *Composition and calculated analysis of basal ration*
Tablo 1. *Temel Rasyonun bileşimi ve hesaplanan analiz değerleri*

Ingredient	(%)	Analyzed Contents of Nutrients
Maize	60.50	Dry matter, %90.17
Soybean meal	29.50	Crude protein, %21.50
Fish meal	4.00	Crude extract, %5.78
Oil	3.30	Crude fiber, %3.35
Limestone	1.20	Crude ash, %3.02
Dicalcium phosphate	0.50	N- free extract, %56.52
Salt	0.30	ME**, kcal/kg 3050
DL- Methionine	0.10	
L- Lysine	0.10	
Vitamin -mineral premix*	0.50	
Total	100.00	

** 1 kg : 20.000.000 IU Vit A, 3.000.000 IU Vit D_3, 25 g Vit E, 4 g Vit B_1, 8 g Vit B_2. 5 g Vit B_6, 20 mg Vit B_{12}, 20 g Nicotinamide, 12 g Ca-D-Pantothenate, 200 g Choline Chloride, 50 g Mn, 50 g Fe, 50 g Zn, 10 g Cu, 0.8 g I, 0.15 g Co, 0.15 g Se*

*** Calculated*

Supplemented of the treatment groups:

1 g/kg Farmagulator XP™ (Group H),
0.5 g/kg Biosacc™ (Group B)
1 g/kg Farmagulator XP™ + 0.5 g/kg Biosacc™ combination (Group H+B)

+4°C for 18 h. Hot and cold carcass yield rates were determined as follow; dividing hot and cold carcass weights by body weight before the slaughter.

Statistical analyses of body weight and carcass parameters of the groups were determined by analysis of variance. Duncan test was used to determine differences between treatment groups. Kruskall Wallis test was employed to determine the effect of groups on BWG, FC and FCR [23]. The statistical analyses were performed of SPSS 10.0 (Inc. Chicago. IL. USA).

RESULTS

The body weights are shown in *Table 2*. Body weight gain, feed consumption and feed conversion ratio are shown in *Table 3*. The carcass yield values are shown in *Table 4*.

Body weights of quail chicks in this study were found statistically higher than the that of group H at the fourth and fifth weeks of the study. Body weight gain, feed consumption, feed conversion ratio and carcass parameters values were not statistically significant between all groups.

DISCUSSION

Although there was no statistically significant difference between the control and experimental groups in the first 3 weeks of the study a significant improvements in body weight of the humic acid supplemented (Group

Table 2. *Mean body weights of groups (g)*
Tablo 2. *Gruplarda ortalama canlı ağırlıklar (g)*

Age (Weeks)	Control X±Sx	Group H X±Sx	Group B X±Sx	Group H+B X±Sx	P
0	8.11±0.07	8.41±0.10	8.31±0.11	8.19±0.10	-
1	17.12±0.43	17.31±0.49	16.74±0.48	17.00±0.46	-
2	37.13±1.24	36.82±1.05	35.95±1.00	35.65±0.94	-
3	67.30±1.67	69.80±1.67	64.56±1.61	66.65±1.65	-
4	108.13±2.38b	118.27±2.15a	104.23±1.85b	108.99±2.04b	*
5	136.67±2.83b	148.34±2.69a	139.51±2.33b	137.11±2.28b	*

a,b: *Differences between values having different letters in the same line are statistically significant (P<0.05)*
- : *Differences among the groups were not statistically significant (P>0.05)*

Table 3. *Mean body weight gain (g), feed consumption (g), and feed conversion ratio* in groups*
Tablo 3. *Gruplarda ortalama canlı ağırlık artışları (g), yem tüketimleri (g/civciv) ve yemden yararlanma oranı**

Age (Weeks)	Parameters	Control X±Sx	Group H X±Sx	Group B X±Sx	Group H+B X±Sx	P
1	Feed consumption	18.57±0.18	19.76±0.23	18.48±0.28	19.60±0.46	-
	Body weight gain	9.01±0.41	8.90±0.74	8.41±0.72	8.81±0.46	-
	Feed conversion ratio	1.92±0.09	2.25±0.16	2.24±0.23	2.47±0.15	-
2	Feed consumption	39.92±2.40	45.61±0.73	42.73±0.74	43.43±1.98	-
	Body weight gain	20.00±1.14	19.80±0.49	18.97±0.99	18.63±0.50	-
	Feed conversion ratio	2.00±0.05	2.31±0.07	2.26±0.09	2.34±0.15	-
3	Feed consumption	82.83±1.34	86.17±1.58	81.03±1.97	79.89±1.83	-
	Body weight gain	30.24±2.48	32.71±0.20	28.91±0.53	30.93±1.40	-
	Feed conversion ratio	2.78±0.27	2.63±0.06	2.80±0.02	2.60±0.15	-
4	Feed consumption	128.21±4.79	142.86±1.14	130.28±3.82	127.46±3.06	-
	Body weight gain	40.79±0.92	48.43±0.48	39.48±4.48	42.40±0.34	-
	Feed conversion ratio	3.14±0.10	2.95±0.03	3.38±0.35	3.01±0.10	-
5	Feed consumption	111.67±3.70	128.87±4.26	119.82±1.49	121.38±2.10	-
	Body weight gain	28.59±1.00	30.12±1.65	35.66±6.38	28.22±1.32	-
	Feed conversion ratio	3.92±0.27	4.29±0.12	3.57±0.58	4.32±0.19	-
1-5	Feed consumption	385.84±9.78	432.75±3.57	405.14±9.34	417.08±7.99	-
	Body weight gain	128.64±3.52	139.96±1.56	131.44±2.58	128.98±2.50	-
	Feed conversion ratio	3.00±0.11	3.09±0.01	3.08±0.02	3.23±0.03	-

***** *(kg, feed consumption /kg, body weight gain)*
- : *Differences among the groups were not statistically significant (P>0.05)*

Table 4. *Mean live weight, carcass weight and yields of experimental groups*
Tablo 4. *Grupların ortalama kesim ve karkas ağırlıkları (g) ile karkas randımanları (%)*

Parameters	Control X±Sx	Group H X±Sx	Group B X±Sx	Group H+B X±Sx	P
Female					
Live weight (g)	152.19±2.78	148.25±4.38	150.97±2.93	153.98±2.96	-
Warm carcass (g)	103.47±1.87	101.53±3.92	104.26±2.60	106.57±2.03	-
Cold carcass (g)	101.83±1.69	98.42±3.48	100.12±1.92	103.20±2.53	-
Warm carcass yield (%)	68.01±0.68	68.42±0.85	69.03±0.49	69.26±1.22	-
Cold carcass yield (%)	66.93±0.62	66.34±0.52	66.33±0.54	67.02±0.97	-
Male					
Live weight(g)	143.88±1.15	141.02±1.66	143.85±0.92	145.60±3.98	-
Warm carcass (g)	101.57±1.18	98.32±1.40	98.97±2.02	102.31±3.07	-
Cold carcass (g)	98.88±1.53	97.32±1.27	96.63±2.37	98.39±3.71	-
Warm carcass yield (%)	70.59±0.47	69.73±0.74	68.78±1.00	70.26±0.77	-
Cold carcass yield (%)	68.72±0.84	69.02±0.75	67.15±1.28	67.51±1.11	-

- : Differences among the groups were not statistically significant (P>0.05)

H) group at 4th and 5th weeks (P<0.05) was noted. Feeding humate during the grower period had the most beneficial effect on broiler performance in terms of growth. This may be explained by the fact that humic acid stabilizes the intestinal microflora and thus ensures an improved utilization of nutrients in animal feed [24]. It is defined that the supplementation of humic acid enhances the growth performance of quails. This study is in accordance with the studies where humic acid had effect (P<0.05) on body weight gains on broilers [8,10]. On the other hand, insignificant differences between the control and experimental groups (Group B ve Group H+B) in terms of body weight is paralell to the studies where S. cerevisiae supplementation to diet of the quail [25] and turkey [19,26] diets did not affect body weight. The results of the studies on humate and probiotic addition to the broiler diets [27,28] revealed similar results to ours.

In this study, feed consumption and feed conversion ratio were determined as 385.84, 432.75, 405.14, 417.08 g and 3.19, 3.15, 3.14 and 2.87, respectively. Feed consumption was found lower in control group than the treatment groups but this was not significant. Our results were in agreement with the studies in which probiotic and humate addition single or in combination did not affect the feed consumption [8,10,25,27,29,30]. Also, the results from the studies conducted with humate [9], humate and probiotic [28], L-carnitine and sodium humate [31], antibiotic, prebiotic, humic acid mixture [25,32] were similar to the results of this study.

No statistical significant difference among the treatment groups with respect to hot and cold carcass yields was similar to previous results obtained from studies where humate/humic acid [8-10], humate and probiotic combined and/or separately [28] were added to broiler diets [8,10,25,33,34].

It is concluded that the use of probiotic and humic acid alone or in combination has no additional effect on quail performance.

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