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The Effects of Humates on Fattening Performance, Carcass Quality and Some Blood Parameters of Broilers

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Abstract: This experiment was conducted to investigate the effect of humic acid on fattening performance, carcass quality and some blood parameters of broilers. Therefore, a total of 160 day-old Ross 308 broiler chicks were assigned to 2 treatments with 4 replicates each containing 20 chicks. The treatment groups were employed: Control group (C) without additive and experimental group (H) supplemented with 2.5 kg ton^{-1} humic acid. Experimental period lasted 42 days. There was no statistical difference in the cases of live weight, live weight gain, feed intake, feed conversion ratio, hot and cold carcass yield, ileum, cecum lengths, total intestinal weight, serum total protein, triglyceride, cholesterol scores among the groups of C and H. As a result, the values obtained by the addition of humates to broiler ratios are generally in a acceptable level.

Key words: Broiler, etheric oils, fattening performance, humates, humic acid

INTRODUCTION

Performance and control of diseases are the most important factors for the efficiancy of broiler production. On the other side, optimal intestinal microflora enhances growing up and feed conversion rates which firstly effects these two factors. Just as this opinion is supported by Kirkpinar *et al.* (1999) who determined that healthy intestinal microflora increases the resistance of animals by enhancing digestion and absorption activities. The contamination of the feed ingredients by *E. coli*, *Salmonella* or *Clostridium* sp., stress factors and by some diseases the lactic acid producing microorganisms population may decrease and the amount of pathogen microorganism increase (Owings *et al.*, 1990; Kücükersan, 2002). This status effects the performance negatively and progression can cause clinical disease formation and death. To escape from these pathogen microorganisms or to minimize their negatory effects antibiotics were used as feed additives (Kirkpinar *et al.*, 1999). But their residual risk in meat, milk and egg restricted their usage. Just as, the European Union banned antibiotics to be used as feed additives except ionophores as anticoccidials. In the light of these data, it is observed that natural, harmless to human and animal health feed additives, which enhance optimal intestinal microflora and could be alternatives of antibiotics have been investigated intensively.

Humates are originated from decomposed plants in the soil and have a very complex structure, their molecular weight differs from 5000-200000. Humates are composed of humic, ulmic and fulvic acids. Humic acids have ingredients of carbohydrates, aminoacids and fenolic compounds. 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 (Levinsky, 1997; Spark *et al.*, 1997). Some researchers reported that humate addition to broiler diets did not effect live weight, live weight gain, carcass yield, abdominal fat pad weight and hearth, gizzard, liver weight scores statistically (Bailey *et al.*, 1996; Yalcin *et al.*, 2003; Ozcelik and Yalcin, 2004; Karaodlu *et al.*, 2004). Other some presented better live weight, feed conversion ratio scores (Eren *et al.*, 2000; Anonymous, 2002; Kocabadli *et al.*, 2002; Ceylan *et al.*, 2003).

In this study, we observed the effects of humates (Farmagulator Dry™) on broilers fattening performance and some blood parameters.

MATERIALS AND METHODS

This study was performed on a number of 160 day old Ross 308 broiler chicks which were purchased from a commercial supplier. Birds were divided randomly into 1 control and 1 experimental groups each containing

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80 chicks. All the groups were divided into 4 subgroups which were containing 13 male and 7 female chicks.

A diet containing 22% Crude Protein (CP) and 3000 kcal kg^{-1} Metabolic Energy (ME) for the first 3 weeks chick period and 20% CP and 3200 kcal kg^{-1} ME containing diet for pullet period was used for the last 3 weeks. No feed additive was added to the control group (C) diets. The experimental groups diet was added 2.5 kg ton^{-1} of mixture Humates (H).

The live weights were obtained at the beginning and at the end of the 1st, 2nd, 3rd, 4th, 5th and 6th weeks of the study. The live weight gain scores were calculated from the difference.

Again at the ends of the 1st, 2nd, 3rd, 4th, 5th and 6th weeks of the study feed consumption scores were determined by the difference of the feed lasted than the amount of we put in the feedboxes. By this way, these scores were divided to bird number and the mean scores of subgroups and groups were determined.

The feed conversion ratios were obtained from dividing the mean feed consumption scores to mean live weight gain scores.

After the weighing procedure of all birds individually at the end of the 6th week of the study 3 birds (2 male 1 female) from all the subgroups were slaughtered and hot carcass weights were deermined. To determine the cold carcass weight the carcass were stored in +4°C for 18 h and after weighed. After all of these hot and cold carcass weight scores were divided to live weight score before slaughtering to define the hot and cold carcass yield rates.

All the slaughtered birds fat pads on internal organs (liver, heart, gizzard), bottom of intestines and on the periton were collected and weighed as abdominal fat pad. After this procedure liver, heart, gizzard and abdominal fat pad weight scores were divided to hot carcass weight and in this way their rates to carcass were determined.

After slaughtering the intestines were tied carefully and extriped. The contents flowed out in a cup and their pH were determined by a pH meter (Orion 420A). Than the duodenum, jejenum, ileum, cecum and colon lengths separately and total intestinal weights were determined.

The slaughtered birds bloods were collected and centrifuged serums were seperated. By the special kits, cholesterol (36033HW00), total protein (38035HW00) and triglyceride levels were determined with an otoanalyser (ABBOTT AEROSET; ABBOTT Laboratories, ABBOTT Park, Illions, USA).

Live weight, live weight gain, feed consumption and feed conversion ratio, hot and cold carcass yields, liver, heart, gizzard weights and their ratios to hot carcass weights, intestinal content pH level, duodenum, jejenum, ileum, cecum lengths, total intestinal weight, serum total protein, triglyceride, cholesterol scores statistical analaysis and the significancy of differences of the mean values of the groups were determined by variance analysis method, the significancy of the differences between the groups were determined by Duncan test. Statistical analyis were performed by SPSS 10.0 software.

RESULTS AND DISCUSSION

The ingredients of the diets are shown in Table 1. The diets nutritional values and their metabolic energy levels used in the study are shown in Table 2.

The mean live weight scores of the groups are shown in Table 3. The mean live weight gain scores of the groups are shown in Table 4.

Table 1: The ingredients of the diets (%)

Feed ingredient	Chick period	Pullet period
Corn	54.25	57.00
Soy bean meal	27.00	19.00
Full fat soy bean	12.50	16.00
Meat-bone meal	2.00	2.00
Oil	1.00	3.00
Limestone	1.50	1.25
DCP	1.00	1.00
Salt	0.25	0.25
Vitamin+mineral mixture	0.25	0.25
Methionin	0.25	0.25

Table 2: Diets nutritional values (%) and their metabolisable energy levels (kcal kg^{-1})

Diets	Chick diet	Pullet diet
Dry matter	89.60	89.30
Crude protein	22.05	20.04
Extracted oil	6.20	8.30
Crude cellulose	3.70	4.25
Ash	5.80	5.55
Metabolic energy	3005.00	3205.00

Table 3: The mean live weight scores of the groups (g)

	C	H	
Weeks	$\bar{X} \pm S\bar{X}$	$\bar{X} \pm S\bar{X}$	F
0	42.02±3.2400	41.81±2.7800	0.215
1	135.85±20.260	136.09±20.230	100.127
2	338.30±57.960	345.95±55.710	183.050
3	636.30±101.70	659.33±90.440	273.550
4	1130.40±170.19	1142.73±152.35	165.700
5	1601.20±221.19	1606.78±218.43	95.700
6	1990.07±270.49	2007.16±306.97	57.450

Table 4: The mean live weight gain scores of the groups (g)

	C	H	
Weeks	$\bar{X} \pm S\bar{X}$	$\bar{X} \pm S\bar{X}$	F
1	92.59±3.070	94.28±8.510	52.860
2	203.69±4.300	209.23±4.970	230.190
3	300.50±14.58	314.13±23.62	120.860
4	493.90±14.54	483.68±28.62	24.360
5	470.80±25.72	463.39±37.67	0.059
6	401.38±13.88	426.51±81.74	0.176
1-6	1962.87±38.79	1991.21±90.58	45.500

Table 5: The mean feed consumption levels of the groups (g)

	C	H	
Weeks	$\bar{x} \pm S\bar{x}$	$\bar{x} \pm S\bar{x}$	F
1	132.85±1.680	125.75±7.470	2.189
2	251.53±7.720	232.30±9.340	24.446
3	499.20±0.800	499.20±0.800	51.381
4	799.05±7.300	817.70±30.32	31.984
5	915.43±19.95	921.78±40.71	10.036
6	936.35±12.96	965.00±11.95	4.674
1-6	3534.40±33.39	3561.73±70.82	35.316

Table 6: The mean feed conversion ratios of the groups

	C	H	
Weeks	$\bar{x} \pm S\bar{x}$	$\bar{x} \pm S\bar{x}$	F
1	1.41±0.027	1.32±0.120	51.360
2	1.24±0.094	1.10±0.095	2.600
3	1.60±0.095	1.60±0.119	77.300
4	1.61±0.069	1.71±0.170	5.120
5	1.94±0.059	2.00±0.092	16.300
6	2.33±0.090	2.34±0.360	0.942
1-6	1.69±0.076	1.68±0.091	1.282

Table 7: The mean carcass weights. hot and cold carcass yield ratios of the groups (%)

	C	H	
Groups	$\bar{x} \pm S\bar{x}$	$\bar{x} \pm S\bar{x}$	F
Live weight	2018.50±36.86	2063.17±49.580	22.480
Hot carcass weight	1491.58±86.98	1521.92±119.91	29.894
Hot carcass yield (%)	73.92±1.150	73.79±1.0600	9.220
Cold carcass weight	1472.42±90.28	1503.83±117.07	30.240
Cold carcass yield (%)	72.96±1.160	72.92±1.0700	11.710

Table 8: The mean liver, gizzard, heart, abdominal fat pad weights and their ratios to hot carcass weights of the groups (%)

	C	H	
Groups	$\bar{x} \pm S\bar{x}$	$\bar{x} \pm S\bar{x}$	F
Liver weight	36.83±3.79	40.58±5.04	1.97
Ratio of liver weight to hot carcass weight (%)	2.47±0.05	2.68±0.11	5.36
Gizzard weight	34.25±3.31	31.50±4.23	2.55
Ratio of gizzard weight to hot carcass weight (%)	2.30±0.06	2.08±0.08	4.43
Heart weight	11.67±2.01	11.41±1.73	1.32
Ratio of heart weight to hot carcass weight (%)	0.78±0.03	0.75±0.03	2.39
Abdominal fat pad weight	22.83±2.31	20.36±1.57	0.70
Ratio of abdominal fat pad weight to hot carcass weight (%)	1.55±0.17	1.34±0.10	0.94

The mean feed consumption levels of the groups are shown in Table 5. The mean feed conversion ratios of the groups are shown in Table 6. The mean carcass weights, hot and cold carcass yield ratios of the groups are shown in Table 7.

The mean liver, gizzard, heart, abdominal fat pad weights and their ratios to hot carcass weights of the groups are shown in Table 8.

Table 9: The mean intestinal content pH, length (cm) and total intestinal weight (g) scores of the groups

	C	H	
Groups	$\bar{x} \pm S\bar{x}$	$\bar{x} \pm S\bar{x}$	F
pH	6.50±0.27a	6.34±0.8b	3.850*
Duodenum length	38.75±5.83a	34.58±4.54b	9.130***
Jejenum length	51.33±10.13a	63.08±7.66b	5.990**
Ileum length	66.67±14.29	65.75±8.26	0.062
Colon length	9.42±2.390	8.50±1.98	0.744
Cecum length	34.92±0.650	36.25±4.37	3.260
Total intestinal weight	73.67±5.580	76.42±9.46	2.170

*($p<0.05$) **($p<0.01$) ***($p<0.001$)

Table 10: The mean serum total protein (g 100 mL^{-1}), triglyceride (mg 100 mL^{-1}) and cholesterol levels (mg 100 mL^{-1})of the groups

	C	H	
Groups	$\bar{x} \pm S\bar{x}$	$\bar{x} \pm S\bar{x}$	F
Total protein	2.96±0.50	3.34±0.52	0.50
Triglyceride	28.00±4.75	26.17±3.93	4.75
Cholesterol	117.42±16.00	111.50±17.35	16.00

The mean intestinal content pH, length and total intestinal weight scores of the groups are shown in Table 9. The mean serum total protein, triglyceride and cholesterol levels are shown in Table 10.

There was no statistical difference between the groups C and H in the case of live weight gain. Many investigations (Ceylan *et al*., 2003; Yalcin *et al*., 2003; Ozcelik and Yalcin, 2004) emphasized that humate or humic acid addition did not effect live weight gain scores like this study. Adversely Eren *et al*. (2000) observed that the addition of 2.5 g kg^{-1} humates increased live weight and live weight gain significantly ($p<0.05$). This result does not confirm ours and can be explained by the difference of the origin of the humate and its treating procedure. In the study of Kocabağli *et al*. (2002) the broilers which diets were added of humic acid in the period of 0-3 and 0-6 weeks did not present statistically difference in the live weight scores at the end of 3. and 6. weeks ($p>0.05$). This data is harmonical with ours. But in the same study the group which diets were added of humic acid in the period of 3-6 weeks showed higher live weight scores than the other groups ($p<0.05$). This data does not confirm with ours. The reason may be the different period of humic acid addition.

In the cases of feed consumption and feed conversion ratio there was no statistical difference between the group C and H. Also, Eren *et al*. (2000), Yalcin *et al*. (2003), Ozcelik and Yalcin (2004), Karaoğlu *et al*. (2004) and Ceylan *et al*. (2003) emphasized that there was no statistical difference between the control and experimental groups ($p>0.05$). It can be said that these results overlap with ours.

At the end of the study, there was no statistcal significancy between the groups C and H in the aspect of hot and cold carcass yields ($p>0.05$). On the other hand, many other studies in which humate/humic acid (Eren *et al*., 2000; Kocabaðli *et al*., 2002; Karaoðlu *et al*., 2004), humate and probiotic combined and seperately (Yalcin *et al*., 2003) were added to broiler diets support our results.

There was no statistical difference between the groups C and H in the cases of liver, gizzard, hearth and abdominal fat pad weights. This result is supported by the studies in which sodium humate (Ozcelik and Yalcin, 2004; Karaoðlu *et al*., 2004) was added to diets and presented that these procedures do not statistically effect these parameters.

The intestinal content pH duedonum and jejenum length scores of goups C and H were determined statistically different ($p<0.05$), ($p<0.001$), ($p<0.01$). But could not defined clearly. Humates bonding character may have protected acidic kimus against neutralizing effects of pancreatic enzymes and gallic secretions and kept the intestinal content pH low. Duedonum and jejenum are very active parts of digestive tract. The statistically long scores of experimental group may be related with the increased digestive activity. Ileum and colon lengths and total intestinal weight scores, serum total protein, triglyceride and cholesterole levels were not different among the groups were not statistically different among the groups ($p>0.05$).

CONCLUSION

Adding feeds 2,5 kg ton^{-1} humates don't effect the fattening performance parameters, hot and cold carcass yields, liver, heart, gizzard weights and their ratios to hot carcass weights, ileum, cecum lengths, total intestinal weight, serum total protein, triglyceride, cholesterol levels. Therefore, the addition of this feed additive in this level can be acceptable. Duedonum and ileum lengths were increased statistically ($p<0.001$, $p<0.01$), but the total intestinal weight was not effected in experimental group. This means that this segment of intestines became thinner. This result can provide better absorption. But no statistical differences were determined in the case of fattening performance like live weight, live weight gain, feed consumption and feed conversion ratio. This feed additive should be investigated intensively.

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