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THE EFFECT OF FULVIC ACID FRACTION SUPPLEMENTATION ON BROILER CHICKENS PERFORMANCE

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ABSTRACT

An experiment had been carried out to study the effect of supplementation of fulvic acid via drinking water as natural feed additive on the performance of broiler chickens. Three hundred and twenty day old broilers were divided into 4 treatment groups: (I) control without fulvic acid; (II), (III) and (IV) with 100, 200 and 300 ppm fulvic acid fraction in the drinking water, respectively. Each group consisted of 4 replicates with 20 birds / replicate. The birds were raised in litter system; feed and water were given *ad libitum* for 5 weeks. During the 5 weeks trial, the treatment has no effect on mortality. Body weight gain of the birds receiving fulvic acid (1891 ± 27 gram / head) were significantly ($P < 0.05$) higher than control ((1841 ± 45 gram / head). There were no significant differences ($P > 0.05$) between the birds receiving different level fulvic acid, 1897 ± 34; 1887 ± 23 and 1888 ± 31 gram/head for treatment II, III and IV respectively. The FCR value was also significantly ($P < 0.05$) affected by the treatments. FCR of the control diet (1.65 ± 0.04) was poorer than the one receiving fulvic acid (1.60 ± 0,02), while level of fulvic acids had no significant effect, the values were 1.59, 1.61 and 1.61 for treatment II, III and IV, respectively. The treatments had no significant ($P > 0.05$) effect on carcass yield, 66.28 ± 1.78; 67.06 ± 3.11; 67.63 ± 2.06 and 67.68 ± 2.21 for treatments I, II, III and IV, respectively. It was concluded that fulvic acid fraction has a potency as natural feed supplement, which could improve growth and feed efficiency without affecting carcass yield.

Keywords: Fulvic Acid, Natural Feed Additive, Broiler Chickens, Performances

INTRODUCTION

Fulvic acid is a fraction of humates with low molecular weight, short chain compounds, yellow in color that are soluble in both alkali and acid. This is the portion of the soil responsible for chelating (grabbing hold of metals) minerals and transferring them to the living organism. Fulvic acid is unique in its chelation ability as it captures life essential minerals and places an electrical charge on them for ready uptake by the organism.

Humates were an accessible raw material that can be used in agriculture and animal husbandry in the form of a humates drink or dry feed as a source of mineral and organic substances for growth stimulation. The subject had been reviewed intensively by Levinsky (1999). The use of humic preparations, as part of a food supplements, had been fully studied using highly productive broiler poultry. The used of humic acid and related products in feed improved gut health for better nutrient utilization, increased digestion of protein and trace element utilization. It also improved health status by working against pathogens by developing immunity (Islam *et al.* 2005). Kompiang & Supriyati (2006) also reported that

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supplementation with humic acid as natural feed additive significantly improved broiler cs performance, better body weight gain and FCR.

The use of fulvic in livestock animal was studied by Hansen (Levinsky, 1999), the test included a blend of fulvic and humic acid used as a feed additive. He also used fulvic acid alone as a treatment for specific ailments in livestock. The results of supplement feeding and treatment in poultry indicated that supplementing to feed acted, as a vermifuge. Pullets receiving supplement were free of most diseases, showed more complete digestion of other feeds in diet, and produced eggs of superior shell hardness and quality.

MATERIALS AND METHODS

Materials

Fulvic acid fraction used in this trial was extracted from peat soil by sodium alkali digestion (sodiumhidroxide- NaOH) followed by acidification of the supernatant with hydrochloric acid (HCl) to seperate humic and fulvic acid fractions. Fulvic acid fractions was not purified yet.

Methods

In the feeding trial, fulvic acid fraction was given through drinking water. Three hundreeds and twenty DOC broiler chickens strain Arbor Acres CP 707 were used, divided into four treatments groups (with 4 replicates/group, 20 birds/replicate): (I). control, (II) 100 ppm fulvic acid fraction, (III) 200 ppm fulvic acid fraction and (IV) 300 ppm fulvic acid fraction. Commercial feed was used in this trial, chickens from week 0 to 3 weeks old received broiler starter ration and from 3- 5 weeks old given broiler finisher ration. Broiler chickens were raised in litter system.

The mean bodyweights of DOC used in this trial were 38.6 ± 0.43 gram/ chick. The trial was carried out for 5 weeks. Feed and water were given *ad libitum.* Body weight gain, feed consumption / FCR, mortality, and carcass percentage were recorded. The different between treatment was tested by statistical design (Cambell, 1967).

RESULTS AND DISCUSSION

Bodyweight gain

Effect of treatments on body weight gain is summerized in Table 1. Analysis of variance showed that during the first 3 weeks (0-3 weeks) treatments had no significant effect on body weight gain of the birds.

During the last 2 weeks (week 3 to week 5), the birds receiving fulvic acid fraction supplementation tended ($P< 0.10$) to be better (1108, 1065, 1085 gram/head) then the control group 1041 gram/head).

Body weight gain through out the experimental trial (0-5 weeks) showed that the birds receiving fulvic acid fraction supplementation significantly ($P<0.05$) were better (1897, 1887,1881 gram / head for group of II, III and IV, respectively) then the control group (1841 gram/head). There were no significant differences between the birds recieving fulvic acid fraction supplementation, 1897, 1887 and 1888 gram/head/5weeks, respectively for group of II, III and IV, respectively.

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Table 1. Effect of fulvic acid supplementation on body weight gain of the experimental birds (g).

Periods	Fulvic acid fraction (ppm)				SEM	P value
	Control (Group I)	100 (Group II)	200 (Group III)	300 (Group IV)		
0-3 weeks	801	790	824	803	9.4	>0.05
3-5 weeks	1041	1108	1065	1085	13.2	*<0.10*
0-5 weeks	1841[b]	1897[a]	1887[a]	1881[a]	17.1	*<0.05*

Notes: Value with different superskript at the same line differ significantly (P<0.05).

This result supported by the earlier studied that the supplementation of humic acid as feed additive in ration of brolier chickens showed that at week 0 to 3 there was no effect on body weight gain, but at week 3 to 5 supplemetation gave positive respon on bodyweight gain (Kompiang & Supriyati, 2006). Bailey *et al.* (1996) and Kocabagh *et al.* (2002), supplemented humates as feed additive in ration of broiler chickens showed that at day 0 to 21 there was no effect on body weight gain, but at day 22 to 42 supplementation gave positive respon on bodyweight gain, the body weight gain improved 10%. In layer chikens (used 20 heads per treatment), after 30 days the biomass 681 g higher than control. Those improvements might be due to the activation of "albuminous exchange",which in results improved the biomass.

However, Karaoglu *et al.* (2004) reported that there were no effect of humic acid supplemetation on bodyweight gain. This different results might be due to the sources of fulvic acid used was not the same, meanwhile the standarization of fulvic acid had not been reported. BUNCH (1981) reported that the chemical and nutrient compositions of humates or fulvic depended on its sources.

Feed convertion ration

Effect of treatments on FCR is summerized in Table 2. Analysis of variance showed that during the first 3 weeks (0-3 weeks) treatments has no significant effect on FCR. But during the last 2 weeks (week 3 to week 5), the birds receiving fulvic acid fraction supplementation tended (P< 0.10) to be better FCR (1.77, 1.81 and 1.82, respectively for Group of II, III and IV) then the control group (1.89). FCR through out the experimental trial (0-5 weeks) showed that the birds receiving fulvic acid fraction supplementation significantly (P<0.05) to be better (1.59, 1.61 and 1.61, respectively for group of II,III and IV) then the control group (1.65).
There was no significant differences between the birds receiving fulvic acid fraction supplementation, 1.59, 1.61 and 1.61, respectively for Group of II, III and IV. This phenomena may due to better the availability of the nutrients. The improvement of FCR with humates supplementation had also been reported by reserchers (Bailey *et al.*, 1996; Kocabagh *et al.*, 2002 dan Karaoglu *et al.*, 2004, Kompiang & Supriyati, 2006). The FCR improvement might be related to the characteristics of fulvic acid, such as it enhances the availability of nutrients and make them more readily absorbable. It also allowed minerals to regenerate, prolongs the residence time of essential nutrients, and prepared nutrients to be utilized by cells. It also intensified the metabolism of proteins, RNA and DNA.

Another factors might be due to the population of non patoghen microbes in gut. Huck *et al.* (1991) reported that humates could stimulate the growth of microbes in the gut. Kompiang *et al.* (2005) also reported that the growth of *Bacillus* spp, the microbe used as probiotics, *in vitro*, was significantly improved, with humates supplementation in culture media.

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Table 2. Effect of fulvic acid supplementation on FCR of the experimental birds.

Periods	Fulvic acid fraction (ppm)				SEM	P value
	Control (Group I)	100 (Group II)	200 (Group III)	300 (Group IV)		
0-3 weeks	1.35	1.35	1.33	1.36	0.013	>0.05
3-5 weeks	1.89	1.77	1.81	1.82	0.024	*<0.10*
0-5 weeks	1.65^{a}	1.59^{b}	1.61^{b}	1.61^{b}	0.015	*<0.05*

Notes: Value with different superskript at the same line differ significantly (P<0.05).

Table 3. Number of birds died (head / treatment) during the 5 weeks trials.

Periods	Fulvic acid fraction (ppm)				Total
	Control (Group I)	100 (Group II)	200 (Group III)	300 (Group IV)	
0-3 weeks	0	1	0	0	1
3-5 weeks	1	1	1	0	3
0-5 weeks	1	2	1	0	4
	2	4	2	0	8

Table 4. Effect of fulvic acid supplementation on carcass yield (%).

Periods	Fulvic acid fraction (ppm)				Average
	Control (Group I)	100 (Group II)	200 (Group III)	300 (Group IV)	
Male	68.68 ± 1.45	65.99 ± 2.77	68.15 ± 2.96	68.41 ± 3.20	67.81 ± 1.23
Female	68.12 ± 2.24	66.94 ± 1.10	66.34 ± 3.20	67.64 ± 1.44	67.26 ± 0.78
Average	68.40 ± 1.77	66.47 ± 2.02	67.24 ± 3.01	68.03 ± 2.34	

The improvement of the population of non patoghen microbes (probiotic) has been known capable of improving chickens performances, such as body weight gain, FCR and eggs production. (Kompiang, 2000; Kompiang *et al.*, 2002; 2004).

Mortality

Number of bird died during the 5 weeks trial is summarized in Table 3. The number was not affected by fulvic acid treatment, indicating that fulvic acid most likely had no toxic factor. Stepchenko *et al.* (1991) reported that giving of humic acids tended reduced the mortality of birds 3 to 5 %. Supplementation of fulvic acid may stimulate the immune system 5-7%.

Carcass yield

Carcass yield (Table 4) was not affected by treatment. Carcass yields were 68.4, 66.5. 67.2 and 68.0% for group of I, II,III, and IV, respectively. Sex has also no significant effect on carcass yield, the values were 67.81 ± 1.23% and 67.26 ± 0.78% for male and female of birds, respectively. Kocabagh *et al.* (2002) and Karaoglu *et al.*. (2004) also reported that there was no significant difference between the birds receiveing supplementation of humates on carcass yield. From these trials, it could be concluded that fulvic acid fractions had a potentcy as feed additive to improve poultry performance. It could increase body weight gain, improve FCR value and had no effect on mortality of chickens.

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