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Effects of adding vinegar diet in water on growth performance and some carcass characteristics of broiler ROSS308

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Abstract

The recent ban on use of antibiotics to stimulate the growth of chicken birds opened the new gate of research for possible alternative approach. Herbal medicine, organic acids and yeasts have been well documented in order to promote the growth of beneficial bacteria which ultimately improve the rates of utilization of food in poultry birds. Therefore, an experiment was conducted to evaluate the effect of natural vinegar diet on growth performance and some carcass characteristics of broiler ROSS308. Overall, 75 days old chicks (male and female) were treated with five different doses (10ml/1000ml, 15ml/1000ml, 20ml/1000ml and 25ml/1000ml) including control. All diets containing 19% and 22% crude protein in the starter and the finisher and all trials lasted for six weeks. The results showed a significant difference in body weight gain, feed intake, feed conversion ratio and water consumption among the birds for all treatments compared with control. The maximum body weight was 2066.7±24.2 in T5 at week 5, maximum daily gain 1921.7±24.2 was in T3 and T4 at week 5, maximum feed consumption was 3173.4±14.2 in T4 at week 5, maximum feed conversation was 1.88±0.32 in control treatment, respectively observed. Meanwhile, in carcass characters (body weight 2090.66±11.63, carcass weight 1525.1±12.7 refinement ratio 73.22±1.8, thigh weight 350.3±6.5, back weight 397.8±8.6 and chest weight of 473.8±9.6) in T4 were observed. Similarly, all organs weight and carcass characteristics were also affected that clearly displayed the effect of vinegar on chicks. Based on outcome of present study, it is highly recommended that vinegar as an additive is highly safe and effective to use for poultry bird.

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Introduction

The new challenge in recent time in the poultry industry is the natural additives to water and diet to improve the efficiency of production of poultry. After imposing the ban by European Union in 2006 on use of antibiotics to stimulate growth, researchers began to look for alternative ways to improve the performance of broiler (Hassan *et al.,* 2007). In this regard, herbal medicine, organic acids and yeasts are used to promote the growth of beneficial bacteria in order to improve the rates of utilization of food. It will ultimately affect the body weight of poultry birds which in results, the enhancement of poultry market will build further (Vogt *et al.,* 1982; Smulders *et al.,* 1998; Paul *et al.,* 2007; Khosravi *et al.,* 2010).

Vinegar is a diluted solution of acetic acid in water and it is one of the organic acids legally allowed to use all over the world as food additives and preserves (Ricke, 2003). It is quite often use to improve the productive performance of meat breeds and barley feed conversion in order to improve the absorption of minerals, vitamins and speed recovery from stress (Fernandes, 2008). Therefore, this research was carried out to know the effect of vinegar in adding water on growth performance of poultry birds. The outcome of this study surely will helpful to improve the health of chicken which will make further an established market for chicken.

Materials and methods

Birds and management

The chicks of 75 days old were kept in a room for 21 days under a decreasing temperature regime that was reduced from 32 °C in the first week of life to 26 °C at third weeks. The chicks were given vitamins from the first to the third day of age and they were vaccinated against Newcastle disease and infectious bronchitis on the 7th and 25th days of their age. Meanwhile, Gumboro vaccine at 10th day was also given to the selected birds. The feed and water were used as mention in Table 1. The experiment lasted for seven weeks during which feed intake, weekly weight gain and feed conversion ratio were monitored and in the end of experiment, all birds were slaughters and each one were considered as observation.

Experimental design and statistical analysis

The vinegar diet was added to drinking water of birds from the first day to the end of the experiment. The chicks were divided into five treatments including control which include 10ml/1000 ml, 15ml/1000 ml, 20ml/1000 ml, 25ml/1000 ml) and 0 ml (control), respectively. An experiment was a Complete Random Design (CRD) which replicated thrice for each dosage consisted of a male and a female chick per replicate in cages throughout the experiment. The data were analysis by using SAS (ver 2008) and the obtained means were compared by Duncan Multiple range and F-test at significant p value of 0.05.

Results and discussion

Increase in body weight

The results in Table 2 showed a significant differences ($P<0.05$) between treatments and control for body weight especially in week 4 and 5 for T3, T4 and T5. The maximum body weight of 2066.7±24.2 was observed in T5 at week 5 that was not statistically varied from the weight achieved in T4 in similar week. However, in week 4, the highest body was gained in T4 rather than T5. Overall, body weight was recorded to build from week 1 but more prominent from week 3. This may be due to the effect of acetic acid on stomach environmental condition by increasing the acidity and digestion of diet and that make a negative environmental for pathogenic bacteria (Duncan, 1955; Adil *et al.,* 2010).

Daily gain

Similarly, the difference was also protuberant in daily gain for treatments as compared to control especially in T4 and T5 in week 5 ($p<0.05$). The maximum daily gain of 1921.7±24.2 followed by 1850.3±29.2 with non-significant difference was observed in T3 and T4 at week 5 and minimum in T1 (control). Meanwhile, the daily gain was gradually increased until week 4 and later promptly initiated to build in week 5 which displayed overall a huge difference in daily gain (Table 3).

Table 1. Diet formulation and compositions (%).

Ingredients	Starter (0 to 21 d)	Grower (22 to 42 d)
Corn	58.4	63.8
Soybean meal (43% CP)	33.7	28.2
Oil	2.9	3.0
Fish meal (60.2% CP)	1.5	1.5
Di-calcium phosphate	1.4	1.4
Limestone	1.2	1.2
Salt	0.21	0.21
dl-Met	0.19	0.19
Vitamin-mineral premix	0.5	0.5
Calculated composition ME, kcal/kg	3,049	3,095
CP %	21	19.05
Calcium %	0.96	0.94
Total phosphorus %	0.68	0.64
Lys %	1.13	0.97

Table 2. The effect of vinegar on body weight (gm) for ROSS308.

Body weight (gm)					
Treatments	Week 1	Week 2	Week 3	Week 4	Week 5
T1	223.3±5.3a	536.2±8.3a	912.3±4.8a	1463.3±11.8 c	1850±11.3 c
T2	221.2±6.5a	546.3±14.2a	906.2±21.2a	1451.4±14.4c	1980±27.3 b
T3	220.3±7.6a	552.6±17.1a	906.6±23.1a	1568.3±22.2 b	2013.7±18.2 b
T4	225.4±4.2a	559.6±11.3a	908.4±17.4a	1608.3±27.7 a	2100.3±29.2 a
T5	227.4±3.2a	529.6±15.4a	967.6±22.4a	1585.3±26.8 ab	2066.7±24.2a

The different letters in column refer to significant different (P<0.05)

T1=Control without additive; while other treatments are water with vinegar at different doses (10,15,20 and 25 ml/l water).

Table 3. The effect of vinegar on daily and total gain (gm) for ROSS308.

		Daily gain (gm)			
Treatments	Week 1	Week 2	Week 3	Week 4	Week 5
T1	310.6±10.6a	427.2±9.3a	414.3±4.8 c	463.3±11.8 b	1603±11.3 c
T2	325.2±4.3a	410.3±6.2a	488.2±4.2 ab	527.4±16.4 a	1748.7±13.2 b
T3	330.6±5.6a	405.6±5.1a	604.6±9.1 a	464.3±13.2 b	1804.7±18.2 b
T4	328.4±3.2a	411.6±7.3a	621.4±7.4 a	492.3±8.7 a	1850.3±29.2 a
T5	301.4±3.2 a	432.6±7.4a	618.6±3.4 a	450.3±11.8 ab	1921.7±24.2 a

The different letters in column refer to significant different (P<0.05).

T1=Control without additive; while other treatments are water with vinegar at different doses (10,15,20 and 25 ml/l water).

Table 4. The effect of vinegar on feed consumption (gm) for ROSS308.

		Feed consumption (gm)			
Treatments	Week 1	Week 2	Week 3	Week 4	Week 5
T1	501.6±9.6a	745.2±6.3a	870.3±3.3 c	930.3±4.5 b	3047.4±14.7 b
T2	512.2±4.3a	750.3±3.2a	905.2±6.3 bc	987.4±5.4 a	3156.3±12.2 a
T3	514.6±5.6a	740.6±8.1a	920.3±4.1 a	950.3±5.2 b	3126.3±11.5 a
T4	484.4±3.8a	749.6±6.3a	950.4±3.4 a	960.3±8.7 a	3144.4±10.3 a
T5	478.4±9.2a	760.6±9.4 a	970.6±7.4 a	954.3±4.8 ab	3173.4±14.2 a

The different letters in column refer to significant different (P<0.05)

T1=Control without additive; while other treatments are water with vinegar at different doses (10,15, 20 and 25 ml/ water)

It may be refer to effects of vinegar on increased benefit from diet as observed by previous studies conducted by various researchers (Chowdhury *et al.,* 2009).

Feed consumption

Furthermore, the results for feed consumption in Table 4 showed a significant differences ($p<0.05$) within treatments as compared to control.The maximum feed consumption of 3173.4±14.2 was observed at 25 ml/ 1lit water in week 5 while the lowest 478.4±9.2 was also observed in T5 but at week 1. However, the highest feed consumption statistically was almost same from T2 to T5 except control treatment in which no water was added. The possible reason of such outcome could be the addition of vinegar which make a balance in blood pH and increased its ability to feed (Kishi *et al.,* 1999; Davison, 2001).

Table 5. The effect of vinegar on feed conversation for ROSS308.

Feed conversation (gm)					
Treatments	Week 1	Week 2	Week 3	Week 4	Week 5
T1	1.63±0.22a	1.74±0.31a	1.87±0.22 a	2.2±0.25 a	1.88±0.32 a
T2	1.57±0.31a	1.82±0.41a	1.85±0.15 a	1.87±0.23 b	1.80±0.12 ab
T3	1.55±0.13a	1.82±0.12a	1.69±0.34 a	1.97±0.17 b	1.73±0.29 b
T4	1.46±0.11a	1.82±0.32a	1.57±0.17 c	1.95±0.11 a	1.69±0.28 b
T5	1.58±0.23a	1.75±0.26a	1.56±0.19 c	1.98±0.34 a	1.65±0.32 b

The different letters in column refer to significant different ($P<0.05$).

T1=Control without additive; while other treatments are water with vinegar at different doses (10,15,20 and 25 ml/l water).

Feed conversation

The results as illustrated in Table 5 displayed that the feed conversation were significant differences for treatments as compared to control. It was clear indication of normal effects of treatment on bird as it relies on weight and feed consumption and stimulates the function of acetic acid on digestive tract. The maximum feed conversation was observed 1.88±0.32 on control treatment followed by 1.80±0.12 in T2 at week 5 with non-significant difference between these treatments. However, overall results were varied ($P<0.05$) among all selected treatments. Furthermore, physiologically it worked and increased the stomach acidity which further results in increased digestion (Moharrery and Mahzonieh. 2007; Abdel-Fatah *et al.,* 2008).

Table 6. The effect of vinegar on drinking water for ROSS308.

Drinking water (ml)					
Treatments	Week 1	Week 2	Week 3	Week 4	Week 5
T1	1007.3±5.5a	1287.8±12.3a	1866.2±15.3 a	2236.3±15.8 a	2954.3±14.8 a
T2	1024.6±7.3a	1122.6±13.4a	1842.3±16.4 a	2213.2±11.4 a	2929.4±16.4 a
T3	1014.3±11.2a	1144.3±13.6a	1814.1±16.1 b	2240.1±15.1 a	2938.3±17.2 b
T4	985.6±11.3a	1130.6±15.8a	1808.7±14.3 a	2161.1±16.3 b	2833.3±15.2 b
T5	978.2±11.7 a	1104.3±16.2a	1777.2±18.4 b	2073.6±17.4 b	2810.3±13.8 b

The different letters in column refer to significant different ($P<0.05$)

T1=Control without additive; while other treatments are water with vinegar at different doses (10,15,20 and 25 ml/ water.

Carcass dressing

In last, the results in Table 7 showed the variable effects of vinegar on carcass dressing especially in T4, T5 for all parameters and T2, T3 for some characteristic ($p<0.05$). The six different carcass parameters were observed with application of different doses of vinegar additives. The overall observed characters were maximum (body weight of 2090.66±11.63, carcass weight of 1525.1±12.7, refinement ratio of 73.22 ± 1.8, thigh weight of 350.3 ± 6.5, back weight of 397.8 ± 8.6 and chest weight of 473.8 ± 9.6) in T4, respectively. These outcomes were normal because it functioned for the superiority of treatments on control. Based on obtained results from present study, it could be concluded that an increment in productive performance as compared with control, especially in body weight, daily and total gain feed consumption and feed conversation ratio, especially promoted with addition of vinegar.

Table 7. The effect of vinegar on body weight and some carcass parameters for ROSS308.

Treatments	Live body weight	Carcass weight	Refinement ratio	Thigh weight	Weight of back	Chest weight
T1	1870.30±10.22b	1286.7±13.6c	68.50 ±1.6b	272.2 ± 3.6c	291.2 ± 6.8c	398.6 ± 8.2c
T2	2005.15±9.55b	1400.1±9.6b	69.78 ± 1.7b	320.8 ± 4.6b	342.3 ± 4.6b	434.5 ± 9.8b
T3	2020.25±8.24ab	1461.4±17.3b	72.37 ±1.8a	332.9 ± 4.2b	351.3 ± 4.2 b	453.6 ± 5.6b
T4	2090.66±11.63a	1525.1±12.7a	73.22 ± 1.8a	350.3 ± 6.5a	372.4 ± 8.6a	473.8 ± 9.6a
T5	2040.32±12.11a	1479.1±12.7a	73.21 ± 1.8a	343.5 ± 3.5a	397.8 ± 8.6a	458.5 ± 9.6a

The different letters in column refer to significant different ($P<0.05$)

T1=Control without additive; while other treatments are water with vinegar at different doses (10,15,20 and 25 ml/l water.

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