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Hassan Abdullah Mohammed
VeterinaryDepartment/ShaqlawaTechnicalInstitute/ErbilPolytechnicUniversity

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ABSTRACT

The purpose of this work was to study the use of different type of (acetic, citric acid) during starter phase of broiler Ross-308 on performance parameters. A total number of 150 one day old broilers (Ross-308 hybrid) Chicks were distributed to three dietary treatments each treatment has 5 replicate, each replicate has 10 chicks, the control group(C) without organic acid supplements, treatment 1(T1) received acetic acid treatment 2(T2) received citric acid. Supplements were used in the drinking water by 0.25% during first 10 days of chick's age. Results showed significant effects with addition of organic acid (p≥0.05) among all treatments for all studied characters were significantly (p≥0.05). Higher value for live body weight, weight gain and best feed conversion found in T2. Higher value for dressing carcass found in T1 and higher value for edible parts except the heart found in T2.

Key words: ***broiler, acetic and citric acid, carcass parameters.***

INTRODUCTION

The High levels of production and efficient feed conversion are the need of the modern poultry industry, which to a certain extent could be achieved by the use of specific feed additives. Antibiotic feed additives as growth promoters have long been supplemented to poultry feed to stabilize the intestinal microbial flora, and consequently, improve the performance in general and prevent some specific intestinal pathogens (Hassan *et al*., 2010).

Used of organic acid individually or as blends of several acids have been found to perform antimicrobial activities similar to those of antibiotics (Wang *et al*., 2009). The European Union allowed the use of organic acids and their salts in poultry production considered as safe (Adil *et al.*, 2010). Organic acids have been used for decades in commercially compound feeds, mostly for feed preservation, for which formic and propionic acids are particularly effective (Lückstädt, 2014). In the European Union, these two organic acids (Acetic and citric acid) and several others

(lactic, citric, fumaric and sorbic acids) and their salts (e.g. calcium format, calcium propionate) are used under the classification of 'feed preservative' (Lückstädt and Mellor, 2011).

The short-chain acids (C1–C7) are associated with antimicrobial activity. They are either simple mono-carboxylic acids such as formic, acetic, propionic and butyric acids or carboxylic acids with the hydroxyl group such as lactic, malic, tartaric and citric acids or short-chain carboxylic acids containing double bonds like fumaric and sorbic acids (Shahidi *et al*., 2014). Organic acids are weak acids and are only partly dissociated. A wide range of organic acids with variable physical and chemical properties exists, of which many are used as drinking water supplements or as feed additives (acidifiers they are also less corrosive and may be more soluble in water (Huyghebaert *et al*., 2011) The use of organic acids has been reported to protect the young chicks by competitive exclusion (Mansoub *et al*., 2011), enhancement of nutrient utilization, and growth and feed conversion efficiency (Lückstädt and Mellor, 2011).

This study aimed to evaluate acetic acid and citric in pre-starter and starter period on performance parameter of broiler chicks in cage technology.

MATERIALS AND METHODS

Design of the experiment

The experiment was conducted with 150 one day old broiler chicks (Ross-308) for a period of 10 days starter phase, the chicks were randomly divided into 3 equal treatments (C, T1 and T2) each having 50 chicks. Each treatment was subjected to 5 equal replications of 10 chicks each. The diets were formulated with commonly available feed ingredients shown in Table 1. Treatments were C (control diet) without any additive; T1, T2 were supplemented with 0.25% acetic acid, 0.25% citric acid respectively by adding 25 ml/100 liter drinking water. Mash feed was supplied on *adlibitum* basis. Fresh clean drinking water was offered during the experiment time. The birds were housed in cages of 120 cm×76cm.

Table 1. The ingredients and chemical composition of the diet

control diet Ingredients	Amount in the diet (%)
Maize	51.30
Soybean meal	42.00
Soybean oil	4.00
Salt	0.25
Di- Calcium Phosphate	0.50
Calcium	1.00
Vitamin-Mineral premix[1]	0.75
DL-Methionine	0.15
Choline Chloride 60%	0.05
Chemical composition*	**Amount (%)**
Dry matter	89.00
Crude protein	23.32
Crude fiber	2.87
Ether extract	2.16

Nitrogen free extract	48.41
Ash	5.75
ME(kcal/kg feed)	2995

1 active substances per kilogram of premix: vitamin A 2 500 000 IU; vitamin E 50 000 mg; vitamin D3 800 000 IU; niacin 12 000 mg; d-pantothenic acid 3 000 mg; riboflavin 1 800 mg; pyridoxine 1200 mg; thiamine 600 mg; menadione 800 mg; ascorbic acid 50000 mg; folic acid 400 mg; biotin 40 mg; vitamin B12 10.0 mg; choline 100000 mg; betaine 50000 mg; Mn 20 000 mg; Zn 16 000 mg; Fe 14 000 mg; Cu 2 400 mg; Co 80 mg; I 200 mg; Se 50 mg
**Calculated according to (N.R.C, 1994).*

Birds' management

Chickens were kept under the basic broiler (Ross 308) management applications. To evaluate the treatment effect, live body weight, weight gain, feed conversion ratio, dressing percentage were determined. At the end of experiment, two birds from each treatment were selected randomly to record the dressing yield and organs weight (Lückstädt, 2014).

Statistical analysis

Data on different variables were subjected to analysis of variance (ANOVA) in a Completely Randomized Design (CRD). The significant differences between the treatment means were compared by the Duncan's Multiple Range Test. All Analyses were performed by using (SPSS program, 2009).

RESULTS

Effect of organic acids inclusion in the broiler water on performance is presented in Table 2. Differences between chicks weight values were insignificant at first day but Significant ($P<0.05$) difference were found between treatments at 10 days old. T2 showed higher value (178.28g) and lower value was in C (162.05g), also significant ($P<0.05$) different was found between T1 and T2. Total weight gain (131.88g) was higher in T2 while lowest was in C (115.95g), also T1 was significantly higher than C group. Feed intake showed high value in C group (185.52g) compared with other groups. The best value for F.C.R was in T2 (1.23) while the worst was in C and T1 showed significant ($P<0.05$) different with both T2 and C.

Table 2. Effect of treatments on broiler performance during pre-starter and starter phase

Attributes	Treatment		
	C	T1	T2
live body weight at 1st day/g	46.2 ± 0.59	46.1 ± 0.56	46.4 ± 0.28
live body weight at 10 day/g	162.05±013c	175.43±0.53b	178.28±0.17a
Total weight gain/g	115.85±0.13c	129.33±0.53b	131.88±0.17a

Total Feed intake/g	185.52±0.21a	167.99±10.45b	148.36±6.62c
F.C.R	1.60±0.01a	1.30±0.08 b	1.23±0.50 c

a,b and c means with different superscript within row are significantly different (p< 0.05)
Values mean ±S.E standard Error of 150 birds.

Carcass characteristics

Organs weight percentage

It is evident from the Table 3 that significant (p≤0.05) differences between groups were observed in carcass percentage, in C was lowest (69.05%) versus T1 (80.93%) and T2 (75.08%). The results are agreed with the previous findings (Kahraman *et al*., 1997), in which at 0-2 week of the age significant effect where observed. The highest value for thigh, breast, back, wings, head, shank and skin, feather, blood and non edible parts. Observed in T1.C, T1, T2,T2,T1 and t2 respectively. AS general the best value seemed for most parts was in T2.

Table 3. Effect of organic acids on carcass characteristics of broiler chickens

Attributes %to live body weight		Groups (Mean ±S.E)		
		c	T1	T2
dressing carcass		69.05±0.26c	80.93±0.54a	75.08±0.50b
Thigh		6.40±0.10c	7.27±0.06a	6.94±0.05b
Breast		13.72±0.02a	13.23±0.04b	12.63±0.03c
Back		13.62±0.01b	13.85±0.10a	12.67±0.22c
Wing		7.01±0.7c	7.59±0.08b	8.03±0.08a
Head		3.97±0.01c	4.14±0.02b	4.73±0.08a
Shank		6.43±0.12b	6.59±0.05a	6.25±0.02c
Skin, blood and non-edible parts		14.57±0.08c	17.83±0.08b	22.57±0.06a

a,b and c means with different superscript within row are significantly different (p< 0.05)
Values mean ±S.E standard Error of 150 birds.

Edible parts

Significant (p≤0.05) differences were observed between treatments with all attributes. High value for heart, liver and gizzard were (2.53, 4.43 and 2.49) in (T1, T2 and T2) respectively.

Table 4. Effect of organic acids on edible parts of broiler chickens

Attributes% to the live body weight	Groups (Mean ±S.E)		
	c	T1	T2
heart	2.22±0.12b	2.53±0.06a	2.33±0.02c
liver	2.46±0.29c	3.25±0.53b	4.43±0.18a
Gizzard	1.52±0.18b	1.85±0.30b	2.49±0.10a

a,b and c means with different superscript within row are significantly different (p< 0.05)
Values mean ±S.E standard Error of 150 birds.

DISCUSSION

All treatment groups showed improvement in growth when administration of citric acid, and acetic acid in drinking water was done. The improvement of live body weight can be attribute to addition of organic acids in diet can have a beneficial effect on the performance of poultry by decreasing pathogenic bacteria that affect the intestinal health of poultry like Salmonella, Campylobacter and Escherichia coli which can be controlled by supplementation of an organic acid in diet (Wang *et al*., 2009). Good intestinal health in the poultry is of great importance to achieve target growth rates and feed efficiency. Organic acids (1.0% Sorbic acid and 0.2% citric acid) supplementation in the broiler's diet significantly increased the villus width, height and area of the duodenum, jejunum and ileum of broiler chicks at 14 days of age. Supplementation organic acids could be highly helpful to young birds for intestinal development and positively affected on live weight, feed intake and feed conversion ratio with no detrimental effect on carcass characteristics. This can be explaining the improvement of growth in T1and T2 (Huyghebaert *et al*., 2009). The result is agreed with [(Schuhmacher *et al*., 2006);(Shen-HuiFang *et al.*, 2005);(Huyghebaert., 2011); (Denli *et al*., 2003) and (Stipkovits *et al*., 1992)] in their studies proved the improvement in weight gain with administration of citric acid in diets at 0.3, 0.5 and 0.7%, respectively. The results contradict with the findings of previous researches (Pinchasov *et al*., 2000) where depression of weight gain was observed with application of acetic acid in broiler diet. In other hand feed intake was lower in TI and T2 conversely to C thus reflected on F.C.R as the higher value was in C (1.6).

In T1 the dressing yield was improved (80.93%) when compared with the control group. This result did not agree with previous findings of Garcia *et al.* (2000) who found decrease in carcass yield. The increased dressing yield in T1 may be attributed to the effect of enhancement of organic acids on intestinal health which increased nutrient intake and uptake to be shifted to the building of body component. The result partially agreed with Sapra *et al*. (1990) who found increased edible meat yield with increasing body weight. Thigh percentage was affected slightly by dietary treatments, in which improved inT1 and T2 treatments. Higher value of breast, head and shank were recorded in C and T1, latest parameters agreed with (Islam *et al*., 2008).

The results of edible parts can be attributing for differences in the digestive system pH, which affected on nutrient metabolism, especially, at pre-starter and starter period (Islam *et al*., 2008). The result partially agreed with (Sapra *et al*., 1990). Gizzard percentage in T2 showed higher value (2.49%) versus lowest value was in C (1.52%), while insignificant different ($P>0.05$) was between C group and T1. These results agreed with results of (Patten and Waldroup, 1988). In addition it can be explained by modifying intestinal pH, in which organic acids improve the solubility of the feed ingredients, digestion and absorption of the nutrients (Patten and Waldroup, 1988).

CONCLUSION

The results from this experiment showed that organic acid supplementation, irrespective of type and level of acid used, had a beneficial effect on the broiler performance.

RECOMMENDATION

We recommend conducting more experiments on natural sources of acid supplements in broiler diet or drinking water.

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ABSTRACT

The purpose of this work was to study the use of different type of (acetic, citric acid) during starter phase of broiler Ross-308 on performance parameters. A total number of 150 one day old broilers (Ross-308 hybrid) Chicks were distributed to three dietary treatments each treatment has 5 replicate, each replicate has 10 chicks, the control group(C) without organic acid supplements, treatment 1(T1) received acetic acid treatment 2(T2) received citric acid. Supplements were used in the drinking water by 0.25% during first 10 days of chick's age. Results showed significant effects with addition of organic acid ($p \geq 0.05$) among all treatments for all studied characters were significantly ($p \geq 0.05$). Higher value for live body weight, weight gain and best feed conversion found in T2. Higher value for dressing carcass found in T1 and higher value for edible parts except the heart found in T2.

تأثير اضافة الاحماض العضوية في ماء الشرب خلال فترة ماقبل البادئ والبادئ على الاداء الانتاجي لفروج اللحم

الملخص

الغرض من هذه التجربة هو دراسة استخدام مصادر مختلفة من (حامضي الخليك والستريك) في فترتي قبل الباديء (3 ايام الاولى من التربية) والباديء (من اليوم الرابع الى العاشر من التربية) على الاداء الانتاجي وصفات الذبيحة لفروج اللحم . استخدمت 150 فرخة من اليوم الاول للتربية قسمت الى 3 معاملات لكل معاملة 5 مكررات لكل مكرر كان 10 افراخ ،معاملة السيطرة (C) بدون اي اضافة اي نوع من الحوامض ، المعاملة الاولى (T1) استخدم فيها حامض الخليك، المعاملة الثانية (T2)استخدم فيها حامض الستريك ، المعاملات الاولى والثانية اضيفت اليها الاحماض العضوية بواسطة ماء الشرب بنسبة 0.25% من اليوم الاول الى اليوم العاشر من التربية. اظهرت النتائج وجود فروقات معنوية بمستوى معنوية ($p \leq 0.05$) بين جميع المعاملات ولكل متوسطات الصفات المدروسة للذبيحة.افضل قيمة للوزن الحي ،الزيادة الوزنية ومعامل التحويل الغذائي كانت في (T2) وافضل قيمة لنسبة التصافي كانت في (T1) وافضل قيمة للاجزاء الثانوية الماكولة عدا القلب كانت في (T2).

كاريطةرى بةكارهيَنانى ترشة ئةندامياةكان لة ئاوى خواردنةوةى جوجةلّةى طؤشتدا لةماوةى ثيَش سةرةتا و سةرةتاى بةرهةم هيَنان

ثوختة

ئامانجى ئةم تاقيكردنةوة بؤ زانيني رؤلى بةكارهيَنانى سةرضاوةى جؤراو جؤر لة (ترشي خةليك و ستريك) لة ماوةى ثيَش سةرةتايي (3 رؤذى يةكةمى بةخيَوكردن) و سةرةتايي (لة رؤذى ضوارةم تا دةيةمى بةخيَوكردن) لة سةر بةرهةم و سفاتى لاشةى مريشكى طؤشتى. بةكارهيَنانى 150 جوجةلَةى تةمةن يةك رِؤذى كة دابةش كرا بؤ 3 مامةلَة هةر مامةلَيةك 5 دووبارة بوونةوة وة بؤ هةر دووبارة بونةوةيةك 10 جوجةلَة . مامةلةى (C) كؤنترؤل بىَ زياد كردنى هيض جؤرة ترشيَك مايةوة , مامةلةى يةكةم (T1) بة بةكارهيَنانى ترشي خةليك , مامةلةى دووةم (T2) بة بةكارهيَنانى ترشي ستريك . مامةلةكانى يةكةم و دووةم ترشى ئةندامياان بؤ زياد كرا بة رِيَطاى ئاوى خواردنةوة بةريَذةى 0.25% لة رؤذى

یەکەم تا رۆژی دەیەمی بەخێوکردن. لە ئەنجامی تۆێذینەوەکدا دەرکەوت کەوا جیاوازی بەرجة ستەیي هةیة بة ئاستی (p≤0.05) لە نێوان طشت مامەلەکان و ناوەندنی سفاتة کانی لاشة. باشترین بەها لە نرخی کێشی زیندوو، زیادەی کێش و مامەلەی طۆرینی خۆراکی لە (T2) بوة، وة باشترین بەهای رێذەی ثوختة لە (T1) بوة ، وة باشترین بەها بۆ بەشة خوراوەکانی لاوەکی جطة لە دلّ لە (T2) بوة.