ORGANIC ACIDS SUPPLEMENTS: INFLUENCE ON LIVE BODY WEIGHT, FEED CONSUMPTION AND CONVERSION OF BROILER

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ABSTRACT: *The study was carried out to investigate the effect of formic acid, propionic acid and phosphoric acid supplementation in diets of broiler on growth performance, water intake, feed consumption and conversion. A total two hundred forty day-old male chicks were used in this study and divided into four groups i.e. A, B, C and D. The groups B, C and D were fed diets containing blend of formic acid, propionic acid and phosphoric acid dose at rate of 0.2, 0.4 and 0.6 ml per litre of water; respectively, while group A was served as control. Increase concentration of organic acids reduced feed intake and water intake in broiler flocks. Average live body weight was recorded higher (P<0.05) in group C (2108.8) followed by B (2086.1), D (2055.7) and A (2027.6) g/bird. Feed conversion ratio was improved in C (1.91) followed by D (1.93), B (1.95) and A (2.05). The maximum live body weight was recorded in group C, 2108.8 g/bird and minimum in the control group 2027.6 g/ bird. Overall, blend of formic acid, propionic acid and phosphoric acid supplemented groups greatly influenced growth performance, water intake, feed consumption and conversion.*

INTRODUCTION

The Cheapest feed, with minimum morbidity and maximum performance is ever demanding object in poultry industry. An effort to produce safer human foods from animal origin more capably, and enhanced profitability are always a continue struggle. This augmented a thrust to search for new feed additives and availed a room for improvement that could enhance growth rate and production level [1].

Organic acids have been used for more than three decades to prevent the destruction of feedstuffs by bacteria and fungus [2-3]. They improve growth performance by lowering the pH of the gastrointestinal tract; thereby support the digestive enzymes (endogenous) in reduction of the undesired gut microflora. Acids are usually categorized as organic or inorganic acids, and further into strong or weak acids. Weak acids can only be used in animal feed or water. Offering alkaline drinking water gives poor performance in body weight gain and feed conversion ratio (FCR), while increasing pH above 8.5 badly affects the cost benefit ratio[4]. Different weak acids are available in the market and are purchased as per choice of their action i.e formic Acid (used to make formaldehyde), lactic acid, propionic acid, sordic acid, acetic acid, citric acid, fumaric acid, benzoic acid and butyric Acid. In the broiler industry, different organic acids were being tested. Acetic acids, formic acid and propionic acids have shown better solubility in water [2] therefore, they can be utilized in drinking water. Acids are utilized after estimating pH in water and producing the best recommended pH to enhance production.

Acidified drinking water helps to abate pathogens level in the crop and proventriculus, regulates gut microflora, and to increases feed digestion and improve growth performance of the broiler [5]. Desai *et al*. (2007) [6] suggested that addition of a combination of formic and propionic acids in the drinking water improves feed conversion ratio and increases weight gain due to higher nitrogen retention in broilers. Acid mixed in water are likely to give better results followed by acids mixed in diet, as organic acid dose will suffer due to reduction in feed consumption during heat stress [7]. Organic acid blends were observed that significantly improve performance average live weight, daily feed consumption and water intake in chicken flocks [8]. Organic acid supplementation, irrespective of its type, that produced improvement in body weight, feed conversion ratio [9, 10] carcass yield and liver weight and bacterial microflora [11].

On the above hypothesis, this study was designed to evaluate effect of diets containing blend of formic acid, propionic acid and phosphoric acid on growth performance, water intake, feed consumption and conversion of broiler.

MATERIALS AND METHODS

In order to determine the effect of blend of formic acid, propionic acid and phosphoric acid supplementation on growth and digestibility of broiler. Total of two hundred forty (240) day-old broiler chicks were used in this study. The chickens were divided into four groups (A, B, C and D) in 3 replicates. The chickens fed the experimental diets (Table 1) and the organic acid blend comprising of formic acid,

propionic acid and phosphoric acid was mixed in water (Table-2). Following the supplementation of organic acid blend in the drinking water analysis were carried out for pH and TDS (Total Digestible Solids). A standard digital pH meter was dipped in each water sample bottle prepared as per treatment plan and the pH shown by meter was recorded. TDS (Total Dissolved Solids) was also measured by dipping standard digital TDS meter and reading shown by TDS meter.

Feed and Water intake

Feed and treated water were offered *ad.libitum* to all groups of broiler. Chickens were initially offered broiler starter ration for first three weeks followed by broiler finisher ration for rest of three weeks. Iso-nitrogen and iso-caloric feed was provided to all groups of broilers during morning and evening times. The refusal of feed and water from all groups was measured and deducted from the offered feed/water to obtain the amount of feed/water consumed by each bird in each group.

Feed and water intake was calculated by following formula:

$$\text{Feed} = \frac{\text{Total Feed Offered-Total Feed Refused}}{\text{Total Broiler}}$$

$$\text{Water} = \frac{\text{Total Water Offered-Total Water Refused}}{\text{Total Broiler}}$$

Live Body Weight

In order to measure the average live body weight gained by each bird per group; three birds per group were randomly selected, weighted (using electric weight balance) and their final live body weight gain was recorded at the end of 42th day of experiment perid.

Feed Conversion Ration

To calculate Feed Conversion Ratio, cumulative weight gain obtained every week and the recorded data for feed consumption were put into following formula to calculate at the of 42th of age.

$$\text{FCR} = \frac{\text{Total Feed Intake/Consumed Per bird}}{\text{Total Live body weight Gained per broiler}} \times 100$$

Statistical Calculations

Computer software package Statistix 8.1, Tallahassee, FL, Statistix, 2005; an analytical software with full data manipulation tools was used for data analysis.

RESULTS AND DISCUSSION

Feed consumption

Average feed intake of broilers (Table-3) of the groups A, B, C and D was recorded as 4071.1, 3996, 3943.7 and 3894.2 g/ bird respectively. The maximum feed 4071.1g/ bird was consumed by group A, while the minimum feed 3894.2 g/bird was consumed by the group D. The results of this study concurrent with the observations reported by [11-12], who reported a reduction in voluntary feed intake and performance with high doses of organic acid in the diet. However, feed intake was not influenced fed increased level of organic acids in the diet of broiler. In contrast, feed consumption was increased significantly in broiler chickens offered organic acid blend in drinking water [8].

Water intake

Average water consumption of broiler in of group A, B, C and D were 8309.8, 8506.8, 8298.5 and 7692.8 ml/bird, respectively (Table-3). Water consumption was maximum 8506.8 in group B and minimum 7692.8 in group D ml/bird. It was shown that acidified drinking water for broiler chicken had higher feed intake, weight gain and growth performance [13]. However, increased level of propionic acid in water reduce water intake, feed consumption, palatability and weight again in broiler flocks [14].

Feed Conversion Ratio

Feed conversion ratio (Table-1) of broiler of group A, B, C and D was calculated as 2.05, 1.95, 1.91 and 1.93; respectively. The better FCR was recorded in group C, i.e. 1.90. The highest ratio 2.05 was observed in group A. The supplmentation of organic acids increase the digestibility of amino acids and proteins thereby enhancing gastric proteolysis. As organic acids decrease the gastric pH that may stimulate the action of pepsin resulting increased proteolysis [15]. The releases of cholecystokinin and gastrin hormones enhance the assimilation and digestion of proteins [10]. Therefore, supplmentation of organic acids were proven to improve the feed conversion from the available nutrients in feed of broiler [16]. Absorption of nutrients is increased with increase in feed digestion and improved growth performance. Organic acids also influence permeability of mucosal cell of the intestine which increases the rate of utilization of nutrients and results better feed conversion [5]. The results of this study are in agreement with the previous studies [8, 11].

Live body weight

Live body weight of broiler groups A, B, C and D was found as 2027.6, 2086.1, 2108.8 and 2055.7 g/bird, respectively. The maximum live body weight was recorded in group C, 2108.8 g/bird and minimum live body weight in the group A 2027.6 g/ bird (Table-3). Previously, it has been reported that increase in live body weight is due to a slower passage of digesta facilitating increased nutrient absorption; this is among one of the positive actions of organic acids. Moreover, they also increase the pancreatic secretion and have positive effects on the mucosa of gastro-intestinal tract [17]. The results of this study are in accordance with previous studies [11].

CONCLUSION

It was concluded from the present study that broilers can be reared on supplementation of organic acid blend @ 0.4 ml/ lit of drinking water for 42 days for higher weight gain, FCR, dressing percentage, better digestibility

Table 1. Composition of diet fed to experimental chicken.

Ingredient (%)	Starter Ration	Finisher Ration
Canola meal	6	8
Soya bean oil meal	18	9
Wheat bran	2.5	3.5
Rice polish	4	5
Molasses	4.25	2.25
Maize	35	36.755
Rice tips	10	11
Wheat	8.2	10
Fish meal	3.5	4
Common salt	0.17	0.17
DCP	0.65	0.55
Lysin-SO4	0.15	0.25
Limestone	0.35	0.35
DL-Methionine	0.16	0.16
L-Threonine	0.06	0.06
Premix	0.22	0.22
Phyt enzyme	0.005	0.005
Corn glutan60%	6.785	8.73
Total	100	100

CHEMICAL COMPOSITION OF THE PROPOSED RATION

Nutrients	Starter Ration	Finisher Ration
CP%	22.37	19.54
Energy(ME Kcal/Kg)	2887.83	2952.01

Table 2. Composition of organic acid blend mixed in drinking water of broiler chickens.

Treatment	Groups			
Organic Acids Blend Composition: Formic acid 600g, Propionic acid 100g and Phosphoric acid 40 g /Kg	A	B	C	D
	Control	0.2 ml/ liter	0.4 ml/ liter	0.6 ml/ liter

Table-3. The effect on water intake, live body weight, feed consumption and conversion of broiler supplemented organic acids in drinking water

	Groups				
	A	**B**	**C**	**D**	**ANOVA**
Feed consumed	4071.1	3996	3943.7	3894.2	**SE±** =70.811 **LSD @ 0.05** = 173.27 **P-value**=0.0510
Average water intake	8309.8	8506.8	8298.5	7692.8	**SE±** =362.60 **LSD @ 0.05** = 887.25 **P-value**=0.2320
Live body weight	2027.6[a]	2086.1[a]	2108.8[b]	2055.7[a]	**SE±** =40.753 **LSD @ 0.05** = 99.71 **P-value**= 0.0490
FCR	2.05[a]	1.95[b]	1.91[b]	1.93[b]	**SE±** =0.0286 **LSD @ 0.05** = 0.0700 **P-value**=0.0103

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