



RESEARCH ARTICLE

Effect of Acidic and Alkaline Drinking Water on Haematological Parameters and Carcass Characteristics in Commercial Broilers

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ABSTRACT

To find out the changes in the blood parameters and carcass characteristics with respect to acidic and alkaline drinking water the following study was undertaken with two hundred broiler chicks. They were randomly divided into five treatment groups with two replicates each. The drinking water was treated with 0.5 and 1 % lactic acid for acidification, 0.2 and 0.4 % sodium chloride for alkalinisation and a control was provided to the birds in the respective treatment groups. The haematological parameters viz. PCV, Hb %, RBC count, Serum total proteins, Serum calcium and Serum phosphorus were studied. The results revealed no significant difference between the treatment groups in the case of haematological parameters viz. PCV, Hb % and RBC count. Serum total protein was significantly low in alkalinisation groups than other treatments. Serum calcium level was highly significant in alkalinisation group than both acidification and control groups. No differences were observed between the alkalinisation groups. Similar trend was also noticed in case of Serum phosphorus. Regarding carcass characteristics, broilers in 0.5 % lactic acid group had highest dressing percentage than other treatment groups. Except the mean percentage of intestine weight, all other carcass characteristics of broilers did not differ significantly between the treatment groups. Alkalinisation group (0.4% sodium chloride) had significantly higher intestine weight than other treatment groups.

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INTRODUCTION

Water is the single most nutrient for broilers to sustain their life and bodily functions. Water is the main constituent of all the body fluids and blood. The quality of drinking water, which is provided to the birds, should be maintained in such way that it cannot alter the bodily functions of the bird. Moreover, the quality should be given prime importance so as to increase the production potential of the birds. By keeping all things in mind, the following study was undertaken with commercial broilers to find out the changes in the blood parameters in respect to acidification and alkalinisation of drinking water.

MATERIALS AND METHODS

Two hundred day old broiler chicks were randomly divided into five treatment groups with two replicates

each consisting of 20 chicks per replicate. The drinking water was treated with 90 per cent lactic acid for acidification and with graded levels of sodium chloride for alkalinisation as given below

T₁ - Control

T₂ - 0.5 per cent lactic acid (4.5 gm per liter of drinking water)

T₃ - 1 per cent lactic acid (9.0 gm per liter of drinking water)

T₄ - 0.2 per cent sodium chloride (2 gm per liter of drinking water)

T₅ - 0.4 per cent sodium chloride (4 gm per liter of drinking water)

Broiler commercial feed was formulated as per the BIS standard and provided to all the treatment groups. Expecting the variations in the drinking water all other managemental practices were rendered same to all the treatment groups.

At the end of the biological trial, eight birds from each treatment were sacrificed and blood samples were collected for estimating haematological parameters.

Haematology

The blood samples were collected from each treatment group. Heller's and Paul mixture was used as the anticoagulant. Haematological studies included determination of packed cell volume by haematocrit method, haemoglobin by acid haematin method and total erythrocyte count using Hayem's fluid.

Serum biochemistry

The blood samples obtained from sacrificed birds were centrifuged after coagulation for serum separation and samples of sera were collected. Serum biochemistry included estimation of serum total protein (Varley, 1980), serum calcium by cresolphthalin complexon method, serum phosphorus by Gomori's method (Gowenlock *et al.*, 1988).

At the termination of the study period eight birds from each treatment group were randomly selected and sacrificed. Slaughter study was carried out by measuring dressing percentage and individual organ weight. The organ weight was then converted into percentage to evaluate the effect of acidic and alkaline drinking water on carcass characteristics (Arumugam and Panda, 1970). The data collected were analysed by completely randomised design (Snedecor and Cochran, 1989).

RESULTS AND DISCUSSION

Haematology

Mean values of Haematological parameters of broilers as influenced by acidification and alkaline drinking water are presented in Table 1.

The results revealed that neither the acidification nor the alkaline drinking water significantly influenced the haematological parameters viz. packed cell volume, haemoglobin percentage and Red blood cell count. Similar observations were also made by Sharma and

Malik (1986), Bora *et al.* (1991), Baidya *et al.* (1994) and Mohan *et al.* (1996). But the parameters like serum total protein and serum total calcium exerted a highly significant difference ($P<0.01$) between the treatment groups, the difference for the serum phosphorus content was also significant between the treatment groups ($P<0.05$).

Serum total protein was significantly low in alkaline drinking water groups as compared to any other treatment group. Though a highly significant difference was exhibited between acidification and alkaline drinking water groups, the acidification at 0.5 per cent lactic acid level did not differ significantly with 1 per cent lactic acid treatment group as well. Significantly lower level of serum total protein was observed in this study concurs with the findings of Anjum *et al.* (1995).

Serum calcium level was significantly ($P<0.01$) higher in alkaline drinking water group (T5 - 0.4 % sodium chloride) than the values observed in both acidification treatment group and control. No differences could be observed with in the levels of treatment either in alkaline drinking water or in acidification. Similar trend was also observed in respect of serum phosphorus except that the acidification or alkaline drinking water at lower concentration did not show any significant difference between them. Significantly higher levels of serum calcium and phosphorus were observed in alkaline drinking water groups which are in congruent with the earlier reports of Sharma and Malik (1986) and Pourreza *et al.* (1994).

The increased concentration of plasma calcium and phosphorus is due to the definite trend exerted by the dietary sodium chloride which increased gradually both calcium and phosphorus level of plasma. It is likely that high sodium chloride levels in the diet helped in absorption of calcium and phosphorus at intestinal level to increase plasma calcium and phosphorus (Fucks and Peterlik, 1979).

Carcass characteristics

Mean values of carcass characteristics of broilers as influenced by acidification and alkaline drinking water are presented in Table 1.

Table 1: Haematological Parameters of broilers as influenced by acidification and alkaline drinking water (Mean \pm S.E)

Treatments	PCV (%)	Hb (g/dl)	RBC (10^6 /ml)	Serum Total Proteins (mg/100ml)	Serum Calcium (mg/100ml)	Serum Phosphorus (mg/100ml)
Control (T ₁)	31.25 \pm 1.16	12.51 \pm 0.51	3.44 \pm 0.18	3.52 ^c \pm 0.13	9.15 ^a \pm 0.54	4.48 ^{ab} \pm 0.09
Acidification	0.5% level (T ₂)	32.75 \pm 1.22	12.99 \pm 0.47	3.45 \pm 0.18	3.79 ^{bc} \pm 0.92	10.80 ^a \pm 0.54
	1% level (T ₃)	31.75 \pm 1.25	13.49 \pm 0.57	3.51 \pm 0.20	3.92 ^a \pm 0.17	10.19 ^a \pm 0.58
	0.2% level (T ₄)	31.88 \pm 1.53	13.30 \pm 0.54	3.63 \pm 0.17	3.13 ^b \pm 0.11	12.89 ^b \pm 0.61
Alkaline drinking water	0.4% level (T ₅)	31.63 \pm 1.19	13.43 \pm 0.90	3.63 \pm 0.16	3.03 ^b \pm 0.13	13.93 ^b \pm 0.83
Over all mean	31.85	13.14	3.53	3.48	11.39	4.52

Mean values (in column) bearing at least one superscript in common do not differ significantly ($P<0.05$)

Table 2: Carcass characteristics (percentage) of broilers as influenced by acidification and alkaline drinking water (Mean \pm S.E)

Treatments	Dressed weight	Proventriculus	Gizzard	Liver	Spleen	Kidney	Heart	Intestine
Control (T ₁)	60.9 ^a \pm 0.42	0.42 \pm 0.02	2.0 \pm 0.07	1.9 \pm 0.09	0.11 \pm 0.01	0.84 \pm 0.03	0.52 \pm 0.02	1.08 ^b \pm 0.08
Acidification	0.5% level (T ₂)	63.0 ^b \pm 0.58	0.41 \pm 0.01	1.9 \pm 0.08	2.4 \pm 0.14	0.10 \pm 0.01	0.81 \pm 0.05	0.46 \pm 0.02
	1% level (T ₃)	62.1 ^{ab} \pm 0.42	0.39 \pm 0.01	1.9 \pm 0.09	2.0 \pm 0.08	0.10 \pm 0.01	0.74 \pm 0.03	0.43 \pm 0.02
	0.2% level (T ₄)	60.8 ^a \pm 0.66	0.39 \pm 0.01	2.0 \pm 0.08	2.2 \pm 0.13	0.13 \pm 0.02	0.77 \pm 0.05	0.48 \pm 0.03
Alkaline drinking water	0.4% level (T ₅)	61.2 ^a \pm 0.68	0.39 \pm 0.01	1.9 \pm 0.07	2.1 \pm 0.10	0.11 \pm 0.01	0.72 \pm 0.03	0.45 \pm 0.02
Over all mean	61.6	0.40	1.94	2.12	0.11	0.776	0.468	4.10

Mean values (in column) bearing at least one superscript in common do not differ significantly ($P<0.05$)

Significant ($P < 0.05$) dressing percentage was observed in this study with the birds in the treatment group T2 (0.5 per cent lactic acid) which had higher dressing percentage than the control group and alkalisation treatment groups. However, it did not differ with higher level of acidification. In contrary to the results observed in this study Mohan *et al.* (1996) observed no significant difference in dressing percentage. The alkalisation treatments did not exert any significant difference between the levels as well as with control group in respect of dressing percentage. This is in corroboration with the earlier reports of Smith and Teeter (1989) and Smith (1994). The weights of visceral organs namely proventriculus, gizzard, liver, spleen, kidney and heart did not exhibit any difference due to treatments. Similar results were observed by Mohan *et al.* (1996), Baidya *et al.* (1994), Rameshwar Singh (1994) and Smith (1994). However, the weight of intestines of the acidification groups exerted a highly significant difference ($P < 0.01$) with that of both the alkalisation treatment groups and control. This is in close agreement with Watkins and Kratzer (1984). They observed relatively lesser intestine weights with probiotic groups than control group. Similarly Talukdar (1992) reported higher percentage of intestine weight in control group rather than probiotic treated group.

Conclusion

The acidic medium induced by lactic acid might have resulted in the thinning of the intestines and the vice-versa with alkalisation which had resulted in significantly lesser and higher weights respectively.

Further studies are required to understand the effects of lactic acid supplementation at different levels whether it efficiently bringing down the microbial load and resulting in better performance.

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