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Effect of Hardness of Underground Waters on Production Performance of Meat Chickens

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Abstract: A six weeks trial was conducted to evaluate the effectof hardness of two underground waters on production of broiler reared at Poultry Experiment Station (PES), TandoJam and Mubashir Farm, Rahuki. Two equal groups of chickens in age and weight were reared under similar managemental conditions and offered same feed (iso-nitrogenous and iso-caloric) *ad libitum* during June-July, 2002. A non-significant intake of water and significant feed intake was recorded in group B (11.711 and 5.303) as compared to group A (11.587 and 5.083) lit/kg per broiler. Significant increase in the mean live bodyweight was recorded in group A (2.224) as compared to group B (1.851) kg b^{-1} and produced carcass weight in group B (3.17 and 18.33) gm b^{-1} as compared with group A. (2.15 and 12.10) gm b^{-1}, respectively. Spleen and kidney sizzes were larger in group B (2.32 and 6.58) than A (1.58 and 3.99) cm b^{-1}, respectively enhanced live body weight/weight gain and dressed carcass recoveries. Spleen and kidney weights and sizes increased with the increase in hardness of water.

Key words: Underground water, hardness, alkalinity, salinity, chloride, TDS, EC, broilers, live weight, carcass weight, spleen and kidney

Introduction

Water is one of the major and cheapest nutrient in nature; almost required double than amounts of feed consumed, for maintaining the body cells shape, body temperature, digestion, absorption and elimination of body wastes (Rodwell, 2000). It's need correlates with liveweight, age and genetic makeup of bird, temperature/humidity, level of performance and chemical nature of water. At normal temperatures poultry consume at least twice as much water as feed within 24 hours periods which may be due to its higher body temperature in normal situation and fast rates of respiration and heart beat.

Water is by far the largest single constituent of the body and represents about 70% of the total body weight. Of this water, about 70% forms intercellular, while 30 percent forms intracellular and blood of the body. The body water content, as a percent of body weight will decreases as the bird age and body fat content increases. Bird obtains its required quantity of water by drinking, eating and catabolism of body tissues, which was a normal part of growth and development (Lesson and Summers, 1997). Nature has provided all macro and micro minerals in water essential for every living being. Water used in the poultry farms has all those properties, which are necessary for a normal life. Water handling/making available systems increase water quality water without some form of water treatment. The quality of water should be given careful consideration during the evaluation of flock performance. So the present research was carried out to see the effect of hardness of underground waters on production performance of meat chickens.

Materials and Methods

An experiment was carried out on 120 day old commercial meat chickens which were randomly selected and divided into 2 equal groups, viz. Group A and B. Brooding for group A was arranged at Poultry Experiment Station (PES), Department of Poultry Husbandry, Faculty of Animal Husbandry and Veterinary Sciences, Tandojam and group B at a Private Poultry Farm (Mubashir at Rahuki) during June to July, 2002. Wooden dust was used as litter, which was spread about 2 inches thick after using dry limestone on floor. Brooder's temperature was maintained between 90 to 95°F during first week and was reduced by 5°F per week till it reached 70°F, which was maintained as house temperature up to the end of the trial. Humidity inside the shed was maintained about 60%. ND, IB, IBD and Hydropericardium disease vaccines were performed.

Chickens were provided commercially available same pre-starter, starter and finisher crumbles/pellets (iso-nitrogenous and iso-caloric) rations *ad libitum* over two weeks period each. Daily offered, refusal and total intake of feed was recorded for each group. Two different waters were offered 24 hours to chickens kept in group A and B. During the trial; to group A underground water of Tandojam (UG, TJ) and to group B underground water of Mubashir at Rahuki (UG, Rk). Offered and refused water of each group was measured 3 times per day by using 1000ml measuring glass/cylinder.

Fresh water samples from the study area were collected each week and brought for the determination of pH and qualitative analysis (chlorides, salinity, alkalinity, TDS and EC) to the laboratory of M. A. Qazi Institute of Chemistry and Institute of Biochemistry, Sindh University, Jamshoro (Merck, 1974; Hussain and Jabbar, 1995)

All the chickens in their respective groups (A and B) were individually weighted at the beginning and later at the end of each week upto the completion of 6 weeks. Ten broilers from each group A and B were randomly selected and slaughtered at the end of the experiment to record bodyweight at slaughter, carcass weight, weight and size of spleen and kidneys of each broiler. The collected data were tabulated and analyzed by using Minitable Microcomputer Software (M. T. B., 1992) in General Linear Model (G. L. M).

Results and Discussion

Water: The collected samples of both the underground waters were determined for their pH and qualitative properties. The comparative values for the properties of Underground water at TandoJam (TJ) and Rahuki (RK) contained, pH 7.42 and 7.91; alkalinity 462 and 539 mg L^{-1} salinity 0.6 and 1.6 g L^{-1} Chloride 117.70 and 441.00 mg^{-1} TDS 761.6 and 1990.4 mg L^{-1} and EC 1190 and 3110 μs/cm, respectively. The underground water of PES, TJ was lower in all the determined properties as compared with underground water of Mubashir, RK.

Results related to average water intake (Table 1) of chickens shows that the difference between both the groups was non-significant. While the interaction between groups and weeks for weekly water intake reveals that there was continuous increase in water consumption by both the group's chickens over 6 weeks and a significant difference was found (G x W) (Fig. 1). Similar findings reported by Rind (2003) that broiler kept in Thar desert on almost hard water were competing efficiently during feed and water intakes.

Table 1: Average water intake of broiler offered various underground waters (lit b^{-1} over 6 weeks)

Group		SED	Probability
A	B		
11.587	11.711	2.264	0.917

Feed: The results shows that chickens housed in group B consumed significantly more feed (av. 5.303 kg b^{-1}) as compared with group A chickens (av. 5.083 kg b^{-1}) Table 2. Interaction between groups and weeks shows significantly different for weekly feed intake of chickens. Results of each week show a continuous rise in broiler feed intake up to the end of slaughter age of both groups (Fig. 2). The results reported by Pourreza, *et al.*, 2000 are in accordance with the findings of present study, who observed that feed intake in broilers was affected by offering waters with different TDS in Iran.

Table 2: Average feed intake of broiler offered various underground waters 9kg b^{-1} over 6 weeks).

Group			
A	B	SED	Probability
5.083	5.303	0.201	0.032

Live Body Weight

During Trial: The result sin Table 3 regarding the average bodyweight gain shows that group A chickens offered UG, TJ had achieved maximum weight (av. 2.181 kg b^{-1}) than group B (av. 1.808 kg/b) ($P<0.05$). The interaction between groups and weeks for bodyweight gain indicates a significant difference among the group statistically.

Table 3: Average live bodyweight and weight gain of broiler offered various underground waters (kg b^{-1})

Group	Initial live body weight	Final live live body weight	Weight gain
A	0.043	2.224	2.181
B	0.043	1.851	1.808
Probability	NS	0.000	*

During Slaughtering: The results pertaining to live bodyweight of broiler at slaughtering stage in each group A got maximum live bodyweight (av. 2.556 kg b^{-1}) followed by group B (av. 1.967 kg b^{-1}) ($P<0.05$). While the results regarding the carcass weight of broiler shows a significant difference such as the average of group B (av. 1.628 and 1.242 kg b^{-1}), respectively (Table 4)

Visceral Organs (Weight and Size)

Kidney: The data related to average weight of kidney of broiler reared in group significantly heavier (av. 18.33 gm b^{-1}) than group A (av. 12.10 gm b^{-1}) respectively (Table 5). While the results on average kidney size of broiler shows that group B (av. 6.58 cm b^{-1}) was significantly enlarged than group A (av. 3.99cm b^{-1}), repsectively (Table 6).

Spleen: Results pertaining to average weight of spleen

Table 4: Average live bodyweight (Pre-slaughter) and carcass weight of broiler offered various underground waters (kg b^{-1})

Particulars	Group		SED	Probability
	A	B		
Live body weight at slaughtering	2.556	1.967	0.185	0.000
Carcass weight	1.628	1.242	0.138	0.000
Carcass (%)	63.69	63.14		

Table 5: Average weight of Kidney and Spleen of broiler offered various UG waters (gm b^{-1})

Particulars	Group		SED	Probability
	A	B		
Kidney weight	12.10	18.33	0.785	0.000
Spleen weight	2.15	3.17	0.544	0.160

Table 6: Average size of Kidney and Spleen of broiler offered various UG waters (cm b^{-1})

Particulars	Group		SED	Probability
	A	B		
Kidney size	3.99	6.58	0.344	0.000
Spleen size	1.58	2.32	0.322	0.039

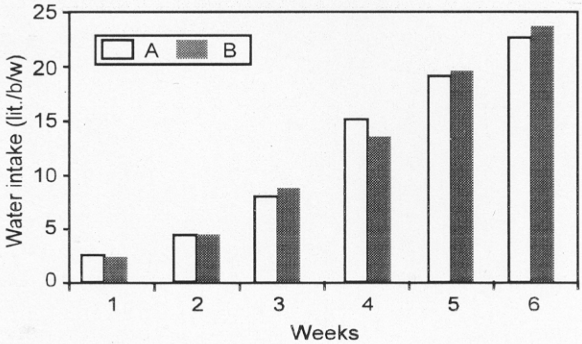

Fig. 1: Interaction between groups and weeks for water intake of broiler offered vsarious underground waters

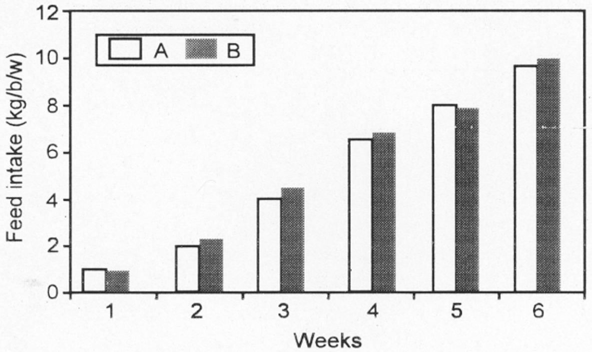

Fig. 2: Interaction between groups and weeks for feed intake of broiler offered various underground waters

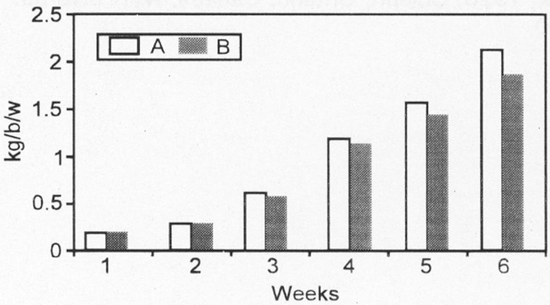

Fig. 3: Interaction betwen groups and weeks for livebody weight of broiler offered various underground waters

of broiler reared on various waters shows statistically non-significant difference from each other (Table 5). Mean spleen weights were 3.17 gm b^{-1} for group B and 2.15 gm b^{-1} for group A, respectively. The results regarding the average size of spleen of broiler (Table 6) shows a significant difference from each othe. Group B rearhed at maximum (av. 2.32 cm b^{-1}) than group A (av. 1.58 cm/b), respectively. The findings of Grizzle, *et al.*, 1996, were in support of the present research, who experienced that spleen weights reduced due to drinking water with low pH and nitrate. Furthermore, the results of Shoremi, *et al.* (1998) were well comparable with the findings of present research, who reported that kidney weight reduced due to inadequate water intake as the aluminum content of water increased.

Conclusion

It was concluded that various waters with different pH, alkalinity, salinity, chloride, TDS and EC affects the overall water and feed intake of meat chickens. UG waters low concentration effectively enhanced live bodyweight/weight gain and dressed carcass recoveries in comparison with high concentration water consuming broilers. Kidney and spleen weights and were sizes increased with the increase in the concentration of water contents offered to broilers.

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