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EFFECT OF DIFFERENT DIETARY LEVELS OF NACL AND KCL ON PERFORMANCE OF BROILER CHICKS FED PLANT DIETS

By

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Abstract: *This work was conducted to study the effect of dietary supplementation of NaCl and KCl to broiler's plant diets on performance, carcass characteristics and meat quality. Three days old broiler chickens (Arbor Acres; n: 108) were randomly distributed among 6 dietary treatments of 3 replicates each with 6 unsexed chickens each. Experimental treatments included 3 dietary levels of NaCl (0.0, 0.3 and 0.5%) and 2 dietary levels of KCl (0.0 and 0.6%) in a (3x2) factorial design. Experimental diets and water were offered ad. libitum throughout the experimental period from 3 to 56 days of age.*

Results revealed that the highest average body weights and gains were due to NaCl addition of 0.3% with 0.6% KCl as compared to those fed without or with 0.5% NaCl and 0.6% KCl. Feed intake was significantly increased and feed conversion ratio was also, improved with increasing dietary NaCl from 0.0 to 0.3% with diminishing responses due to further increase of NaCl up to 0.5% (0.22% Na). On the other hand, no significant main effect of KCl or interaction between NaCl and KCl on feed intake or conversion ratio was noted.

Feeding the control plant diet significantly reduced dressing and breast meat percentages as compared to other dietary NaCl levels. Plant diet supplementation with KCl (0.6%) significantly increased dressing percentage by 4%. Kidney, pancreas and gizzard enlargements were observed as control diets were fed. Shearing force, bound water and bone breaking strength were not affected by dietary NaCl and KCl, whereas meat plasticity was affected by KCl level and the interaction.

INTRODUCTION

The monovalent minerals sodium (Na^+), potassium (K^+), and chloride (Cl^-) are known as "strong ions" due to their exert characteristic effects on the chicken's acid-base homeostasis. These minerals are considered together because of similarity of their functions and distribution in the body, in contrast to Ca, P and Mg, which are stored in the skeleton. Sodium and potassium occur largely in body fluids and soft tissues. These ions play major roles in synthesis of tissue proteins, maintenance of intracellular and extracellular homeostasis, maintenance of the electric potential of cell membranes, osmotic pressure, glucose and amino acid absorption and transport, development of membrane potentials of cells and acid-base homeostasis, as well as in enzyme and nerve functioning (Mongin, 1980 and Leeson and Summers, 2001). The NRC (1994) recommended levels for Na, Cl and K are 0.20, 0.15 and 0.12, 0.20, 0.15 and 0.12 and 0.30, 0.30 and 0.30% for birds aged 0 to 3, 3 to 6 and 6 to 8 weeks of age, respectively. Various equation have been proposed (Leach, 1980) to define an optimum balance of Na, K and Cl for feed formulation.

Sodium occurs largely in the extracellular fluids (with less than 10%) and bones while, K mainly found inside cells, muscles and nervous tissues. Sodium makes up over 90% of the base of serum and thus it is the major cation in acid-base regulation, while in blood the level of Na is higher than that of K by an order of magnitude (Aron, 1982). An excess of Na may cause alkalosis, therefore it is desirable to feed rations supplying approximately equivalent amounts of Na and Cl.

Edwards (1984) demonstrated that the weekly Na requirements for maximum growth of the chick was found to be 0.41, 0.33 and 0.30% in the diet for the first 3 weeks of age and Cl requirements were 0.53, 0.37 and 0.36 % for the same periods. Wojcik *et al.* (1983) found that the body weights of broiler chicks at 8 wks of age fed starter and finisher diets containing 0.4 and 1.2 % NaCl were significantly increased as compared to those fed 0.0% NaCl. Murakami *et al.* (1997), Oviedo-Rondon *et al.* (2001) and Mushtaq *et al.* (2007) concluded that the Na and Cl requirements for optimum performance of young broiler chickens up to 21 day of age and from 22 to 42 day were 0.28, 0.25% and 0.15, 0.23%, respectively. Murakami *et al.* (1997) reported an optimum Na level of 0.12 and 0.15, respectively, for weight gains and feed conversion ratio of broiler from 21 to 42 day of age.

Sodium, potassium, broilers, performance, meat quality.

Potassium is the 3rd most abundant intracellular cation, is involved in many metabolic processes, including nerve conduction, excitation-contraction in muscles, and regulation of cell volume (McDoweell, 1992 and Chen *et al.*, 2003). Potassium dose not independently, and the correct balance among Na, K and Cl is necessary for optimal animal performance, bone development, egg shell quality and amino acid metabolism (Mongin, 1980). Consequently, changes in K homeostasis profoundly affect cellular functions (Their, 1986). A daily K intake of 1.8 to 2.3 g has been recommended for maximum body weight gain in broilers under hot conditions (Rao *et al.*, 2002). However, providing K as potassium bicarbonate exaggerated respiratory alkalosis (Borges *et al.*, 2003). Ahmad *et al.* (2008) reported that supplementing drinking water with 0.6% KCl significantly increased body weight gain by 14.5 and 7.9% at 28 and 42 d of age, respectively, relative to the control. Also, a significant improvement in feed conversion ratio and a reduction in body temperature were noted in groups fed 0.6% KCl as compared with control and 0.3% KCl. The NRC (1994) recommended K level is 0.3% for broilers during growing and finisher periods, are considerably lower than levels typically presented in commercial plant diets. Oliveira *et al.* (2005) determined K nutritional requirements in birds from 8 to 21, 22 to 42 and 42 to 53 days of age to be 0.628, 0.714 and 0.798 %, respectively. Furthermore, authors added that at 8 to 21 day of age, a quadratic effect to body weight gain (K estimated BWG= 0.628%) and fed intake (K estimated FI= 0.640%) and above 0.72% K feed intake began to decrease.

The objective of this study was to investigate the effect of different dietary Na and/or K levels on productive performance, carcass characteristics and meat quality of broiler chickens.

MATERIALS AND METHODS

This experiment was conducted to study the relationship between NaCl and KCl on performance of broiler chickens fed plant diets. A total of 108 unsexed Arbor Acres broiler chickens (3-days old) were fed the experimental diets from 3 to 56 days of age. Chickens were randomly distributed in a factorial design among 6 dietary treatments (3x2). Each treatment was replicated 3 times of 6 chicks each. Experimental treatments included 3 NaCl levels (0.0, 0.3 and 0.5%) and 2 KCl levels (0.0 and 0.6%) in factorial (3x2) design. Basal corn-soybean, not supplemented with NaCl level, were formulated to contain 21.45% CP and 2933 kcal ME/kg feed for the first 4 weeks of age, then finisher corn-soybean diet were formulated to contain 17.50% CP and 3019 kcal ME/kg feed from 5 to 8 weeks of age (Table 1).

General Management:

Experimental diets and water were offered *ad. libitum* all over the experimental period. Chickens in all treatments were kept under similar managerial and hygienic conditions. Body weights (**BW**), weight gains (**BWG**), feed intake (**FI**) and feed conversion ratio (**FCR**) were determined at 4 and 8 weeks of age. At the end of the experimental, 3 chicks from each treatment were randomly chosen and slaughtered for carcass characteristics evaluation, where liver, spleen. heart and bursa organs were removed and weighed.

Physico-chemical Properties of meat :

Water holding capacity (**WHC**) and plasticity were measured according to Grau and Hamm (1957) as modified by Volovinskaia and Merkoolova (1958), shearing force was measured by the method of Lyon *et al.* (1985, 1989) as modified by Sams *et al.* (1992). Also, the bone breaking strength was measured following the method of Shafey (1991) and Watkins and Lee Southern (1991).

The statistical analysis was conducted using SAS® (2001) software program. Two way ANOVA of GLM procedures of SAS were used. Mean differences were tested by Duncan's New Multiple Range Test (Duncan's, 1955).

RESULTS AND DISCUSSION

Mineral contents of drinking water including Ca, Na^+ and Mg are presented in (Table 2), and water quality was found in an acceptable range for farm animals. Also Na and K content of basal diets during the growing and finisher periods were 0.03 and 0.03, 0.92 and 0.74, respectively. The Na content was lower from the recommended level for broiler chickens by NRC (1994), even when Na of the drinking water was considered.

Increasing dietary NaCl significantly increased ($P \leq 0.05$) average BW and BWG, but dietary KCl supplementation insignificantly affected growth at 28 day of age. During the 2^{nd} experimental period (28 to 56 d) and at the end of experimental period (56 d) growth was significantly affected ($P \leq 0.05$) by NaCl and KCl dietary levels, but not by the interaction. Results at the end of the experiment revealed that the highest average growth was observed due to addition 0.3% NaCl (1892.1 g) as compared to those fed diet without or with 0.5% NaCl and 0.6% KCl (Table 3). Results indicated that Na requirement for broiler fed plant diet is about 0.14% (0.3% NaCl). It seems that the relation of Na and K is independent of each other, since both factors had a significant influence on BWG at 56 days of age; however, the interaction was insignificant although these results showed a positive response to 0.6% KCl when added with of 0.30% NaCl. Grunert *et al.* (1950) showed that there was a slight sparing effect of the Na requirement by high dietary K levels and a large effect in K requirement by increasing Na levels.

Present results almost agree with those of Murakami *et al.* (1997 and 2000), who reported that Na level of 0.15% was sufficient to maintain maximum growth rate of male broilers grown to 56 days. Also, Ahmad *et al.* (2008) indicated that supplementing drinking water with 0.6% KCl significantly increased BWG by 14.5 and 7.9% at 28 and 42 d of age, respectively. On the other hand, Oviedo-Rondon *et al.* (2001) and Mushtaq *et al.* (2007) reported Na and Cl requirements for optimum performance of young broiler chickens up to 21 day of age (0.28 and 0.25%) and from 22 to 42 day and (0.15 and 0.23%), respectively. Note that NRC (1994) recommended levels for Na, Cl and K are 0.20, 0.15 and 0.12%, 0.20, 0.15 and 0.12 and 0.30, 0.30 and 0.30 for birds from 0 to 3, 3 to 6 and 6 to 8 wk of age, respectively. Wojcik *et al.* (1983) found that growth rate of broiler chickens at 8wks of age has increased significantly ($P \leq 0.05$) as birds were fed starter and finisher diets containing 0.4 and 1.2 % compared to those fed 0.0 % NaCl.

During the whole experimental period and at the end of the experiment FI was significantly increased and FCR was significantly improved ($P \leq 0.05$) by increasing NaCl dietary supplementation from 0.0 to 0.3% NaCl with no further response as NaCl increased to 0.5% NaCl (0.22% Na). No significant effects of KCl supplementation or NaCl x KCl interaction on FI and FCR were observed. Although it seems that broilers fed diet supplemented with 0.60% KCl yielded better FCR throughout the experimental period than those fed the control diet (Table 3). The role of NaCl in stimulating appetite is clear from obtained results, while K level had no significant effect on FI. Na and Cl are important factors to stimulate feed intake especially during the first weeks of age and this is depended to stimulation of appetite for feed (Edwards, 1984 and Britton, 1992). Oliveira *et al.* (2005) found a quadratic effect in FI from 8 to 21 days, (K estimated for the highest FI= 0.640%) and above 0.72% K the FI began to decrease. also they observed no significant effect of K on FCR. In agreement with the positive present results, Ahmad *et al.* (2008) demonstrated a significant improve ($P \leq 0.05$) in FCR for broiler supplemented with 0.6% KCl as compared with control and 0.3% KCl.

Dressing percentages as well as breast meat percentage were significantly ($P \leq 0.05$) influenced by NaCl level, in which feeding plant diet without added NaCl significantly decreased dressing and breast meat percentages as compared to the two added NaCl levels (Table 4). However, Mushtaq *et al.* (2005) reported that dressing weight was not influenced by dietary Na levels. Also, Sayed *et al.* (2008) indicated that carcasses characteristic were not significantly affected by different levels of Na. Supplementation of 0.6% KCl to the plant diet significantly ($P \leq 0.05$) improved only the dressing percent by 4% (Table 4). There was no significant effect of KCl on thigh and breast meat percentages. No significant interaction was showed on dressing, thigh and breast meat percentages. Percentages of heart, liver, spleen showed no significant effect of both variables, and their interactions. Enlargements in kidney, pancreas and gizzard were shown when diets were fed without adding NaCl or KCl. The NaCl x KCl interaction was significant ($P \leq 0.05$) only on pancreases, where pancreas percentage showed no change under the intermediate NaCl level and decreased by adding KCl in the diet under the other NaCl levels. However, the magnitude was greater in the control diet. Curran (1965), Crane (1965) and Lee and Campbell (1983) reported that Na play an essential role in the processes leading to the absorption of sugars and amino acids in the intestine. That could influence tissues and subsequently organs weight. This observation may be explaining the enlargement in the kidney, pancreas and gizzard enlargement when the Na deficient diet was fed. This showed an adaptive response of chicks to overcome the Na deficiency. Furthermore, the intestinal length significantly increase with increasing NaCl level up to 0.30 or 0.50%. This may be reflected in improvement of nutrient absorption and could explain the improvement in growth performance of broiler chickens fed NaCl supplemented diet. No effect of KCl and the interaction between NaCl and KCl was showed on the intestinal length (Table 4).

Shearing force, bound water and bone breaking strength showed no effect of dietary NaCl, KCl and their interaction (Table 5). This result agreed with the result of Kornegay *et al.* (1991) who reported that Na intake did not consistently influence bone diminution and strength characteristics. Also, Mushtaq *et al.* (2007) found that dietary Na at 0.30% significantly increased toe ash %. However, Sayed *et al.* (2008) indicated that increasing Na level from 0.20 to 0.30 % significantly reduce ($P \leq 0.05$) dried tibia weight, tibia bone ash, tibia bone calcium and tibia bone phosphorus percentages.

Plasticity of meat was affected by KCl levels and interaction between NaCl and KCl levels. Plasticity of meat of chicks fed diets without adding KCl was significantly higher than those fed 0.60% KCl. The present result confirmed that NaCl affected on protein deposition in the tissue moreover, protein deposit was influenced by K levels and the interaction between the two variables.

In conclusion, feeding broiler chickens corn-soybean diet supplemented with 0.3 % NaCl and/ or 0.6% KCl from 3 to 56 days of age should yield the best for growth performance and meat quality.

Table (1): Composition and calculated analysis of experimental diets

Ingredients	Starter (3-28 d)						Finisher (29-56 d)					
Yellow corn	55.00	55.00	55.00	55.00	55.00	55.00	65.00	65.00	65.00	65.00	65.00	65.00
Soybean meal *(44 CP)*	38.00	38.00	38.00	38.00	38.00	38.00	27.00	27.00	27.00	27.00	27.00	27.00
Bone meal	2.50	2.50	2.50	2.50	2.50	2.50	2.70	2.70	2.70	2.70	2.70	2.70
Lime stone	0.50	0.50	0.50	0.50	0.50	0.50	0.47	0.47	0.47	0.47	0.47	0.47
Corn oil	2.55	2.55	2.55	2.55	2.55	2.55	2.50	2.50	2.50	2.50	2.50	2.50
Premix[1]	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
NaCl	0.00	0.30	0.50	0.00	0.30	0.50	0.00	0.30	0.50	0.00	0.30	0.50
KCl	0.00	0.00	0.00	0.60	0.60	0.60	0.00	0.00	0.00	0.60	0.60	0.60
Methionine	0.10	0.10	0.10	0.10	0.10	0.10	0.14	0.14	0.14	0.14	0.14	0.14
sand	1.10	0.80	0.60	0.50	0.20	0.00	1.94	1.64	1.44	1.34	1.29	0.84
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Calculated analysis, %												
ME, (kcal/ kg)	2933	2933	2933	2933	2933	2933	3019	3019	3019	3019	3019	3019
Crude protein	21.45	21.45	21.45	21.45	21.45	21.45	17.47	17.47	17.47	17.47	17.47	17.47
C/P ratio	136.7	136.7	136.7	136.7	136.7	136.7	172.8	172.8	172.8	172.8	172.8	172.8
Methionine	0.44	0.44	0.44	0.44	0.44	0.44	0.43	0.43	0.43	0.43	0.43	0.43
TSAA	0.77	0.77	0.77	0.77	0.77	0.77	0.71	0.71	0.71	0.71	0.71	0.71
Lysine	1.10	1.10	1.10	1.10	1.10	1.10	0.95	0.95	0.95	0.95	0.95	0.95
Ether extract	3.38	3.38	3.38	3.38	3.38	3.38	2.92	2.92	2.92	2.92	2.92	2.92
Crude fiber	5.03	5.03	5.03	5.03	5.03	5.03	5.27	5.27	5.27	5.27	5.27	5.27
Calcium	0.98	0.98	0.98	0.98	0.98	0.98	0.99	0.99	0.99	0.99	0.99	0.99
Ava. Phosphorus	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
Sodium	0.03	0.14	0.22	0.03	0.14	0.22	0.03	0.03	0.14	0.22	0.14	0.22
Potassium	0.92	0.92	0.92	1.23	1.23	1.23	0.74	0.74	0.74	1.05	1.05	1.05

[1]Premix supplied per kg of diet: Vit A, 5500 IU; Vit E, 11 IU; Vit D_3, 1100 IU; riboflavin, 4.4 mg; Ca pantothenate, 12 mg; nicotinic acid, 44 mg; choline chloride, 191 mg; vitamin B_{12}, 12.1 ug; vitamin B_6, 2.2mg; thiamine (as thiamine mononitrate), 2.2 mg; folic acid, 0.55 mg; d-biotin, 0.11 mg. Trace mineral (mg /kg diet): Mn, 60; Zn, 50; Fe, 30; Cu, 5 and Se, 0.3.

Table (2) Minerals contents*of water supply of poultry research center

Mineral	Concentrate (mg/ l)
Ca	51.70
Na	56.35
Mg	21.17

* Source El-Seuof water station.

Table(3): Effect of different NaCl and/or KCl levels on growth performance of broiler chickens

Parameters	Age (day)	KCl level	NaCl Level			Average	SEM	Sig. of inter.
			0.00	0.30	0.50			
Body weight (g)	3	0.00	48.7	47.9	48.3	48.3	1.01	NS
		0.60	48.8	48.7	48.5	48.7		
		Average	48.8	48.3	48.4			
	28	0.00	308.0	781.6	829.8	639.8	22.9	*
		0.60	781.6	826.7	796.9	668.9		
		Average	326.7 ^{b}	804.1 ^{a}	813.4 ^{a}			
	56	0.00	493.1	1828.3	1739.4	1353.6 ^{B}	56.5	NS
		0.60	706.9	1955.9	1710.0	1457.6 ^{A}		
		Average	600.0 ^{c}	1892.1 ^{a}	1742.7 ^{a}			
Body weight gain (g)	3-28	0.00	259.3	733.6	781.4	591.5	22.6	*
		0.60	334.3	778.	748.4	620.3		
		Average	296.8 ^{b}	755.8 ^{a}	764.9 ^{a}			
	28-56	0.00	183.0	1046.4	909.7	639.8 ^{B}	46.9	NS
		0.60	335.8	1119.4	913.1	668.9 ^{A}		
		Average	259.4 ^{c}	1082.0 ^{a}	911.4 ^{b}			
	3-56	0.00	444.5	1780.6	1691.1	1305.3 ^{B}	56.3	NS
		0.60	657.8	1907.5	1661.5	1408.9 ^{A}		
		Average	551.6 ^{c}	1843.9 ^{a}	1676.3 ^{b}			
Feed Intake (g)	3-28	0.00	1063.6	1388.9	1532.2	1328.2	82.64	NS
		0.60	1131.1	1471.1	1462.2	1354.8		
		Average	1097.4 ^{b}	1430.0 ^{a}	1497.2 ^{a}			
	28-56	0.00	1913.9	3015.0	2940.0	2622.9	133.3	NS
		0.60	2237.2	2978.1	2760.0	2658.4		
		Average	2075.6 ^{b}	2996.5 ^{a}	2850.0 ^{ab}			
	3-56	0.00	2977.5	4403.9	4472.2	3951.2	181.2	NS
		0.60	3368.3	4449.2	4222.2	4013.2		
		Average	3172.9 ^{b}	4426.5 ^{a}	4347.2 ^{a}			
Feed conversion ratio (g/g)	3-28	0.00	4.16	1.89	1.96	2.67	0.40	NS
		0.60	3.62	1.88	1.95	2.50		
		Average	3.89 ^{a}	1.89 ^{b}	1.96 ^{b}			
	28-56	0.00	12.01	2.87	3.27	6.05	1.54	NS
		0.60	6.73	2.67	3.08	4.16		
		Average	9.37 ^{b}	2.77 ^{b}	3.18 ^{b}			
	3-56	0.00	7.04	2.47	2.65	4.05	0.70	NS
		0.60	5.20	2.34	2.55	3.40		
		Average	6.12 ^{a}	2.41 ^{b}	2.60 ^{b}			

$^{a b}$ Means within a column or a row with no common superscript differ significantly ($P \leq 0.05$). NS = not significant

Table (4): Effect of different NaCl and/or KCl levels on carcass characteristics of broiler chickens

Parameters, (%)	KCl level	NaCl Level 0.00	0.30	0.50	Average	SEM	Sig. of inter.
Dressing	0.00	61.53	72.72	72.90	69.05[a]	1.70	NS
	0.60	67.15	75.60	72.60	71.80[b]		
	Average	64.34[b]	74.20[a]	72.75[a]			
Thigh	0.00	21.36	22.21	20.60	21.40	1.41	NS
	0.60	18.22	22.00	21.10	20.44		
	Average	19.80	22.10	20.83			
Breast	0.00	15.59	21.20	19.41	18.74	1.02	NS
	0.60	16.85	20.64	19.56	19.02		
	Average	16.22[b]	20.92[a]	19.48[a]			
Heart	0.00	0.62	0.50	0.52	0.55	0.05	NS
	0.60	0.41	0.48	0.50	0.46		
	Average	0.52	0.49	0.51			
Liver	0.00	3.15	2.22	2.44	2.60	0.50	NS
	0.60	2.82	2.10	2.51	2.47		
	Average	3.00	2.16	2.48			
Kidney	0.00	0.81	0.65	0.74	0.73[a]	0.10	NS
	0.60	0.70	0.50	0.70	0.63[b]		
	Average	0.76[a]	0.58[b]	0.72[ab]			
Pancreas	0.00	0.52	0.22	0.32	0.35[a]	0.04	**
	0.60	0.24	0.22	0.22	0.22[b]		
	Average	0.37[a]	0.22[b]	0.27[b]			
Spleen	0.00	0.23	0.20	0.20	0.21	0.04	NS
	0.60	0.20	0.17	0.20	0.19		
	Average	0.22	0.19	0.20			
Gizzard	0.00	3.20	2.34	2.04	2.53	0.31	NS
	0.60	2.70	1.83	2.30	2.28		
	Average	2.95[a]	2.10[b]	2.17[b]			
Intestinal length (cm)	0.00	170.0	176.7	176.7	174.5	8.95	NS
	0.60	130.0	183.3	165.0	159.4		
	Average	150.0[b]	180.0[a]	170.9[a]			

[a-b] Means within a column or a row with no common superscript differ significantly ($P \leq 0.05$)
NS = not significant ** = $P \leq 0.01$

Table(5): Effect of different NaCl and/or KCl levels on physical characteristic of meat of broiler chickens

Parameters	KCl level	NaCl Level 0.00	0.30	0.50	Average	SEM	Sig. of inter.
Shearing force (kg force/40g)	0.00	173.9	136.7	172.8	161.1	19.71	NS
	0.60	163.6	176.2	140.9	160.2		
	average	168.8	156.5	156.9			
Bound Water	0.00	98.70	99.14	98.75	98.86	0.19	NS
	0.60	99.13	98.89	99.27	99.10		
	average	98.92	99.02	99.01			
Plasticity	0.00	0.152	0.321	0.294	0.256[a]	0.048	*
	0.60	0.211	0.213	0.102	0.175[b]		
	average	0.182	0.267	0.198			
Bone breaking strength (kg force/kg)	0.00	6.65	6.66	6.66	6.66	0.11	NS
	0.60	6.40	6.67	6.67	6.58		
	average	6.53	6.67	6.66			

a-b Means within a column or a row with no common superscript differ significantly ($P \leq 0.05$)

NS = not significant * = $P \leq 0.05$

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الملخص العربى

تأثير مستويات مختلفة من كلوريد الصوديوم و / أو كلوريد البوتاسيوم على أداء كتاكيت اللحم المغذاة على أعلاف نباتية

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أجريت التجربة لدراسة تأثير اضافة مستويات متدرجة من كلوريد الصوديوم و/ أو كلوريد البوتاسيوم الى الأعلاف النباتية والمستخدمة فى تغذية كتاكيت اللحم وذلك على صفات الأداء وجودة الذبيحة واللحم. تم توزيع عدد ١٠٨ كتكوت عمر ٣ يوم (اربورايكر) الى ستة معاملات غذائية وتتضمن كل معاملة ثلاث مكررات وبكل مكررة ٦ كتاكيت. وكانت نسبة كلوريد الصوديوم المضافة هى ٠.٠ و ٠.٣ و٠.٥% ونسبة كلوريد ابوتاسيوم (٠.٠ و ٠.٦%) وذلك فى تصميم عشوائى متداخل (٣X ٢). تم تقديم علف التجربة والماء للأستهلاك بصورة حرة خلال فترة الدراسة من عمر ٣ ايام الى ٥٦ يوم.

أوضحت النتائج ان أعلى متوسط وزن جسم وكذلك وزن الجسم المكتسب كان نتيجة لاضافة ٠.٣% من كلوريد الصوديوم مع ٠.٦% كلوريد البوتاسيوم الى علف كتاكيت اللحم مقارن بالتى غذيت على ٠.٥% من كلوريد الصوديوم و ٠.٦% من كلوريد البوتاسيوم.

اوضحت النتائج ان اعلى متوسطات لوزن الجسم و كذلك وزن الجسم المكتسب كان نتيجة لإضافة ٠.٣% من كلوريد الصوديوم و ٠.٦% كلوريد البوتاسيوم. تزداد كمية العلف المستهلكة وتتحسن الكفاءة التحويلية.للعلف معنويا بزيادة مستوى كلوريد الصوديوم المستخدم من ٠.٠% الى ٠.٣% بينما عند المستوى ٠.٥% من كلوريد الصوديوم (٠.٢٢% صوديوم) كانت الزيادة طفيفة.

لايوجد تأثير لاضافة كلوريد الصوديوم وكذلك للتداخل بين كل من كلوريد الصوديوم وكلوريد البوتاسيوم على كمية العلف المستهلكة أو الكفاءة التحويلية للعلف. التغذية على أعلاف نباتية بدون استخدام كلوريد الصوديوم يؤدى الى انخفاض معنوى فى نسبة التصافى ونسبة لحم الصدر مقارنة مع المجموعتين المضاف الى أعلافهما كلوريد الصوديوم. أضافة كلوريد البوتاسيوم الى الأعلاف النباتية عند المستوى المستخدم فى التجربة (٠.٦%) يؤدى الى زيادة معنوية فى نسبى التصافى بنسبة ٤% فقط.

لوحظ تضخم فى الكليتين و البنكرياس والقونصة نتيجة لعدم اضافة كل من كلوريد الصوديوم و كلوريد البوتاسيوم الى علف كتاكيت اللحم. قوة الشد و الأحتفاظ بالماء للأنسجة وقوة الكسر للعظام لم تتأثر نتيجة لأضافة كلوريد الصوديوم و كلوريد البوتاسيوم ، بينما ليونة وطراوة الأنسجة تتأثر معنويا بمستويات كلوريد البوتاسيوم وكذلك بالتداخل بين امعاملات المختلفة.