

BROILER PERFORMANCE AT HIGH TEMPERATURES IN RELATION TO
DIETARY ELECTROLYTE BALANCE AND CATION-ANION BALANCE

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Although relationships exist between broiler performance, acid-base homeostasis and the ionic composition of the diet, attempts to define a practical ionic balance equation for use in feed formulation have been inconclusive. Such an equation is likely to be more important at high temperatures where panting can induce respiratory alkalosis. Normally, few salts have been used in testing such equations, with a majority of studies using only NH_4Cl and NaHCO_3 .

The present study was designed to compare dietary electrolyte balance [$\text{EB} = \text{Na} + \text{K} - \text{Cl}$, mEq/kg] with cation-anion balance [$(\text{CAT} - \text{AN}) = (\text{Na} + \text{K} + \text{Ca} + \text{Mg}) - (\text{Cl} + \text{P} + \text{S})$, mEq/kg]. Twelve diets were formulated to enable simultaneous comparisons between EB, (CAT-AN) and specific ion effects. Male broiler chicks (21-d old) were housed at a constant 30°C and given free access to feed and water. Feed intakes and weight gains were measured to 42 days of age and feed conversion ratios (F.C.R.) calculated.

Table 1. Performance of broilers from 21-42 days of age

DIET	TOTAL ION (g/kg)	EB (mEq/kg)	(CAT-AN) (mEq/kg)	GAIN (g)	F.C.R. (g/g)
Basal		186	485	1247 bcd	2.03 bcd
CaCO_3	Ca 15.24	186	787	1142 a	2.07 d
MgCO_3	Mg 5.55	186	786	1210 b	2.04 cd
K_2CO_3	K 18.29	487	786	1219 bc	2.04 bcd
Na_2SO_4	Na 3.98				
	S 1.08	286	484	1234 bcd	2.00 abc
Na_2CO_3	Na 8.62	488	787	1259 bcde	2.01 abc
NH_4Cl	Cl 5.95	85	384	1260 bcde	1.99 abc
NaH_2PO_4	Na 3.98				
	P 3.09	286	405	1264 bcde	1.99 abc
NaCl	Na 3.98				
	Cl 5.95	183	483	1269 cde	1.99 abc
KCl	K 10.49				
	Cl 5.95	186	485	1277 cde	1.97 abc
$(\text{NH}_4)_2\text{SO}_4$	S 1.11	186	381	1282 de	1.96 ab
NaHCO_3	Na 8.61	487	787	1317 e	1.93 a

Within a column values with the same suffix are not significantly different ($P > 0.05$)

There was no significant effect of either EB or (CAT-AN) on weight gain or feed conversion. The carbonates, other than Na_2CO_3 , performed the most poorly of all the salts. Birds fed NaHCO_3 gave the best performance and this treatment was the only one to show significant improvements in weight gain and feed conversion compared with birds fed the basal diet.

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