GROWTH AND ENERGY EFFICENCY OF BROILERS FED DIFFERENT COMMERCIAL PREMIXES AT TWO DEVELOPMENTAL STAGES

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ABSTRACT

Three different brands of commercial premixes were fed to a total of 270 Brown Hypeco breeds of broilers at starter and finisher stages of development. At the starter phase the broiler chickens were divided into three experimental groups. Each group was fed one type of premix in duplicates and designated A, B and C. At the finisher phase, each of the 3 groups was divided into 3 experimental group to obtain a total of nine premix combinations. Data on growth rate, feed and energy intake were recorded from which weight gain and energy efficiency were calculated. The results showed that broilers fed premix B at both developmental stages had better body weight and gain (20.59 g/day), comsumed more DM (56g/day), energy (168 kcal /day) with better energy efficiency than broilers in other groups. Energy efficiency of broilers fed premix A was better than that of C- fed broilers at finisher phase. Energy efficiency was improved when broilers were finished with premix B irrespective of the starter premix. The poor energy efficiency of broilers fed premix A or C was attributed to deficiency of thiamine and marginal deficiency of other energy related micronutrients leading to nutrients imbalance.

Keywords: Growth, Energy efficiency, Commercial premixes , Broilers.

INTRODUCTION.

There is a correlation between micronutrients, energy and broiler performance. Thiamine (vitaminB_1) functions in the regulation of carbohydrate metabolism (McLandless and Shanker, 1968 and McLandless *et al* 1976) . Sibbald *et al* .(1961) reported that calcium , phosphorus, antibiotics and vitamin levels exert variable influence on energy availability to chicks. Oduguwa *et al* 1996 stated that the growth of poultry industry in Nigeria was parallel to the improved supply and utilization of micronutrients . The increase in demand and supply of these products they say led to appearance in the market of many brands of premixes with marked differences in their vitamin and trace mineral profiles. Oduguwa and Ogunmodede (1995a, and 1995b) reported works on the potentials of three locally available vitamin and trace mineral premixes for rearing meat type chickens. In their works they did not measure the efficiency of energy utilization in spite of the fact that the energy is the main cost factor of poultry diets considering the proportion of energy ingredients in a compounded ration competition between man and his livestock for the conventional energy ingredients, scarcity and high cost of the ingredients. The interdependence of micronutrients and energy becomes more apparent when intakes of one or the other is below requirement. Energy is quite important because the requirement for energy must be met before that of protein, otherwise, the protein supply will be used to supply energy. The micronutrients are needed in sufficient quantities in the diets to ensure adequate energy utilization. The obvious conclusion from all this is that energy study must receive more attention than it has been until now.

This work was designed to investigate the efficiency of energy utilization and the complemental effect of three commercial premixes used solely or when replaced at the finisher phase of broiler rearing taking into cognisance the instability in the supply of micronutrients which are normally imported into the country.

MATERIALS AND METHODS.

A total of 270 day old Hypeco brown broiler

TABLE 1 : COMPOSITION OF EXPERIMENTAL DIETS (G/KG diet).

	Starter diets Premixes			Finisher diets Premixes		
Ingredients	**A**	**B**	**C**	**A**	**B**	**C**
Maize	568.0	568.0	568.0	650.0	650.0	650.0
Groundnut cake	162.0	162.0	162.0	100.5	100.5	100.5
Brewer's Dry Grain	80.0	80.0	80.0	94.5	94.5	94.5
Blood meal	80.0	80.0	80.0	60.0	60.0	60.0
Fish meal	40.0	40.0	40.0	40.0	40.0	40.0
Oyster shell	10.0	14.0	12.5	10.0	14.0	12.5
Bone meal	46.0	46.0	46.0	31.0	31.0	31.0
Salt	3.0	3.0	3.0	3.0	3.0	3.0
Methionine	3.0	3.0	3.0	3.0	3.0	3.0
Lysine	3.0	3.0	3.0	3.0	3.0	3.0
Premix	5.0	1.0	2.5	5.0	1.0	2.5
	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
Determined Analysis						
Crude protein (g.kg diet)	229.0	229.0	229.0	198.52	198.52	198.52
Crude fibre (g.kg diet)	49.8	50.00	49.55	53.44	53.82	53.60
Ether Extract (g.kg diet)	58.2	57.81	57.85	55.22	55.33	55.43
Energy (kcal/kg)	3,000.0	2,998	3,000	2,758	2,760	2,759

Figure 1: PREMIX FED AT STARTING AND FINISHING STAGES OF DEVELOPMENT

Starter Premix	A			B			C		
Finisher Premix	A	B	C	A	B	C	A	B	C

chicks were used for this experiment. At starter phase the birds were divided into 3 treatment groups in duplicates. At this stage, three diets containing each of the premixes were formulated and fed to the birds (Table 1). The diets were designated ,A, B, and C and made isocaloric and isonitrogeneous. The starting diets were fed from 0 to 28 days.

At the finisher phase, the broilers in each of the treatment group were further divided into 3 groups to give a total of 9 treatment combination in duplicates as shown in figure 1. One treatment group continued on the premix it received at starter phase and the other two groups were randomly assigned to the remaining premixes that were not given at the starter phase for the particular treatment group. Feed and water were supplied *ad ibitum*. Data collected on growth rate and feed intake were recorded from which rate of gain, feed efficiency and energy efficiency were calculated. Analysis of the diets for proximate composition was done by the A.O.A.C.,(1990) methods. Two metabolic trials at the starting and finishing stages of development were carried out, first at the end of the fourth week, and seond end of the nineth week. Dry matter digestibility and energy efficiency were determined.Energy efficiency was calculated as the ratio of energy intake and weight gain while energy was calculated as dry matter feed intake x metabolizable energy of diet. The resulting data were subjected to analysis of variance (ANOVA) using Duncan multiple range test to separate the means where there were significant differences (Gomez and Gomez, 1984; Steel and Torrie, 1980).

RESULTS AND DISCSSSION .

The growth pattern is shown in Figures 2, 3 and 4 for the starter phase and Figures 5, 6,and 7 for the finisher phase of development . Broilers given premix B had higher body weights and gave better efficiency of feed and energy utilization at both starter and finisher stages.

Table 2 shows the result of the digestibility studies. Broilers fed premix C had high dry matter digestibility as in broilers fed B but broilers fed premix C had smaller body weights at finisher phase Oduguwa *et.al.* (1996) reported that vitamins and mineral play more roles in the fate of absorbed materials than in the process of digestion. The pattern of nitrogen retention was similar to that of nitrogen digestibility. Energy efficiency was affected at both starter and finisher stages of development by the premix type (Table 3 and 4).The heavier weight of broilers fed premix B than those given A or C is an indication that the feed was properly utilized for growth as a result of better efficiency of energy utilization based on the balanced mineral composition of the premix (Table 5). Premixes A and C were lacking in vitamin B_1, which is a major vitamin that affects energy utilization . Pyruvic acid is a key metabolite in energy utilization in citric acid cycle in which thiamine functions physiologically as coenzyme, thiamine pyrophosphate (TPP). TPP is required by pyruvate dehydrogenase and ketoglutarate as coenzyme (Church and Pond, 1982: Lehninger, 1987). Lockhart *et al* (1966a,b) reported a similar decrease in energy utilization when certain B.-vitamins were deficient in broiler diets. Table 5 clearly show that C and A were completely lacking in this important vitamin

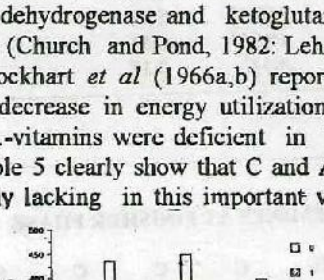

Figure 2: Bar chart showing relative body weights of broilers fed three different micro-nutrient mixtures at starter phase

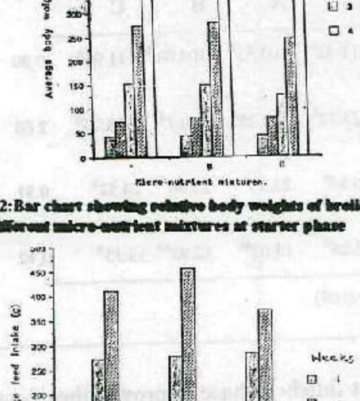

Figure3: Bar chart showing ralative feed intake of broilers given three different micro-nutrient mixture at starter phase

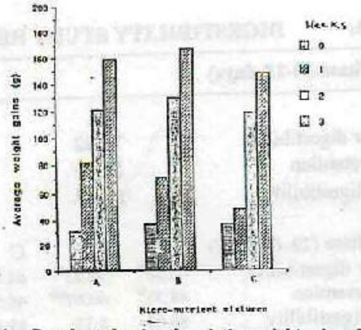

Figure4: Bar chart showing the relative weight gains of broilers fed three different micro-nutrient mixtures at starter phase

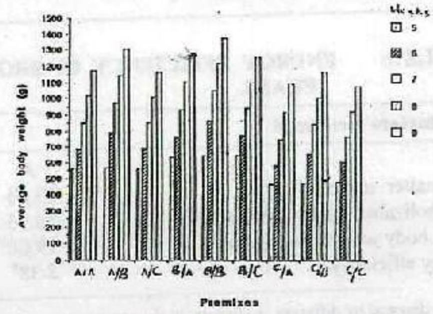

Figure5: Bar chart showing the effect of using different premixes at starter and finisher phase on body weight of broilers.

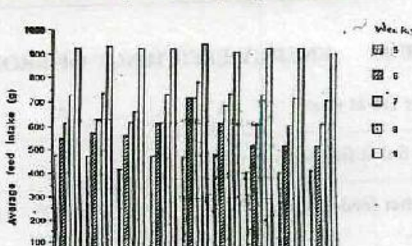

Figure 6: Bar chart showing the effect of changing the starter premix at the finisher phase on feed intake of broilers

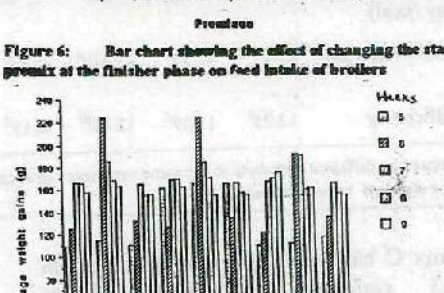

Figure7: Bar chart showing the effect of changing the starter premix on weight gains of broilers at the finisher phase

TABLE 2: DIGESTIBILITY STUDY RESULTS AT STARTER AND FINISHER STAGES

Starter Phase (0-29 days)	Type of Premix fed.			
	A	B	C	SEM
Dry matter digestibility	71.22	71.52	74.33	3.2
Nitrogen retention	52.00	51.86	51.64	7.28
Nitrogen digestibility	82.43	83.15	81.68	3.44

Finisher Phase (29 -63 days)	A	B	C	A	B	C	A	B	C	SEM
Dry matter digestibility	66.50^{b}	70.23^{a}	64.12^{b}	69.13^{ab}	77.41	71.83^{ab}	70.32^{ab}	71.14^{ab}	77.89^{ba}	±5.13
Nitrogen retention	48.55^{b}	60.67^{ab}	49.54^{b}	68.45^{ab}	72.36^{a}	61.34^{ab}	60.11^{ab}	65.22^{ab}	70.23^{a}	±4.84
Nitrogen digestibility	86.00	8.13	85.48	83.91	88.68	87.34	86.53	84.8	87.92	±3.0

Means denoted by the same alphabet in the same row are not significantly different (P>0.05)
SEM is the standard error of mean.

TABLE 3: ENERGY EFFICIENCY OF BROILERS FED DIFFERENT PREMIXES AT STARTER PHASE.

Parameters measured	Types of Premixes Fed			
	A	B	C	SEM
Dry matter intake(g/day)	53.05	56.0	53.40	1.83
Metabolizable energy intake (k/day)	59.15	168.00	160.00	5.49
Mean body weight gain (g/day)	19.00^{b}	20.5^{a}	18.75^{b}	0.51
Energy efficiency	8.38^{a}	8.16^{b}	8.54^{a}	0.17

Means denoted by different alphabets in the same row were significantly different (P<0.05)
SEM is the standard error of mean.

TABLE 4: ENERGY EFFICIENCY OF BROILERS FED PREMIXES AT FINISHER PHASE

Premixe fed at starter	A	A	A	B	B	B	C	C	C	SEM
Premix fed at finisher	A	B	C	A	B	C	A	B	C	
Dry matter feed intake (g/day)	103.32^{d}	101.56^{b}	107.12^{b}	110.9^{a}	104.61^{dc}	111.42^{a}	103.53^{d}	104.03^{dc}	111.96^{a}	0.90
Metabolisable energy intake/day (kcal)	299.63^{d}	294.52^{d}	310.64^{b}	321.62^{a}	303.38^{c}	323.12^{a}	300.25^{d}	310.7^{d}	323.23^{a}	2.60
Mean body weight gain (g/day)	23.64^{dc}	23.95^{c}	23.61d^{c}	26.46^{a}	26.02^{a}	26.34^{a}	23.33^{c}	23.06^{dc}	24.52^{b}	0.31
Energy efficiency	12.73^{c}	12.29^{d}	13.16^{ab}	12.15^{d}	11.63^{a}	12.26^{d}	13.02^{ab}	12.93^{ab}	13.15^{a}	0.12

Values denoted by different alphabets in the same row were significantly different (p,0.05)
SEM is the standard error of mean.

and premix C had very low proportions of B6 and B3 compared to NRC (1984) recommendations. In addition, premixes A and C are replete with excess of some other vitamins like vitamins A and K which play less significant role in energy metabolism thereby causing nutrient imbalance with adverse effect on energy efficiency. Changing from premix A or C to B at finisher phase improved the energy efficiency but not vice versa.

Conclusively, care must be taken in choosing premixes for broiler rearing as many of them are deficient in the vitamins and mineral that affect energy metabolism and replete in others that have little nutritional importance leading to nutritional imbalance of the diets. If there is the

TABLE 5: PERCENTAGE OF NATIONAL RESEARCH COUNCIL REQUIREMENT OF BROILER CHICKEN SUPPLIED BY THE PREMIXES

	**Premix A		PremixB%	Premix C%
	Starter %	Finisher%		
Vitamin A	1200	1000	833	533
Vitamin D3	1250	1250	1250	750
Vitamin E	140	110	400	30
VitaminB2	333	278	167	69
VitaminB3	163	148	130	29
VitaminB6	933.33	667	117	10
Choline Chloride	37	31	23	-
Manganese	200	200	167	17
Iron	88	88	63	6.25
Copper	125	125	25	2.50
Iodine	628	628	443	42.6
Selenium	133	133	67	6.67
Vitamin K3	-	-	500	600
Calcium Pantothenate	-	-	100	30
$VitaminB_{12}$	-	-	113	89
Zinc	-	-	112.5	11.25
Cobalt	-	-	-	-
$VitaminB_1$	-	-	111	-
Biotin	-	-	33	-
Folic Acid	-	-	182	-

*NRC 1984

**Manufacturers of premix A had designated premixes for starter and finisher broiler while manufacturers of premix B and C provided only one premix for the starter and finishers.

need to change the premixes at any stage of broiler rearing it is better to start the broiler on premixes that will support efficient utilization of energy based on their vitamin and mineral profile.

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