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# Performance and Carcass Characteristics of Broilers Fed Five Different Commercial Vitamin-Mineral Premixes in Ibadan, Nigeria

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**Abstract:** The relative efficacy of five proprietary vitamin-mineral premixes on performance and carcass characteristics of broiler chickens was undertaken in a trial lasting six weeks at the Teaching and Research Farm, University of Ibadan, Ibadan, Nigeria. A total of two hundred and eighty eight 1-day broiler chicks of Abor acre strain were randomly allotted to six dietary treatments of forty eight chicks per treatment. Each treatment was a triplicate of sixteen chicks per replicate. Six isocaloric and isonitrogenous diets were formulated. Diet 1 (T1) was the control without any premix. Other diets were supplemented appropriately with 0.25% Daramvita (T2), Biorganics (T3), Hinutrients (T4), Optimix (T5) and DSM Nutripoults (T6). The experimental diets were offered to the respective birds with water given ad libitum. The design of the experiment was a completely randomized design. The feed conversion ratio of birds on T3, T4, T5 and T6 were 2.64, 2.58, 2.61 and 2.57 respectively and were significantly different ($p<0.05$) from those on T1 (3.62) and T2 (3.35). The obtained live, bled and defeathered weights and dressing percentage values of broilers varied significantly ($p<0.05$) with the type of vitamin-mineral premix used while values of other primal cuts were statistically similar ($p>0.05$). Performance and carcass indices indicated variable potency and efficacy of the evaluated proprietary vitamin-mineral premixes in Ibadan, Nigeria.

**Key words:** Proprietary vitamin-mineral premixes, premix efficacy and potency, broiler production, dressing percentage, primal cuts

## INTRODUCTION

Premix is a critical input in the feed of broilers as the use of quality premix is an important feature of a successful poultry production leading to improved safety, reliability and performance (Raven and Walker, 1980). Poultry ingredients could be low in some vitamins, thus the addition of premix to poultry diet is therefore a good insurance to protect birds from diseases, stress and disorder. Chickens are more susceptible to vitamin deficiency because gut flora of chickens provide very little vitamins synthesis but compete with the host for dietary vitamins (Asaduzzman *et al*., 2005).

Though, minerals and vitamins contribute only 10 percent of the total cost of feed (Singh and Panda, 1988), the effects of using sub standard or less potent vitamins on production could easily be felt in production indices of birds. Carefulness and professional attention in the formulation and choice of vitamin-mineral premixes is therefore of great importance.

Several proprietary vitamin-mineral premixes are sold in Ibadan, Nigeria with each manufacturer ascribing similar effectiveness and potency. The labels would usually indicate slightly different or similar composition but the same potency and efficacy claim without any cognate experimental evidence. This situation is further compounded by the dearth or utter lack of suitable equipment and laboratory to undertake the analyses and instant chemical profiling of vitamin-mineral premixes in Nigeria. The slower but rational approach is the use of live animals to evaluate the premixes. Broilers are fast growing animals and they offer a veritable leeway for relatively rapid assessment of vitamins and minerals efficacy.

The use of three commercial micronutrients mixtures in determining the growth and protein utilization of broiler chicks have been undertaken (Oduguwa and Ogunmodede, 1995). Oduguwa *et al*. (1996), examined the comparative efficacy of three commercial micronutrient premixes for rearing broilers at two physiological stages of growth. Other studies (Oduguwa *et al*., 2000; Asaduzzman *et al*., 2005) investigated the use of proprietary vitamin mineral premixes for broiler or layer chickens. However, recent studies have not been carried out on the relative efficacy of vitamin- mineral premixes in broiler production in Nigeria.

The aim of this experiment therefore is to evaluate five commercial vitamin-mineral premixes in broiler production in Ibadan, Nigeria.

## MATERIALS AND METHODS

The experiment was carried out at the Teaching and Research Farm, University of Ibadan, Ibadan, Nigeria. A total of 288, 1-day old broiler chicks were randomly allotted to six dietary treatments of forty eight chicks per

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Table 1: Gross composition of the experimental starter and finishers diets

| Ingredients | Starter | Finishers |
|---|---|---|
| Maize | 51.00 | 50.00 |
| Soybean meal | 36.00 | 32.00 |
| Palm oil | 2.00 | 2.00 |
| Wheat offal | 7.99 | 12.99 |
| Avatec | 0.06 | 0.06 |
| DCP | 1.50 | 1.50 |
| Oyster shell | 1.00 | 1.00 |
| Salt | 0.25 | 0.25 |
| Methionine | 0.15 | 0.15 |
| Lysine | 0.05 | 0.05 |
| Vitamin-mineral premix | - | - |
| Total | 100.00 | 100.00 |
| **Calculated nutrient values** | | |
| Crude protein (%) | 22.30 | 21.29 |
| Metabolizable Energy (ME kcal/kg) | 3036.38 | 2987.00 |
| Calcium (%) | 1.16 | 1.16 |
| Phosphorus (%) | 0.74 | 0.77 |

DCP: Dicalcium phosphate

treatment. Each treatment was a triplicate of sixteen birds per replicate. They were raised on partitioned deep litter house.

Six isocaloric and isonitrogenous diets were formulated at both the starter and finishers' phases. The five proprietary vitamin-mineral premixes were purchased from a toll feed milling factory in Ibadan, Nigeria. Each diet was supplemented with 0.25% vitamin-mineral premixes as shown below:

T1 - Control (without any vitamin-mineral premix)
T2 - Control diet + 0.25% Daramvita
T3 - Control diet + 0.25% Bio-organic
T4 - Control diet + 0.25% Hinutrient
T5 - Control diet + 0.25% Optimix
T6 - Control diet + 0.25% Nutripoults

The composition of the experimental starter and finishers diets is shown in the Table 1, while Table 2 shows the composition of the test vitamin-mineral premixes.

The animals were weighed prior to their allotment to various dietary treatments. Routine medication, vaccination and husbandry practices were administered on the birds. The experimental period lasted six weeks within which the birds were given feeds and water *ad libitum*. The design of the experiment was a completely randomized design.

Birds feed intake was obtained by subtracting the leftover from the quantity of feed offered to the birds. Body weight gain was determined by subtracting initial weight gain from final live weight. Feed conversion ratio was obtained by dividing feed intake (kg) by the body weight gain (kg). At week 6, two birds per replicate were purposively selected and slaughtered, after they were starved of water and feed for 16 hrs. They were scalded manually and de feathered. The carcass were carefully dissected into primal cuts and weighed. All the internal and visceral organs were weighed and converted to percentage of the live weight using the formula:

$$\frac{\text{Weight of primal/organ}}{\text{Live weight}} \times \frac{100}{1}$$

Data obtained were analyzed using analysis of variance (SAS, 1999) while significant means were separated.

## RESULTS AND DISCUSSION

The performance indices obtained for broilers fed five different commercial vitamin-mineral premixes is shown in Table 3. Feed intake values (kg) (2.51, 2.95, 2.84,

Table 2: Composition/2.5 kg of broiler vitamin-mineral premixes as shown on the labels

| | Hinutrient | Daramvita | Biorganic | DSM Nutripoult | Optimix |
|---|---|---|---|---|---|
| Vitamin A (iu) | 12,000,000 | 10,000,000 | 8,500,000 | 10,000,000 | 10,000,000 |
| Vitamin D3 (iu) | 2,500,000 | 2,000,000 | 2,000,000 | 2,000,000 | 2,400,000 |
| Vitamin E | 30,000iu | 10,000iu | 10,000mg | 40,000mg | 10,000mg |
| Vitamin K | 2,000mg | 2,000iu | 1,500iu | 2,000mg | 2,000mg |
| Vitamin B1 (mg) | 2,250 | 1,500 | 1,600 | 1,500 | 1,500 |
| Vitamin B2 (mg) | 6,000 | 4,000 | 1,500 | 4,000 | 1,500 |
| Vitamin B6 (mg) | 4,500 | 1,500 | 20,000 | 40,000 | 1,500 |
| Vitamin B12 | 15mcg | 10mgr | 10mgr | 20mgr | 15mg |
| Niacin (mg) | 40,000 | 15,000 | 20,000 | 40,000 | 15,000 |
| Panthothenic (mg) | 15,00 | 5,000 | 5,000 | 10,000 | 5,000 |
| Folic (mg) | 1,500 | 300 | 500 | 1,000 | 500 |
| Biotin | 50mcg | 20mgr | 75mg | 100mg | 20mg |
| Choline chloride (mg) | 30,000 | 200 | 175,000 | 300,000 | 200,000 |
| Manganese (mg) | 80,000 | 80,000 | 40,000 | 80,000 | 80,000 |
| Zinc | 50,000mg | 50gr | 30,000mg | 60,000mg | 60,000mg |
| Iron | 20,000mg | 20gr | 20,000mg | 40,000mg | 40,000mg |
| Copper | 5,000mg | 5gr | 3,000mg | 80,000mg | 5,000mg |
| Iodine | 1,000mg | 1.2mgr | 1,000mg | 800mg | 1,200mg |
| Selenium (mg) | 200 | 200 | 200 | 200 | 200 |
| Cobalt | 500mg | 200gr | 200mg | 300mg | 200mg |
| Antioxidant | 125,000mg | 125gr | 1,250mg | 100,000mg | 125,000mg |

Table 3: Performance of broilers fed diet supplemented with five commercial premixes

| Parameters | T1 | T2 | T3 | T4 | T5 | T6 | SEM |
|---|---|---|---|---|---|---|---|
| Feed intake (kg) | 2.51$^{e}$ | 2.95$^{b}$ | 2.84$^{c}$ | 2.70$^{d}$ | 2.25$^{cd}$ | 3.05$^{a}$ | 0.03 |
| Weight gain (kg) | 0.69$^{c}$ | 0.90$^{b}$ | 1.08$^{a}$ | 1.06$^{ab}$ | 1.06$^{ab}$ | 1.19$^{a}$ | 0.05 |
| Feed conversion ratio | 3.62$^{a}$ | 3.35$^{a}$ | 2.64$^{b}$ | 2.58$^{b}$ | 2.61$^{b}$ | 2.57$^{b}$ | 0.17 |

$^{a,b,c,d,e}$Means along the same row with dissimilar superscripts differs significantly (p<0.05). SEM - Standard Error of the Mean; T1 - Control (without any vitamin-mineral premix), T2 - Control diet + 0.25% Daramvita, T3 - Control diet + 0.25% Bio-organic, T4 - Control diet + 0.25% Hinutrient, T5 - Control diet + 0.25% Optimix, T6 - Control diet + 0.25% DSM Nutripoults

Table 4: Live weights and processing values of broiler chickens fed diets supplemented with five different commercial Vitamin-mineral premixes

| Parameters | T1 | T2 | T3 | T4 | T5 | T6 | SEM |
|---|---|---|---|---|---|---|---|
| Live weight (kg) | 1.48$^{b}$ | 1.88$^{a}$ | 1.80$^{a}$ | 1.62$^{ab}$ | 1.71$^{ab}$ | 1.85$^{a}$ | 0.09 |
| Bled weight (kg) | 1.43$^{c}$ | 1.79$^{a}$ | 1.71$^{ab}$ | 1.53$^{bc}$ | 1.60$^{abc}$ | 1.72$^{ab}$ | 0.08 |
| Defeathered wt (kg) | 1.37$^{c}$ | 1.76$^{a}$ | 1.65$^{ab}$ | 1.47$^{bc}$ | 1.55$^{abc}$ | 1.66$^{ab}$ | 0.07 |
| Dressing % | 66.21$^{b}$ | 73.4$^{a}$ | 71.66$^{a}$ | 67.9$^{ab}$ | 70.18$^{ab}$ | 72.97$^{a}$ | 6.00 |

$^{a,b,c}$Means along the same row with dissimilar superscripts differs significantly (p<0.05). SEM - Standard Error of the Mean; T1 - Control (without any vitamin-mineral premix), T2 - Control diet + 0.25% Daramvita, T3 - Control diet + 0.25% Bio-organic, T4 - Control diet + 0.25% Hinutrient, T5 - Control diet + 0.25% Optimix, T6 - Control diet + 0.25% DSM Nutripoults

2.70, 2.25 and 3.05 for birds on treatments 1, 2, 3, 4, 5 and 6 respectively) differed significantly (p<0.05). Birds on T1 had the lowest feed intake perhaps, due to the absence of vitamin-mineral premixes in their diet. This confirmed the findings of Christmas *et al.* (1995) that feed consumption declined numerically with the removal of both vitamin and trace minerals from diets fed to birds. Birds on T6 had the highest value of feed intake which suggested that the feed was probably more acceptable to the birds. Weight gain values also differed significantly (p<0.05) and was consistently higher for birds on diet 6. This may suggest that the vitamin-mineral premix used for T6 was more potent. It can also be because of higher feed consumption, utilization or better growth support as earlier surmised (Oduguwa *et al*., 1996; Oduguwa *et al*., 2000).

The feed conversion ratio (FCR) is an index of how best the feed given was turned to meat and the lower the value, the better. The values obtained (3.62, 3.35, 2.64, 2.58, 2.61 and 2.57 for birds on T1, T2, T3, T4, T5 and T6 respectively) differed significantly (p<0.05); higher for birds on diets 1 and 2 but lower for birds on diets 3, 4, 5 and 6. This indicated the differences in the quality of the vitamin-mineral premixes used as differences in the premix was the only variable which indeed confirmed the earlier observations of Reza *et al.* (1983) in broiler chicks.

Results of live weight and processing values of broilers fed diets supplemented with five different commercial vitamin-mineral premixes is presented in Table 4. The mean live weight (kg) of birds at week 6 of age were 1.48, 1.88, 1.80, 1.62, 1.71 and 1.85 for birds on T1, T2, T3, T4, T5 and T6 respectively. Birds on T2 had the highest live weight which was statistically similar (p>0.05) to the values obtained for birds on T3, T4, T5 and T6. Earlier reports (Oduguwa and Ogunmodede, 1995; Oduguwa *et al*., 1996) indicated that the tested vitamin-mineral premixes had differing capabilities for

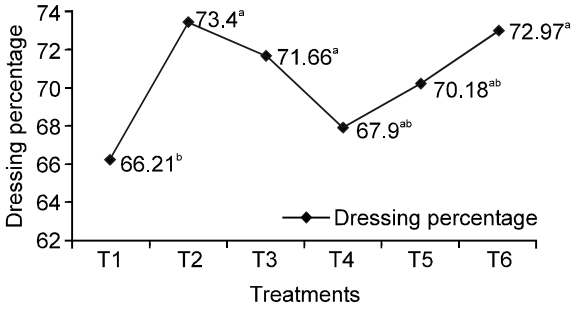


Fig. 1: Dressing percentage of broilers fed five different commercial premixes

supporting the growth of broilers up to market weight. However, significant variation (p<0.05) in the value of live weight occurred between the birds on vitamin-mineral premixes on one hand and those on control diet. Reza *et al.* (1983) earlier reported lowest body weight gain in broilers fed with diets without vitamin-mineral premix.

The bled weights (kg) (1.43, 1.79, 1.71, 1.53, 1.60 and 1.72 for birds on T1, T2, T3, T4, T5 and T6 respectively), defeathered weights (kg) (1.37, 1.76, 1.65, 1.47, 1.55 and 1.66 for birds on T1, T2, T3, T4, T5 and T6 respectively) and dressed weights (kg)(66.21, 73.40, 71.66, 67.90, 70.18 and 72.97 for birds on T1, T2, T3, T4, T5 and T6 respectively) followed a normal trend which supported the earlier remarks (Ikeme, 1990) that birds with higher pre-slaughter weights were expected to produce higher bled weights. The graphical representation of the dressing percentage of birds fed five different commercial premixes is shown in Fig. 1.

Primal cuts of broiler chickens fed diets supplemented with five different commercial vitamin-mineral premixes are shown in Table 5. There were no significant differences (p>0.05) in the weights of prima cuts

Table 5: Primal cuts of broiler chicken fed diets supplemented with five different commercial vitamin-mineral premixes

| Parameters | T1 | T2 | T3 | T4 | T5 | T6 | SEM |
|---|---|---|---|---|---|---|---|
| Drumstick | 10.44 | 11.04 | 10.52 | 11.09 | 10.76 | 11.29 | 0.52 |
| Thigh | 10.03 | 11.37 | 11.17 | 11.37 | 11.22 | 12.09 | 0.38 |
| Wings | 8.57 | 8.24 | 8.43 | 8.14 | 8.19 | 8.74 | 0.23 |
| Breast | 20.06 | 20.34 | 20.59 | 19.27 | 20.02 | 20.03 | 0.43 |
| Back | 12.89 | 13.60 | 13.17 | 12.92 | 12.62 | 13.73 | 0.61 |

SEM - Standard Error of the Mean; T1 - Control (without any vitamin-mineral premix), T2 - Control diet + 0.25% Daramvita, T3 - Control diet + 0.25% Bio-organic, T4 - Control diet + 0.25% Hinutrient, T5 - Control diet + 0.25% Optimix, T6 - Control diet + 0.25% DSM Nutripoults

Table 6: External offal and organ weights of broiler fed diets supplemented with five different commercial vitamin-mineral premixes

| Parameters | T1 | T2 | T3 | T4 | T5 | T6 | SEM |
|---|---|---|---|---|---|---|---|
| Shanks | $4.46^{b}$ | $5.05^{ab}$ | $5.12^{ab}$ | $5.40^{a}$ | $5.09^{ab}$ | $5.46^{a}$ | 0.20 |
| Head | 3.03 | 3.07 | 2.99 | 3.25 | 3.26 | 2.87 | 0.14 |
| Neck | 5.03 | 4.89 | 5.11 | 4.99 | 5.35 | 4.97 | 0.17 |
| Bile | 0.14 | 0.23 | 0.09 | 0.09 | 0.09 | 0.24 | 0.07 |
| Intestine | 6.41 | 5.63 | 5.80 | 6.21 | 6.19 | 5.83 | 0.21 |
| Whole gizzard | 3.78 | 3.59 | 4.09 | 3.54 | 3.53 | 3.83 | 0.38 |
| Empty gizzard | 2.25 | 2.24 | 2.31 | 2.06 | 2.22 | 2.29 | 0.14 |
| Lungs | $0.78^{a}$ | $0.53^{b}$ | $0.55^{b}$ | $0.63^{b}$ | $0.56^{b}$ | $0.52^{b}$ | 0.05 |
| Spleen | 0.11 | 0.08 | 0.07 | 0.08 | 0.08 | 0.09 | 0.02 |
| Abdominal fat | 0.89 | 0.83 | 0.71 | 0.59 | 0.12 | 0.68 | 0.22 |
| Liver | $2.03^{a}$ | $2.00^{a}$ | $1.85^{bc}$ | $1.81^{c}$ | $1.88^{bc}$ | $1.96^{ab}$ | 0.04 |

$^{a,b,c}$Means along the same row with dissimilar superscripts differs significantly ($p<0.05$).

SEM - Standard Error of the Mean; T1 - Control (without any vitamin-mineral premix), T2 - Control diet + 0.25% Daramvita, T3 - Control diet + 0.25% Bio-organic, T4 - Control diet + 0.25% Hinutrient, T5 - Control diet + 0.25% Optimix, T6 - Control diet + 0.25% DSM Nutripoults

indicating that each proprietary vitamin-mineral premix did not influence the weights of these cut up parts ($p>0.05$). Earlier studies (Fencher and Jensen, 1989; Oduguwa and Ogunmodede, 1995) obtained breast yield that were not affected by the vitamin-mineral composition of the diets.

The external offal and organ weights of broilers fed diets supplemented with five different commercial vitamin-mineral premixes are presented in Table 6. Values obtained for head, neck, bile, intestine, whole gizzard, empty gizzard, spleen and abdominal fat were statistically similar ($p>0.05$). Higher weights of shank were obtained for birds on T4 and T6 compared to birds on other treatments and control. The weight obtained for lungs and liver also varied significantly ($p<0.05$). Broilers on control (T1) diet recorded significantly higher ($p<0.05$) value of lungs compared to those whose diets were supplemented with different commercial vitamin-mineral premixes. Also, the weights of liver were significantly higher for birds on T1 and T2. These observations as earlier noted (Oduguwa *et al*., 2000) may be indicative of the type and extent of utilization of the vitamin-mineral premixes that accompany protein in the diets.

**Conclusion:** Empirical findings from this experiment showed that proprietary vitamin-mineral premixes in Ibadan, Nigeria were of differing efficacy and potency judging from the varying effects on performance indices and carcass characteristics of broilers.

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