EFFECTS OF FIVE DIFFERENT DIETARY VITAMIN MINERAL PREMIXES ON CHEMICAL COMPOSITION OF EGGS FROM LAYERS IN BATTERY CAGE HOUSING SYSTEM

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Abstract
Effects of five different proprietary vitamin-mineral premixes (PVMP) on chemical composition of eggs produced by laying chickens kept in the battery cages were determined. Five isocaloric and isonitrogenous diets were formulated and each respectively supplemented with 0.25% of a brand of the five proprietary vitamin-mineral premixes. In a completely randomized design, Ninety Bovans Nera chickens were allocated to five treatments each in triplicate of six birds per replicate. The five diets were then fed to the respective experimental birds from the onset of lay at week 19 until week 41, when samples of eggs were collected for analyses. There was no significant effect ($p>0.05$) of dietary PVMP supplementation on eggs moisture (%), crude protein (%), ether extracts (%) and true protein (%) contents. However, values recorded for ash (%) were 0.92, 0.96, 1.06, 1.02 and 1.14 for eggs collected from laying chickens fed diets supplemented with PVMP 1, 2, 3, 4 and 5 respectively. The gross energy, calcium and phosphorous composition were consistently higher ($p<0.05$) for eggs collected from chickens on PVMP 5. Effects of the different PVMP tended to be only on minerals and energy composition of eggs.

Keywords: Dietary vitamin-mineral premixes, Egg laying chickens, Battery cage housing system, Feed supplementation

Introduction

Despite the fact that vitamin mineral premix (VMP) constitutes less than one percent in the formulation of any diet for poultry, the ingredient is the major contributor of cofactors essential for virtually all metabolic processes *in vivo*. Available reports (Ogunwole *et al*., 2012; 2015a) indicated that profitable poultry production cannot be undertaken in the humid tropical environment without the input of good quality VMP.

Earlier documentations (Oduguwa and Ogunmodede, 1995; Ogunwole *et al*., 2015a) showed that commercial proprietary VMP in Ibadan, Nigeria are of variable efficacy and that quality of the different condiments used in dietary supplementation determines the survivability, productivity and profitability (Ogunwole *et al*., 2012; 2013; 2015b)

Despite several reports on the effects of VMP on meat and egg production in poultry, there have been relatively very scanty studies on the effects of the different VMP on the chemical composition of eggs as affected by the housing type. Ogunwole *et al*. (2015b, c) earlier reported the effect of VMP on eggs collected from laying chickens kept in the deep litter. The present study was aimed at providing similar information for eggs collected from layers kept in the battery cage

Materials and Method

The experiment was conducted at the Poultry Unit of the Teaching and Research Farm, University of Ibadan, Ibadan, Nigeria. It is situated in the derived Savanna vegetation belt on longitude 7°27.05 north and latitude 3°53.74 of the Greenwich Meridian east at an altitude 200m above sea level. Temperature range and the average relative humidity of the location were between 23-25°C and 60% respectively.

Experimental birds and Management

Ninety Bovan Nera black pullets at week 19 of age with a track record of medication, vaccination and performance from one-day old were used for the experiment. Birds were allotted to five treatments. Each treatment was in triplicate of six pullets per replicate. Fresh experimental diets and water were daily offered *ad libitum* to birds throughout the feeding trial which lasted twenty-eight weeks. Routine medical, vaccination and husbandry practices were also administered (Oluyemi and Roberts, 2000).

Experimental Diets

Five isocaloric and isonitrogenous diets were formulated and each diet supplemented with any of the five different proprietary layers VMP. The five proprietary layers VMP were purposively selected based on their use by most poultry farmers indiscriminately in the study area. They were: Nutripoult, Agrimix, Hi-Nutrient, Daramvita and Micro-Mix layers' VMP. They were incorporated according to the manufacturers' specifications in to the diets of laying hens at 2.5Kg/ton of feed as follows:

T1 - Basal diet + 0.25% Nutripoult premix (VMP

1); T2 - Basal diet + 0.25% Hi-Nutrient premix (VMP 2); T3 - Basal diet + 0.25% Agrimix premix (VMP 3); T4 - Basal diet + 0.25% Daramvita premix (VMP 4) and T5 - Basal diet + 0.25% Micro-Mix premix (VMP 5). The gross composition of experimental diets for layers and the detailed composition of the test VMP as shown on the respective VMP labels have been earlier documented (Ogunwole *et al.*, 2015b).

At week 41, two freshly laid eggs per replicate were collected from each treatment and labelled. The two eggs from each replicate were broken and whisked together to obtain a homogenous mixture. Proximate, true protein, gross energy, calcium and phosphorous content of the samples were determined {AOAC, 2005}.

Results and Discussion

The chemical composition of eggs collected from eggs in the battery cage is presented in Table 1. Moisture composition obtained for layers on PVMP 1, 2, 3, 4 and 5 were 69.98, 70.15, 69.96, 69.87 and 68.86%, respectively and were not significantly affected ($p>0.05$) by the different PVMP supplementation. Similarly, values obtained for crude protein (%), ether extracts and true protein were similar ($p>0.05$). The values obtained in the present study for moisture was contrary to the corresponding values for eggs from hens kept in the deep litter (Ogunwole *et al.*, 2015c) whose moisture content were significantly affected by the type of PVMP. The values of crude protein (14.85, 15.45, 15.27, 15.64 and 15.59 obtained from eggs of hens on T1, T2, T3, T4 and T5 respectively), ether extracts (13.13, 13.13, 13.29, 13.14 and 13.32 obtained from eggs of hens on T1, T2, T3, T4 and T5 respectively) and true protein (12.72, 13.23, 13.17, 13.50 and 13.39 obtained from eggs of hens on T1, T2, T3, T4 and T5 respectively) were not significantly different ($p>0.05$) and therefore not affected by type of PVMP.

However, gross energy, ash, calcium and phosphorous compositions were affected significantly by the type of PVMP supplementation in the diet of hens kept in the battery cage. Similar effect on egg was obtained for eggs collected from hens in the deep litter (Ogunwole *et al.*, 2015c). This indicated that irrespective of the type of housing systems, the composition and or deposition of energy as well as minerals are determined by the type of VMP supplementation.

Conclusion and Recommendation

Effects of the different PVMP employed to supplement the diets of layers in the battery cage influenced only the gross energy and minerals composition of the analysed eggs. Detailed research should be undertaken to ascertain the extent of the implications of PVMP supplementation on these egg components.

References

AOAC (2005). Association of Official Analytical Chemistry. Associate of Official Analytical Chemistry. 15th Edition Arlington Virginia, U. S. A.

Oduguwa, O. O. and Ogunmodede, B. K. (1995) Growth and protein utilization by broiler chicks fed three commercial micronutrient mixture. *Int. J. of Anim. Sci.* 10:170–175

Oluyemi, J. A. and Roberts, F. A. (2000). Poultry production in warm wet climates, Macmillan Press Ltd. London. 124-140.

Ogunwole, O. A., E. O. kolade, and Taiwo, B. A. (2012). Performance and Carcass Characteristics of Broilers Fed Five Different Commercial vitamin-mineral premixes in Ibadan, Nigeria. *International Journal of Poultry Science.* 11(2) 120-124.

Ogunwole, O. A., Omojola, A. B., Ayinde, B. O., Taiwo, B. A. and Kolade, E. O. (2013). Physico-chemical properties of meat and blood profile of broiler chickens fed five commercial vitamin-mineral premixes in Ibadan, Nigeria. *Ibadan J. of Agricultural Research,* Vol. 5-9: pp. 200-210.

Ogunwole, O. A., A. Y. P. Ojelade, M. O. Oyewo, and Essien, E. A. (2015a). Proximate composition and physical characteristics of eggs from laying chickens fed different proprietary vitamin-mineral premixes under two rearing systems during storage. *International Journal of Food Science and Nutrition Engineering,* 5(1): 59-67

Ogunwole, O. A., Solaru, O. and O. O. Tewe. (2015b). Effects of serial withdrawal of dietary vitamin- mineral premixes on performance, carcass characteristics and organs weight of broiler chickens. *Tropical Animal Production Investigations Journal* 18(1): 71-89

Ogunwole, O. A., Ojelade, A. Y. P. and I. K. Aikore (2015c). Effects of five different dietary vitamin mineral premixes on chemical composition of eggs from layers in deep litter rearing system. Proceedings of the 4th ASAN-NIAS Joint

Annual Meeting held at the International Conference Centre and Department of Animal Science, University of Ibadan from 6-10 September, 2015. Eds. O. A. Adebiyi, O. A. Ogunwole, O. J. Babayemi and E. A. Iyayi, pp. 528-531

SAS. (2012). SAS/STAT User's guide Version 8 for Windows SAS Institute Inc. SAS.

Table 1: Proximate, true protein and energy compositions of eggs from hen fed five different proprietary dietary vitamin-mineral premixes in battery cage system of rearing

Parameters	T1	T2	T3	T4	T5	SEM
Proximate						
Moisture (%)	69.98	70.15	69.96	69.87	68.86	1.15
Crude protein (%)	14.85	15.45	15.27	15.64	15.59	2.22
Ash (%)	0.92_{d}	0.96_{cd}	1.06_{ab}	1.02_{bc}	1.14_{a}	0.07
Ether extracts (%)	13.13	13.13	13.29	13.14	13.32	1.13
Other Chemical Components						
True protein (%)	12.72	13.23	13.17	13.50	13.39	1.75
Gross energy (Kcal/g)	1.39_{bc}	1.38_{c}	1.40_{ab}	1.41_{a}	1.41_{a}	0.08
Calcium (mg/100g)	42.60_{b}	40.97_{c}	43.53_{ab}	43.97_{a}	44.50_{a}	0.75
Phosphorous (mg/100g)	184.13_{bc}	181.33_{c}	186.90_{ab}	185.60_{b}	189.73_{a}	0.82

a, b, c, d subscripts on means along the rows are significantly different at $\alpha_{0.05}$