

CARCASS CHARACTERISTICS AND ORGANOLEPTIC PROPERTIES OF BROILERS FED FIVE DIFFERENT VITAMIN AND MINERAL PREMIX

Ojebiyi, O.O., Akinwumi A.O., *Oladejo, R.O., Ayoola B.N., Fatoki, H.O., Idowu, A.O. and Ayoola, S.J.

Department of Animal Nutrition and Biotechnology,
Ladoke Akintola University of Technology, P.M.B 4000, Ogbomoso, Oyo State, Nigeria

Corresponding Author: oladayoracheal10@gmail.com

ABSTRACT

The inclusion of a balanced vitamins and mineral premix in broiler chickens' diets is essential for optimal growth, health, and performance. An eight-week feeding trial was conducted to evaluate the chemical and organoleptic properties of broilers fed five different vitamin-mineral premixes at 0.30% inclusion level. One-Hundred and eighty (180) 1-day old Arbor Acre strain of broiler chickens were used for the study. The birds were randomly divided into six (6) treatments of three replicates each. There were 10 birds per replicate to make a total of 36 birds per treatment. Feed and water were supplied *ad libitum* and data were collected on carcass characteristics and organoleptic parameters. The result showed that the values for flavour, colour, juiciness and texture were statistically similar. Carcass yield as well as organ weights were significantly affected ($p < 0.05$). The dressing percentage was higher for the birds on VMP2. It was concluded that birds fed VMP2 performs better than the control for some carcass characteristics which is better for broilers production, as good carcass weight is an advantage for the farmers.

Keywords: Carcass characteristics, Organoleptic properties, Organ characteristics, Vitamins-mineral premix

INTRODUCTION

Premixes allude to the micro nutrients (vitamin and minerals) used in small quantity (Memon, 2006) and the roles of premix in broiler rearing cannot be overemphasized. Feed ingredients could be low in some vitamin thus the addition of premix to poultry diet is therefore a good insurance to protect birds from diseases, stress and disorder. All vitamins except vitamin C are dietary essentials in poultry (Saif *et al.*, 2008), because they have positive effect on the growth performance of chickens in terms of improving feed utilization and metabolism, stimulating the immune system and minimizing many stresses (Sahin *et al.*, 2003). Chickens are more susceptible to vitamin deficiency because gut flora of chickens provide very little vitamin synthesis but compete with the host for dietary vitamins (Oduguwa *et al.*, 2000; Asaduzzman *et al.*, 2005) Asaduzzman *et al.* (2005) also investigated the use of proprietary vitamin-mineral premixes for broiler or layer chickens. Organoleptic characteristics are the trait that influence the consumer to regularly purchase and eat meat. The measure of meat quality includes such indicator as tenderness, palatability, flavour, colour and juiciness. The meat has its own characteristics flavour which can be modified by cooking conditions (Tuleun *et al.*, 2008). Meat colour varies with species, breed, age, sex, stress and the feed given to the animal (Zhang *et al.*, 2013). Meat juiciness is dependent on the inherent water holding capacity of meat and the amount of fat in it. The tenderer the meat the more quickly the juices are released on chewing and also, the juicer the meat appears (Castellini *et al.*, 2002). This present study is to determine the carcass characteristics and organoleptic properties of broilers meat fed five different vitamin-mineral premixes.

MATERIALS AND METHODS

Experimental site

The experiment was carried out at the Poultry Unit of the Teaching and Research Farm, Ladoke Akintola University of Technology (LAUTECH), Ogbomoso, Oyo State, Nigeria.

Tests Ingredients

The five proprietary vitamin-mineral premixes (VMP) were purchased from a distributor of the vitamin-mineral premixes in Ogbomoso, Nigeria. Each diet was supplemented with 0.30% vitamin-mineral premixes. The composition of the VMPs used is presented in Table 1

Experimental birds and management

One hundred and eighty (180) Arbor Acres train of broiler chicks was used for the experiment. The birds were weighed and randomly distributed into 6 treatments of 30 birds each. Each treatment was replicated 3 times at the rate of 10 birds per replicate in a completely randomized design. The birds

were offered adequate feed and clean water *ad-libitum* on daily basis throughout the experiment, while routine medication and vaccination programmes recommended were done to maintain healthy flock. The experiment lasted for 8 weeks.

Data Collection

Carcass characteristics

At the end of 8th week of the experiment, two birds having representative weight of the group mean were selected from each replicate for carcass and organ evaluation. The birds were starved of feed over the night, each bird was weighed before slaughtering by severing the jugular vein after which they were bled. The bled weight was taken and the birds were defeathered, eviscerated and the carcass and the internal organs were measured. The eviscerated carcass was carefully cut into primal cut and weighed. All internal and visceral organs were weighed and expressed as to percentage of the live weight.

Table 1: Composition of VMP as provided by the manufacturers (2.5kg/ton)

Content	VMP1	VMP2	Quantity		
			VMP3	VMP4	VMP5
Vitamin A	10,000,000IU	10,000,000J/IU	7,000,000.000IU.U	12,000,000IU	12,000,000IU
Vitamin D ₃	300,000,000I	2,000,000J/IU	14,000,000IU	3,000,000IU	2,500,000IU
Vitamin E	30,000.00mg	4,000mg/kg	5,000.00IU	30,000mg	30,000.00
Vitamin K	2,300mg	900mg/kg	1,000.00mg	2,500mg	2,000mg
Vitamin B ₂	-	500mg/kg	-	2,000mg	2,800mg
Vitamin B ₃	-	5,500mg/kg	-	-	-
Vitamin B ₆	3,000.00mg	500mg/kg	3,000.00mg	3,500mg	4,500mg
Vitamin B ₁₂	10,000mg	4mg/kg	10,000.00mg	20mg	15mcg
Vitamin C	2,000.00mg	-	20.00mg	-	-
Vitamin PP	-	18,000,000mg/kg	-	-	-
Niacin	30,000.00mg	-	10,000.00mg	40,000mg	40,000mg
Pantothenic Acid	8,000.00mg	-	-	10,000mg	-
Calpan	-	-	-	10,000mg	-
Folic Acid	600.00mg	150,000mg/kg	500mg	10,000mg	1,500mg
Biotin	200,000.00mg	-	400.00mg	80mcg	50mcg
Choline chloride	300,000.00mg	130,000.00mg	-	300,000mg	-
Manganese	85.00mg	2.40%	70,000mg	70,000mg	50,000mg
Zinc	50,000.00mg	2.80%	1,250,000mg	1,250,000mg	1,250,000mg
Iron	20,000,000IU	1.80%	15,000.00mg	40,000mg	20,000mg
Copper	30,000.00mg	0.20%	1,000.00mg	8,000mg	5,000mg
Iodine	2,300mg	0.04%	10,000mg	1,200mg	1,000mg
Selenium	-	0.016%	20,000mg	250mg	200mg
Cobalt	30,000.00mg	0.04%	1,250.00mg	-	-
Antioxidant	120,00mg	0.50%	1,250.00mg	125,000mg	125,000mg
Recommended					
Rate per ton (kg)	2.5	2.5	2.5	2.5	2.5
Price per kg (₦)	880	600	960	968	600

Organoleptic studies

Samples from the breast muscle was collected and washed in clean water. The cut parts (primal) were packed in a transparent double layer polythene bag and tagged for identification. Thereafter, the samples were boiled in water bath at 80°C for 30 minutes, allowed to cool under room temperature and served to train panelist for sensory evaluation. Each panelist was required to masticate one sample per treatment and ranked preference in the following parameters; colour, juiciness, flavour, texture, tenderness, overall acceptability. To avoid carry over effect of one sample to another, each panelist was required to rinse their mouth with warm water after assessing each sample. The panelists awarded scores using a nine (9) point hedonic scale as outlined by Sanwo *et al*, 2011.

Data analysis

All data collected were subjected to one-way analysis variance (ANOVA) of SAS (2003). Means were compared by the Duncan Multiple Range Test Option of the same software package.

RESULTS AND discussion

The effect of vitamin-mineral premix inclusion on absolute carcass characteristics of broiler chickens is shown in Table 2. Significant ($P<0.05$) effects were observed in final weight, eviscerated weight, dressing percent, wings weight, carcass weight, drum stick, breast and thigh weights. However, bled weight was not significantly ($P<0.05$) affected by the brands of vitamin-mineral premix. This corroborates the findings of Mohammad *et al*. (2015) who reported that dietary inclusion of vitamin

premix had no significant impact on bled weight of broiler birds. The dress weight was significantly ($P<0.05$) higher (1769 g) in birds fed 0.30% VMP2 but lower (1351 g) in birds fed without vitamin-mineral premix 0%VMP. Furthermore, broiler chicken fed vitamin-mineral premix (VMP2) had significant ($P<0.05$) higher carcass weight (1633.33 g) while birds fed without vitamin-mineral premix (control) had lowest values (1236.67 g). This contradicts the finding of Mohammad *et al.* (2015) who documented that vitamin-mineral premix had no significant effect on carcass weight of broiler chickens. Breast weight was significantly ($P<0.05$) higher (415.33 g) in birds fedVMP2 but lower (299.00 g) in broiler chickens fed diet without vitamin-mineral premix This result negate the finding of Ogunwole *et al.* (2013) who reported that breast yield of broiler chicken were not affected by dietary inclusion of mineral composition.

Table 2: Absolute carcass characteristics of broilers fed diets containing five different vitamin-mineral premixes

Parameters	Control	VMP1	VMP2	VMP3	VMP4	VMP5	S.E.M	P. Value
Final weight (g)	1839 ^c	1859 ^c	2309 ^a	2089 ^b	2070 ^b	1991 ^b	0.001	0.01
Bled weight (g)	1730	1779	2288	2010	1971	1891	0.09	0.11
Eviscerated weight (g)	1430 ^c	1451 ^c	1869 ^a	1669 ^b	1601 ^b	1560 ^{bc}	0.00	0.01
Dress weight (g)	1351 ^c	1389 ^c	1769 ^a	1541 ^b	1531 ^b	1480 ^{bc}	0.08	0.01
Dressing percentage (%)	67.25 ^b	67.41 ^b	70.31 ^a	69.89 ^{ab}	67.97 ^b	67.97 ^b	0.05	0.01
Wing (g)	178.00 ^b	153.00 ^c	225.00 ^a	157.67 ^{bc}	172.78 ^b	170.22 ^b	1.03	0.01
Carcass weight (g)	1236.67 ^c	1253.33 ^c	1633.33 ^a	1460.00 ^b	1396.67 ^{bc}	1353.33 ^{bc}	8.24	0.01
Drum stick (g)	219.33 ^b	196.00 ^c	243.67 ^a	219.00 ^b	213.67 ^b	12.71 ^{bc}	1.41	0.01
Breast (g)	299.00 ^c	317.00 ^c	415.33 ^a	386.67 ^{ab}	385.67 ^{ab}	377.67 ^b	2.92	0.01
Thigh (g)	219.67 ^b	219.33 ^b	262.33 ^a	237.33 ^b	238.00 ^b	224.33 ^b	1.92	0.01

^{abc} Means in the same row with different superscripts are significantly different ($p<0.05$)

Table 3: Organoleptic properties of broiler fed diet containing various brands of vitamin-mineral premix

Parameters	Control	VMP1	VMP2	VMP3	VMP4	VMP5	S.E.M	P-value
Color	7.60 ^a	6.70 ^{ab}	7.00 ^{ab}	6.50 ^b	6.70 ^{ab}	6.80 ^{ab}	0.12	0.02
Flavor	5.60	5.00	5.10	4.60	5.30	4.90	0.30	0.96
Tenderness	5.60 ^{ab}	5.30 ^{ab}	6.50 ^a	4.70 ^b	4.10 ^b	4.40 ^b	0.23	0.03
Juiciness	5.70	6.30	5.60	5.80	4.50	5.30	0.23	0.36
Texture	4.60	4.30	5.50	5.00	5.60	5.80	0.23	0.34
Overall acceptability	5.60 ^{ab}	7.20 ^a	6.30 ^{ab}	4.90 ^b	4.90 ^b	6.20 ^{ab}	0.30	0.05

^{ab} Means in the same row with different superscripts are significantly different ($p<0.05$)

The effect of feeding vitamin-mineral premixes at 0.30% level on organoleptic properties of broiler chicken's meat is summarized in Table 2. The colour and tenderness were significantly ($P<0.05$) influenced by the dietary treatments, but no significant ($P>0.05$) effect was observed for flavour, juiciness, texture and overall acceptability of the meat. Broiler fed 0% VMP (control) had the highest score value (moderately light) for colour of the meat but the lowest score values was observed in birds on VMP3 (slightly light). This report negate the finding of Chouliara *et al.* (2007), who reported that colour parameter of fresh chicken breast meat did not vary with addition of grape seed and bearberry extracts. Furthermore, Camo *et al.* (2008) reported evidence of natural antioxidant inhibiting off-odour formation and discoloration of meat. The Vitamin mineral premix had significant influence on the meat tenderness. VMP2 had the highest tenderness score value (slightly Tender) while the lowest tenderness score value (slightly tough) was recorded for birds on VMP4

Effect of vitamin-mineral premix inclusion on relative organ characteristics of broilers is presented in Table 4. The liver, kidney, spleen, pancreas, lungs and heart were significantly ($P<0.05$) influenced by the dietary treatment. This negates the finding of Belloir *et al.*, (2017) who reported that vitamin-mineral premix did not significantly affect ($p>0.05$) the texture of breast meat. kidney weight was significantly ($P<0.05$) higher (0.71) in birds fed diet withVMP3 while the lowest value (0.56) was observed in in birds onVMP2. Likewise, birds fed diet containingVMP3 had the highest lung weight (0.77) while birds onVMP2 diet had the lowest (0.42) lung weight. Moreover, the birds fedVMP2 had the highest value (0.95) of heart weight while the lowest value (0.82) was recorded in birds fed without vitamin-mineral premix (control).

Table 4: Relative organ characteristics of broilers fed diets containing five different vitamin-mineral premixes

(Parameters %)	Control	VMP1	VMP2	VMP3	VMP4	VMP5	S.E.M	P.Value
Liver	3.56 ^c	4.09 ^a	3.50 ^c	3.76 ^{ab}	3.96 ^{ab}	3.65 ^b	0.02	0.01
Kidney	0.67 ^{cd}	0.66 ^{bcd}	0.56 ^d	0.71 ^a	0.59 ^{ab}	0.59 ^{ab}	0.03	0.02
Spleen	0.18 ^c	0.24 ^a	0.15 ^b	0.17 ^{bc}	0.10 ^c	0.15 ^b	0.00	0.02
Pancreas	0.52 ^c	0.48 ^b	0.48 ^b	0.35 ^a	0.52 ^c	0.37 ^c	0.00	0.01
Lungs	0.70 ^c	0.72 ^c	0.42 ^d	0.77 ^a	0.69 ^b	0.57 ^c	0.00	0.01
Heart	0.82 ^c	0.88 ^c	0.95 ^a	0.93 ^{ab}	0.84 ^c	0.93 ^{ab}	0.00	0.03

^{abc} Means in the same row with different superscripts are significantly different (p<0.05)

CONCLUSION

It may be concluded that broiler chickens fed diet containing VMP2 (Microvite Vitamin-Mineral Premix) had improve dress weight, eviscerated weight, carcass weight and breast weight when compared with other vitamin-mineral premix and also without VMP. Therefore, dietary supplementation of VMP2 at 0.30% will improve the carcass yield of Arbor Acre strain of broiler chickens.

REFERENCES

- Asaduzzman, M. S., Jahan, M. R., Mondol, M. A., Islam, G. S. and Sakar, A. K. (2005). Efficacy of different commercial vitamin-mineral premixes on productive performance of caged laying pullets. *International Journal of Poultry Science*, 4:589-595.
- Belloir, P., Méda, B., Lambert, W., Corrent, E., Juin, H., Lessire, M. and Tesseraud, S. (2017). Reducing the CP content in broiler feeds: Impact on animal performance, meat quality and nitrogen utilization. *Animals*, 11:1881–1889.
- Camo, J., Beltran, J. A. and Roncales, P. (2008). Extension of display life of lamb with an antioxidant active film as a function packaging. *Meat Science*, 88:174-178.
- Castellini, C., Mungnai, C. and DaiBosco, A. (2002). Effect of organic production system on broiler carcass and meat quality. *Meat Science*, 60:219-225.
- Chouliara, E., Karatapanis, A., Savvaidis, I. N. and Kontominas, M.G.A. (2007). Combined effect of oregano essential oil and modified atmosphere packaging on self-life extension of fresh chicken breast meat, stored at 4°C. *Food Microbiology*, 24:607-617.
- Mohammad, H.R., Nazim, A., Mohammad, R., A. and Mohammad, L. (2015). Effects of selected vitamins and minerals on growth rate and hematological parameters in broilers. *Asian Journal of Medical Biochemical Resource*, 1 (3): 487-494.
- Memon, M. (2006). Effect of Vitamin Mineral Premixes on the growth of broiler. Sindh Agriculture University, Tandojam.
- Oduguwa, O.O., Oduguwa, B.O., Fanim, A.O. and Dipeolu, M.A. (2000). Proprietary vitamin-mineral premixes in Potency of two proprietary micronutrients premixes for broiler chickens at marginally deficient Protein contents. *Architecture Zootechnology*, 49: 433-444.
- Ogunwale, O.A, Kolade, E.O. and Taiwo, B.A. (2013). Performances and carcass characteristics of broiler feed five Different vitamin premixes in Ibadan, Nigeria. *International Journal of Poultry Science*, 11(2):120-124.
- Saif, Y.M., Fadly, A.M., Glisson, J.R., McDougald, L.R., Nolan, L.K. and Swayne, D.E. (2008). *Diseases of Poultry*. 12th Edition., Blackwell Publishing Co., Ames, Iowa, USA.
- Sahin, K., Onderci, M., Sahin, N., Gursu, M.F. and Kucuk, O. (2003). Dietary Vitamin C and Folic Acid Supplementation Ameliorates the Detrimental Effects of Heat Stress in Japanese Quail. *Journal Nutrition*, 133:1882-1886.
- SAS Institute. (2003). SAS Statistics Users Guide, Statistical Analysis System, 5th Edition. 8.2 Version, Carry, NC, SAS Institute Incorporated, Carry, NC.
- Tuleun, C. D. and Igba, F. (2008). Growth and carcass characteristics of broiler chickens fed water soaked and cooked velvet bean (*Mucuna utilis*) meal. *African journal of biotechnology*, 7 (15):2676-2681.
- Zhang W., Xiao S. and Ahn D. U. (2013). Protein Oxidation: Basic Principles and Implications for Meat Quality, *Critical Revised Food Science Nutrition*, 53:1191-1201.