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Growth performance of broiler starter chickens fed varying levels of five different vitamin-mineral premixes

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Abstract

Vitamin Mineral Premixes (VMPs) are the usual medium through which poultry diets are fortified to ensure better utilization of nutrients. 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 stress, diseases and disorder. Each manufacturer claimed superior effectiveness and potency without any cognate experimental evidence. Therefore, this research surveyed the available broiler VMPs in Ogbomoso and compared their potency through a feeding trial. A survey was carried out using structured questionnaire administered to feed millers and poultry farmers after which a feeding trial was conducted using the popular VMPs. Arbor acre broiler strains (n=330) day old chicks weighing 36.9±5.00g were randomly allotted diets without any VMP (control) while others were supplemented with five different VMPs at 0.20 and 0.25% to obtain diets 0.20VMP1, 0.20VMP2, 0.20VMP3, 0.20VMP4, 0.20VMP5, 0.25VMP1, 0.25VMP2, 0.25VMP3, 0.25VMP4 and 0.25VMP5 respectively in a completely randomized design using a 5x2 factorial arrangement and reared for 56 days. Daily feed intake, weight gain and feed to gain ratio were assessed. Data were analyzed using descriptive statistics and ANOVA at P<0.05. The study revealed 16.70% of the premixes surveyed were imported while 83.30% were produced in Nigeria. Also, 10.00% of the respondents bought himix, 36.70% optimix, 13.30% wrightmix, 10.00% aeromix, 5.00% duramix, 6.7% micromix, 5% livestovit and 13.3% agrited. The on-farm study showed that the final liveweight and daily weight gain were significantly higher in birds fed the control (649.33g, 21.75g respectively) compared with birds fed 0.20VMP4 having the lowest values for the starter phase (557.93, 19.95g). Feed cost per kg weight gain was higher (>270.86) in birds fed 0.20VMP5 while the lowest (>224.90) was observed in control. The daily feed intake ranged between 44.53g in 0.20VMP4 and 47.50g in 0.20VMP5.In conclusion, the commonest vitamin mineral premix used by broiler farmers in Ogbomoso was Optimix and the broiler chickens fed the control diet had the best growth performance and were the most economical diet.

Keywords: Vitamins, mineral, premix, broiler chicken

Performances de croissance des poulets de chair nourris à différents niveaux de cinq prémélanges de vitamines et de minéraux différents

Résumé

Les prémélanges vitaminiques et minéraux (PVM) sont le moyen habituel par lequel les régimes alimentaires des volailles sont enrichis pour assurer une meilleure utilisation des nutriments. Les ingrédients de la volaille peuvent être pauvres en certaines vitamines, donc l'ajout de prémélange à l'alimentation de la volaille est donc une bonne assurance pour protéger les oiseaux du stress, des maladies et des troubles. Chaque fabricant a revendiqué une efficacité et une puissance supérieures sans aucune preuve expérimentale apparentée. Par conséquent, cette recherche a étudié les PVM de poulets de chair disponibles à

Ogbomoso et a comparé leur puissance au moyen d'un essai d'alimentation. Une enquête a été réalisée à l'aide d'un questionnaire structuré administré aux meuniers et aux éleveurs de volaille, après quoi un essai d'alimentation a été mené à l'aide des PVM populaires. Des souches de poulets de chair Arbor acre (n = 330) d'un jour pesant 36,9 ± 5,00 g ont reçu des régimes aléatoires sans aucun PVM (témoin) tandis que d'autres ont été supplémentés avec cinq PVM différents à 0,20 et 0,25 % pour obtenir des régimes 0,20PVM1, 0,20PVM2, 0,20 PVM3, 0,20PVM4, 0,20PVM5, 0,25PVM1, 0,25PVM2, 0,25PVM3, 0,25PVM4 et 0,25PVM5 respectivement dans un plan complètement randomisé utilisant un arrangement factoriel 5x2 et élevés pendant 56 jours. La prise alimentaire quotidienne, le gain de poids et le rapport alimentation/gain ont été évalués. Les données ont été analysées à l'aide de statistiques descriptives et ANOVA à P<0,05. L'étude a révélé que 16,70 % des prémélanges étudiés étaient importés tandis que 83,30 % étaient produits au Nigeria. De plus, 10,00 % des personnes interrogées ont acheté himix, 36,70 % optimix, 13,30 % wrightmix, 10,00 % aeromix, 5,00 % duramix, 6,7 % micromix, 5 % livestovit et 13,3 % agrited. L'étude à la ferme a montré que le poids vif final et le gain de poids quotidien étaient significativement plus élevés chez les oiseaux nourris avec le témoin (649,33 g, 21,75 g respectivement) par rapport aux oiseaux nourris avec 0,20 PVM4 ayant les valeurs les plus faibles pour la phase de démarrage (557,93, 19,95 g) . Le coût des aliments par kg de gain de poids était plus élevé (> 270,86) chez les oiseaux nourris avec 0,20PVM5 tandis que le plus bas (> 224,90) a été observé chez les témoins. La prise alimentaire quotidienne variait entre 44,53 g dans 0,20VMP4 et 47,50 g dans 0,20PVM5 régime le plus économique.

Mots clés : Vitamines, minéraux, prémélange, poulet à griller

Introduction

Vitamin-Mineral premix is the combination of Vitamins and Minerals added to the formulated diet to make for any deficient vitamins and minerals in the formulated diet. Vitamins and minerals represent only a minute fraction of Poultry feeds amounting to less than 0.1% by weight and 10% of the cost of Poultry rations (Singh and Panda, 1998; Bawa *et al*., 2014).Inclusion of Vitamin-Mineral Premix in Poultry nutrition has become indispensable because the feed ingredients used in formulating their ration does not contain all essential Vitamins and Minerals in the right proportion needed for growth and production (Asaduzzaman *et al.,* 2005). Limiting vitamins like choline, folic acid, pantothenic acid, pyridoxine, riboflavin, Vit-A, Vit-D3, Vit-E and limiting minerals like Calcium, phosphorus, copper, iodine, iron, manganese, sodium and zinc should be checked carefully in the diet because the gut flora of Chickens provides very little vitamin synthesis and because intensively kept chickens undergo many stresses (Asaduzzaman *et al.,* 2005), therefore economizing on inclusion of Vitamins and minerals in Poultry diet or neglecting or reducing safety margin restricts performance of birds with heavy losses, according to the authors. McDowell and Ward (2015) reported that for Poultry to express their full genetic potential, ideal farm management conditions and optimum levels of Vitamins are necessary. Top leading poultry industries recognize the need for optimum vitamin nutrition. Performance benefits from OVN diets for meat production include increased growth, feed efficiency, oxidative stability of meat, resistance to high density stress and prevention of bone problems with vitamin D3 and/or 25-OHD3 (McDowell and Nelson, 2008).This study was undertaken to verify the claims by the manufacturers of selected vitamin-mineral premixes, the optimum inclusion level of the selected vitamin mineral premixes and to investigate the effects of non-inclusion of VMP in

broilers diet at the starter phase.

Materials and methods

Prior to the selection and choice of the Vitamin Mineral Premix (VMP) to be used in the study, there was a survey of available VMP within Ogbomoso locality through the use of structured questionnaires. The information collected are the Brand name, manufacturers name, Location of the company, Location of organization, Types of VMP sold, rate of turnover and relative availability. Sixty questionnaires were administered to feed millers and poultry farmers. The information gathered was subjected to the descriptive Analysis of Variance (ANOVA) using SPSS (2000) statistical software to generate frequency table.Consequent upon the findings during the survey, five VMPs were selected and used for the study.The experiment was carried out at the Poultry Unit of Teaching and Research Farm, Ladoke Akintola University of Technology, Ogbomoso, Oyo State. Eleven isonitrogenous and isocaloric diets meeting the recommendation of NRC (1994) were formulated such that the five (5) different mineral premixes were included at 0.20 and 0.25% of the diet respectively. The control diet had no inclusion of vitamin mineral premix. The experimental diet is presented as Tables 1.A total of 330 one-day-old broiler chicks of Arbor Acre strain were used for the experiment. The chicks were weighed and separated into experimental units in a 5×2 factorial arrangement using the completely randomized design. The birds were raised on deep litter and wood shavings were used as bedding materials. The brooding period lasted for two weeks. Chick drinkers and tray feeders were used during brooding to enable the birds' access and feed after which the drinkers were changed to bowl and guard and the feeders were changed to cone feeders to prevent feed wastage. Three replicates of 10 chicks were assigned to each of the 11 dietary treatments. The chicks were fed on starter diets from day 1 to 4 weeks. Feed and water were supplied *ad libitum.* All the necessary vaccinations and medications were administered at the appropriate time according to standard practice for broilers.To determine daily feed intake, weighed quantity of feed was given to the birds on replicate basis and left over was collected and weighed to determine feed intake. Weight gain is calculated as the weight of the previous week subtracted from the present weight to determine the weight gain of each animal. Feed to gain ratio was determined using this formula:

$$\text{Feed to gain ratio} = \frac{\text{Total feed intake (g)}}{\text{Total weight gain (g)}}$$

Results and discussion

The distribution of respondents according to the vitamin mineral premixes stocked is presented 2. A total of 13.3% of the respondents stocked Himix, 33.3% stocked Optimix, 3.3% stocked Wrightmix, 13.3% stocked Aeromix, 3.3% stocked Duramix, 3.3% stocked Livestovit, 16.7% stocked Micromix while 13.3% stocked Agridom. This indicates that majority of the respondents stocked Optimix premix. Ten percent of the respondents usually buy Himix, 36.7% Optimix premix. 13.3% wrightmix, 10% aeromix. 5% duramix while 6.7% buy micromix. Five percent of the respondents usually buy Livestovit while 13.3% purchasedAgridom. The highest proportion of the respondents buys Optimix.

The result showed that 16.7% of premixes were imported while 83.3% were produced locally. Within Nigeria, 43.3% were produced in Lagos, 20% in Ibadan, 6.7% in Ilorin and 6.7% in Kaduna. The highest proportion of premix in this study produced locally originated from Lagos.The chemical analysis of the different vitamin-mineral premixes and he control diet is presented in Table 3 and the proximate composition of the experimental starter diets presented in Table 4.

Table 1: Gross composition of experimental diet (Starter phase g/100g)

	Inclusion levels (%)/ vitamin Premix Type										
Ingredients	0VMP	0.20VMP1	0.20 VMP2	0.20 VMP3	0.20 VMP4	0.20 VMP5	0.25 VMP1	0.25 VMP2	0.25 VMP 3	0.25 VMP4	0.25 VMP 5
Maize	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00
Soybean meal	34.45	34.45	34.45	34.45	34.45	34.45	34.40	34.40	34.40	34.40	34.40
Palm kernel meal	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Wheat offal	1.50	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30
Fish meal (65%)	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
Limestone	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Lysine	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Methionine	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
VMP 1	---	0.20	---	---	---	---	0.25	---	---	---	---
VMP 2	---	---	0.20	---	---	---	---	0.25	---	---	---
VMP3	---	---	---	0.20	---	---	---	---	0.25	---	---
VMP 4	---	---	---	---	0.20	---	---	---	---	0.25	---
VMP 5	---	----	---	---	---	0.20	---	---	---	---	0.25
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Calculated analysis											
Crude protein (%)	22.79	22.79	22.79	22.79	22.79	22.79	22.79	22.79	22.79	22.79	22.79
Met. Energy (kcal/kg)	2965.07	2965.07	2965.07	2965.07	2965.07	2965.07	2965.07	2965.07	2965.07	2965.07	2965.07
Ether extract (%)	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70
Crude fibre (%)	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92	3.92
Lysine (%)	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42
Methionine (%)	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52
Calcium (mg/kg)	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29
Phosphorus (mg/kg)	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64
Feed cost/ kg (₦)	101.35	102.14	101.38	102.26	102.34	102.26	102.33	102.63	102.48	102.58	102.48

Data generated in this study were subjected to Analysis of Variance (ANOVA) using the General linear model of SAS (2000). Means were compared using Duncan's Multiple Range Test (DMRT) of the same statistical package.

Table 2: Distribution of respondents according to vitamin mineral premixes stocked, patronage and location of production

Brand Name	Frequency	Percentage (%)
Stock		
Himix	8	13.33
Optimix	20	33.33
Wrightmix	2	3.33
Aeromix	8	13.33
Duramix	2	3.33
LIvestovit	2	3.33
Micromix	10	16.67
Agridom	8	13.33
Total	60	100.00
Patronage		
Himix	6	10.00
Optimix	22	36.70
Wrightmix	8	13.30
Aeromix	6	10.00
Duramix	3	5.00
Livestovit	3	5.00
Micromix	4	6.70
Agridom	8	13.30
Total	60	100.00
Location of Production		
Imported	10	16.67
Lagos	26	43.33
Ibadan	12	20.00
Ilorin	6	10.00
Kaduna	6	10.00
Total	60	100.00

Table 3: Chemical analysis of Vitamin mineral premixes and Control

Content (mg/100g)	Control diet	Aeromix	Microvite	Agridom	Optimix	Himix
Vitamin A	397.81	395.67	392.49	401.69	406.56	404.39
Vitamin D3	81.76	82.69	84.94	78.47	85.67	83.52
Vitamin E	478.76	481.89	482.94	481.47	485.67	481.47
Vitamin K	81.69	81.86	81.39	81.14	84.27	82.63
Choline chloride	5988.50	5997.3	5994.80	6026.30	6042.70	6031.60
Panthothenic acid	598.60	601.30	595.80	604.20	611.30	607.40
Niacin	194.60	193.70	192.80	196.80	204.50	196.80
Manganese	3257.00	3263.00	3282.00	3264.00	3265.00	3433.00
Zinc	2411.00	2409.00	2407.00	2415.00	2425.00	2418.00
Iron	1613.00	1617.00	1609.00	1621.00	1633.00	1625.00
Copper	321.00	318.00	315.00	325.00	337.00	329.00
Cobalt	9.30	9.80	9.60	10.20	10.70	10.40
Selenium	6.50	5.90	5.60	6.10	7.40	6.90
Iodine	36.70	36.20	35.80	38.90	41.40	39.50

Table 4: Proximate Composition of diet (Starter Phase)

Parameters (%)	Inclusion level (%)/ Vitamin mineral Premix type										
	Control	0.20 VMP1	0.20 VMP2	0.20 VMP3	0.20 VMP4	0.20 VMP5	0.25 VMP1	0.25 VMP2	0.25 VMP3	0.25 VMP4	0.25 VMP5
Dry Matter	91.33	91.41	91.25	91.19	91.21	91.17	91.08	91.05	91.24	91.16	91.13
Crude protein	22.69	22.78	23.25	23.27	22.88	23.09	22.97	22.15	23.19	23.48	23.57
Crude fat	3.65	3.68	3.74	3.77	3.69	3.73	3.71	3.76	3.78	3.67	3.75
Crude fibre	3.45	3.47	3.53	3.51	3.48	3.52	3.49	3.54	3.55	3.53	3.56
Nitrogen free extract	63.49	63.32	62.80	62.72	63.18	62.87	63.17	63.84	62.70	62.55	62.38
Ash	6.72	6.75	6.68	6.73	6.77	6.79	6.66	6.71	6.78	6.76	6.74
Gross energy (Kcal/g)	4.02	4.02	4.01	4.01	4.03	4.03	4.02	4.03	4.03	4.03	4.03

The main effect of feeding five different vitamin mineral premixes at varying levels on the growth performance of broilers (starter phase) is presented in Table 5. Final weight, daily weight gain, feed cost per kilogram, feed cost per kilogram weight gain were not significantly (P>0.05) affected by dietary treatment. The interaction effect of Premix type and level of inclusion on growth performance of broilers is presented in Table 6.

Table 5: Main effect of feeding five different vitamin mineral premixes at varying levels on the growth performance of broilers (starter phase)

Effect	Factors	IW (g)	FW (g)	DWG (g)	FCKG (₦)	FCKWG (₦)	FGR	DFI
Levels	0.20	35.47	587.87	19.72	102.08	248.96	2.32	45.81
	0.25	38.24	574.58	19.15	102.50	252.50	2.38	45.60
	SEM	0.27	8.26	0.29	0.01	4.79	0.05	0.01
VMP	VMP1	38.40	601.97	20.12	102.24	241.70	2.38	45.90
	VMP2	36.43	589.55	19.80	102.01	244.37	2.28	45.16
	VMP3	35.60	582.40	19.61	102.37	247.55	2.31	45.25
	VMP4	38.06	561.50	18.74	102.46	255.75	2.39	44.75
	VMP5	35.78	571.07	18.91	102.37	264.28	2.46	46.47
	SEM	0.61	13.07	0.46	0.01	7.57	0.07	0.01

VMP1= Aeromix, VMP2= Agrodom, VMP3= Microvite, VMP4= Optimix, VMP5= Himix.

Table 6: Interaction effect of Premix type and level of inclusion on growth performance of broilers (Starter phase)

Parameters	Inclusion levels (%) / Premix type										SEM	P. Value
	Control	0.20 VMP1	0.20 VMP2	0.20 VMP3	0.20 VMP4	0.20 VMP5	0.25 VMP1	0.25 VMP2	0.25 VMP3	0.25 VMP4	0.25 VMP5		
IW (g)	37.87	38.00	35.80	33.20	37.23	33.13	38.80	37.06	38.00	38.90	38.40	0.18	0.08
FW (g)	649.33^{a}	621.67^{b}	600.77^{b}	594.00^{b}	557.93^{c}	565.00^{bc}	582.27^{bc}	578.33^{bc}	570.13^{bc}	564.37^{bc}	577.00^{bc}	5.47	0.01
DWG (g)	21.75^{a}	20.85^{ab}	20.27^{ab}	20.18^{ab}	18.67^{c}	18.63^{c}	19.39^{ab}	19.33^{ab}	19.00^{ab}	18.77^{c}	19.24^{ab}	0.19	0.01
FCKG (N)	101.35	102.14	101.38	102.26	102.34	102.26	102.33	102.63	102.48	102.58	102.48	0.00	0.08
FGR	2.22	2.35	2.36	2.37	2.48	2.65	2.38	2.43	2.48	2.56	2.50	0.03	0.20
FCKGW (N)	224.9^{e}	239.51^{d}	238.5^{d}	241.92^{d}	253.59^{b}	270.86^{a}	243.88^{d}	249.89^{c}	253.1^{b}	257.89^{b}	257.68^{b}	3.13	0.02
DFI (g)	47.50	46.30	46.10	44.60	44.53	47.50	45.49	46.22	45.89	44.96	45.44	0.00	0.13

^{abc}Means in the same row with similar superscript are not significantly (p>0.05) different from each other.
IW-Initial weight, FW- Final weight, DWG-Daily weight gain, FCKG-Feed cost per kilogram, FGR-Feed to Gain Ratio, FCKGW-Feed Cost Per kilogram weight gain, Daily Feed Intake.

There were significant ($P<0.05$) interactions of inclusion levels and Premix type on final weight, daily weight gains and feed cost per kilogram weight gain.Broilers fed the control diet had the heaviest final weight (649.33g) and best daily weight gain (21.75g). Broilers fed diet containing VMP5 at 0.25% had significantly ($P<0.05$) better daily weight gain (19.24g) than their counterparts fed the same VMP5 at 0.20% in the diet (18.63g).The daily weight gain values of broilers fed VMP1, VMP2 and VMP3 (20.85, 20.27 and 20.18g) respectively at 0.20% were similar to those of broilers fed VMP1, VMP2 and VMP3 (19.39g, 19.33g and 19.00g) at 0.25% inclusion levels. The feed cost per kilogram weight values was higher in birds fed VMP2 at 0.25% (N249.89) than birds fed VMP2 at 0.20% (N238.50).Birds fed 0.20VMP5 had significantly ($P<0.05$) higher (N270.86) feed cost per kilogram weight gain than birds fed 0.25VMP5 (N257.68).The survey revealed that 83.3% of the vitamin mineral premixes available in Ogbomoso Agricultural Zone was produced locally in Nigeria while 16.7% of the vitamin mineral premixes used were imported. It is worthy of note that the vitamin mineral premixes produced locally are more patronized than the imported ones. This may be the result of the directive of the Federal government of Nigeria for the consumption of locally made goods to boost the economy and perhaps the performance of birds with the use of locally produced vitamin-mineral premixes. Furthermore, feed millers stock Optimix Premix more than any other Premix and farmers preferred the use of Optimix Premix in their feed. This could be because of the strong media awareness. The high demand of Optimix Premix by farmers could also be because of its moderately competitive price and good performance of their birds. Optimix could also be getting its high patronage because the farmers network a lot and might have discussed in their different fora that Optimix Premix gives the best result.

Furthermore, the chemical analysis of the different vitamin mineral premixes used in this study reveals that their composition varies. The diet that contained no Premix shows comparable composition with the diets containing different vitamin mineral premixes. Klassing (1998) had earlier suggested that nutritionists do not consider the minerals supplied from the natural feedstuffs. Consequently, the birds' requirements for these nutrients are possibly met from natural feedstuffs as well as body reserves.

The birds fed diet without vitamin-mineral premix had the highest final weight value during the starter phase. This observation differs from the reports of Islam *et al.* (2004) and Paul *et al.* (2010) that weight gain and feed efficiency significantly increase with the supplementation of vitamin mineral premixes. The high growth performance of birds fed diet without vitamin mineral premix could be because the nutrients in the feed ingredients used were adequate to support the growth of the birds without any deleterious effect at this phase. It could also be that the birds were able to obtain part of their vitamin requirements more indirectly from the ingested litter materials (Ingrid *et al.,* 2011). Gwyther *et al.* (1992) also reported that diets not fortified with mineral premix especially those that contain some animal protein feedstuffs may contain quantities of vitamins and minerals sufficient to meet or exceed the minimum recommended needs. Maiorka *et al.* (2002) observed that corn and soybean meal-based diet provide a portion of the vitamin and mineral requirements. Furthermore, Waldroup *et al.* (1968) observed that mineral premix usage in corn-soybean meal-based diets does not have any significant deleterious effect on body weight, feed intake or feed conversion of broiler chickens and this agrees with the

findings of this study as there was no significant difference observed for the final weight values of broilers fed lower levels of Vitamin-mineral premixes and recommended levels both at the starter phases. In a study conducted by Nilipour *et al.* (1994) where vitamin mineral premixes were included at 0, 25, 50, 75 and 100 percent of recommended level, reduction of premixes up to 50% had no adverse effect on broiler chickens. Fat soluble vitamins are stored in the fatty tissue of the body and can be remobilized when deficiency occurs (Maiorka *et al.,* 2002). Jafari *et al.* (2005) also observed that excluding trace minerals like Manganese and Zinc, other requirements are met by Corn and soybean meal used in poultry rations. Leeson and Summers (2008) also observed that deficiency of minerals and vitamins requires long periods to demonstrate clinical signs. Reduction or total removal of vitamin mineral premix in the starter phase could significantly reduce growing costs without any deleterious effect on performance. This is in agreement with the findings of Muhammad *et al.* (2015) who concluded study that reducing trace mineral premix led to reduction in relative cost per unit of body weight and is more economical to obtain maximum profitability from broiler production. This contrasts sharply with the report of Sayadi *et al.* (2005) that dietary mineral premix reduction or withdrawal during most part of the growth stage of rearing period may cause an increase in cost per kilogram of broilers. However, the savings in terms of feed cost will depend on the level of inclusion and the procurement cost of the different vitamin mineral premixes.

Conclusion

The study showed that the most common Vitamin-mineral Premix used by broiler farmers within Ogbomoso Agricultural Zone of Oyo State was Optimix Premix produced by Animal Care Services and Consult. Also, broiler chickens fed the control diet (No vitamin-mineral premix included in the diet) had the best growth performance and it's the most economical diet based on having the lowest feed cost per kilogram weight gain.

References

Asaduzzman, M., Jahan, M.S., Mondol, M.R., Islam, M.A. and Sarkar, 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.*

AOAC 2005. Official methods of analysis of the Association of the Analytical Chemists International. 17th ed. Published by the Association of the official Analytical Chemists International, Suite 400, 2200 WlsonBoutevard, Arlington, Virginai, USA.

Bawa, G. S., Adeyemi, O.A., Karsin, P. and Shamaki, D. 2014. Effect of feeding different commercial chick vitamin mineral premixes at varying inclusion levels on performance of pullet chicks. *Nigerian Journal of Animal Production,* 41(1):125-134.

Gwyther, M.J., Tillman, P. B., Frye, T. M. and Lentz, E.L.1992.Comparison of 2 levels of vitamin supplementation for broilers. *Poultry Science.* 71:153–159.

Islam, M.S., Lucky, N.S., Islam, M.R., Ahad, A., Das, B.R., Rahman, M.M. and Siddiui, M.S.I. 2004. Haematological parameters of offayoumiassil and local chickens reared in Sylhet region of Bangladesh, *International Journal of Poultry Science* 3(2):144- 147.

Ingrid, J., Charlotte, B., Andy B. and

Inma, E. 2011. Scientific report on the welfare of broilers and broiler breeders. *Livestock research*, pages1-116.

Jafari S.A., Navidshad B., Abolghasemi A., Royan M. and Seighalani R. 2005. Effects of dietary mineral premix reduction or withdrawal on broilers performance. *Internatinal Journal of Poultry Science*. 4:896–899.

Klassing, K.C. 1998 Nutritional modulation of resistance to infectious diseases. *Poultry Science*. 77(8):1119-1125.

Maiorka A., Laurentiz, A.C., Santin, E., Araujo, L.F and Macari 2002. Dietary vitamin or mineral mix removal during the finisher period on broiler chicken performance. *Journal of Applied Poultry Resources* 11: 121-126

Mc Dowell, L. and Nelson 2008. Optimum Vitamin Nutrition for Poultry. *International Poultry Production.,*16: 27-34.

Muhamad, I.A., Shuaibu, B.A., Nurudeen, K.A., Abdulmumin, B.A., and Haleema A. 2015. Studies on haematology and serum biochemistry of broiler chickens finished on an unprocessed and processed velvet bean as dietary sources. *Biokemistri* 27(2):68-75

Nilipour, A.H., Fabrego, R. and Butcher, B.D. 1994. Determine the effect of withdrawing various levels of vitamins and minerals from the broiler male finisher diets. *Poultry Science.,* 73: 153-153

NRC 1994. National Research Council, Nutrient Requirement of Poultry 9th rev. National Academy Press, Washington, D.C.

Paul, R.C., Ahmed, N., Moinuddin, M.A. and Hasan, N. 2010. Effects of administration of multivitamins and enzymes for broilers either singly or in combination on body weight and hematobiochemical parameters. *Journal of Bangladesh Agricultural University*. 8: 39-44.

SAS 2000. SAS User's Guide: Statistics. Version 9.1.3, SAS Institute Inc., Cary, NC., USA.

Skinner, J.T., Waldroup, A.L., and Waldroup 1992. Effects of removal of vitamin and trace mineral supplements from grower and finisher diets on live performance and carcass composition of broilers. *Journal of Applied Poultry Resources*. 1, 280-286

Waldroup, P.W., Bowen., T.E., Morrison., H.L. Hull S.J., and Tollett, V.E. 1968. The influence of EDTA on the performance of chicks fed corn-soybean meal diets with and without trace mineral supplementation. Poultry Science, 47: 956-960.

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