COMPARING THE EFFICACY OF TWO SUPPLEMENTAL METHIONINE TYPES ON GROWTH PERFORMANCE OF TWO LAYING HEN STRAINS AT THE STARTER PHASE

Kareem, D. U.[†*], Adeniran, A. D.[†], Adeyeye, E. A.[†], Amos, A. T.[†], Idowu, O. P. A.[‡], Aboderin, A. T.[#], Orbugh, A. T.[†], Idowu, O. M. O.[†]

[†] Department of Animal Nutrition, College of Animal Science and Livestock Production, Federal University of Agriculture, P.M.B. 2240, Abeokuta, Ogun State, Nigeria

[‡] Department of Animal Production and Health, College of Animal Science and Livestock Production, Federal University of Agriculture, P.M.B. 2240, Abeokuta, Ogun State, Nigeria

[#] Department of Animal Science, McGill University, 21111 Lakeshore, Sainte-Anne-de-Bellevue, QCH9X3V9, Canada

[*]*Correspondence: kareemdu@funaab.edu.ng*

ABSTRACT

Methionine is considered the first limiting amino acid in poultry, commercial laying hens inclusive. Poultry birds cannot meet their methionine requirement from conventional feedstuffs, hence the need for supplementation. This experiment was therefore conducted to compare the efficacy of two supplemental methionine types on growth performance of two laying hen strains at the starter phase. A total of 120 14-day-old ISA Brown pullet chicks were randomly allotted to four treatments with three replicates of ten birds each. The treatments were arranged in a 2x2 factorial design of two methionine types (DL and MHA-FA methionine) and two laying hen strains (Isa brown and Dekalb Amberlink). The data collected were subjected to analysis of variance (ANOVA) and significant (p<0.05) means compared using Duncan Multiple Range Test. Growth performance (weight gain, feed intake, feed conversion ratio, protein efficiency ratio, and % mortality) data were collected. All observed growth performance variables were not significantly (p>0.05) affected by the methionine types, hen strains, nor their interaction. It could therefore be concluded that both MHA-FA and DL methionine are good sources of supplemental methionine, and thereby could be utilised in pullets' diets, during the starter phase. Also, both Dekalb Amberlink and Isa Brown pullets have no clear advantage over each other at the starter phase and could therefore be raised by farmers.

Key words: Amberlink, DL methionine, Isah brown, MHA-FA methionine, poultry

INTRODUCTION

Methionine is the first limiting amino acid in poultry diets, and therefore usually supplemented in layer diet for optimal performance (Liu *et al.,* 2004). Synthetic amino acids are widely used to enhance protein synthesis in animals by adding them into their diets (Al-Mayah, 2006). The use of synthetic methionine in poultry diets makes it possible to meet the daily methionine requirement of poultry birds (Jacquie, 2013). The two main supplemental methionine types in the market are dry DL-Methionine (DLM; 99%) and liquid Methionine Hydroxy Analogue Free Acid (MHA-FA; 88%, containing 88% of the compound 2-hydroxy-4-methylthio-butanoic acid) (Kim *et al*., 2006; Panda *et al.,* 2007; Vincent and Markus, 2010).

Supplementation with limiting amino acid allows the level of protein rich feedstuffs to be reduced, while maintaining the performance, and thus reduce nitrogen excretion (Mandal *et al.,* 2004). According to EFSA (2012), supplementation of appropriate amounts of methionine and methionine analogues to meet requirements is safe for target species. Therefore, the development of highly prolific egg strains of chickens such as Isa brown and Dekalb Amberlink via genetic modification to enhance their production indices necessitates the need to explore the best supplemental methionine to be used in their diets. This study therefore aimed to compare the efficacy of two supplemental methionine types on growth performance of two laying hen strains at the starter phase.

MATERIALS AND METHODS

Experimental site

The research was carried out at the poultry unit of the Directorate of University Farms (DUFARMS), Federal University of Agriculture, Abeokuta (FUNAAB) Ogun state.

Experimental birds, management, test ingredient and diets

A total of 120 one-day-old chicks of two egg laying hen strains (60 ISA brown and 60 Dekalb Amberlink) were sourced from a reputable commercial hatchery and used for the experiment. The test ingredients (supplemental DL and MHA-FA methionine) were obtained from reputable veterinary stores, which were used in the formulation of the experimental diets. The two strains of pullet chicks were reared separately for two weeks and fed basal diets before random allotment into dietary treatments groups. Each bird strain was allotted to diets containing either DL-methionine or MHA-FA methionine to have a 2x2 factorial of two laying hen strains (ISA brown and Dekalb Amberlink) and two supplemental methionine types (DL and MHA-FA methionine). Proper medication schedule was strictly followed. The experiment lasted from week 3 – 8, after a 2-week brooding period. The experimental diets are presented in Table 1.

Table 1. Experimental diet at the starter phase

Ingredients (%)	DL-methionine	MHA-FA methionine
Maize	58.00	58.00
Soybean meal	21.00	21.00
Groundnut cake	5.00	5.00
Wheat offal	11.60	11.60
Common salt (NaCl)	0.75	0.75
Oyster shell	2.00	2.00
Bone meal	1.00	1.00
Lysine	0.20	0.20
DL-Methionine	0.20	-
MHA-FA methionine	-	0.20
Premix	0.25	0.25
Total	100	100
Calculated analysis (%, unless otherwise stated)		
Crude protein	19.0	19.0
Metabolizable energy (kcal/kg)	2800	2800
Fibre	4.32	4.32
Available phosphorus	0.64	0.64
Available calcium	1.58	1.58
Methionine	0.38	0.38

Vit/Min. premix would contain: Vit. A, 10,00000 IU; D3: 2,000000 IU; E: 12500IU; K:1.30g; B2:4.00g, D Calcium-Pantothenate: 1.30g; B6: 1.30g, B12:0.01g; nicotinic acid: 15.00g; folic acid: 0.05g; biotin: 0.02g; Co: 0.20g; Cu: 5.00g; Fe:25.00g; I:0.06g; Mn: 48.00g; Se: 0.10g; Zn: 45.00g; Choline chloride: 200.00g, BHT: 50.00g

Experimental design

The experiment was arranged in a 2x2 factorial of two laying hen strains (ISA brown and Dekalb Amberlink) and two supplemental methionine types (DL and MHA-FA methionine) using a completely randomized design, to make up a total of four treatments. Each treatment is replicated thrice with ten birds each.

Data collection

Initial body weight, weekly feed intake, average weight gain, and mortality were recorded during the trial. The data obtained from the experiment was used to calculate the total feed intake (g/b), daily feed intake (g/b*d), total weight gain (g/b), daily weight gain (g/b*d), feed conversion ratio (FCR), protein efficiency ratio (PER), and % mortality.

$Total\ feed\ intake\ (g/b) = Total\ Feed\ offered\ g - Total\ Left\ over\ (g) Number\ of\ birds$

$Daily\ feed\ intake\ (g/b*d) = Total\ feed\ intake\ (g/b) Number\ of\ days$

*Total weight gain (g/b*d) = Total Final weight g−Total Initial weight (g)Number of birds*
*Daily weight gain (g/b*d)=Total weight gain (g/b)Number of days*
Feed conversion ratio =Total feed intake (g/b)Total weight gain (g/b)
Protein efficiency ratio =TTotal weight gain (g/b)Total protein consumed (g/b)

Statistical analysis

The data collected from the study was subjected to analysis of variance (ANOVA) using SAS 9.1.4. Significant ($p<0.05$) means among variables were compared using Duncan Multiple Range Test contained in the statistical package.

Statistical model

$Y_{ijk} = \mu + S_i + M_j + (SM)_{ij} + \varepsilon_{ijk}$

Where, Y_{ijk} = Observed value of the dependent variable, μ = overall mean, S_i = Effect of strain, M_j = Effect of methionine types, $(SM)_{ij}$ = Interaction effect of hen strains and methionine types, ε_{ijk} = Error term.

Results

Table 2 shows the main and interaction effects of two laying hen strains and supplemental methionine types on pullet chicks. It was observed that neither the methionine types nor hen strains had significant ($p>0.05$) effect on all growth performance parameters considered during the starter phase. Also, the interaction of strain (Amberlink and Isa Brown) and supplemental methionine types (DL and MHA-FA) yielded no significant ($p>0.05$) impacts on the growth performance parameters (Feed intake, final weight, weight gained, feed conversion ratio, protein efficiency ratio and mortality) of the pullet chicks.

Table 2. Main and interaction effects of hen strains and supplemental methionine types on growth performance of pullets during starter phase (3-8 weeks)

		IW	FW	TWG	TFI	DFI	DWG	FCR	PER	%Mortality
		(g/b)				(g/b*d)				
Interaction										
Hen strain	Methionine type									
Amberlink	DL	37.33	594.67	557.33	1861.75	33.25	9.95	3.34	1.59	0.50
	MHA-FA	39.33	591.67	552.33	1847.17	32.99	9.86	3.35	1.58	0.42
Isa Brown	DL	38.42	599.83	561.42	1839.92	32.85	10.03	3.28	1.59	0.42
	MHA-FA	38.67	592.58	553.92	1860.83	33.23	9.89	3.37	1.57	0.25
SEM		0.595	6.770	6.683	8.856	0.158	0.119	0.043	0.021	0.224
p-value		0.141	0.831	0.78	0.246	0.246	0.78	0.576	0.789	0.883
Main effects (p-value)										
Hen strain		0.534	0.656	0.674	0.648	0.648	0.674	0.614	0.793	0.581
Methionine type		0.068	0.455	0.357	0.723	0.723	0.357	0.315	0.357	0.581

IW: Initial weight, FW: Final weight, TWG: Total weight gain, TFI: Total feed intake, DFI: Daily feed intake, DWG: Daily weight gain, FCR: Feed conversion ratio, PER: Protein efficiency ratio

DISCUSSION

This study revealed the production performance of two different strains of young commercial laying hens (Dekalb Amberlink and Isa brown) to diets containing two methionine types (DL and MHA-FA methionine) at the starter phase. No difference in growth performance was observed between the Dekalb Amberlink and Isa brown pullet chicks which could be due to the fact that the chicks were adapted to the rearing conditions or perhaps as a result of the little physiological needs of the chicks at that growth phase. The pullet chicks fed the two supplemental methionine types (MHA-FA or DL-methionine) showed similar response to all growth performance parameters measured during the starter phase. This is in line with the findings of Bateman *et al.* (2005) and Liu *et al.* (2003) who reported that it was difficult to detect the difference between DL and MHA-FA from a point-to-point comparison. This observation is also similar to that of Knight *et al.* (1998) who reported that MHA-FA had the same effectiveness as DLM on an equimolar basis in liver cell culture and growth performance of early-weaned pigs from 4 to 14kg of body weight. Chung and Baker (1992) also observed similar result while testing the molar efficacy of methionine isomers including DLM and MHA-FA with a growth assay in swine. Since the young birds showed similar response to DL and MHA-FA methionine types, and the performance of the two hen strains were also similar at the growth phase under consideration, this study thus established that both MHA-FA and DL methionine are good sources of supplemental methionine, and thereby could be utilised in pullets' diets, during the starter phase. Also, both Dekalb Amberlink and Isa Brown pullets have no clear advantage over each other and could therefore be raised by farmers, depending on the egg colour preference (brown eggs for Isa Brown and white eggs for Amberlink) of the consumers.

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