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Effects of Prelay Supplementations of Graded Levels of Alphamune ^{R} G on the Performance of Laying Hens

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Abstract

This study was carried out to determine the effects of age at prelay (15 and 19 weeks) and dietary supplementation of graded levels of Alphamune G (0.00, 0.04, 0.05, 0.06%) on laying performance of pullet chickens. The experiment period was 17 weeks and completely randomized design was employed. Feed intake, nutrient retention, weight gain and feed to gain ratio values were similar ($p > 0.05$) among birds fed the different dietary inclusion levels of Alphamune G. Hen day production, Haugh unit and Albumen height were significantly high ($p < 0.05$) for laying hens of fed the control diet. There was also interaction effect of Alphamune G and Age. The interaction of Alphamune G and Age gave the highest value in laying hens of group B fed the 0.05% diet when compared to the control. However, birds fed the 0.06% Alphamune G inclusion level gave the best result in terms of Production characteristics, Cost to benefit ratio expressed as Cost of feed to produce a Dozen Egg and Egg Quality. Also birds of group B gave better results than that of group A except in the Haugh unit value.

Keywords: Alphamune ^{R} G, pullet- laying hens, diet

1. Introduction

Antibiotics has many possible benefits such as; improvement of feed utilization, reduction of mortality, improvement of weight gain, body weight evenness and feed conversion rate (Bolu et al., 2011). Currently, the use of antibiotics has come under critical reviews since antibiotic resistant bacteria strains can be transferred from the animals to humans consuming the products (Bent & Jesen, 2001). Development of alternatives to Antibiotic Growth Promoters (AGPs) is a current research adventure. Organic acids have been reported as promising alternatives to AGPs (Hyden, 2000). It has been reported that gut health is a major determinant of performance and consequently, economics of poultry production (Samik et al., 2007). In the same vein, Dhawale, (2005) opined that the profile of intestinal microflora plays an important role in gut health. One of the promising alternative to Antibiotic Growth Promoter (AGP) that have proven benefits on the overall health of the gut in poultry and other species, is ALPHAMUNE ^{R} G. It is produced after autolysis of food grade yeast (*Saccharomyces cerevisiae*), and it contains a unique combination of (1-3, 1-6) β-glucans and mannan oligosaccharides (mannans) (Alpharma, 2004). The β-glucans, have been reported to enhance of the immunocompetence in biological system by binding and activating macrophages (Huff et al., 2007; Solis de los Santos et al., 2007). Mannans have been reported to exert prebiotic effects; they act as a substrate and energy sources for Lactobacillus spp. And in this way enhance the beneficial gut microbiota. The sub-therapeutic dose of Alphamune G is at 500g/tonnes of feed (Alpharma Animal Health, 2004). Bolu et al. (2009) reported that 0.04% and 0.06% dietary inclusion of Alphamune G gave better performance in broiler chicks and cockerel chicks respectively. The present study evaluated the effects of age at prelay and dietary supplementation of Alpharmune G on the performance of caged laying hens.

2. Materials and Methods

One hundred and forty-four (144) commercial black Harco pullets were used for this study. The age groups were nineteen (19) and fifteen (15) weeks old tagged group A and B respectively. The pullets were weighed and randomly allotted to the four dietary groups. Each group was replicated in six battery cage compartments of three birds each.

The dietary groups were the supplemental graded levels of Alphamune G (0.00, 0.04, 0.05 and 0.06%) incorporated into a basal diet (Table 1) which was formulated to meet the nutrient requirement of laying hens (NRC, 1994). Routine management programme for vaccination and other production activities in the laying hen pens followed. The birds were fed with the pre-lay diet 0-3 week and layer diet was fed 3-17 weeks of the experiment. Water and feed were given *ad-libitum*. Birds of group B fed with 0.00% level of Alphamune G were administered 0.05% dietary treatment level of Alphamune G at 28 weeks old till the end of the experiment. This was done to observe the effect of Alphamune G on birds not offered Alphamune G during pre-lay but later offered Alphamune G during laying. Data were collected when birds were thirty-six and thirty-two weeks old to when birds were forty-four and forty weeks old for each of group A and B, respectively to ensure that the laying pullets are in Phase II of egg production. Feed intake and body weight gain values were measured weekly and the values obtained were employed to compute the feed to gain ratio. Feed per Dozen Egg and Feed Cost per Dozen Egg was calculated to compute the efficiency of production. Albumen height, Albumen width and Haugh unit score were recorded and used to compute the Albumen quality, Haugh unit was also calculated. A tripod spherometer was used to measure the height of the Albumen at the mid-point, Albumen width was measured with venier calliper. Nutrient retention was determined at thirty-two weeks old for a period of three days, using the total collection method. Proximate compositions of the diet and faecal samples were determined according to the methods of AOAC (1990).

Table 1. Composition of basal diets (%dm)

Ingredient	Pre-lay diet %	Layers diet %
Maize	46.42	58
Corn Bran	12.5	-
Wheat Bran	11	7
PKC	6	6
Fishmeal 68%	1.5	2
Soybean Meal	15	18
Oyster Shell	4.65	7.3
Bone Meal	2.2	2
Vitamin Premix	0.25	0.25
Lysine	0.1	0.1
Methionine	0.1	0.1
Salt	0.28	0.2
Total	100	100
Analysed nutrient content		
ME (kcal/kg)	2661	2716
Crude Protein (%)	16	16.1
Ca (%)	2.5	3.5
P (%)	0.83	0.83
Lysine (%)	0.72	0.78
Methionine	0.27	0.28

*Premix supplied per kg of diets; Vitamin A: 8 X 106 IU, Vitamin D3: 1500 IU, Vitamin E: 10 IU, Vitamin K3: 1.5 mg, Vitamin B1: 1.6 mg, Vitamin B2: 4 mg, Vitamin B6: 1.5 mg, Vitamin B12:0.0 mg, Niacin: 20 mg, Pantothenic acid: 5 mg, Folic acid: 0.05 mg, Biotin 0.75 mg, Choline Chloride: 1.75 X 104 mg, Cobalt: 0.2 mg, Copper: 0.2 mg, Iodine: 1mg, Iron: 20 mg, Manganese: 40 mg, Selenium: 0.2 mg, Zinc: 80 mg, Antioxidant: 1.25 mg.

3. Statistical Analysis

Response criteria from the were subjected to Analysis of Variance (ANOVA) (Steel & Torrie, 1980) for Completely Randomized experimental Design with a factorial treatment design of 2x4 (2 levels of group A and B ages of birds by 4 levels of dietary feed) using Genstat 5, Release 3.2 (2nd Edition) Statistical software. Differences between treatment means were separated by subjecting them to Duncan Multiple Range Test (Duncan, 1955).

4. Results and Discussion

Feed intake was not significantly affected ($p > 0.05$) dietary Alphamune^R G. Laying hens fed 0.06% dietary inclusion of Alphamune®G gave the highest values for weight gain (-2.53 g/bird/week) (Table 2). This observation corroborates the reports of Bolu et al. (2009) when Alphamune®G was fed to broiler chicks. Cumulative weight gain is a function of nutrition; Alphamune®G and other yeast cell complex have been reported to improve feed conversion efficiency and increase final body weight in chickens (Bolu et al., 2009; Zhang et al., 2005). Body weight controls feed intake and egg size. Body weight has a dramatic effect on egg size; large birds at maturity can be expected to produce large eggs throughout their laying cycle (Leeson & summers, 2005).

Table 2. Effects of graded levels of alphamune®g on production performance of the laying hens

	Dietary Alphamune®G (%)				
Parameters	0	0.04	0.05	0.06	SEM
Feed Intake(g/d/bird)	86.54	88.81	83.89	85.65	3.63
Weight Gain(g/d/bird)	-3.51	-5.72	0.06	-2.53	6.4
% Hen Day Production	57.7^{c}	53.1^{b}	58.0^{a}	55.9^{bc}	3.86
Feed To Gain Ratio	-46	-27	-49	-3	21
Feed/Dozen Egg(g)	1919	2072	2175	1976	157.8
Feed cost/Dozen Egg(N)*	130.7^{a}	140.8^{bc}	148.0^{b}	134.5^{a}	10.7

a b- Means values that have different superscript letter in the same row are significantly different ($P > 0.05$). *1 usd = N156.

Table 3. Interactive effects of graded levels of Alphamune and age at which alphamune was administered on the production characteristics

Alphamune	Age	Parameters					
		Av.Feed Intake	Av.Weight Gain	%HDP	Av. Feed:Gain	Av.Feed/dozen Egg (g)	Av.Feed cost /dozen Egg (N)
0	A	87.42	-4.03	55.3	-36	2029	138.2
	B	85.67	-2.98	60.1	-55	1810	123.2
0.04	C1	86.31	-5.77	51.6	-50	2046	139
	D1	91.31	-5.67	54.6	-4	2098	142.7
0.05	C2	85.47	-0.87	47	-37	2270	154.3
	D2	82.3	0.98	49.1	-61	2081	141.7
0.06	C3	88.16	-0.35	54.1	-3	2120	144.2
	D3	83.13	-4.72	57.7	-3	1833	124.8
SEM		SD	NS	NS	NS	NS	NS

Means followed by the same superscript letter in the same row are not significantly different ($P > 0.05$).

Table 4. Effects of graded levels of alphamune®g on egg quality traits of the laying hens

	Dietary Alphamune®G (%)				
Parameters	0	0.04	0.05	0.06	SEM
Egg weight (g/d/bird)	56.16	56.55	58.31	55.18	1.16
Albumen Width (mm)	62.9	62.52	60.57	62.11	1.24
Egg Yolk Height (mm)	13.89	14.98[b]	14.82	15.28	0.33
Albumen Height (mm)	8.24	8.22	8.18	8.15	0.28
Yolk Index	0.41	0.43	0.44	0.46	0.01
Yolk Width (mm)	33.76	34.18	34.15	33.33	0.35
Haugh Unit (mm)	73.5	74.1	74	73.9	2.13
Egg Shell Thickness (mm)	0.33	0.33	0.33	0.32	0.01

a b-Means followed by the same superscript letter in the same row are not significantly different (P > 0.05).

Table 5. Effects of age at which alphamune was administered on of laying hens egg quality traits

Parameters	A	B	SEM
Egg Weight (g)	56.93	56.17	0.82
Albumen Width (mm)	59.67[a]	64.37[b]	0.88
Egg yolk Height (mm)	14.41	15.08	0.24
Albumen Height (mm)	9.23[b]	7.16[a]	0.2
Yolk Index (mm)	0.43	0.44	0.01
Yolk Width (mm)	33.52	34.2	0.25
Haugh Unit (mm)	82.1[b]	65.7[a]	1.51
Eggshell Thickness (mm)	0.33	0.33	0.01

a,b Means followed by the different superscript letter in the same row are significantly different (P >0.05).

Table 5.1. Interactive effects of graded levels of alphamune and age at which alphamune was administered on the laying hens egg quality traits

		Parameters							
Alphamune	Age	Alb. Height	Alb. Width	Yolk Index	Yolk Width	Egg Yolk Height	Haugh Unit	Shell Thick ness	Egg Weight
0	A	9.73	58.85	0.41	32.93	13.35	84.9	0.3367	57.03
	B	6.75	66.95	0.4183	34.58	14.43	62.2	0.335	55.28
0.04	A	9.33	60.17	0.42	34.18	14.37	82.8	0.3233	57.97
	B	7.1	64.87	0.4567	34.18	15.6	65.5	0.3383	55.13
0.05	A	8.87	59.47	0.4433	34.2	15.03	80	0.3317	56.92
	B	7.5	64	0.43	34.1	14.6	67.9	0.335	59.71
0.06	A	9	60.22	0.455	32.75	14.88	80.7	0.3317	55.82
	B	7.3	64	0.46	33.92	15.68	67.2	0.325	54.55

Table 6. Effects of graded levels of alphamune on nutrient retention of laying hens (%)

Alphamune® G Level	0	0.04	0.05	0.06	SEM
Crude Fibre (%)	36.62	-6.05	2.34	1.7	0.01
Crude Ash (%)	7.96	-53.12	-44.6	-47.75	0.06
Crude Protein (%)	67.17	45.73	34.3	43.25	0.15
Crude Fat (%)	62.9	37.95	45.05	7.65	0.19

Means followed by the different superscript letter in the same row are significantly different (P > 0.05).

Table 7. eEffects of age at which alphamune was administered on nutrient retention of laying hens egg quality traits

AGE	A	B	SEM
Crude Fibre (%)	-1.09[a]	18.39[b]	0.01
Crude Ash (%)	-47.83	-20.92	0.04
Crude Protein (%)	46.23 [a]	48.99[b]	0.1
Crude Fat (%)	43.34[b]	33.68[a]	0.14

a b- Means followed by the different superscript letter in the same row are significantly different (P > 0.05).

There were no significant difference ($p > 0.05$) of interaction effect between Alphamune and Age in the egg quality traits except for Albumen height and Haugh unit. Laying hens of group A had a higher mean value of Albumen height and Haugh unit than those of group B (Table 4). Age of the hens significantly influenced ($p < 0.05$) the Haugh unit this observation agrees with earlier reports that many factors such as storage time, temperature, age of birds, strain, nutrition and disease may affect the Haugh unit (Atteh & Leeson, 2005; Toussant et al., 1999). Petersen (1965) reported that feed formulations or genetic manipulations may not reduce the economic loss attributed to moisture loss and a decline in interior egg quality during extended storage. In the same vein, Albumen height has been reported to decrease significantly post-storage and lower albumen weights of eggs modified by high storage temperature (Walsh et al., 1995). There was no significant difference in the egg shell thickness thus supporting the reports of Mahdavi et al. (2005) that addition of lactic acid producing bacteria to the laying hen diet had no significant effect on egg shell thickness. Bare and Striem (1998) stated that a probable explanation for thin egg shell in older hens may be lessening of calcium deposition with the passage of time. Protein and fat retention results obtained disagreed with the report of Bolu et al. (2009) that similar treatments did not influence nutrient retention.

HDP value were high for birds fed the control diet and 0.06 inclusion level of Alphamune®G. Feed per Dozen Egg value was lowest followed similar trend as the HDP. For all the laying pullets given dietary Alphamune®G, feed intake was lowest for birds fed 0.05% and 0.06% inclusion leves. Haugh unit values was lowest in birds fed control diet followed by 0.06% Alphamune®G. Laying hens fed inclusion level 0.06% gave the best result in term of Production Characteristics, Cost to Benefit ratio and Egg Quality.

5. Conclusion

Prelay supplementation of Alphamune G at 0.05-0.06% enhanced production parameters. To further ensure higher benefits from this practice, prelay dietary supplementation should be done at the age of nineteen.

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