Growth performance and haematological characteristics of pullet chickens fed different feed forms supplemented with or without Oyster mushroom (*Pleurotus ostreatus*)

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Abstract

In a bid to decrease cost of production and increase performance in poultry, the study aimed at determining the growth performance and haematological characteristics of pullet chicken fed different feed forms supplemented with or without oyster mushroom (OM), three hundred and twenty (320) day old Harco Black pullet chicks were brooded for five weeks before they were allocated based on weight equalization on the basis of feed forms (mash and pellet) and OM supplementation (without and with 1g of OM per kg of feed) into four (4) treatments for an experiment which lasted for eleven weeks. Each treatment consisting of 80 birds was replicated eight (8) times with ten (10) birds per replicate. Data collected were arranged in a 2 × 2 factorial layout and subjected to Analysis of Variance in a Completely Randomized Design. Final weight, average weight gain and average feed intake in the grower phase were significantly ($p < 0.05$) higher (1244.69g, 11.13g and 106.11 g) in birds given pelletized feed and lower (1146.25g, 9.27g and 105.08 g) in birds fed mash. Also, PCV, WBC, and Hb obtained in the starter phase were significantly ($p < 0.05$) higher (30.00%, $2.70 \times 10^9/l$ and 10.10 g/dl, respectively) in pullet chicken fed diet supplemented with oyster mushroom than those (26.75%, $2.12 \times 10^9/l$ and 8.85 g/dl, respectively) recorded by birds fed diets without oyster mushroom. Therefore, improved weight gain, feed conversion ratio, and immunity can be achieved by feeding pullet chickens with pelletized feed supplemented with oyster mushroom.

Keywords: pullets, pelletized, mash, oyster mushroom, performance and haematology.

Performances de croissance et caractéristiques hématologiques de poulettes nourries avec différentes formes d'aliments supplémentées avec ou sans pleurotes (*Pleurotus ostreatus*)

Résumé

Dans le but de diminuer les coûts de production et d'augmenter les performances des volailles, l'étude visait à déterminer les performances de croissance et les caractéristiques hématologiques de poulettes nourries de différentes formes d'aliments supplémentées avec ou sans pleurotes (MO), trois cent vingt (320) jours de vieux poussins de poulettes Harco Black ont été couvés pendant cinq semaines avant d'être répartis sur la base d'une égalisation de poids sur la base des formes d'aliments (purée et granule) et d'une supplémentation en MO (sans et avec 1 g de MO par kg d'aliment) en quatre (4) traitements pour une expérience qui a duré onze semaines. Chaque traitement composé de 80 oiseaux a été répliqué huit (8) fois avec dix (10) oiseaux par répliquant. Les données recueillies ont été organisées selon une disposition factorielle 2 × 2 et soumises à une analyse de la variance dans un plan complètement randomisé. Le poids final, le gain de poids moyen et la prise

Growth performance and haematological characteristics of pullet chickens

alimentaire moyenne pendant la phase de croissance étaient significativement ($p < 0,05$) plus élevés (1244,69 g, 11,13 g et 106,11 g) chez les oiseaux ayant reçu des aliments granulés et inférieurs (1146,25 g, 9,27 g et 105,08 g) chez les oiseaux. oiseaux nourris de purée. De plus, les PCV, GB et Hb obtenus lors de la phase de démarrage étaient significativement ($p < 0,05$) plus élevés (30,00 %, $2,70 \times 10^9/l$ et 10,10 g/dl, respectivement) dans le régime alimentaire des poulettes supplémentées en pleurotes que ceux (26,75 %, $2,12 \times 10^9/l$ et 8,85 g/dl, respectivement) enregistrés par des oiseaux nourris avec des régimes sans pleurotes. Par conséquent, une amélioration du gain de poids, du taux de conversion alimentaire et de l'immunité peut être obtenue en nourrissant des poulettes avec des aliments granulés complétés aux pleurotes.

Mots-clés : poulettes, granulés, purée, pleurote, performance et hématologie.

Introduction

Poultry production is an important rapid growing money making industry. The advantage of poultry over other livestock is primarily due to the short and relatively quick turn over on investments and high quality protein products (Adeyemo *et al.*, 2010). Feed cost in poultry production accounts for about 60 – 70% of the total production cost, with the cost of ingredients the major portion of feed cost (Nolan *et al.*, 2010). New developments in the production and processing of feed in the poultry sector are promoted in order to increase the quality and safety of feed to achieve a more improved energy-efficient feed. Pelleting is the most common thermal processing method in the production of poultry feed. A major step in the pelleting process is the conditioning of mash prior to pelleting (Skoch *et al.*, 1981), which is generally accomplished by adding steam to the mash feed. Offering feed to poultry in pellet form enhances the economics of production by increasing feed intake, and thus growth performance and feed efficiency. Feed processing further add to the cost of feed (Nolan *et al.*, 2010), however, it provides an opportunity to improve performance. These improvements have been attributed to higher density, improved starch digestibility resulting from chemical changes during pelleting, increased nutrient intake, changes in physical form, and decreased energy spent for eating (Calet,

1965; Jensen, 2000). On the other hand, the use of ethno-veterinary herbs such as mushrooms are known to have considerable health-promoting benefits based on their content of antioxidants, phenolic compounds, tocopherols, carotenoids, and antibacterial compounds (Zhou *et al.*, 2010). The use of mushrooms can serve as alternatives to antibiotic growth promoters (AGP) in poultry due to the ban and use of AGPs in livestock rearing by the European Union (Guo *et al.*, 2004). Mushrooms with their flavour, texture, nutritional value and high productivity per unit area have been identified as an excellent food source to alleviate malnutrition in developing countries and has been utilized a long time ago for both food and medicine (Eswaran and Ramabadran 2000; Cheung 2010). Oyster mushroom, (*Pleurotus ostreatus*), is a common edible mushroom and previous studies on *Pleurotus ostreatus* have demonstrated various antimicrobial, antiviral and anticancer properties (Bobek and Galbavy 2001; Jedinak and Sliva, 2008). Oyster mushrooms (*Pleurotus ostreatus*) have been reported to contain many valuable benefits such as rich in dietary fibre, protein, vitamins and mineral while having low fat and calorific values (Sogunle *et al.*, 2019). Besides its nutritive values, the unique functionality of β -glucan is its contribution towards healthy characteristics (Manzi and Pizzoferrato 2000). However, the utilization of feed

forms supplemented with oyster mushroom in pullet chickens' production in order to bridge the ever-widening animal protein source in human's diets in the developing countries has not been widely researched. Based on this background, this study aimed to determine the **growth performance and haematological characteristics of pullet chickens fed different feed forms supplemented with or without Oyster mushroom.**

Materials and methods

Experimental site

The experiment was carried out at the Poultry Unit of the Directorate of University Farms (DUFARMS), Federal University of Agriculture, Abeokuta, Ogun State, Nigeria which is located on Latitude 7° 10' N and Longitude 3° 2' E (Federal University of Agriculture, Abeokuta Agrometeorology Unit). The prevailing climatic condition is tropical and it lies in the rain forest region of the country. The area has an annual rain fall of 1037mm and temperature range of 28°C to 36°C in the wet and dry seasons, respectively.

Ethical statement

This study was performed in accordance with the recommendations of the Animal Ethics Committee guidelines of the Federal University of Agriculture, Abeokuta.

Processing of test ingredient (Oyster mushroom)

Fresh oyster mushrooms (*Pleurotus ostreatus*) were obtained from a popular market centre within Abeokuta Metropolis. The bulk harvested mushrooms were oven dried at 60 °C and properly blended. The blended mushrooms were incorporation into the diet by thorough hand mixing on the floor.

Preparation of pelletized feed

The dried mash feed was passed through a 1mm sieve screen, weighed and thoroughly mixed by hand for approximately 10 minutes. Water was added to the mixture to

attain a consistent form before passing through a hand operated extruder. The paste was homogenized by kneading for an additional 10 minutes. A hand extruder was used to produce pellets of about 2mm diameter. The extruder strands were oven dried at 30 °C for 24 hours and was stored at room temperature.

Experimental birds and management

A total of three hundred and twenty (320) day old Harco Black pullet chicks were purchased from a reputable hatchery in Ogun state. Brooding was done for five weeks before birds were allotted based on weight equalization *in a Completely Randomized Design* into four (4) treatments *in a 2 × 2 factorial layout (i.e. two feed forms (mash and pelletized) and two modes of oyster mushroom supplementation (-OM and +OM).* Each treatment consisting of 80 birds was replicated eight (8) times with ten (10) birds per replicate. The birds were reared on deep litter system. The experiment lasted for 11 weeks (i.e. starter phase: 5 – 8 weeks; grower phase 8 – 16 weeks). The experimental birds were fed *ad libitum* on the formulated diets shown in Table 1, and water was supplied *ad libitum*. Descriptions of experimental treatments are;

- (i) Birds fed mash form of feed supplemented with 1g of oyster mushroom per kg of feed.
- (ii) Birds fed mash form of feed without oyster mushroom.
- (iii) Birds fed pellet form of feed supplemented with 1g oyster mushroom per kg of feed.
- (iv) Birds fed pellet feed without oyster mushroom.

Data collection

Data were collected at starter (5 -8 weeks) and grower (8 – 16 weeks) phases

Growth performance parameters

The following growth performance parameters were measured and recorded on

Growth performance and haematological characteristics of pullet chickens

weekly basis:

$$\text{Average feed intake (g/bird)} = \frac{\text{Total feed offered (g)} - \text{Left over (g)}}{\text{Number of birds per replicate}}$$

$$\text{Average body weight gain (g/bird)} = \frac{\text{Final weight (g)} - \text{initial weight (g)}}{\text{Number of birds per replicate}}$$

Feed Conversion Ratio (FCR):

$$\text{FCR} = \frac{\text{Total feed consumed (g)}}{\text{Body weight gain (g)}}$$

Blood collection and analyses

At 8th and 16th week of age, two birds per replicate were selected and 4 ml blood samples were collected in the morning between 7:00 am and 9:00 am from the vein puncture. About 2 ml of blood sample collected used for haematological analysis was stored in Bijou bottles with ethylenediamine tetra acetate (EDTA) as anticoagulant while the other 2 ml was stored in plain bottles without coagulant for blood lipid profile analysis. Sample bottles containing the collected blood were properly labelled and placed in ice packs to maintain a cool and stable temperature and immediately sent for laboratory analysis.

Haematological analysis

Packed cell volume was determined by means of the microhematocrit technique. Haemoglobin concentration was recorded photometrically using a SPECOL-11 photometer and Drabkin's solution at a wavelength of 540 nm. The estimate of the total number of white blood cells and red

blood cells were carried out using Neubauer haemocytometer counting chamber (Jain 1986). White blood cell differentials (neutrophils, lymphocytes, monocytes, eosinophils and basophils) were also determined via slide reading under microscope after blood smear and staining.

Statistical analysis

Data collected in this experiment were arranged in a 2 × 2 factorial layout (i.e. two feed forms (mash and pelletized) and two modes of oyster mushroom supplementation (-OM and +OM) and subjected to Analysis of Variance in a Completely Randomized Design as contained in minitab® version 17.1.0 (Minitab, 2013). Significant (p<0.05) differences among means were separated using Turkey's test of the same software.

Experimental model is as follows;

$$Y_{ijk} = \mu + \alpha_i + \beta_j + (\alpha\beta)_{ij} + \epsilon_{ijk}$$

Where:

Y_{ijk} = Individual Observation

μ = Population Mean

α_i = Effect of feed form (I = 2)

β_j = Effect of oyster mushroom supplementation (j = 2)

$(\alpha\beta)_{ij}$ = Interaction between feed form and oyster mushroom supplementation

ϵ_{ijk} = Residual error

Experimental diet

The experimental diet is shown in table one with an inclusion of 1g of Oyster mushroom per 1kg of feed.

Table 1: Percentage composition of experimental diets

Ingredients	Starter (-OM)	Starter (+OM)	Grower (-OM)	Grower (+OM)
Maize	47.00	47.00	46.20	46.20
Soya bean meal	15.70	15.70	12.00	12.00
Wheat offal	18.00	18.00	26.00	26.00
Groundnut cake	13.60	13.60	10.00	10.00
Dicalcium Phosphate	3.00	3.00	3.00	3.00
Limestone	2.00	2.00	2.00	2.00
Salt (NaCl)	0.25	0.25	0.25	0.25
*Vitamin/mineral premix	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10
Methionine	0.20	0.20	0.20	0.20
Oyster Mushroom	-	+	-	+
Total	100	100	100	100
Calculated analysis (%)				
Metabolizable Energy (MJ/kg)	11.34	11.34	11.05	11.05
Crude protein	18.50	18.50	16.50	16.50
Crude fat	4.30	4.30	4.10	4.10
Crude fibre	3.90	3.90	4.20	4.20

*Vitamin A=10,000 iu, vitamin D3 = 2000iu, vitamin E = 5iu, vitamin K = 2mg, riboflavin = 4.20mg, vitamin B12 = 0.01mg, panthothenic acid = 5mg, nicotinic acid = 20mg, folic acid = 0.5mg, choline = 3mg, Magnesium = 56mg, Iron = 20mg, Copper = 10mg, Zinc = 50mg, cobalt = 125mg, Iodine = 0.08mg

- = Without Oyster Mushroom + = With Oyster Mushroom (1g of Oyster mushroom per 1kg of feed)

Results and discussion

The main effects of feed forms and oyster mushroom supplementation on growth performance of pullet chickens at starter and grower phases are presented in Table 2. The average feed intake recorded in the starter phase was significantly ($p<0.05$) higher (43.46 g) in birds fed mash than 43.07 g recorded in birds fed pelletized feed. This observation is an indication that birds were comfortable eating mash feed due to its smaller particle size and consequently spent less energy during feeding when compared with their counterparts fed pellets at this stage of production. According to Cerrate *et al.* (2008), young birds select an appropriate feed size according to variation of their oral cavity. Therefore, younger birds prefer a smaller particle size while older ones select

a bigger particle size. The values for final weight, average weight gain and average feed intake in the grower phase were significantly ($p<0.05$) higher (1244.69g, 11.13g and 106.11 g) in birds given pelletized feed and lower (1146.25g, 9.27g and 105.08 g) in birds fed mash. These results are in agreement with earlier reported by Abdollahi *et al.* (2011) who indicated that pelleting improves feed intake and weight gain. A better feed conversion ratio (9.53) was also recorded in birds fed pelletized feed than 11.34 recorded in birds fed mash. Similar results were obtained by Chehraghi *et al.* (2013) who reported that pellets had a better feed efficiency over mash. Kim and Chung (1996) also concluded that feeding poultry crumble-pellets significantly improved feed conversion.

Growth performance and haematological characteristics of pullet chickens

Table 2: Main effect of the feed forms and Oyster mushroom supplementation on growth performance of pullet chickens at chick and grower phases

Parameters	Feed forms		SEM	P-value	Oyster mushroom supplementation			
	Mash	Pelletized			-OM	+OM	SEM	P-value
starter phase (5 – 8 weeks)								
Initial weight (g/bird)	295.94	310.25	5.71	0.087	307.31	298.88	5.71	0.305
Final weight (g/bird)	627.13	621.56	7.68	0.613	626.31	622.38	7.68	0.720
Average Weight gain (g/day/bird)	15.77	14.82	0.42	0.123	15.19	15.41	0.42	0.721
Average feed intake (g/bird)	43.46 ^a	43.07 ^b	0.10	0.013	43.30	43.22	0.10	0.569
Feed conversion ratio	2.78	2.94	0.08	0.163	2.89	2.83	0.08	0.619
Grower phase (8 – 16 weeks)								
Initial weight (g/bird)	627.12	621.56	7.68	0.613	626.31	622.37	7.68	0.720
Final weight (g/bird)	1146.25 ^b	1244.69 ^a	9.97	0.0001	1196.25	1194.69	9.97	0.913
Average Weight gain (g/day/bird)	9.27 ^b	11.13 ^a	0.25	0.0001	10.18	10.22	0.25	0.881
Average feed intake (g/bird)	105.08 ^b	106.11 ^a	0.26	0.008	105.48	105.72	0.26	0.514
Feed conversion ratio	11.34 ^a	9.53 ^b	0.15	0.0001	10.36	10.34	0.15	0.748

^{a,b} Means in the same row with different superscripts differ significantly (P<0.05)

On the other hand, oyster mushroom supplementation had no significant ($p>0.05$) effect on growth performance of pullet chickens. This is in line with the findings by Guo *et al.* (2004) who incorporated similar level of different mushroom powder to broilers diet and concluded that their inclusion had no impact on the birds' performance. The interaction between feed form and oyster mushroom supplementation significantly ($p<0.05$) influenced final weight, average weight gain, average feed intake and feed conversion ratio of pullet chickens at the growers' phase (Table 3). Birds fed mash diet with and without oyster mushroom had lower final weight and average weight gain

compared to values recorded in birds fed pelletized feed with and without oyster mushroom. Average feed intake ranged from 104.77g recorded in birds fed mash without oyster mushroom to 106.19g recorded for birds fed pelletized feed without oyster mushroom. Feed conversion ratio obtained in birds fed mash without oyster mushroom was significantly ($p<0.05$) low than that of birds fed pelletized feed with and without oyster mushroom. This further confirms earlier reports by Giannenas *et al.* (2010) that improved performance in poultry can be achieved through dietary supplementation with edible mushroom.

Table 3: Interaction effect of the feed forms and Oyster mushroom supplementation on growth performance of pullet chickens at starter and grower phases

	Mash		Pelletized		SEM	P-value
	-OM	+OM	-OM	+OM		
Parameters						
starter phase (5 – 8 weeks)						
Initial weight (g/bird)	299.38	292.50	315.25	305.25	8.08	0.848
Final weight (g/bird)	630.50	623.80	622.10	621.00	10.90	0.798
Average Weight gain (g/day/bird)	15.77	15.77	14.61	15.04	0.60	0.729
Average feed intake (g/bird)	43.48	43.42	43.12	43.02	0.14	0.876
Feed conversion ratio	2.79	2.77	2.98	2.89	0.11	0.749
Grower phase (8 – 16 weeks)						
Initial weight (g/bird)	630.50	623.70	622.10	621.00	10.90	0.798
Final weight (g/bird)	1140.00 ^b	1152.50 ^b	1253.50 ^a	1237.90 ^a	14.10	0.327
Average Weight gain (g/day/bird)	9.10 ^b	9.44 ^b	11.28 ^a	11.02 ^a	0.36	0.290
Average feed intake (g/bird)	104.77 ^b	105.40 ^{ab}	106.19 ^a	106.03 ^{ab}	0.36	0.281
Feed conversion ratio	11.51 ^a	11.17 ^a	9.41 ^b	9.62 ^b	0.21	0.038

^{a,b} Means in the same row with different superscripts differ significantly (P<0.05)

The results of the main effects of feed forms and oyster mushroom supplementation on haematological parameters of pullet chickens at starter and grower phases are depicted in Table 4. Feed form had negligible effect on all haematological parameters measured. This indicated that feed forms had no marked/significant effect on the haematological parameters of pullet chickens at starter and growers phases. This result is in line with findings of previous studies by Fasuyi and Arire (2015) and Fasuyi and Odunayo (2015) who observed similarities in haematological parameters of birds fed mash and pellet. However, packed cell volume, white blood cell count, and Haemoglobin concentration obtained in the starter phase were significantly ($p<0.05$) higher (30.00%, $2.70 \times 10^9/l$ and 10.10 g/dl , respectively) in pullet chicken fed diet supplemented with oyster mushroom than values (26.75%, $2.12 \times 10^9/l$ and 8.85 g/dl , respectively) recorded in their counterpart fed diets without oyster mushroom. The increased PCV obtained in birds fed diets

supplemented with oyster mushroom can be ascribed to elevation in both red and white cell indices. These results corroborated the reports by Iheukwumere *et al.* (2002) and Sogunle *et al.* (2019) who observed differences in PCV, Hb and WBC of chickens administered varying inclusion levels of oyster mushroom. In the grower phase, lymphocyte was significantly ($p<0.05$) higher (70.50%) in birds fed diet without oyster mushroom and lower (67.50%) in birds fed diet supplemented with oyster mushroom. According to Guyton and Hall (2006), increases in lymphocytes in the blood indicate enhanced immunological well-being of the body. Furthermore, the interaction between feed forms and oyster mushroom on haematological parameters of pullet chickens shown in Table 5, revealed that red blood cell count was significantly ($p<0.05$) highest ($2.90 \times 10^{12}/l$) in birds fed pelletized feed supplemented oyster mushroom and lowest (2.20 and $2.50 \times 10^{12}/l$) in birds fed mash and pelletized feed without oyster mushroom.

Table 4: Main effect of the feed forms and Oyster mushroom supplementation on Haematological parameters of pullet chickens at starter and grower phases

Parameters	Feed forms				Oyster mushroom supplementation			
	Mash	Pelletized	SEM	P-value	-OM	+OM	SEM	P-value
starter phase (5 – 8 weeks)								
Packed cell volume (%)	28.00	28.75	0.69	0.482	26.75 ^b	30.00 ^a	0.69	0.028
Red blood cell ($\times 10^{12}/l$)	11.58	10.28	0.61	0.203	11.10	10.75	0.61	0.703
White blood cell ($\times 10^9/l$)	2.35	2.48	0.06	0.238	2.12 ^b	2.70 ^a	0.06	0.003
Neutrophil (%)	27.50	27.50	2.02	1.000	26.75	28.25	2.02	0.627
Lymphocyte (%)	70.50	69.50	1.89	0.727	70.25	69.75	1.89	0.861
Monocyte (%)	1.00	1.25	0.53	0.756	1.25	1.00	0.53	0.756
Basophil (%)	0.25	0.75	0.25	0.230	0.50	0.05	0.25	1.000
Eosinophil (%)	0.25	0.75	0.25	0.230	0.50	0.05	0.25	1.000
Haemoglobin concentration (g/dl)	9.35	9.60	0.20	0.433	8.85 ^b	10.10 ^a	0.20	0.012
Grower phase (8 – 16 weeks)								
Packed cell volume (%)	44.25	45.50	4.59	0.857	45.25	44.50	4.59	0.914
Red blood cell ($\times 10^{12}/l$)	3.65	3.73	0.36	0.890	3.73	3.65	0.36	0.890
White blood cell ($\times 10^9/l$)	10.93	11.53	0.67	0.559	11.18	11.28	0.67	0.921
Neutrophil (%)	28.75	30.25	0.97	0.335	28.50	30.50	0.97	0.218
Lymphocyte (%)	69.25	68.75	0.75	0.662	70.50 ^a	67.50 ^b	0.75	0.047
Monocyte (%)	1.00	0.75	0.53	0.756	0.75	1.00	0.53	0.756
Basophil (%)	1.00	0.75	0.53	0.756	0.75	1.00	0.53	0.756
Eosinophil (%)	0.75	0.25	0.43	0.460	0.25	0.75	0.43	0.460
Haemoglobin concentration (g/dl)	14.08	14.78	1.28	0.719	14.78	14.08	1.28	0.719

^{a,b} Means in the same row with different superscripts differ significantly ($P<0.05$)

Growth performance and haematological characteristics of pullet chickens

Table 5: Interactive effect of feed forms and Oyster Mushroom supplementation on Haematological parameters of pullet chickens at chick and grower phases

Parameters	Mash		Pelletized		SEM	P-value
	-OM	+OM	-OM	+OM		
Parameters						
Chick phase (5 – 8 weeks)						
Packed cell volume (%)	26.50	29.50	27.00	30.50	0.97	0.809
Red blood cell (x 10 ¹² /l)	2.20 ^b	2.50 ^{ab}	2.05 ^b	2.90 ^a	0.09	0.038
White blood cell (x 10 ⁹ /l)	12.15	11.00	10.50	10.50	0.86	0.402
Neutrophil (%)	26.50	28.50	27.00	28.00	2.85	0.869
Lymphocyte (%)	71.00	70.00	69.50	69.50	2.67	0.861
Monocyte (%)	1.00	1.00	1.50	1.00	0.75	0.756
Basophil (%)	0.50	0.00	0.50	1.00	0.35	0.230
Eosinophil (%)	0.50	0.00	0.50	1.00	0.35	0.230
Haemoglobin concentration (g/dl)	8.70	10.00	9.00	10.20	0.29	0.870
Grower phase (8 – 16 weeks)						
Packed cell volume (%)	45.50	43.00	45.00	46.00	6.49	0.801
Red blood cell (x 10 ¹² /l)	3.75	3.55	3.70	3.75	0.51	0.817
White blood cell (x 10 ⁹ /l)	11.25	10.60	11.10	11.95	0.94	0.471
Neutrophil (%)	29.00	28.50	28.00	32.50	1.37	0.142
Lymphocyte (%)	69.50	69.00	71.50	66.00	1.06	0.078
Monocyte (%)	1.00	1.00	0.50	1.00	0.75	0.756
Basophil (%)	1.00	1.00	0.50	1.00	0.75	0.756
Eosinophil (%)	0.50	1.00	0.00	0.50	0.61	1.000
Haemoglobin concentration (g/dl)	14.60	13.55	14.95	14.60	1.81	0.856

^{a,b} Means in the same row with different superscripts differ significantly (P<0.05)

Conclusion

As seen in the results obtained from the study, it can be concluded that improved weight gain, feed conversion ratio, and immunity can be achieved by feeding pullet chickens with pelletized feed supplemented with oyster mushroom.

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