

**REPRODUCTIVE ORGAN DEVELOPMENT OF PULLETS FED DIFFERENT FORMS OF DIET CONTAINING OYSTER MUSHROOM (*Pleurotus ostreatus*)**

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**ABSTRACT**

The prohibition on antibiotic use in animal production has prompted a search for safe, natural alternatives to incorporate into poultry nutrition. A total of 320, fourteen (14) weeks old pullets were divided into four treatments containing 80 birds per treatment which were further sub-divided into 10 replicates of 8 birds each. The study was a 2 × 2 factorial arrangement laid out in a Completely Randomized Design consisting of two feed forms (mash and pellets) and two inclusion levels of oyster mushroom (0 or 1 g/kg). Two birds per replicate were randomly selected and eviscerated to determine the reproductive organ development at 24<sup>th</sup> week of age. At the 24<sup>th</sup> weeks, a total of 96 birds (32 birds at each successive week) were slaughtered respectively. Data collected were subjected to One-Way Analysis of Variance. Results showed that at 16 weeks, the birds had not generally developed ovaries, while at 24 weeks, birds on pelletized feed had significantly ( $p < 0.05$ ) higher number of ovaries (7.50) and ovary weight (37.50 g) than those on mash diet. The inclusion of 1 g/kg oyster mushroom did not affect ( $p > 0.05$ ) the reproductive organ development of the birds. The study concluded that feeding layers with pelletized feed improved the reproductive organ development

**Keywords:** Microbiota, Oyster mushroom, Ovaries, Pullets

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**INTRODUCTION**

Poultry encompasses the range of domesticated and commercialized types of birds such as chickens, turkeys, pigeons, ducks, geese, upland game birds (quail, pheasant, partridges) and ratites (ostriches, emu) used for production of eggs and meat for human food (FAO, 2003). The imprudent use of antibiotic growth promoters (AGPs) in poultry production has led to the development of antibiotic-resistant bacteria and the accumulation of antibiotic residues in poultry products, which can pose a threat to consumers. Since then, several natural alternatives to antimicrobials have been researched. These alternatives include probiotics, prebiotics, organic acids, etc. According to Santos and Turnes (2005), probiotics and prebiotics may provide beneficial modulation of the intestinal microbiota, enhance the immune response, protect intestinal integrity, and consequently, the performance of poultry. Oyster mushroom (*Pleurotus ostreatus*) is known to have antioxidant and immunomodulatory effects (Shamtsyan *et al.*, 2007) and has been shown to improve growth, immunity and intestinal health (Giannenas *et al.*, 2010).

The oviduct is a useful model for hen reproductive biology. Active ovary and oviduct have well enough secretory functions and it ensures quality egg (Rahman, 2013). Any abnormality in the reproductive tract or egg materials may reduce the egg laying frequency as well as egg quality and it could be an indication on the process of quality egg laying. Thus, it could be important for the poultry farmers and the poultry researchers to study how feeding processes affects reproductive organ development. Thus, this study investigated the reproductive organ development and gut histomorphometry of egg type chickens fed different forms of diets containing oyster mushroom (*Pleurotus ostreatus*).

**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.

**Experimental birds and management**

A total of three hundred and twenty (320) Harco black pullet at the point of cage were purchased from a poultry farm in Ogun state. The birds were allocated based on weight equalization to four experimental treatments. The birds were grouped into four (4) treatments, each treatment was replicated eight (8) times with ten (10) birds per replicate. The birds were reared intensively on deep litter system. Feed and water were supplied *ad libitum*. Proper medication and vaccination program were strictly followed. The experiment lasted for 10 weeks (i.e. 98 – 168 days). The birds were fed 125 g of feed/bird on the formulated diets shown in Table 1. Water was supplied *ad*

*libitum*. Each group was randomly allotted to 2 different feed forms (mash and pellet) containing 1 g of *Pleurotus ostreatus* per kg of feed.

#### Processing of test ingredient (Oyster mushroom)

Fresh oyster mushrooms (*Pleurotus ostreatus*) were obtained from a fruit and vegetable market centre within Abeokuta Metropolis. The intact mushrooms were dried at 60°C and properly blended. The blended mushrooms were ground through a 5mm sieve before incorporation into the diet by thorough hand mixing.

#### 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 consistency appropriate for 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 was oven dried at 30°C for 24 hours and was stored in a plastic drum at room temperature.

#### Data collection

##### Reproductive Organ Development Evaluation

At the 16<sup>th</sup> and 24<sup>th</sup> weeks, a total of 96 birds (32 birds at each successive week) were slaughtered respectively. The ovary and oviduct were removed from each bird and weighed, and the number of developing follicles were counted and weighed using a sensitive scale.

**Table 1: Percentage composition of experimental diet**

Ingredients (%)	Grower's mash	Layers mash
Maize	46.20	40.20
Soya bean meal	12.00	14.00
Wheat offal	26.00	22.00
Groundnut cake	10.00	15.00
Dicalcium Phosphate	3.00	5.00
Limestone	2.00	3.00
Salt (NaCl)	0.25	0.25
*Vitamin/mineral premix	0.25	0.25
Lysine	0.10	0.10
Methionine	0.20	0.20
<b>Total</b>	<b>100</b>	<b>100</b>
Calculated Analysis.		
Metabolizable Energy (MJ/kg)	11.05	10.65
Crude protein (%)	18.10	20.00
Crude fat (%)	4.10	4.10
Crude fibre (%)	4.20	4.10
Calcium	1.80	2.90
Phosphorus	0.50	0.80
Lysine (%)	0.80	0.90
Methionine (%)	0.50	0.50

#### Statistical analysis

The experiment was laid out in a 2 × 2 factorial arrangement; that is two (2) feed forms and two (2) inclusion levels of oyster mushroom. Using analysis of variance within a completely randomized design framework, Significant (p<0.05) differences among means were separated using Tukey test as contained in minitab® version 17.1.0 (Minitab, 2013).

**RESULTS AND DISCUSSION****Main effect of feed form and oyster mushroom inclusion on reproductive organ development of pullets at 24 weeks**

The effect of the feed forms was significant ( $p < 0.05$ ) only on the number of ovaries and ovary weight of the egg type chickens at 24<sup>th</sup> week (Table 2). Every other parameter was not significantly ( $p < 0.05$ ) influenced by the feed form. The effect of the oyster mushroom was not significant ( $p > 0.05$ ) on the reproductive organ parameters of the pullets.

**Table 2: Main effect of feed form and oyster mushroom inclusion on reproductive organ development of pullets at 24 weeks**

Parameter	Feed form				Oyster mushroom inclusion			
	Mash	Pellets	SEM	P-value	Control	1 g/kg	SEM	P-value
Oviduct (cm/100 g)	1.278	2.565	0.807	0.246	2.394	1.449	0.699	0.383
No of follicle	9.50	13.07	2.16	0.316	11.38	11.20	2.46	0.960
Follicle weight (g)	1.50	1.75	0.48	0.693	2.25	1.00	0.43	0.068
No. of Ovary	1.000 <sup>b</sup>	7.500 <sup>a</sup>	0.520	0.003	3.250	5.250	0.581	0.112
Ovary weight (g)	0.50 <sup>b</sup>	37.50 <sup>a</sup>	3.12	0.003	18.50	19.50	3.49	0.879

<sup>ab</sup>: means on the same row with different superscript differ significantly

SEM: Standard error of mean

The interaction between the feed forms and oyster mushroom inclusion did not significantly ( $p > 0.05$ ) affect the reproductive organ parameters of the pullets at 24<sup>th</sup> week (Table 3).

**Table 3: Interaction of feed form and oyster mushroom inclusion on reproductive organ development of pullets at 24 weeks**

Parameter	Mash		Pellets		SEM	P-value
	Control	1 g/kg	Control	1 g/kg		
Oviduct (cm/100 g)	1.63	0.93	3.162	1.967	0.807	0.812
No of follicle	6.00	13.00	16.75	9.40	3.72	0.059
Follicle weight (g)	2.00	1.00	2.50	1.00	0.53	0.693
No. of ovary	13.67	15.67	16.67	15.00	5.36	0.757
Ovary weight (g)	12.33	15.50	9.00	2.00	3.12	0.149

SEM: Standard error of mean

A desirable trait in poultry is the early attainment of puberty and consequently greater egg production (Tan *et al.*, 2021). In this study, it was observed that feeding the birds with pellets and the inclusion of 1 g/kg of oyster mushroom did not shorten the age at which the birds attained maturity. The reproductive organs were not present at 16<sup>th</sup> weeks, but were fully present at 24<sup>th</sup> weeks. This graduation in the reproductive organ parameters with maturity of the birds is a normal phenomenon associated with female birds (Assersohn *et al.*, 2021). It was observed that birds on diet with the inclusion of 1 g/kg of oyster mushroom had a slight increase (i.e. non-significant increase) in the number of ovaries and ovary weight by the 24<sup>th</sup> week which may indicate a tendency for sexual maturation as a result of the presence of oyster mushroom in the diet of the birds. The recorded increase in the number of ovaries and ovary weight recorded by the 24<sup>th</sup> week was however, preceded by a significant decrease in the follicle weight by the 16<sup>th</sup> week and also by a slight decrease by the 24<sup>th</sup> week. It thus could be suggested that the inclusion of 1 g/kg of oyster mushroom may affect egg production through mechanism(s) other than acting directly on the ovary and/or its follicles. Maya *et al.* (2005) also reported that a decrease in follicle weight was associated with an increase in the number of ovaries and ovary weight.

**CONCLUSION**

It can be deduced from the results of this study that;

Pellet feed and oyster mushroom inclusion had no significant effect on the reproductive organs of the birds. However, further research on utilizing higher inclusion levels of oyster mushroom should be conducted.

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