EVALUATION OF GROWTH PERFORMANCE INDICES IN BROILER CHICKENS FED GRADED LEVELS OF *Pleurotus tuber-regium* SUPPLEMENTATION

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ABSTRACT

This study investigated the effect of *Pleurotus tuber-regium* supplementation (PTS) on growth performance of broiler chickens over eight weeks. A total of 120 day-old broiler chicks were randomly assigned to four dietary treatment groups (T1: control, T2: 2%, T3: 4%, T4: 6% PTS) in a completely randomized design with three replicates per treatment. Birds were fed respective diets during starter (weeks 1–4) and finisher (weeks 5–8) phases. Growth parameters were measured and statistically analysed using one-way ANOVA with significance set at $p<0.05$. Results showed no significant differences ($p>0.05$) in all growth parameters except feed cost per kilogram gain, which was higher in PTS groups during the starter phase. At the finisher phase, average daily feed intake and weight gain were highest in the 4% PTS group. These results indicate that *Pleurotus tuber-regium* supplementation up to 4% does not impair growth, and may optimize intake and gain at moderate levels.

Key words: alternative protein sources, cost-effectiveness, dietary treatment, king tuber mushroom, poultry, sustainability

DESCRIPTION OF PROBLEM

Alternative protein sources offer promising solutions for sustainable poultry production by reducing dependency on conventional feeds, potentially lowering feed costs by up to 25%, and supporting resource efficiency through the utilization of locally available materials [1]. Within this context, mushrooms have emerged as particularly promising alternative feed resources for poultry nutrition. Recent research has demonstrated that edible mushrooms, rich in bioactive compounds such as β-glucans, glycoproteins, polyphenols, terpenoids, and antioxidants, exhibit significant immunomodulatory, antimicrobial, anti-inflammatory, and antioxidative properties [2]. Various mushroom species including *Pleurotus ostreatus, Agaricus bisporus*, and *Flammulina velutipes* have shown positive effects on growth rate, feed conversion ratio (FCR), carcass traits, meat quality, and egg production in poultry [3].

Pleurotus tuber-regium, commonly known as king tuber mushroom, represents a particularly significant species within this emerging field of alternative feed resources. This edible mushroom possesses remarkable nutritional characteristics, containing substantial levels of carbohydrates (85.81g/100g), crude fiber (9.29g/100g), and crude protein (3.53-15.4g/100g on dry weight basis). The species is notably rich in essential minerals, particularly potassium (3.74g/100g), calcium (1.28g/100g), and magnesium (1.12g/100g) [4]. Despite the established benefits of mushroom supplementation in poultry nutrition and the rich nutritional profile of *P. tuber-regium,* significant knowledge gaps remain regarding the specific application of king tuber mushroom as a feed ingredient for broiler chickens. While preliminary studies have shown that dietary inclusion of tuber mushrooms up to 2.5% does not adversely affect growth performance [5], comprehensive evaluation of growth performance parameters specifically for *P. tuber-regium* remains limited. The existing literature lacks detailed investigation of optimal inclusion levels, dose-response relationships, and comprehensive assessment of growth performance indices when broiler chickens are fed diets containing king tuber mushroom. Hence, this study was designed to evaluate the

growth performance indices of broiler chickens fed *Pleurotus tuber-regium* as a dietary supplement. This investigation is particularly significant and timely given the global emphasis on reducing antibiotic use in livestock production and the increasing consumer demand for products derived from animals raised on natural, sustainable feeding systems. Hence, the study evaluates the effect of *Pleurotus tuber-regium* supplementation (PTS) on growth performance of broiler chickens over eight weeks

MATERIALS AND METHODS

Study Location and Environmental Conditions

The experiment was carried out in the Poultry Facility at the Department of Animal Science Teaching and Research Farm, University of Nigeria, Nsukka. The feeding trial spanned eight (8) weeks; from the 1st of June till the 27th of July, 2018, and characterized by a tropical climate with average ambient temperatures ranging from 22°C to 32°C and relative humidity between 50% and 70% throughout the study period. The birds were housed in well-ventilated pens, with uniform lighting (16 hours of light and 8 hours of darkness) controlled naturally by vents to optimize environmental conditions for the birds. Temperature and humidity were recorded daily using a digital thermo-hygrometer (Century Light, model SKH235) to monitor environmental uniformity and to control for potential confounding effects.

Experimental Ingredient

Fresh *Pleurotus tuber-regium* sclerotia were procured from the Orie Orba Market, and systematically identified by means of a standard press in the Herbarium at the Department of Plant Science and Biotechnology, University of Nigeria, Nsukka. The test sclerotia were rinsed with water, drained, then sliced to small pieces (approximately 5 cm in diameter), oven-dried at 60°C until crispy dry (moisture content was below 10%), and ground and sieved into fine powder using a manual kitchen cranker and 0.2mm-sieve, respectively. The proximate composition of the test ingredient was determined by official methods of the AOAC [6] and presented in Table 1.

Table 1: Proximate Composition of *Pleurotus tuber-regium* Sclerotia

Nutrients	Composition (%)
Crude protein	16.50
Crude fibre	10.50
Ether extract	1.80
Mineral Ash	10.20
Nitrogen-free extract	61.00

Diet Formulation and Treatment Groups

A basal diet that are adequate for starter (weeks 1–4) and finisher (weeks 5–8) phases were formulated to meet the nutrient requirements proscribed standard for broiler chickens by the National Research Council [7]. The basal diet served as the control (T0) and was supplemented with graded levels of the mushroom powder, thus: T1, no mushroom powder (control); T2, 2% mushroom powder per kg diet; T3, 4% mushroom powder per kg diet; T4, 6% mushroom powder per kg diet. Table 2 shows the percentage composition of the experimental basal diets.

Experimental Birds and Design

A total of 120 day-old Arbor Acre broiler chicks, sourced from a certified hatchery, were used. Upon arrival, chicks were disinfected using a poultry-safe disinfectant spray, and health status was confirmed by a veterinary officer. The birds were randomly allocated to four treatment groups (T0, T1, T2, and T3), each comprising 30 chicks subdivided into three replicates of 10 birds per replicate pen. The study employed a completely randomized design (CRD) to distribute the experimental units evenly across treatment groups, minimizing bias and ensuring statistical validity. Experimental treatments consisted of a control diet and diets supplemented with 2%, 4%, and 6% PTS per kg diet administered over starter

and finisher growth phases on ad libitum basis. To ensure dietary effects were attributable only to PTS, all diets were formulated to be nutritionally equivalent (isonitrogenous and isocaloric). Proximate analysis of the diets were performed to confirm uniformity in nutrient contents according to AOAC [6] as presented in Table 1. Weekly body weight and feed intake data were recorded for all replicates.

Access to the experimental site was limited to authorized personnel only, and footbaths containing disinfectants were placed at all entry points. Personnel wore designated protective clothing and footwear, and equipment was disinfected routinely. Pens, feeders, and drinkers were cleaned and disinfected daily. Bird welfare practices adhered strictly to the internationally accepted guidelines for poultry care. Stocking density was maintained at 10 birds per m² to prevent overcrowding, and fresh clean water was provided *ad libitum* through nipple drinkers. Data were collected at the end of each growth phase on initial body weight, weekly body weight, body weight gain for each week was calculated, feed intake was recorded daily and summed weekly, average daily gain, feed conversion ratio, feed cost per kilogram gain and protein efficiency ratio were calculated. Randomization, replication, and control of extraneous variables were implemented to isolate the effect of the dietary treatments. The study followed standard biosecurity and welfare protocols to maintain health and minimize confounding environmental effects. Statistical analysis involved one-way ANOVA to compare means among groups, with significance declared at $p < 0.05$.

Table 2: Percentage compositions of the experimental basal diets

Ingredients	Starter	Finisher
Maize	48.00	53.00
Wheat offal	10.00	12.50
Palm kernel cake	12.00	11.55
Soybean meal	20.00	18.00
Fish meal	5.00	2.00
Vegetable oil	2.00	2.50
Limestone	1.50	200
Bone meal	1.50	2.00
Salt	0.30	0.40
Lysine	0.20	0.15
Methionine	0.10	0.10
Vitamin and mineral premix	0.40	0.40
Total	100.00	100.00
Calculated nutrients		
Protein	23.88	20.05
Fiber	4.00	5.19
Metabolizable energy (kcal/kg)	2860.00	2920.00
Proximate nutrients		
Crude protein	24.37	19.22
Crude fiber	5.68	8.13
Ether extract	7.05	9.97
Mineral ash	8.21	10.44
Nitrogen-free extract	54.69	52.24

RESULTS AND DISCUSSION

Growth Performance of Broiler Chickens Fed *Pleurotus tuber-regium* Supplementation

Table 3 presented the growth performance indices of starter and finisher broiler chickens fed graded levels of *Pleurotus tuber-regium*. In the starter phase, there were no significant differences ($p > 0.05$) among treatment groups in initial body weight, final body weight, average daily weight gain, average daily feed intake, feed conversion ratio, or protein efficiency ratio (Table 3). However, feed cost per kilogram gain was significantly higher ($p = 0.03$) in all mushroom-supplemented groups (T2, T3, and T4) compared

to the control (T1), reflecting the additional cost of supplementation during this phase. During the finisher phase (Table 4), final body weights and feed conversion ratios did not differ significantly ($p > 0.05$) across treatments. Notably, average daily weight gain was significantly higher ($p = 0.04$) in the 4% supplementation group (T3) compared to the others, indicating enhanced growth performance at this inclusion level. Correspondingly, average daily feed intake was significantly greater ($p = 0.02$) in T3, while the 2% group (T2) recorded the lowest intake, which was significantly less than T1 and T4. Feed cost per kilogram gain and protein efficiency ratio showed no significant differences among treatments during the finisher phase. These results demonstrate that *Pleurotus tuber-regium* supplementation at levels up to 6% does not adversely impact growth performance indices of broiler chickens. The lack of adverse effects on starter and finisher growth parameters supports the safety and nutritional adequacy of PTS at appropriate inclusion levels. The improved feed intake and weight gain at 4% inclusion during the finisher phase may suggest an optimal dietary level for performance enhancement. The higher initial feed cost in starter phase warrants economic consideration but may be offset by growth benefits in later phases.

Table 3: Growth performance of starter and finisher broiler chickens fed *Pleurotus tuber-regium*

Starter phase							
Parameters	T1 control	T2 (2%)	T3 (4%)	T4 (6%)	SEM	p-value	Significance
IBW	42.50	42.30	42.70	42.10	0.35	0.95	NS
FBW	814.20	803.40	825.70	810.90	7.50	0.68	NS
ADG	19.50	19.20	20.30	19.80	0.22	0.59	NS
ADFI	36.70	37.00	37.50	36.90	0.35	0.77	NS
FCR	1.88	1.93	1.85	1.87	0.02	0.42	NS
FCG	450.00	503.00	521.00	534.00	5.20	0.03	*
PER	1.75	1.70	1.78	1.74	0.02	0.54	NS
Finisher phase							
FBW	1910.00	1892.00	1978.00	1888.00	14.50	0.64	NS
ADG	38.50	38.40	40.20	37.80	0.35	0.04	*
ADFI	65.40	63.80	68.50	64.70	0.50	0.02	*
FCR	1.70	1.66	1.70	1.71	0.02	0.58	NS
FCG	430.00	435.00	445.00	448.00	4.80	0.54	NS
PER	1.85	1.83	1.87	1.79	0.02	0.45	NS

SEM denotes standard error of the mean. Significance levels: * $p < 0.05$; NS = not significant ($p \geq 0.05$). Feed cost is expressed in Nigerian Naira (₦). IBW = initial body weight; FBW = final body weight; ADG = average daily gain; ADFI = average daily feed intake; FCR = feed conversion ratio; FCG = feed cost per kilogram gain; PER = protein efficiency ratio.

CONCLUSION AND APPLICATION

This study demonstrated that *Pleurotus tuber-regium* supplementation up to 6% per kg diet does not impair growth, and may optimize intake and gain at moderate levels of 4% per kg diet.

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