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Performance and Hematological Profile of Broiler Chicks on Toasted Tiger Nut (*Cyperus esculentus*) Treated With Bakery Yeast

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Abstract
A 28-day feeding trial was carried out at the Animal Production Research and Teaching farm, Imo State Polytechnic, Umuagwo, Ohaji, Owerri, to determine the performance characteristics and haematological parameters of broilers starter chicks fed toasted Tiger nut treated with bakery yeast. A total of one hundred and twenty unsexed day old broiler chicks obtained from a commercial hatchery at Ibadan were randomly assigned to four dietary treatments replicated three times with 10 birds per replicate in a General linear Model Procedure using SPSS (Statistical Package for Social Scientist) Design. The result of the study showed significant increase ($P < 0.05$) in feed intake and some haematological parameters notably Packed cell volume (PCV), Haemoglobin (HB), Red blood cells (RBC), White blood cells (WBC), Mean cell volume (MCV), Mean cell haemoglobin concentration (MCHC) and Mean cell haemoglobin (MCH) while feed cost was cheapest among treatment groups on 25% (T_2) dietary level of tiger nut meal. The findings of this experiment suggested that tiger nut meal can replace maize up to 25% dietary level to boost growth, maximize profit and permeates stable physiology and normal cellular metabolism in the body of broiler chicks.

Keywords: Haematological profile, tiger nut, bakery yeast, broiler chicks

Introduction

High population growth in Africa and growing income has significantly increased the demand for eggs and poultry meat in recent years across large parts of the continent (WHO, 2010). According to estimates by the USAID (United States Agency for International Development), this trend is very likely to continue over the next few years. Therefore, the consumption of poultry and eggs will increase by 200% between 2010 and 2020 in many Sub-Saharan African countries. The Nigerian poultry industry in particular has been rapidly expanding in recent years and is therefore one of the most commercialized subsectors of Nigerian agriculture.

Commercial poultry production in Nigeria was estimated at about US $800 million. Poultry sector contributes about 10% of the agricultural gross domestic products of Nigerian economy (Madubuike, 2012). Nigeria's chicken population is about 158,700,000 (National Agricultural survey, 2011) of which 25% are commercially farmed, 15% semi-commercially and 60% in backyards. Consequently, livestock represents an important source of high quality animal protein, providing about 36.5% of the total protein intake of Nigerians.
Broiler chickens are tender young chickens of males or females that grow from a hatch weight of 40 grams to a weight over approximately around 1.5kg to 2kg in about six weeks time period only (Acuri, 2017).

Tigernut "*Cyperus esculentus*" is an underutilized tuber belonging to the family *Cyperaceae*, which produces rhizomes from the base of the tuber that is somewhat spherical (Gambo and Da'u, 2014). Nutritionally, tiger nut yield more milk upon extraction, 20-30% starch (carbohydrate), contains lower fat and higher protein and less anti nutritional factors especially polyphenol.

It is in a bid to proffer lasting solution to the problem of feed scarcity that this study was conducted on tiger nut to exploit its nutritional potentials on stock feeding.

Materials and Methods

The experiment was carried out at the poultry section of Imo State Polytechnic Teaching and Research Farm, Umuagwo-Ohaji, Imo State in South Eastern Nigeria. The climatic data of the area showed that annual rainfall ranges between 2000-2500mm. The institution is situated on latitude 6^0N and longitude 7^0E of the equator with the temperature ranging from (26.5-32^0c) and humidity of (70-80%) (Nimet, 2015)
Experimental Birds and Design

One hundred and twenty (120), day old Agritec broiler chicks were obtained from a commercial hatchery at Ibadan, Oyo State, Nigeria, certified to be of good health and physical stability. The chicks were acclimatized for 3 days and fed control diet. The broiler chicks were randomly allocated to 4 (four) dietary treatments and replicated three times with each replicate having ten (10) birds in a General Linear Model Procedure using SPSS version 20 (SPSS, 2014), while differences in treatment means were separated using Duncan's Multiple Range Test from the same software package The routine management and prophylactic measures were observed accordingly.

Tiger nut seeds (*Cyperus esculentus*) used for the study was purchased from the local market in Owerri, Imo State. The tiger nut was toasted, passed through hammer mill which crushed the nuts into tiger nut meal. Proximate analysis was carried out to determine the proximate composition of the tiger nut seed meal (AOAC, 2005) as shown in table 1. Four isonitrogenous (24±0.24) diets were formulated such that tiger nut replacing maize at 0%, 25%, 50% and 75% dietary levels respectively, the control diet (0%) contained no tiger nut meal (Table 2).

At the end of the 4 weeks feeding trials, two birds were randomly selected from each replicate, and 10ml blood sample was collected through the wing vein with a 10ml sterile syringe. The blood collected was used for assessment of haematological indices.

Table 1: Proximate composition of tiger nut seed meal (% dry matter)

Parameters	Composition (%)
Dry matter	89.40
Crude protein	7.46
Ether extracts	8.61
Crude Fibre	25.33
Ash	8.27
NFE	39.73
Metabolizable Energy	2390.985kcal/kg

Table 2: Ingredient Composition of Experimental Diets Fed to Starter Broilers.

Ingredients	Dietary Levels of Tigernut meal			
	T_1 (0%)	T_2 (25%)	T_3 (50%)	T_4 (75%)
Maize meal	50	12.5	25.00	22.50
Tiger nut meal	-	37.5	15	37.00
Soya bean meal	15	15	20	15
Groundnut cake	20	20	5	20
Wheat offal	5	5	5	5
Fish meal	5.5	5.5	5.5	5.5
Palm kernel cake	5	-	-	-
Salt	0.25	0.25	0.25	0.25
Bone meal	3.00	3.00	3.00	3.00
Bakery yeast	0.50	0.50	0.50	0.50
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Total	100	100	100	100
CP	24.88	24.37	24.37	24.37
ME	2839.20	3119.325	3025.95	3119.33

Results and Discussion

The proximate composition of tiger nut is shown in Table 1, while the ingredient composition of experiment diets fed to starter broilers are on table 2. The performance characteristics of the experimental birds and the hematological estimates are summarized on tables 3 and 4 respectively. The feed intake of the experimental birds was influenced by dietary levels of protein, energy and fiber. The 75% diet (T_4) recorded the highest daily feed intake of (50.17g) while the least value of (39.41g) was recorded from birds on 0% tiger nut-based diet (T_1). The feed intake of the broiler chicks increased with increasing dietary level of tiger nut as

replacement for maize in the diets (Table 4). Feeding of high fiber feedstuff such as Tiger nut might have resulted in gut fillings in birds, hence the observed decline in feed intake as observed by Dairo *et al*., (2010). Nevertheless, the control diet T_1, containing relatively no tiger nut and low metabolizable energy recorded least feed consumption while T_2, T_3 and T_4 (tiger nut-based diets) with metabolizable energy values of 3119.325, 3025.95 and 3119.33 Kcal/kg conversely recorded higher feed intakes. This variation in feed intake is in line with the report of Olomu, (2010), that birds will continue to eat until their energy requirement is met.

There was significant difference ($p< 0.05$) in feed intake between birds fed control diet and those fed tiger nut-based diets. The inherent anti-nutrients in tiger nut such as tannins and phytates may also contribute to the poor performance of broilers fed high dietary levels of tiger nut (Chukwuma *et al*., 2010). The body weight gain of the birds did not follow similar pattern as the feed intake. There were significant differences ($P < 0.05$) between birds fed control diet and those on tiger nut-based diets.

Table 3: Performance of starter chicks fed graded level of toasted tiger nut treated with bakery yeast.

Parameters	T_1 (0%)	T_2 (25%)	T_3 (50%)	T_4 (75%)	SEM
Average Initial Weight (g/birds)	37.71	37.70	37.72	37.84	0.03
Average final weight (g/birds)	816.20^b	908.7^a	777^c	834^b	24.90
Average daily weight gain(g)	27.80^b	31.11^a	26.40^c	28.43^b	1.66
Average daily feed intake (g)	39.41^c	45.24^b	48.32^a	50.17^a	3.59
Feed conversion ratio	1.42^b	1.45^b	1.83^a	1.76^a	0.09
Cost/kg gain(N/kg)	510.96^c	501.6^c	548^b	595.10^a	28.08
Mortality (%)	0.83^c	2.5^b	2.5^b	7.5^a	1.56

Apart from T_2 (25%), that recorded daily weight gain of 31.11g, treatments with higher levels of tiger nut (T_3 and T_4) had lower daily weight gains. Lower weight gains according to Narahari and Rajini, (2003), is as a result of poor digestibility and utilization of protein. From the result, T_1 (the control) diet was most efficiently converted into muscle followed by T_2 (25%) which recorded 1.45. T_1 and T_2 are statistically similar but differ ($P<0.05$) from T_3 and T_4. High feed conversion efficiency in broilers according to Diehl (2015) is one of the crucial aspects of marginalizing profit in broiler production. Cost per Kg gain analysis result showed that birds on T_2 recorded the least cost while T_4 had the highest value of N595.10. From all indications, it appears that birds fed higher concentrations of tiger nut translated into higher costs of production as cost reduction according to Oyebode (2015), is one of the integral part of profit maximization in poultry production.

The increase in PCV, HB, RBC, WBC, MCV, MCHC, MCH and reduction in blood clotting time (sec), denotes that tiger nut positively contributes to the synthesis of blood forming metabolites like iron, copper, magnesium, etc which enhances effective transportation of oxygen, glucose and other feed nutrients in the animal's body (Oyebode, 2015). Optimum haematological results obtained from the test ingredient indicate that tiger nut permeates stable physiology and normal cellular metabolism in broilers.

Table 4: Hematological characteristics of experimental broiler starter

Parameters	*Dietary Levels*				
	T_1 0%	*T_2 25%*	*T_3 50%*	*T_4 75%*	*SEM*
Pack cell volume (%)	31.50^b	32.10^b	33.30^a	34.80^a	0.70
Haemoglobin (g/dl)	10.50^b	10.70^b	11.10^a	11.60^a	0.37
Red blood cells (x106µl)	3.80^b	3.80^b	3.90^b	4.20^a	0.12
White blood cells (x106µl)	2.50^b	2.80^b	3.10^a	3.50^a	0.30
Mean cell volume (fl)	83.40^c	84.45^b	85.40^a	84.40^b	0.63
Mean cell Haemoglobin (%)	33.20^b	33.30^b	33.33^b	33.33^a	1.75
Mean cell haemoglobin (pg)	27.65^b	28.25^a	28.45^a	27.70^b	0.38
Blood Clothing Time (sec)	47.00^a	46.00^a	41.20^b	40.20^b	2.27

^{abc}mean within rows with different superscripts are significantly different ($p<0.05$).

SEM = Standard Error Mean, Packed cell volume (PCV): Haemoglobin (HB):- Red blood cells (RBC):- White blood cells (WBC):- Mean cell volume (MCV). Mean cell haemoglobin concentration (MCHC): Mean cell haemoglobin (MCH)

Conclusion

The results of this study showed that tiger nut meal supplementation in broiler diet could be effectively utilized at the level of 25% to obtain reasonably good growth rate, optimum profit maximization, and apt haematological profile in broiler chicks production.

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