



## Effect of Feeding Polyalthia Longifolia Leaf Meal as Partial Replacement of Wheat Offal

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**Abstract:** This study examined some haematological and serum biochemical Indices of broiler chickens fed *Polyalthia longifolia* leaf meal (PLM) as partial replacement of wheat offal. A total number of 250 broiler chickens were used in the experiment which lasted for 8 weeks. They were randomly allotted to five treatment groups with ten (10) birds per treatment and replicated five times in a Completely Randomized Design (CRD). Treatment 1 (T1) contained 0 % PLM, while PLM was used to replace W/O at 5 % (T2), 10% (T3), 15 % (T4) and 20 % (T5) respectively. Feed and water were supplied ad libitum while standard routine management was observed throughout the period of the experiment. Haematological parameters covered Pack cell volume (PCV), red blood cell (RBC), haemoglobin (Hb), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), white blood cell (WBC) and its differentials while serum biochemistry includes total protein, globulin, albumin, calcium, phosphorus, serum glutamic phospho transaminase (SGPT) and serum glutamic oxaloacetate (SGOT). The results from this study showed no significant difference ( $P > 0.05$ ) among all the haematological parameters measured. Similarly, PLM did not influence ( $P > 0.05$ ). Total protein, globulin, albumin, calcium and phosphorus. SGPT and SGOT were significantly different among the treatments ( $P < 0.05$ ). It was recommended that *Polyalthia longifolia* leaf meal can be used in growing broiler chickens as feed supplement. This will enhance satisfactory performance, without causing any deleterious effect on the health of the animal.

**Keywords:** Broiler chicks, haematology, serum, *Polyalthia longifolia*.

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## INTRODUCTION

The poultry industry in the developing countries is facing some challenges, one of which is increase in the cost of feed because of high prices of protein and energy sources [1]. Livestock feed costs in developing countries are a continuing challenge. The high and increasing prices for animal feeds have compelled researchers to direct their attention to non-conventional feed sources like *Polyalthia longifolia*. *Polyalthia longifolia* (Sonn) belongs to the family of Annonaceae, it is an evergreen plant commonly used as an ornamental street tree due to its effectiveness in combating noise pollution [2]. The genus *Polyalthia* includes about 120 species

occurring mainly in Africa, South and South – Eastern Asia, Australia and New Zealand. Several researches have reported the use of this plant for its significant biological and pharmacological activities such as antibacterial, antifungal, antitumor, anti-ulcer, anti-diabetic and antioxidant [3]. It is also believed to be a potential livestock feed material that will serve dual purposes of feed material and also a therapeutic material for the animals. Therefore, to sustain interest, there is need to evaluate many feed resources, especially the non-conventional feed materials that has little or no competitive demand by man especially as source of human food.

Nigeria's rapidly growing population has informed the need to increase livestock production to satisfy her animal protein requirement. Contributions of beef and poultry products to this national dilemma has been indeed marginal, providing succor to only a select few who mostly are urban and peri-urban dwellers, while leaving about 90% of the populace who reside in the hinterlands on consumption of less than 10g as against recommended 35g animal protein per day [4]. This wide nutritional gap has fueled the need to intensify the production of some livestock species to address the low per capita animal protein intake by Nigerians. What inspired the interest in broiler birds are their short generation interval, good meat quality and acceptability by all.

Several studies have reported on the oral acute toxicity of *P. longifolia* leaf in mice [5]; Alagbe [6] also evaluated the effect of *Polyalthia longifolia* leaf meal as a phytogenic feed additive in the diet of broiler chicks. But there is less information on the addition of dried *P. longifolia* leaf meal in the diet of broilers. A timely evaluation of its effects as a feed additive in broiler chickens feed will provide useful information relating to the tolerable rate of its inclusion in the diet of birds especially broilers. Therefore, this study was conducted to evaluate the effects of various levels of mature *Polyalthia longifolia* leaf meal as a partial replacement for wheat offal on the nutrient retention, immune response and serum biochemistry of broiler chicks fed on graded levels of *P. longifolia* leaf meal diet.

## MATERIALS AND METHODS

### Location and Duration of the Study

The study was carried out at the poultry section of the Teaching and Research Farm of the Faculty of Agriculture University of Abuja, Abuja Nigeria. The study carried out lasted for 8 weeks. The study territory exist in the southern guinea savanna ecological zone of Nigeria, geographically situated within latitude 08°25' and 9° 20' N and longitude 06° 45' and 07°39' E.

### Collection and Processing of *Polyalthia longifolia* Leaf

Fresh, healthy and mature *P. longifolia* leaves were obtained in Kuje, Kuje Area Council of the Federal Capital Territory. The leaves were washed with running tap water to remove the dirt's, it was later air dried separately until constant weights were obtained and made to meal using a hammer mill. The sample was later stored in an air tight container at 4°C for further analysis.

### Experimental Birds and Management

Two hundred and fifty (250) day old Ross 308 broilers of mixed sex were obtained from a commercial hatchery in Ibadan. The chicks were weighed individually at the beginning of the experiment and wing banded. They were assigned into five dietary treatments with five replicates of ten (10) birds each. Anti-stress was added into their drinking water. Heat was supplied through electric bulb continuously to maintain an initial brooding temperature of 34°C for the first week of age with gradual reduction by 2°C per week. Vaccines were administered according to the prevailing vaccination schedule in the environment. Clean feed and water was provided unrestricted throughout the experimental period which lasted for 8 weeks.

### Experimental diets and design

Birds were fed five experimental diets with *Polyalthia longifolia* leaf meal (PLM) replacing wheat offal at 0%, 5%, 10 %, 15 % and 20 % respectively in completely randomized design.

### Parameters measured

The initial body weight was recorded at the beginning of the experiment and weekly thereafter, total feed and water consumption, mortality were recorded daily throughout the experimental period.

### Haematological and serum biochemical analysis

Blood samples were collected very early in the morning from the wing vein from three (3) randomly selected birds per replicate into a 5 ml sterile syringe using 23 gauge needles and transferred into an ethylene diamine tetra acetic acid (EDTA) bottle. Haematological parameters: pack cell volume (PCV), red blood cell (RBC), haemoglobin (Hb), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), mean corpuscular volume (MCV), white blood cell (WBC) and its differentials were analyzed using an automated machine (Sysmex, Model KU-30 HG, India).

Serum analysis was carried out using bottles free from EDTA, blood were analyzed for total protein, albumin, globulin, glucose, cholesterol, creatinine, alanine transaminase (ALT) and aspartate transaminase (AST) were assayed using diagnostic kit manufactured by Merck India Ltd (Model PS-09R) as described by Olubukola *et al.* [7].

### Chemical analysis

Proximate compositions of experiment diet were determined by using official method of analysis by AOAC [8]. Phytochemical composition of tannins, alkaloids, saponins, flavonoids, phenols, oxalate, glycosides, steroids and terpenoids were estimated using methods described by Atamgba *et al.* [7],

Harbone [9], Shabbir *et al.* [10], Odebiyi and Sofowora [11], Boham and Kocipai [12].

### STATISTICAL ANALYSIS

All data were subjected to one -way analysis of variance (ANOVA) using SPSS (18.0) and significant means were separated using Duncan multiple range tests [13]. Significant was declared if  $P \leq 0.05$ .

**Table-1: Composition of experimental diet (Broiler starter) 5 - 8 weeks**

Ingredients	T <sub>1</sub> 0 %	T <sub>2</sub> 5 %	T <sub>3</sub> 10 %	T <sub>4</sub> 15%	T <sub>5</sub> 20%
Maize	50.00	50.00	50.00	50.00	50.00
PLM	0.00	0.35	0.07	1.05	1.40
Wheat Offal	7.00	6.65	6.93	5.95	5.60
G/Cake 44%	5.50	5.50	5.50	5.50	5.50
Soya cake	30.05	30.05	30.05	30.05	30.05
Fish meal (imported)	2.00	2.00	2.00	2.00	2.00
Limestone	1.50	1.50	1.50	1.50	1.50
Bone meal	3.00	3.00	3.00	3.00	3.00
Salt	0.30	0.30	0.30	0.30	0.30
Vit TM Premix	0.25	0.25	0.25	0.25	0.25
Lysine	0.20	0.20	0.20	0.20	0.20
Methionine	0.20	0.20	0.20	0.20	0.20
<b>Total</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>
<b>Calc. Analyses</b>					
%CP	23.00	22.98	22.99	22.93	22.91
ME:Kcal/kg	2727	2728	2727	2730	2730
E:Prot ratio	118.59	118.73	118.62	119.02	119.16
EE %	4.59	4.58	4.59	4.56	4.55
CF %	4.71	4.74	4.72	4.80	4.83
Ca %	1.50	1.50	1.50	1.50	1.50
Avail P %	0.58	0.58	0.58	0.58	0.58
Ca : P ratio	2.60	2.60	2.60	2.60	2.60
Lysine %	1.43	1.44	1.43	1.44	1.44
Met + cys (%)	0.91	0.91	0.91	0.91	0.91

**Table-2: Chemical composition of experimental diet (Broiler finisher) 5-8 weeks**

Ingredients	T <sub>1</sub> (0%)	T <sub>2</sub> (5 %)	T <sub>3</sub> (10 %)	T <sub>4</sub> (15 %)	T <sub>5</sub> (20 %)
Maize	60.00	60.00	60.00	60.00	60.00
PLM		0.25	0.26	0.75	1.01
Wheat Offal	5.05	4.80	4.90	4.30	4.04
G/Cake 44%	1.50	1.50	1.50	1.50	1.50
Soya bean meal	26.0	26.0	26.0	26.0	26.0
Fish meal (imported)	2.00	2.00	2.00	2.00	2.00
Limestone	1.50	1.50	1.50	1.50	1.50
Bone meal	3.00	3.00	3.00	3.00	3.00
Salt	0.30	0.30	0.30	0.30	0.30
Vit TM Premix	0.25	0.25	0.25	0.25	0.25
Lysine	0.20	0.20	0.20	0.20	0.20
Methionine	0.20	0.20	0.20	0.20	0.20
<b>Total</b>	<b>100.00</b>	<b>100.00</b>	<b>100.110</b>	<b>100.00</b>	<b>100.00</b>
<b>Calc. Analyses</b>					
%CP	20.07	20.06	20.08	20.03	20.01
ME:Kcal/kg	2853	2854	2855	2855	2856
E:Prot ratio	142.15	142.29	142.24	142.55	142.69
EE %	4.40	4.40	4.40	4.38	4.38
CF %	4.14	4.16	4.18	4.20	4.22
Ca %	1.48	1.48	1.48	1.48	1.49
Avail P %	0.57	0.57	0.57	0.57	0.57
Ca : P ratio	2.60	2.60	2.60	2.60	2.60
Lysine %	1.27	1.27	1.27	1.27	1.27
Met + cys (%)	0.83	0.83	0.84	0.84	0.84

**Proximate composition of *Polyalthia longifolia* leaf meal (PLM)**

Table 3 reveals the proximate composition of *Polyalthia longifolia* leaf meal. The diet contained 10.01 % crude protein, 19.70 crude fibre, 6.02 % total ash, 0.18 % ether extracts, 7.70 % moisture content and 59.39% nitrogen free extract. The result obtained is in agreement with the findings of Alagbe [14] but contrary to the reports of Olafadehan *et al.* [15]; Ojewuyi *et al.* [16] on the proximate analysis of mature *Polyalthia longifolia* leaves. The differences in the chemical analysis could be attributed to age of plants, processing method and geographical locations.

**Table-3**

Parameters	% Composition
Moisture content	7.70
Crude Protein	10.01
Crude fibre	19.70
Ash	6.02
Ether extracts	0.18
NFE	59.39
Energy (kcal/kg)	1510.0

**Proximate composition of *Polyalthia longifolia* leaf meal**

Table 4.3 showed the phytochemicals composition of the experimental diets. The result of the analysis of *Polyalthia longifolia* revealed 2.21 mg/100g tannins, 3.68 mg/100g saponins, 1.08 mg/100g alkaloids, 13.10 mg/100g flavonoids and 2.28 mg/100g phenol. Flavonoids > saponins > phenols > tannins > alkaloids. Alkaloids have been reported to perform various pharmacological activities including anti-malarial, anticancer, antihypertensive and antiarrhythmic activities [10]. Flavonoids have been suggested to be involved in antifungal, antidiarrheal and antioxidant activity [17]. Saponins play a key role in antimicrobial and anti-inflammatory activities [18]. Phenols are capable of scavenging free radicals to prevent disease in the body [16]. However, all values were

within the permissible range reported by Alagbe and Oluwafemi [19].

**Table-4: Phytochemical analysis of *Polyalthia longifolia* leaf meal**

Parameters	Composition (mg/100g)
Tannins	2.21
Saponins	3.68
Alkaloids	1.08
Flavonoids	13.10
Phenols	2.28

**Hematological parameters of broiler chicks fed *Polyalthia longifolia* leaf meal**

Hematological parameters of broiler chicks fed *Polyalthia longifolia* leaf meal is presented in Table 5. The pack cell volume (PCV), haemoglobin (Hb), red blood cell (RBC), Haemoglobin (Hb), red blood cell (RBC), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) values ranged between 26.50 – 28.00 %, 10.12 – 11.11 (g/dl), 2.88 – 2.90 ( $10^6\mu\text{l}$ ), 100.9 – 101.7 (fl), 54.50 – 57.00 (pg) and 39.80 – 39.47 (g/dl) were not significantly different among the treatments ( $P>0.05$ ). White blood cell ranged between (20.89 – 21.65  $10^3\mu\text{l}$ ), lymphocytes (12.40 – 12.60  $10^3\mu\text{l}$ ) and monocytes (0.05 – 0.08  $10^3\mu\text{l}$ ) were not significantly ( $P>0.05$ ) influenced by PLM. According to Zhou *et al.* [21]; Alagbe [20] blood is vital in the transport of nutrients, gases and waste products around the body. Blood constituents change in relation to the physiological conditions of health [22]. PCV, Hb and MCH are indexes used to ascertain the level of anaemia [20, 23] Red blood cells are involved in the transport of oxygen and carbon (IV) oxide in the body [24, 7]. WBC play a vital role in preventing entry of disease in the body by producing white blood cells [25-27]. However all values were within the physiological range for birds according to Talebi *et al.* [28]; Livingstone *et al.* [29]. Mohammad *et al.* [30] reported a PCV and Hb range of 29.75 – 30.00 % and 10.00 – 10.88 (g/dl) in broiler chicks fed diet supplemented with garlic extract.

**Table-5: Haematological Parameters of broilers fed *Polyalthia longifolia* leaf meal**

Parameters	T1	T2	T3	T4	T5	SEM
PCV (%)	26.50	27.31	27.02	28.56	28.00	0.22
Hb (g/dl)	10.12	10.50	10.94	11.00	11.11	0.03
RBC $\times 10^6\mu\text{l}$	2.88	2.56	2.70	2.65	2.90	0.02
MCV (fl)	100.9	100.8	100.5	103.1	101.7	0.51
MCH (pg)	54.50	54.00	54.08	56.60	57.00	1.22
MCHC (g/dl)	39.80	38.60	39.08	39.67	39.47	0.27
WBC $\times 10^3\mu\text{l}$	20.89	20.62	21.17	21.90	21.65	0.04
Differentials ( $10^3\mu\text{l}$ )						
Lymphocytes	12.40	12.08	12.67	12.76	12.60	0.10
Monocytes	0.08	0.07	0.08	0.05	0.07	0.01

### Serum analysis of broiler chicks fed different levels of PLM

Table 5 revealed the serum biochemical parameters of broiler chicks fed different levels of PLM. Total protein, albumin, globulin, calcium and phosphorus values ranged between 2.85 – 2.93 (g/dl), 1.35 – 1.50 (g/dl), 1.42 – 1.53 (g/dl), 0.80 – 0.89 (mg/dl) and 102.7 – 106.1 (mg/dl) were not significantly ( $P>0.05$ ) different among the treatments. SGPT (45.5 – 97.1 i.u/L) and SGOT (79.0 – 136.4 i.u/L) were significantly ( $P<0.05$ ) influenced by PLM. Values were lowest in T5 and highest in T1, however all values were within the normal range reported for birds by Aldi-Hachesoo *et al.* [31]; Yakhkeshi *et al.* [32].

The non-significant ( $P>0.05$ ) differences observed in the total protein across the treatment are an indication that the protein reserve across the treatment is enough to support the growth of the animal. This is inconformity with the reports of Olabanji *et al.* [33]; Alagbe [34] when miadiasin was fed to broiler chicks. The presence of calcium and phosphorus is important in many biochemical reactions and metabolic process in the body [16]. SGPT and SGOT values reduced as the level of PLM increased in the diet, this signifies that PLM is non toxic and it had no deleterious effect on the health of the animal [35].

**Table-5: Serum analysis of broiler chicks fed different levels of ATSM**

Parameters	T1	T2	T3	T4	T5	SEM
Total protein (g/dl)	2.93	2.90	2.89	2.85	2.86	0.17
Albumin (g/dl)	1.40	1.50	1.43	1.35	1.44	0.01
Globulin (g/dl)	1.53	1.40	1.46	1.50	1.42	0.01
Calcium (mg/dl)	0.89	0.76	0.80	0.85	0.80	0.06
Phosphorus (mg/dl)	106.1	104.4	102.7	104.0	105.1	2.78
SGPT (iu/L)	97.1 <sup>a</sup>	67.0 <sup>b</sup>	65.4 <sup>b</sup>	46.8 <sup>c</sup>	45.5 <sup>c</sup>	0.04
SGOT (iu/L)	136.4 <sup>a</sup>	108.6 <sup>b</sup>	100.4 <sup>b</sup>	80.8 <sup>c</sup>	79.0 <sup>c</sup>	1.44

Means in the same row with different superscripts differ significantly ( $P<0.05$ )

### CONCLUSION

Feeding and cost of feeding is an important factor in livestock management. The need for alternative sources of feed ingredients to replace the conventional feed materials is become imperative now in the face of competing demands and consequent high cost of such conventional feed ingredients. Feed formulators are fast becoming conscious of the need to explore less utilized sources including *Polyalthia longifolia*, a tropical tree that has recently received significant attention in research. Therefore PLM could be introduced into poultry feed at 20 % without any deleterious effect on the health of the birds.

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