

Growth Performance and Haematological Profile of Broiler Chickens Fed Graded Levels of Lemon Grass Leaf Meal

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ABSTRACT

Background and Objective: In most developing countries, the use of leaves, seeds, fruits, bark and roots of some plants to improve the performance of farm animals is common. Some of the beneficial effects of these bioactive plant substances in animal nutrition may include the reduction of microbial threat and promotion of intestinal health. The research work was conducted to determine the effect of supplementing lemon grass (*Cymbopogon citratus*) leaf meal on the growth performance and haematological profile of broiler chickens. **Materials and Methods:** One hundred and twenty day-old "Agrited" broiler chicks were distributed into four treatment groups which were replicated thrice in a completely randomized design (CRD). Four diets were compounded for the birds and the lemon grass leaf meal was added to the diets at the level of 0.75, 1.50 and 2.25%, respectively, with treatment 1 which served as the control with 0% level of lemon grass leaf meal inclusion. Feed and water were given *ad-libitum* throughout the experimental period of 49 days. **Results:** The data from the growth performance showed that there was a significant ($p < 0.05$) difference in the values obtained in final body weight, body weight gain, average daily body weight gain and feed conversion ratio. Data obtained for average feed intake and average daily feed intake did not differ ($p > 0.05$) significantly across the treatment groups. Final body weight was superior ($p < 0.05$) in T4 (2530 g), but lowest in T1 (2200 g), body weight gain was highest in T4 (1290 g), but least in T1 (958 g). Feed conversion ratio was at its best in T4 (1.99 g). Dietary effect on haematology results revealed that there was no significant ($p > 0.05$) impact of lemon grass leaf meal across the treatments studied in terms of haemoglobin and red blood cell, but differences ($p < 0.05$) in packed cell volume and white blood cell. **Conclusion:** It can be concluded that the inclusion of lemon grass leaf meal in the diet of broiler birds up to the levels of 2.25% can lead to an enhanced growth rate and better immunity development in the birds.

KEYWORDS

Growth performance, graded, haematological, broiler, lemon grass, leaf meal

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INTRODUCTION

The current global restriction on the use of antibiotic growth promoters in animal production has stimulated the interest of animal producers in the use of other alternatives such as phytochemical feed additives, phytobiotics and phyto-genic feed additives among others as growth promoters¹. Phyto-genic feed additives are plant-derived products (e.g. extracts, dried plant materials, essential oil, pure isolated compounds) containing plant metabolites as active principles². Most of this active secondary plant metabolite belongs to classes of flavonoids, isoprene derivatives and glucosinolates; a large number of which have been suggested to act as antioxidants and antibiotics³. At present, phytochemicals and phyto-genic feed additives have been proposed as antibiotic growth promoter replacement and sources of anabolic compounds that enhance growth⁴.

Plant herbs such as lemongrass, garlic, ginger, black pepper, alchomea etc have been reported to improve the performance of various species of livestock animal⁵. Some of these phytochemicals have been proven to possess anti-microbial properties, increase immune system and promote the release of natural chemicals that attack tumor cells⁴. The use of phyto-genic plant materials in ethno-medicine applications and performance improvement in broiler chicken has also been reported⁶. However, it has been observed and reported that the use of phytochemicals as feed additives or supplements could cause major deviations from normal physiological state and reflect in the haemological indices of the animals⁵.

Cymbopogon citratus (lemon grass) is a widely used herb in tropical countries especially in Southeast Asia and is cultivated in South and Central America, Africa and other tropical countries. It is also an aromatic perennial tropical plant that can grow as high as 3.5 m with long thin leaves. It produces a network of roots and rootless that rapidly exhausts the soil.

In human medicine, lemongrass has the following therapeutic properties; analgesic, anti-depressant, antimicrobial, bactericidal, fungicidal and insecticidal. Some of the reported phytoconstituents are essential oils that contain citral, citronellal, terpinolene and terpineol methylheptone. Others include flavonoids and phenolic compounds, which consist of luteolin, isoorientin, quercetin, kaempferol and apigenin⁷. Therefore, the objective of the study is to determine the effect of supplementing lemon grass (*Cymbopogon citratus*) leaf meal on the growth performance and haematological profile of broiler chickens.

MATERIALS AND METHODS

Experimental site: The research work was conducted at the poultry unit of Federal College of Agriculture, Ishiagu, Ivo Local Government Area of Ebonyi State from March 2021 to May, 2021.

Source and processing of black plum leaf: The lemon grass leaf (8.6 kg) that was used for the experiment was sourced from Afikpo and Ishiagu, both in Ebonyi State. The lemon grass leaf was obtained fresh and washed. The lemon grass leaf was then sun-dried and later ground into a meal.

Experimental design and management of birds: A total number of 120 day-old broiler chicks were used for the research work. The birds were randomly distributed into four treatment groups. Each treatment was replicated three times in a completely randomized design (CRD) with 10 birds per replicate. The birds were purchased from 'Cosin farm' in Enugu, Enugu state. The birds were rear on a cemented floor covered with wood shavings as a source of litter. The pens were divided into partitions such that each partition was accommodated 10 birds each. Feed and water were given *ad-libitum* and other management practices such as routine medication and sanitation were properly observed to prevent disease outbreaks.

Four experimental diets (Table 1) were formulated with diet 1 containing 0% lemon grass leaf meal which served as the control. Diets 2, 3 and 4 contained the lemon grass leaf meal at the levels of 0.75, 1.5 and 2.25%, respectively. Proximate composition of lemon grass leaf meal was also carried out (Table 2).

Table 1: Composition of experimental diets

Ingredients	Treatments			
	T1	T2	T3	T4
Maize	50.45	49.70	49.70	48.95
Lglm	0.00	0.75	1.50	2.25
Wheat offal	10.10	10.10	9.35	9.35
Groundnut cake	21.00	21.00	21.00	21.00
Palm kernel cake	8.00	8.00	8.00	8.00
Fish meal	2.50	2.50	2.50	2.50
Blood meal	3.50	3.50	3.50	3.50
Bone meal	2.00	2.00	2.00	2.00
Limestone	1.50	1.50	1.50	1.50
Methionine	0.25	0.25	0.25	0.25
Lysine	0.15	0.15	0.15	0.15
Finisher premix	0.30	0.30	0.30	0.30
Salt	0.25	0.25	0.25	0.25
Total	100	100	100	100
Calculated value				
Crude protein (%)	21.95	21.99	22.09	22.12
MEnergy (Kcal/kg)	2830.15	2830.09	2830.05	2829.89
Crude fiber (%)	3.76	3.82	3.80	3.86
Ether extract (%)	4.15	4.17	4.19	4.23
Calcium (%)	1.30	1.30	1.30	1.30
Phosphorus (%)	0.47	0.47	0.47	0.47
Methionine (%)	0.58	0.58	0.58	0.58
Lysine (%)	1.09	1.09	1.09	1.09

Lglm: Lemon grass leaf meal and MEnergy: Metabolizable energy

Table 2: Proximate composition of lemon grass leaf meal

Components	Composition (%)
Dry matter	90.90
Moisture	9.10
Crude protein	11.45
Crude fiber	7.89
Ether extract	1.69
Ash	10.16
Nitrogen-free extract	59.71

Statistical collection: Data obtained in the experiment was subjected to Analysis of Variance (ANOVA) and significant means were compared using the Duncan's Multiple Range Test at 5% significant level. At the end of the research work, three birds per treatment at one bird per replicate were randomly selected for haematological assay.

RESULTS AND DISCUSSION

Growth performance characteristics of broiler chickens fed graded levels of lemon grass leaf meal are shown in Table 3. Effect of dietary treatments on final body weight was significantly ($p < 0.05$) higher in treatment 4 (2530 g) and did not differ from the value of 2460 g obtained in treatment 3. The lowest value of 2200 g was observed in treatment 1, which was not significantly ($p > 0.05$) different from the value of 2370 g obtained in treatment 2 respectively. This implies that the birds were able to access the rich store of vitamins and minerals in the lemongrass and also the availability of good quality antioxidants in the lemon grass enhanced the performance in the treatment groups fortified with lemon grass leaf meal. This assertion was supported by previous studies⁸⁻¹⁰. These results were also consistent with those obtained by Moorthy *et al.*¹¹ who observed that the dietary inclusion of *Andrographis paniculata* not only compared very well with antibiotic growth promoters for growth improvement but also showed significant superiority over the antibiotic in terms of immunomodulatory effects of the broiler chickens.

Table 3: Growth performance characteristics of broiler birds fed graded levels of lemon grass leaf meal (lglm)

Parameter	Treatments				SEM
	T1	T2	T3	T4	
Initial body weight (g)	242	240	242	240	-
Final body weight (g)	2200 ^b	2370 ^b	2460 ^a	2530 ^a	40.58
Body weight gain (g)	1958 ^d	2130 ^c	2218 ^b	2290 ^a	38.19
Feed intake (g)	4069.35	4066.28	4072.10	4079.61	51.38
Daily body weight gain (g)	39.96 ^b	43.47 ^a	45.27 ^a	46.75 ^a	18.24
Daily feed intake (g)	83.05	82.99	83.10	83.26	21.90
Feed conversion ratio	2.08 ^a	1.91 ^b	1.84 ^b	1.78 ^b	0.05

^{abcd}Means on the same row with different superscripts are significantly ($p < 0.05$) different and SEM: Standard Error of Mean

Table 4: Haematological indices of broilers fed graded levels of lemon grass leaf meal (lglm)

Parameter	Treatments				SEM
	T1	T2	T3	T4	
Packed cell volume (%)	33.50 ^b	36.11 ^a	35.71 ^a	36.82 ^a	0.75
Haemoglobin (g/L)	9.10	10.11	10.37	10.60	0.29
Red blood cell ($\times 10^{12}/L$)	3.30	3.70	3.60	3.90	0.11
White blood cell ($\times 10^9/L$)	7.06 ^b	9.01 ^a	9.10 ^a	8.99 ^a	0.26

^{ab}Means on the same row with different superscripts are significantly ($p < 0.05$) different and SEM: Standard Error of Mean

Dietary effect on daily feed intake was not significantly ($p > 0.05$) influenced across the treatment groups. Values of 83.05, 82.99, 83.10 and 83.26 g were obtained in treatments 1, 2, 3 and 4, respectively. This showed that the inclusion of lemon grass leaf meal had no influence on the feed consumption by the birds across the treatments. This could be a result of the diets having enough energy content in the diet since birds eat to satisfy their energy requirement first before any other nutrient. This was similar to the work carried out by Kahn and Line¹² where they observed no significant ($p > 0.05$) difference in feed intake of finisher birds fed processed lemon grass leaf meal, which they attributed to the iso-caloric and iso-nitrogenous nature of the experimental diets.

Effect of treatments on feed conversion ratio showed superiority in treatment 4 (1.78) which is the lowest, while the highest value of 2.08 was observed in treatment 1. Values of 1.91 and 1.84 were obtained for feed conversion ratio in treatments 2 and 3, which were also similar to each other. The superior feed conservation ratio observed in treatment 4 is a reflection of the ability of the birds in that group to be able to utilize to an optimal level the nutrients in the diet, which was also seen in the final body weight and body weight gain of the birds. This work agreed with the reports of El-Husseiny *et al.*⁹ which observed a better feed conversion ratio in lemon grass-based diet when compared to the control diet.

The results obtained for haematological indices are revealed in Table 4. Results showed that Packed Cell Volume (PCV) of birds on treatment 1 had a value of 33.5% for packed cell volume which was similar ($p > 0.05$) to those of birds in treatments 2, 3 and 4 with values of 36.11, 35.71 and 36.82%, respectively. This was in agreement with the report of Simaraks *et al.*¹³ who worked with broiler birds and obtained a range of value for PCV between 22-35%. The effect of dietary treatments on haemoglobin showed that there was no significant ($p > 0.05$) effect of the diets on haemoglobin across the treatment group. Haemoglobin level of birds on treatment 1 with the value of 9.10 g/L was not significantly ($p > 0.05$) different from those of birds on treatments 2, 3 and 4, which had values of 10.11, 10.37 and 10.60g/L, respectively.

The values obtained in this study are within the normal ranges of value of 7-12 g/dL as outlined by Bonadiman *et al.*¹⁴. Data obtained for red blood cells for birds in control did not differ ($p > 0.05$) from those obtained for those on treatments 2, 3 and 4 with values of $3.30 \times 10^{12}/L$, $3.70 \times 10^{12}/L$, $3.60 \times 10^{12}/L$ and $3.90 \times 10^{12}/L$, respectively. This suggested availability of enough blood for the birds all across the treatment

group for their different activities. Dietary treatments had a significant ($p < 0.05$) effect on the white blood cells the result showed that birds on treatment 4 had a value of 8.99, which was similar ($p > 0.05$) to the value of 9.01 and 9.10 obtained for birds on treatment 1 had the least value of 7.06, which differ ($p < 0.05$) from the rest of the treatment groups. It connotes that lemon grass serves as a natural immune booster to the birds and helps the birds maintain a better defense system.

This showed that lemon grass leaf meal can be added to the diet of broiler birds up to the level of 2.25% thus, enhancing growth and improving the immune system of the birds.

Based on these results, it would be recommended that higher levels of lemon grass leaf meal be used to fortify the diet of broiler birds. Also, other methods of processing should be used instead of the shade-drying and sun-drying processing methods. This study also recommends the use of lemon grass leaf meal in other poultry birds.

A major challenge encountered in the course of the study has to do with annexing a large quantity of the lemon grass leaf meal at the time it was needed for the research work.

CONCLUSION

The study concluded that lemon grass leaf meal can be a source of potent natural feed additive in broiler nutrition. The meal can be included in the diets of broiler chickens up to the level of 2.25% and can enhance immunity and help the birds to develop antibodies which helps in fighting against microbial infestation. The aromatic pleasant smell and taste of the lemon grass leaf meal can be an additional advantage as regards feed intake and conversion of feed to weight in broiler production.

SIGNIFICANCE STATEMENT

The study showed the possibility of using lemon grass leaf meal in the diet of broiler birds to enhance their performance and also improve the immunity of the birds. It showed that lemon grass leaf meal is rich in vital nutrients and bioactive substances which are readily digestible and absorbable by the birds. This study recommended that higher levels of lemon grass leaf meal be used to fortify the diet of broiler birds and the use of lemon grass leaf meal in other poultry birds.

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