IMPACT OF PROCESSED *CYMBOPOGON CITRATUS* (LEMON GRASS) LEAF MEAL ON GROWTH PERFORMANCE AND HAEMATOLOGICAL INDICES OF BROILER CHICKENS

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ABSTRACT
The experiment was carried out to determine the impact of processed lemon grass (Cymbopogon citrates) leaf meal on the growth performance and haematological indices of broiler birds. One hundred and twenty (120), day old "Agrited" broiler chicks were randomly distributed into four treatment groups, each replicated three times with ten birds per replicate in a completely randomized design (CRD). Four diets were formulated such that the lemon grass leaf meal was incorporated into the diets at 0%, 0.75%, 1.50% and 2.25% corresponding to treatments 1, 2, 3 and 4 respectively. Feed and water were given ad-libitum throughout the experimental period of 49 days. Final body weight was superior (P<0.05) in T4 (2530g), while the least value of 2200g was observed in treatment 1. Body weight gain was highest in T4 (1290g), but least in T1 (958g). While feed conversion ratio was at its best in treatment 4 with 1.99. Haematological profile results showed that there was no significant (P>0.05) effect of lemon grass leaf meal across the treatment groups studied in terms of haemoglobin and red blood cell, but differed (P<0.05) in packed cell volume and white blood cell. From the results obtained in this present research, it can be concluded that lemon grass leaf meal can be added up to 2.25% in the diet of broiler chickens without any undesirable effect in terms of growth performance and no negative impact on the health of the birds at this phase of growth.
Key word: Growth performance, Haematological indices, Broilers, Processed lemon grass leaf meal.

INTRODUCTION

The current global restriction on the use of antibiotic growth promoter in animal production has stimulated interest of animal producers on the use of other alternatives such as phytochemical feed additives, phytobiotics, phytogenic feed additive among others as growth promoters. Phytogenic feed additives are plant derived products (e.g. extracts, dried plant materials, essential oil, pure isolated compounds) containing plant metabolites as active principles (Akbarian *et al*., 2016). Most of this active secondary plant metabolite belong to classes of flavonoides, isoprene derivatives and glucosinolates; a large number of which have been suggested to act as antioxidants and antibiotics (Suganya *et al*., 2016). At present, phytochemicals and phytogenic feed additives have been proposed as antibiotic growth promoter replacement and source of anabolic compounds which enhance growth.

Plant herbs such as lemon grass, garlic, ginger, black pepper, alchomea etc have been reported to improve the performance of various species of livestock (Oloruntola *et al*., 2016). Some of these phytochemicals have been proven to possess anti-microbial properties, enhance immune system and promote the release of natural chemicals that attack tumor cells. The use of phytogenic plant materials in ethno-medicine application and performance improvement in broiler chicken have also been reported. 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 haematological indices of the animals (Oloruntola *et al*., 2016).

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. They are tufted perennial grasses with numerous stiff stems arising from a short rhizomatous rootstock, as with citrus flavor and can be dried and powdered or used fresh (Tatiana and Jose, 2011). Lemon grass is commonly used in teas, soups and curries. It is also suitable for poultry, fish and seafood. Some of the reported phytoconstituents are essential oils that contain citral, citronellal, terpinolene and terpinolmethylheptone. Others include flavonoids and phenolic compounds, which consist of luteolin, isoorientin, quercetin, kaempferol and apiginin (Negrelle and Gomes, 2007).

MATERIALS AND METHODS

This research work was conducted at the poultry unit of Federal College of Agriculture, Ishiagu, Ivo local government area of Ebonyi state. The lemon grass leaf 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 meal. A total number of one hundred and twenty (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 ten (10) birds per replicate. The birds were purchased from 'Cosin farm' in Enugu, Enugu state. The birds were reared on a cemented floor covered with wood shavings as a source of litter. The pens were divided into partitions such that each partition accommodated ten (10) birds each. Feed and water were given *ad-libitum*, other management practices such as routine medication and sanitation were properly observed to prevent disease outbreak.

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. 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 (one bird per replicate) were randomly selected for haematological assay

Table 1: Composition of experimental diet

	Treatments			
Ingredients	**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
Fishmeal	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
Common 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

Note: LGLM = lemon grass leaf meal

RESULTS AND DISCUSSION

Growth performance characteristics of broiler chickens fed graded levels of lemon grass leaf meal is shown in table 2. Effect of dietary treatments on final body weight was significantly ($P<0.05$) higher in treatment 4 (2530g) and similar to 2460g obtained in treatment 3. The lowest value of 2200g was observed in treatment 1, which was not significantly ($P>0.05$) different from the value of 2370g obtained in treatment 2 respectively. This implies that the birds were able to access the rich store of phytonutrients in the lemon grass and also the availability of good quality antioxidant in the lemon grass enhanced the performance in the treatment groups fortified with lemon grass leaf meal. These results were consistent with those obtained by Rangasamy and Kaliaiasil (2007) who observed that the dietary inclusion of *Andrographis paniculata* not only compared very well with antibiotics growth

promoters for growth improvement but also showed significant superiority over the antibiotics in terms of immunomodulatory effects in broiler chickens. Daily feed intake was not significantly (P>0.05) influenced across the treatment groups. Values of 83.05g, 82.99g, 83.10g and 83.26g were obtained in treatments 1, 2, 3 and 4 respectively. This showed that the inclusion of lemon grass leaf meal had no influence on feed consumption by the birds across the treatments. This could be as a result of the diets having sufficient energy contents, since birds eat to satisfy their energy requirement first before any other nutrient. This is similar to the work carried out by Moorthy *et al*. (2009) 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 was the lowest, while the highest value of 2.08 was observed in treatment 1. Values of 1.91 and 1.84 obtained for feed conversion ratio in treatments 2 and 3, were similar. The superior feed conservation ratio observed in treatment 4 was a reflection of the ability of the birds in that group utilizing the nutrients in the diet optimally, which was also seen in the final body weight and body weight gain of the birds. This work agrees with the reports of Mehale and Moorthy (2008) who observed better feed conversion ratio in lemon grass-based diet when compared to the control diet.

Table 2: Growth performance characteristics of broiler birds fed graded levels of lemon grass leaf meal (LGLM)

	Treatments				
Parameters	**T1**	**T2**	**T3**	**T4**	**SEM**
Initial Body Wt. (g)	242	240	242	240	-
Final Body Wt. (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 wt 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.

The results obtained for haematological indices are shown in Table 3. Results showed that packed cell volume (PCV) of birds on treatment 1 had a value of 33.5% 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 Cynthia *et al*. (2010) 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 value of 9.10g/L was not significantly (P>0.05) different from those of birds on treatments 2, 3 and 4, which had values of 10.11g/L, 10.37g/L and 10.60g/L respectively. The values obtained in this study were within the normal ranges of 7-12g/dL as outlined by Aengwanich *et al*. (2004) and Bonadiman *et al*. (2009). Data obtained for red blood cell 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 x10^{12}/L, 3.70 x10^{12}/L, 3.60 x10^{12}/L and 3.90 x10^{12}/L respectively. This connotes unrestricted circulation and free flow of blood in the system of birds across the treatment groups fortified with the test ingredients for their different daily activities.

Table 3: Haematological indices of broilers fed graded levels of lemon grass leaf meal (LGLM)

	Treatments				
Parameters	**T1**	**T2**	**T3**	**T4**	**SEM**
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 (x10^{12}/L)	3.30	3.70	3.60	3.90	0.11
White Blood Cell (x10^{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.

CONCLUSION

Judging from the details obtained and analysed in the present research work, the following assertions could be made;

i. That lemon grass leaf meal can be a source of potent natural feed additive in broiler nutrition
ii. That processed lemon grass leaf meal can be included in the diets of broiler chickens up to the level of 2.25%
iii. That processed lemon grass leaf meal when added to the diet of broiler birds can enhance immunity and helps the birds to develop antibodies which helps in fighting against microbial infestation.

REFERENCES

Aengwanich, W., Simaraks, S. and Chinrasri, O. (2004). Haematological, electrolyte and serum biochemical values of Thai indigenous chickens (*Gallus domesticus*) in North-eastern Thailand, *Songklanakarin Journal Science Technology*. 26 (3):425-430.

Akbarian, A., Michiels, J., Degroote, J., Majdeddin, M., Golian, A. and Desmet, S. (2016). Association between heat stress and oxidative stress in poultry; mitochondrial dysfunction and dietary interventions with phytochemicals. *J. Anim. Sci. Biotech.,* 7: 37-56.

Bonadiman, S.F., Stratievsky, G.C., Machado, J.A., Albernaz, A.P., Rabelo, G.R. and Damatta, R.A. (2009). Leukocyte ultrastructure, hematological and serum biochemical profiles of ostriches (*Struthio camelus*). *International Journal of Poultry Science.* 88(11): 2298-2306.

Cynthia, K., Merck, S. and Dohme C. (2010). The Merck Veterinary Manual 10th (tenth) edition. Merck Sharp and Dohme Corporation.

Negrelle, R.R.B. and Gomes, E.C. (2007). *Cymbopogon citrates* (DC). Stapt: Chemical composition and biological activities. *Revista, Brasileira de plantas. Medicinais:* 9: 80-92.

Mehala, M. and M. Moorthy (2008). Production performance of broilers fed with Aleo Vera and *Curcurma longa* (Turmeric). *Int. J. Poult.Sci*., 7: 862-871.

Moorthy, M., C. Mehala, S. Saravana and S.C Edwin (2009). Aloe vera in white leghorm layer diet. *Int. J. Poult.Sci*, 6: 705-706.

Oloruntola, O.D., Ayodele, S.O., Agbede, J.O. andOloruntola, D.A. (2016). Effect of feeding broilers with diets containing *Alchorneacordifolia* leaf meal and enzyme supplementation. *Arch. Zootec*., 65(252): 489-498.

Rangasamy, Mathivaan and Kaliapan Kaliaiasil, 2007.Panchagavya and Andrographis paniculata asalternatives to antibiotic growth promoters on haematological serum biochemical parameters and immune status of broilers. *J. Poult*., 44: 198204.

Suganya, T., Senthilkumar, S., Deepa, K., Muralidharan, J., Gomathi, G. and Gobiraju, S. (2016). Herbal feed additives in poultry. *Int. J. Sci, Env. Tec,* 5(3): 1137-1145.

Tatiana, F.B. and Jose, M.S. (2011). Lemon grass and citral effect on cytokines production by murine macrophages. *Journal of Ethnopharmacology*. 137: 909-913.