

Effects of Supplemental Lemongrass and Pawpaw Leaf Meal on Finisher Broilers' Performance

¹Olabode, Adeyemi David, ²Okelola, Olufemi Emmanuel, ¹Pius, Ajah, ¹Onyishi, Paul, ¹Anuonye Adaeze Chioma, ¹Osuchukwu Amarachi, Augustina, ¹Azodo, Lilian Nonye, ¹Irelen, Terry and ¹Nduka, Christiana Ekelemeotuosicho
¹Federal College of Agriculture, Ishiagu, Ebonyi State, Nigeria
²Federal College of Fisheries and Marine Technology, Victoria Island, Lagos State, Nigeria

ABSTRACT

Background and Objective: The diversity of plant-based materials and their uses in the livestock sector, especially in the poultry industry cannot be over-emphasized. Poultry birds and their end users stand great risk with the continuous use of synthetic feed additives which have over the years proven to be negatively inclined both to the birds and to their end users. Hence, the aim and objectives of the present work are geared towards the impact of finisher broilers fed supplemental levels of lemon grass and pawpaw leaf meal. **Materials and Methods:** A Ross 308 broiler strain of ninety-six in number was used for the experiment. The birds were purchased at four weeks of age for the research work. The research was conducted at the poultry site of the Federal College of Agriculture, Ishiagu in Ebonyi State, Nigeria. Four experimental diets were formulated at 3% inclusion levels, with diet 1 containing 0% lemon grass and pawpaw leaf meal, which served as the control. Diets 2, 3, and 4 contained lemon grass and pawpaw leaf meal at the levels and ratios of 0.75:2.25, 1.50:1.50, and 2.25:0.75, respectively. Data obtained from the experiment were analyzed using Analysis of Variance (ANOVA), and significant means were compared using Duncan's Multiple Range Test at a 5% significance level. **Results:** The effect of diets on growth performance was significantly ($p < 0.05$) influenced for final body weight, body weight gain, daily weight gain, and feed conversion ratio, but was similar in daily feed intake. Dietary effect on final body weight was superior in treatment 4 with a value of 2270 g, which was not significantly different from the value of 2150 g observed in treatment 1. The least value of 2000 g was seen in treatment 3 which did not differ from the value of 2060 g obtained in treatment 2. Feed conversion ratio had the highest value of 1.43 in treatment 3 while the lowest value of 1.23 was reported in treatment 4. The cost of feed consumed was highest in treatment 1 with a value of #1561.82, which was not significantly different from the value of 1440.64 observed in treatment 4. The lowest value of 1361.09 was observed in treatment 3. The value reported for cost-benefit ratio had the largest value of 8.10 in treatment 3 which was significantly different from the value of 3.86 reported as the least for cost-benefit ratio in treatment 4. **Conclusion:** It can be deduced that the inclusion of lemongrass and pawpaw leaf meal in the diet of finisher broiler chickens was possible up to a combination level of 3% with the best results obtained in treatment 4 (2.25:0.75 lemon grass to pawpaw leaf meal).

KEYWORDS

Impact, finisher broilers, lemon grass, pawpaw leaf meal, growth performance, cost-benefit

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INTRODUCTION

The subsequent and continuous issues (such as mutation, the resistance of microbes, etc) arising from the constant use of antibiotics growth promoter and some other synthetic feed additives as growth promoters to stimulate the growth and overall performance in poultry and livestock production have necessitated the search for alternative natural feed additives in the form of oil, extract and leaf meals, such as neem extract, ginger lily extract, ginger extract, turmeric powder, neem leaf, moringa leaf, aloe vera, scent leaf, lemon grass, pawpaw leaf, etc to synthetic antibiotic growth promoter to eliminate their negative impact on animals that consume them and their end users¹.

Hence, a need to combat this abnormal scenario by looking out for the potential in feed ingredients of plant origin, which include leaf meals that have high nutritional and biological values. Supplementing the diet with plant material that is rich in active substances with beneficial effects on the immune system can be used as an alternative to antibiotic growth promoters especially in poultry birds². Beneficial effects of herbal plants or active substances in such plants may include the stimulation of appetite and feed intake, the improvement of endogenous digestive enzyme secretion, activation of immune response, antibacterial, antiviral, antioxidant, and antihelminthic actions³. It is sustaining that plant-based materials could be expected to serve as safer alternatives as growth promoters due to their suitability and preference, lower cost, reduced risk of toxicity, minimum health hazards, and environment friendliness⁴. Thus, animal scientists have begun to concentrate on the use of ancient medicinal systems to find beneficial herbs and plants, especially their leaves which can safely be used to increase the production in the poultry industry. Some of such plant leaves that have found importance in poultry nutrition include neem leaf, lemongrass, moringa leaf, bitter leaf, scent leaf, pawpaw leaf, and moringa leaf meal.

Lemon grass is a perennial tropical plant that can grow as high as 3.5 m with long thin leaves. In human medicine, lemon grass has the following therapeutic properties: Analgesic, antidepressant, antimicrobial, antipyretic, antiseptic, bactericidal, diuretic, fungicidal, insecticidal, and nervous system sedative tonic⁵. Lemon grass (*Cymbopogon citratus*) contains flavonoids, phenolic compounds, terpenoids and essential oils (such as citral α , citral β , nerogeraniol, citronellal, terpinolene, geranyl acetate, myrcene and terpinyl methylheptenone) which may be responsible for its different biological activities such as anti-bacterial, anti-diarrheal, anti-fungal antioxidants, and as a growth promoter⁶.

Pawpaw (*Carica papaya*) is a plant native to tropical America. It is known as okwuru bekee in Igboland, 'Goda' in Hausa, and Ibepe in Yoruba-speaking areas of Nigeria. Nigeria is the sixth largest producer of pawpaw globally, and the level of production has been estimated to be 836, 702 metric tons, after India, Brazil, Mexico, Indonesia, Dominican Republic⁷. The fruit is high in vitamins (A, B1, B2, C) and minerals (Ca, K, P, Fe) low in sodium, fat, and calories, and contains practically no starch⁸. Pawpaw latex contains four identified proteolytic enzymes (Papain Chymopapain A and B and Papaya peptidase A. The different parts of the pawpaw plant including leaves, seeds, and fruit have been shown to have excellent nutritional and medicinal values⁷.

This study aims to assess the impact of dietary supplementation with lemongrass and pawpaw leaf meal on the growth performance, feed efficiency, and health status of finisher broilers. It examines their effects on weight gain, feed conversion ratio, and overall productivity. The study also evaluates potential benefits for poultry health and welfare.

MATERIALS AND METHODS

Experimental site: The experiment was done at the poultry section of the Federal College of Agriculture, Ishiagu, Ivo Local Government Area of Ebonyi State from September to November, 2024.

Table 1: Experimental diet with different treatments

Ingredient	Treatment			
	T1	T2	T3	T4
Maize	58.00	58.00	58.00	58.00
Wheat offal	6.90	5.40	5.40	5.40
Soya bean meal	6.00	6.00	6.00	6.00
Groundnut cake	12.00	12.00	12.00	12.00
Fish meal (72%)	1.50	1.50	1.50	1.50
Blood meal	3.50	3.50	3.50	3.50
Palm kernel cake	7.00	5.50	5.50	5.50
Lemon grass leaf meal	0.00	0.75	1.50	2.25
Pawpaw leaf meal	0.00	2.25	1.50	0.75
Limestone	1.50	1.50	1.50	1.50
Bonemeal	2.50	2.50	2.50	2.50
Methionine	0.30	0.30	0.30	0.30
Lysine	0.20	0.20	0.20	0.20
Finisher premix	0.35	0.35	0.35	0.35
Salt	0.25	0.25	0.25	0.25
Total	100	100	100	100
Calculated value				
Crude protein (%)	19.45	19.90	19.76	19.53
M energy (kcal/kg)	3007.90	2979.20	2975.85	2971.44
Crude fiber (%)	3.78	3.91	3.89	3.89
Ether extract (%)	4.73	4.69	4.69	4.69
Calcium (%)	1.35	1.37	1.37	1.37
Phosphorus (%)	0.54	0.56	0.56	0.56
Methionine (%)	0.61	0.59	0.59	0.59
Lysine (%)	1.11	1.09	1.09	1.09

Source and processing of black plum leaf: An equal amount of the leaves namely (lemon grass leaf and pawpaw leaf) used for the research was sourced from Enugu and Ishiagu, in Ebonyi and Enugu State, respectively. The lemon grass and pawpaw leaf were obtained fresh and washed. The leaves were then sun-dried and later ground into a meal.

Experimental design and management of birds: A total of 96, four weeks old broiler birds of Ross 308 strains were used for the research work. The birds were randomly distributed into four groups, each replicated three times in a Completely Randomized Design (CRD) with 8 birds per replicate. The birds were obtained from 'Cosin farm' in Enugu, Enugu State. The birds were raised on a cemented floor covered with wood shavings as a source of litter. The pens were also divided into partitions such that each partition accommodated 8 birds. Feed and water were given *ad-libitum*.

Four diets were compounded at 3% inclusion levels, with diet 1 containing 0% lemon grass and pawpaw leaf meal, which served as the control. Diets 2, 3, and 4 will contain lemon grass and pawpaw leaf meal at the levels and ratio of 0.75:2.25, 1.50:1.50, and 2.25:0.75, respectively (Table 1).

Statistical collection: Data obtained in the experiment were subjected to Analysis of Variance (ANOVA) and significant means were compared using Duncan's Multiple Range Test at 5% significant level.

RESULTS AND DISCUSSION

The results of growth performance characteristics of finisher broiler birds fed supplemental levels of lemon grass and pawpaw leaf meal are shown in Table 2. Dietary effect on final body weight was superior in treatment 4 with a value of 2270 g, which was not significantly different from the value of 2150 g observed in treatment 1. The lowest value of 2000 g was seen in treatment 3 which did not differ from the value of 2060 g obtained in treatment 2, respectively. It can be observed that the value for final body weight

Table 2: Growth performance characteristics and cost-benefit analysis

Component (%)	Treatment				SEM
	T1	T2	T3	T4	
Initial body weight (g)	810.90	812.20	812.80	811.73	-
Final body weight (g)	2150.00 ^a	2060.00 ^b	2000.00 ^b	2270.00 ^a	41.92
Body weight gain (g)	1339.10 ^b	1247.80 ^c	1187.20 ^c	1458.27 ^a	32.93
Feed intake (g)	1782.90	1734.81	1695.96	1795.08	37.07
Daily body weight gain (g)	63.77 ^a	59.42 ^a	56.53 ^{ab}	69.44 ^a	1.65
Daily feed intake (g)	84.90	82.61	80.76	85.48	2.02
Feed conversion ratio	1.33 ^b	1.39 ^a	1.43 ^a	1.23 ^c	0.03
Cost of birds at 4 weeks (₦)	4000.00	4000.00	4000.00	4000.00	-
Cost of kg of feed (₦)	876.00	802.55	802.55	802.55	15.02
Cost of feed consumed (₦)	1561.82 ^a	1392.27 ^{ab}	1361.09 ^{ab}	1440.64 ^a	30.11
Managerial cost (₦)	870.00	870.00	870.00	870.00	-
Total cost of production (₦)	6431.82	6262.27	6231.09	6310.64	44.29
Revenue (₦)	7525.00 ^a	7210.00 ^b	7000.00 ^b	7945.00 ^a	135.92
Benefit/net profit (₦)	1093.18 ^b	947.73 ^b	768.91 ^c	1634.36 ^a	102.49
Cost-benefit ratio	5.88 ^b	6.61 ^b	8.10 ^a	3.86 ^c	0.48

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

decreased across the treatments as the level of lemon grass and pawpaw leaf meal increased in the diets of the groups, except in treatment 4. These could suggest that the birds were unable to extract necessary nutrients from test ingredients and the active substance was not able to enhance the growth of the birds in these treatments, except for treatment 4 where the value was higher than the control. The result obtained in this study is similar to the work carried out by David *et al.*¹ and Olabode *et al.*² who observed increased growth performance in the treatments where herbs were used to replace synthetic growth promoters and other biological feed additives in broiler birds. The effect of pawpaw leaf and seed meals composite mix supplementation on broiler chickens reported better and higher final body weight of the birds placed on the diet containing higher levels of the leaf meal and seed meal, respectively⁹. They observed that at levels of 6, 8, and 10 g/kg the performance was higher than that of control.

Values obtained for daily feed intake were not significantly ($p > 0.05$) different among the treatment group. Birds in treatment 1 had a daily feed intake of 84.90 g which was not significantly different from the values of 82.61, 80.76, and 85.48 g obtained in treatments 2, 3, and 4, respectively. The decrease in feed intake across the treatment group can be due to the level of fiber in the diet which was a result of the inclusion of the test ingredient which was high in fiber content.

This agreed with the assertion of Olabode *et al.*² where they reported high fiber in the diet of broiler birds usually leads to the decline in their feed intake. Data reported for daily body weight gain in this study showed significant differences across the treatment group. Birds in treatment 4 had the highest value of 69.44 g which did not differ from the values of 63.77 and 59.42 g observed in treatments 1 and 2. Birds in treatment 3 had the lowest value of 56.53 g. The trend showed that there was a decrease in the average daily body weight gain of birds in the treatments where lemon grass and pawpaw leaf meal were added above the control, except for treatment 4. The research work is in agreement with the work of Olabode *et al.*² and Olabode *et al.*⁴ who noted an increase in the values obtained for body weight gain in broiler birds when lemon grass leaf meal was added to the diets. This he attributed to the immune-modulatory effect of the lemon grass leaf meal. Dietary impact on feed conversion ratio showed that the highest value of 1.43 was observed in treatment 3 (which depicts the poorly performed treatment) which was not significantly different from the values of 1.39 obtained in treatment 2. The lowest value of 1.23 was reported in treatment 4 (connecting the best-performed treatment). Birds in treatment 1 had a value of 1.33 for feed conversion ratio. The superior feed conversion ratio observed in treatment 4 could be a reflection of the ability of the birds in that treatment to be able to utilize an optimal level of the nutrients

in the diets, as also seen in the final body weight and average daily weight gain. This work agrees with the work of Mehala and Moorthy¹⁰ where they observed a better feed conversion ratio in a lemon grass-based diet when compared to the control.

The cost-benefit analysis of finisher broiler birds fed supplemental levels of lemon grass and pawpaw leaf meal is displayed in Table 2. From the table presented, it can be observed that the values reported for the cost of birds at 4 weeks and managerial cost were constant throughout the treatment groups. The cost of birds at 4 weeks had a value of #4000, while managerial cost had a value of #870 respectively. Values obtained for the cost of a kg of feed were high in treatment 1 with a value of #876, which differed from the value of #802.55 observed in treatments 2, 3, and 4 respectively. Values obtained for the cost of feed consumed differed across the treatment groups. The cost of feed consumed was highest in treatment 1 with a value of #1561.82, which was not significantly different from the value of #1440.64 observed in treatment 4. The lowest value of #1361.09 was observed in treatment 3 which did not differ from #1392.27 reported in treatment 2, respectively. Dietary effect on the total cost of Production did not vary across the treatments. The value of #6431.82 was reported in treatment 1 which was not significantly different from the values of #6262.27, #6231.09, and #6310.64 obtained in treatments 2, 3, and 4. The effect of diet on revenue value was superior in treatment 4 with #7945 which was closely followed by the value of #7525 observed in treatment 1. The lowest value of #7000 was seen in treatment 3 which was not significantly different from the value of #7210 observed in treatment 2. Net profit had the highest value of #1634.36 in treatment 4, while the lowest value of #768.91 was observed in treatment 3. Net profit in treatment 1 had a value of #1093.81 which was similar to those of #947.73 in treatment 2 respectively. The value reported for cost-benefit ratio had the largest value of 8.10 in treatment 3 which was significantly different from the value of 3.86 reported as the least for cost-benefit ratio in treatment 4. Values of 5.88 and 6.61 were obtained in treatments 1 and 2 which were by themselves similar to each other statistically.

CONCLUSION

It can be deduced that the inclusion of lemongrass and pawpaw leaf meal in the diet of finisher broiler chickens was possible up to a combination level of 3% with the best results obtained in treatment 4 (2.25:0.75 lemon grass to pawpaw leaf meal). This was true judging by the values obtained in the final body weight, feed conversion ratio, and cost-benefit ratio, which were superior when compared to the control.

SIGNIFICANCE STATEMENT

Considering the critical need to avail and supply the growing populace of humanity with safe and quality table meat, it has become expedient to focus on the use of herbal plants which have little or no side effects when used in the production of livestock and poultry birds in particular. Herbal plants, such as lemon grass and pawpaw have been used as medicinal plants over the years and their significant impact in the area of antibacterial, antifungal, and antioxidant effects cannot be overemphasized. Thus, the pivotal of this research work circles around the use of these herbal plants as feed additives in the diet of finisher broiler chickens.

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