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Growth Performance and Carcass Characteristics of Broilers Fed Varying Levels of *Ocimum gratissimum* Leaf Meal

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Abstract
A study was conducted to evaluate the growth performance and carcass characteristics of broilers fed varying levels of *Ocimum gratissimum* leaf meal. Eighty (80) day old broiler birds were used for the experiment, The eighty (80) birds were weighed and randomly allocated into four (4) treatment groups (T1, T2, T3 and T4) having twenty (20) birds per treatment. Each treatment was replicated four (4) times with five (5) birds per replicate. Treatment 1 served as the control and did not contain any *Ocimum gratissimum* leaf meal supplement, while treatments 2, 3 and 4 contained 0.25, 0.50 and 0.75% respectively of *Ocimum gratissimum* leaf meal supplement. The experiment lasted for eight (8) weeks. Results showed that there were no significant ($p>0.05$) differences among treatments in average daily feed intake and feed conversion ratio while significant ($p<0.05$) differences among treatments existed in average daily weight gain (ADWG). The study also revealed that there were significant ($p<0.05$) differences among treatments in dressing weight, dressing percentage, wing weight and heart weight, while significant ($p>0.05$) differences among treatments did not exist in the weights of neck, backbone, thigh, drumstick, shanks, breast, gizzard, liver, kidney and offal. Birds fed diets containing 0.25% OGLM had a better average daily weight gain, dressed weight, dressing percentage and heart weight than birds on other treatment groups. Based on the results obtained in this study T2 (diet containing 0.25% OGLM) was recommended as the most efficacious diet.

Keywords: *Ocimum gratissimum*, growth performance, carcass characteristics, broilers.

Introduction

Animal protein requirement in developing countries has become critical due to a disproportionate growth in human population relative to livestock production. This creates adverse consequences on food security, leading to hunger and malnutrition (Olorunsanya *et al.,* 2007). In Nigeria, the effect of inadequate animal protein intake is felt more by a large proportion of the population, especially in the rural areas. Chicken industry is one of the most dynamics of world agribusiness trade. Hence, research on meat production globally indicates poultry as the fastest growing livestock sector especially in developing countries (Portugaliza and Fernandez, 2012). Sub-therapeutic doses of antibiotics have been used in animal feed to promote growth and improve feed efficiency in contemporary intensive animal farming (Ogle, 2013). The emergence of antibiotic resistance by pathogenic bacteria has led to international restriction on the use of antibiotics in animal feeds. It is therefore imperative to find safe alternatives to the use of antibiotics. These alternatives can be found in the use of phytobiotics such as scent leaf (*Ocimum gratissimum*) as a supplement in feed. Phytogenic feed additives (phytobiotics or botanicals) are commonly defined as plant-derived compounds incorporated into diets to improve the livestock productivity through improvement of nutrient digestibility, absorption and elimination of pathogens in the gut. Phytogenic compounds are included in the diets of farm animals to improve the animals' production performance and to improve the quality of food derived from those animals. In modern animal feeding, they can be used as natural antimicrobial agents and growth promoters as well as vitamin/mineral supplements (Tipu *et* al*.,* 2006). Compared with synthetic antibiotics or inorganic chemicals, these plant-derived products have proven to be natural, less toxic, residue-free and are thought to be ideal feed additives in food animal production (Hashemi *et al*., 2008). Ijeh *et al.* (2004) noted that scent leaf is rich in alkaloids, tannins, phytates, flavonoids, oligosaccharides, terpenoids, thymol and saponin, with tolerable cyanogenic content. The proximate composition shows a crude protein of 4.7%, 10.8% crude fibre, and ash content of 12.24% (Mensah and Okoli, 2008). Presently it is grown on a large scale in South Eastern Nigeria.

The research was therefore designed to evaluate the effect of scent leaf (*Ocimum gratissimum*) on growth performance and carcass characteristics of broiler birds.

Materials and Methods

The experiment was carried out at the Department of Animal Science Teaching and Research Farm University of Nigeria, Nsukka. It lasted for eight (8) weeks. Eighty (80) day old broiler birds were purchased from a reliable source. The birds were weighed and randomly allocated into four (4) treatment groups having twenty (20) birds per treatment. Each treatment was replicated four (4) times with five (5) birds per replicate. Treatment 1 served as the control and did not contain any *Ocimum gratissimum* leaf meal supplement, while treatments 2, 3, and 4, contained 0.25, 0.50 and 0.75 %, respectively of *Ocimum gratissimum* leaf meal supplement. Clean water and feed were provided *ad libitum*. The required drugs and vaccinations were administered appropriately according to the vaccination routine for broilers. The scent leaf *(Ocimum gratissimum)* was procured from Ogige market in Nsukka town, Enugu state, Nigeria. The leaves were detached from the stems and were spread out evenly in an environment having sufficient air flow so that they could be well air dried. Afterward, the dried leaves were milled to fine powder using a milling machine. The percentage composition of the diets is shown in Tables 1 and 2. The experimental diets were assayed for proximate composition (Table 3) by the method of the Association of Official Analytical Chemist (AOAC, 1990).

Table1: Percentage Composition of Experimental Diets

Ingredients (%)	Broiler starter diets				Broiler finisher diets			
Scent leaf meal	0	0.25	0.50	0.75	0	0.25	0.50	0.75
Maize	30	29.9	29.82	29.8	28.62	28.44	28.26	28.08
Wheat offal	12	11.95	12.01	11.85	28.62	28.44	28.26	28.08
PKC	20.5	20.2	20.01	19.83	18.63	18.69	18.74	18.60
SBM	29.5	29.6	29.66	28.77	18.13	18.19	18.24	18.30
Fish meal	4	4	4	4	2	2	2	2
Lysine	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Oyster shell	3	3	3	3	3	3	3	3
Total	100	100	100	100	100	100	100	100
Calculated composition:								
Crude protein%	23.89	23.87	23.88	23.90	19.66	19.77	19.78	19.77
Energy (Mcal/kgME)	2.78	2.79	2.80	2.81	2.89	2.90	2.88	2.91
Crude fibre %	6.27	6.26	6.27	6.26	6.68	6.70	6.72	6.71
Analyzed composition:								
Components(%)								
Dry matter	86.05	88.33	84.54	85.40	89.43	88.96	87.98	87.56
Crude protein	23.97	24.12	24.09	23.89	19.86	20.11	19.99	20.20
Crude fibre	5.60	5.92	5.88	5.77	5.85	5.76	5.66	5.79
Ether extract	2.34	3.10	3.87	2.99	2.33	2.42	3.13	3.10
Ash	5.12	5.33	4.89	5.22	5.42	5.64	5.79	5.38
Nitrogen-free extract	49.02	49.86	45.81	47.53	55.97	55.03	53.41	53.09

Body weights of the birds were taken on a weekly basis. Daily feed intake was obtained from the difference between the quantity of feed offered and that of the left over from the previous day divided by the number of birds per replicate. Feed conversion ratio was then calculated as quantity (gram) of feed consumed per unit (gram) weight gained over the same period. At the end of the experiment, three (3) birds were randomly selected from each treatment. They were weighed and humanely slaughtered in a research abattoir at the Department of Animal Science, University of Nigeria. The carcasses were de-feathered, eviscerated and cleaned. The weights of various parts and organs were determined. The live weight, dressing weight, dressing percentage, neck, wing, backbone, wing, thigh, drumstick, shanks, breast, gizzard, heart, liver, kidney and offal were determined using a manual and electronic weighing scale.

Data collected were subjected to analysis of variance in a completely randomized design as decribed by Steel and Torrie (1980). Significant differences between treatment means were separated using Duncan's New Multiple Range Test (Duncan, 1955).

Results and Discussion

The effects of varying dietary levels of OGLM on the performance characteristics of broilers are shown in table 2. There were no significant ($p>0.05$) differences among treatments in average daily feed intake and feed conversion ratio while significant ($p<0.05$) differences among treatments existed in average daily weight gain (ADWG). The ADWG value (37 g) of birds fed diet 2 (0.25% SLM) was significantly ($p<0.05$) higher than those (34 g, 31 g and 30 g) for birds fed diets 1, 3 and 4, respectively. The ADWG value (34 g) for birds on diet 1 was significantly ($p<0.05$) higher than those fed diets 3 and 4 (31 g and 30 g), respectively which are comparable. This corroborates the findings of other researchers on the efficacy of herbs in promoting body weight gain in broiler birds (Makonjuola *et al.*, 2014, Hashemipour *et. al*., 2013). Alabi and Chime (2007) reported that scent leaf has a high mineral and vitamin content and can increase the digestibility of diets and consequently increase the utilization of the feed as indicated by the better ADWG. Similarly, El-Deek *et al,* (2003) and Hassan *et al.* (2004) have reported the efficacy of spices in improving the performance of poultry species. This is attributed to their antimicrobial properties and impact on gut function. It is likely that the intake of herbs and spices or their products affects the gastrointestinal microflora composition and population (Leung and Foster, 1996) thus, controlling potential pathogens (Roth and Kirchgessner, 1998). However, these favourable attributes of spices can be masked when they are used in large proportions where the effects of inherent anti-nutritional factors like tannin and saponin become pronounced. These anti-nutritional factors have been reported to affect utilization of nutrients and depress growth (Odoemelam *et al.,* 2013). This may be the reason for the decrease in weight gain as the dietary inclusion of *Ocimum gratissimum* increased beyond 0.25% level (T3 and T4). The effects of varying dietary levels of OGLM on the carcass characteristics of broilers are shown in table 3.

Table 2: Growth performance of broilers fed varying dietary levels of *O.gratissimum* leaf meal

Parameters	T1	T2	T3	T4	SEM
Average daily feed intake (g)	78	82	77	77	2.72
Average daily weight gain (g)	34^{b}	37^{a}	31^{c}	30^{c}	1.03
Feed conversion ratio	2.3	2.2	2.5	2.6	0.09

T1=0% OGLM (control); T2=0.25% OGLM; T3=0.50% OGLM; T4=0.75% OGLM

Table 3: Carcass Characteristics of broiler birds fed varying dietary levels of O.*gratissimum* leaf meal

Parameters	T1	T2	T3	T4	SEM
Dressing weight (g)	1705^{b}	1902^{a}	1765^{b}	1675^{c}	77.01
Dressing percentage	72.09^{b}	78.91^{a}	65.77^{c}	73.21^{b}	1.65
Neck (g)	4.36	3.61	3.53	4.00	0.18
Backbone (g)	12.32	12.78	11.83	12.24	0.41
Wings (g)	14.06^{b}	14.00^{b}	17.59^{a}	13.28^{b}	0.35
Thigh (g)	10.30	10.56	10.40	10.59	0.27
Drumstick (g)	10.22	9.49	9.58	9.10	0.19
Shanks (g)	4.25	4.04	4.55	4.04	0.12
Breast (g)	14.62	14.62	15.65	15.84	0.62
Gizzard (g)	3.25	3.38	3.00	3.34	0.11
Heart (g)	1.29^{b}	1.64^{a}	1.62^{a}	1.26^{b}	0.02
Liver (g)	2.19	2.96	2.08	2.87	0.10
Kidney (g)	0.12	0.12	0.16	0.13	0.019
Offal (g)	15.25	15.63	16.03	15.95	0.407

^{abc}Means on the same row with different superscript are significantly different ($p<0.05$).

There were significant ($p<0.05$) differences among treatments in dressing weight, dressing percentage, wing weight and heart weight, while significant ($p>0.05$) differences among treatments did not exist in the weights of neck, backbone, thigh, drumstick, shanks, breast, gizzard, liver, kidney and offal. The dressing weight value

(1900g) for T2 (0.25% OGLM) was significantly ($p<0.05$) higher than those for T1 (0% OGLM), T3 (0.50% OGLM) and T4 (0.75% OGLM) (1700, 1765 and 1675g), respectively. The dressing weight values (1700 and 1765 g) for T1 and T3, respectively were similar but these were significantly ($p<0.05$) higher than that (1675 g) of T4. The dressing percentage value (78.91%) for T2 was significantly ($p<0.05$) higher than those (72.09%, 65.77% and 73.21%) for T1, T3 and T4, respectively. The dressing percentage values (72.09% and 73.21%) for T1 and T4 respectively were similar but these were significantly ($p<0.05$) higher than that (65.77%) for T3. The wing weight values (14.06, 14.00 and 13.28 g) for T1, T2 and T4, respectively were similar but these were significantly ($p<0.05$) lower than that (17.59 g) for T3. The heart weight values (1.64 and 1.62 g) for T2 and T3, respectively were similar but these were significantly ($p<0.05$) higher than those (1.29 and 1.26 g) for T1 and T4, respectively which were similar.

Demir *et al*. (2002) observed significant ($P < 0.05$) differences in dressed weight, thigh, wing and head in broiler birds fed varying levels of *O. gratissimum* leaf meal. However, no significant ($p>0.05$) differences were observed in live weight, breast muscle, neck, drumstick and dressing percentage. Odoemelam *et al.,* (2015) reported that the relative weights of the carcass, liver, spleen, lung, gizzard and pancreas of broiler birds fed *O. gratissimum* did not differ significantly ($p>0.05$) from control except for dressing percentage, heart weight and abdominal fat. Treatment 2 (T2) promoted a significantly ($p<0.05$) higher dressed weight, heart weight and higher dressing percentage compared to other treatment groups. The significantly ($p < 0.05$) higher dressed weight, heart weight and higher dressing percentage of birds fed diet 2 (0.25% OGLM) in this study confirms a better and efficient utilization of nutrients in terms of digestion, absorption and assimilation (Bamgbose *et al.,* 2004).

Conclusion

Based on the results obtained in this study T2 (diet containing 0.25% OGLM) is recommended as the most efficacious diet that enhanced the performance of the birds.

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