

## PERFORMANCE AND CARCASS QUALITY OF BROILERS FED DIETARY SCENT LEAF, GARLIC AND ANTIBIOTIC

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### ABSTRACT

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The effect of dietary *Ocimum gratissimum* (scent leaf), *Allium sativum* (garlic), combination of garlic and scent leaf was compared with feed-grade antibiotic growth promoter (oxytetracycline HCl) on the performance, organ characteristics and organoleptic properties of broiler chickens using ninety (90) broiler chicks in a 56-day feeding trial. Five experimental diets designated T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> and T<sub>5</sub> were formulated (T<sub>1</sub>- Control diet without oxytetracycline HCl, *Ocimum gratissimum* nor *Allium sativum*; T<sub>2</sub> had Oxytetracycline HCl; T<sub>3</sub> had 1% of *Ocimum gratissimum*, T<sub>4</sub> had 1% of *Allium sativum*; T<sub>5</sub> had 0.5% of *Ocimum gratissimum* and 0.5% *Allium sativum* respectively). The birds were randomly assigned to the five dietary treatments with each treatment comprising 18 birds replicated three times with 6 birds per replicate in a completely randomized design. Feed and water were offered *ad libitum*. Data were collected on feed intake, weight gain and used to calculate feed conversion ratio (FCR). Organ quality and organoleptic properties was assessed. The results showed that there was no significant ( $p>0.05$ ) difference in feed intake, body weight gain and FCR due to dietary treatment. There were significant ( $p>0.05$ ) differences in dressing percentage, Heart weight and Abdominal fat. Birds on T<sub>1</sub> (control) had significantly lower dressing percentage compared to those on other treatments. Birds fed diets containing *Ocimum gratissimum* (T<sub>3</sub> and T<sub>5</sub>) had higher heart weight and lower abdominal fat. There was significant ( $p<0.5$ ) increase in juiciness and tenderness of the broiler meat on the inclusion of dietary *Ocimum gratissimum* and *Allium sativum*. Considering results for growth performance, organ weight and organoleptic properties, T<sub>4</sub> (1% Garlic) on the average had the most favourable result and is recommended as a suitable alternative to antibiotics compared to *Ocimum gratissimum* or the combination of *Ocimum gratissimum* and garlic.

**Keywords:** Antibiotics (AGP), Garlic, Scent leaf, Carcass quality, Broilers

### INTRODUCTION

In broiler production fast growth is necessary if maximum productivity is to be achieved, which in turn would reflect in the gross margin (Oluyemi and Robert, 2000). A lot of strategies have been employed to achieve high performance including the use of antibiotics (Odoemelam, *et al.*, 2013a). Among the common antibiotics used as growth promoters in livestock animals are Virginimycin, Salinomycin, Neomycin, Avilamycin and Oxytetracycline (Kumar *et al.*, 2010). Although in some cases birds raised with these feed additives achieved good performance, the potential side effect which include host and cross drug resistance constitutes a real public health concern globally (Al-Harthi, 2006) and has led to the ban of these products by many countries of the world (Cardozo *et al.*, 2004; Kehinde *et al.*, 2011). This has elicited a lot of interest and investigation on the use of new and promising alternative feed additives including probiotics, prebiotics and phytochemicals.

Herbs and spices and a host of other plant derivatives used in animal feeding are referred to as phytochemicals (Odoemelam *et al.*, 2013b). Some of these useful herbs and spices are indigenous to Africa and have been reported to influence nutrient utilization by chicken (Denli *et al.*, 2003; Windisch *et al.*, 2007) and enhanced performance of broiler chicken (Carrijo *et al.*, 2005). Some of these herbs and spices include; ginger, *Allium cepa* (onion), *Piper nigrum* (black pepper), *Allium sativum* (garlic), *Ocimum gratissimum* (scent leaf). *Ocimum gratissimum* commonly referred to as "scent leaf" is a herbaceous perennial grass. It is pan tropical and widely naturalized in many regions (Nnabugwu, 2010). It is also a known traditional medicinal plant used in curing different ailments, (Onajobi, 1986; Kokwaro, 1993). Some chemical compounds and active ingredients from this plant that makes it exhibit strong antimicrobial properties include Eugenol, Cinamate, Camphor and Thymol (Adebolu and Oladimeji, 2005; Matasyoh *et al.*, 2007). However, available information on the use of *O. gratissimum* in poultry diets is still scanty.

Garlic (*Allium sativum*) is widely used in all parts of the world as a spice and herbal medicine for the prevention and treatment of a variety of diseases ranging from infectious to heart diseases. It has long been considered that garlic has several beneficial effect for human and animals (Konjufca *et al.*, 1997). Garlic has been said to have positive effects on digestion in birds due to the essential oil content of garlic (Demir *et al.*, 2002). This study therefore aimed at comparing the effect of the dietary inclusion of *Ocimum gratissimum*, *Allium sativum*, their mixture as alternatives to the use of Antibiotic Growth Promoter (Oxytetracycline HCl) on the performance, organs weight and organoleptic properties of broiler chickens.

## MATERIALS AND METHODS

The experiment was conducted at the Teaching and Research farm of the Department of Animal Science, Federal University of Technology Owerri, Imo state, Nigeria. Scent leaf (*Ocimum gratissimum*) was collected from Umulemoha community in Isialangwa North Local Government Area of Abia State. The leaves were spread and air dried until it became crispy while still retaining its greenish coloration. The dried leaves were hammer milled through a 2mm screen to obtain a fine meal. Garlic (*Allium sativum*) was collected from Owerri, Imo state, Nigeria. They were crushed, air dried, milled and incorporated in the diets. Oxytetracycline HCl powder was procured from a veterinary shop. Five experimental diets were formulated and designated T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> and T<sub>5</sub> respectively. Treatment (T<sub>1</sub>) was the Control without scent leaf meal (SLM), garlic meal (GM) nor the antibiotic growth promoter (Oxytetracycline HCl), Treatment 2 (T<sub>2</sub>) contained 0.1% of antibiotic growth promoter (Oxytetracycline HCl), Treatment 3 (T<sub>3</sub>) contained 1% of scent leaf meal (SLM), Treatment (T<sub>4</sub>) contained 1% of garlic meal while T<sub>5</sub> contained 0.5% of scent leaf meal (SLM) and 0.5% of garlic meal (GM).

Ninety (90) broiler chicks were randomly assigned to five diets in a completely randomized design (CRD) with 18 birds per treatment. Each group was further sub divided into three replicates of 6 birds each. Vaccination and other routine poultry management practices were maintained. Chicks were weighed at the beginning of the experiment and on weekly basis thereafter. Feed and water were offered *ad libitum*. Data on feed intake, body weight were collected and used to calculate feed conversion ratio and other performance parameters. At the end of the feeding trial (56 days), three birds from each treatment were randomly selected, fasted overnight and slaughtered for dressing percentage and organ characteristics. The thigh was collected from each of the treatment groups for organoleptic assessment, conducted by 10 panelists. Each treatment sample was dipped into a super saturated brine solution for about 5 seconds and was put in a double layer polythene bag with label on each for identification. The samples were subjected to moist boiling at 100°C for 20 minutes. Samples were cut to about 10g size and randomly assigned to the panelists. The parameters assessed were Tenderness, Flavor, Juiciness and General acceptability. The samples were rated using the 9 points hedonic scale with 9 as the maximum score and 1 as the least score (AMSA, 1978). Data collected were subjected to analysis of variance using the SPSS (1996) package. Means were separated using the Duncan's Multiple Range Test (Duncan, 1955) using the SPSS (1996) package.

Table 1: Composition of experimental broiler finisher diets (%)

Ingredient	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>5</sub>
Maize	56.25	56.15	55.25	55.25	55.25
Soyabean meal	23.70	23.70	23.70	23.70	23.70
Scent leaf meal	0.00	0.00	1.00	0.00	0.50
Oxytetracycline (HCl)	0.00	0.10	0.00	0.00	0.00
Garlic meal	0.00	0.00	0.00	1.00	0.50
Palm kernel cake	12.00	12.00	12.00	12.00	12.00
Fish meal	3.00	3.00	3.00	3.00	3.00
Blood meal	1.00	1.00	1.00	1.00	1.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Common salt	0.30	0.30	0.30	0.30	0.30
Vit./Min. premix	0.25	0.25	0.25	0.25	0.25
L-Lysine	0.25	0.25	0.25	0.25	0.25
L-methionine	0.25	0.25	0.25	0.25	0.25
Total	100	100	100	100	100

Table 2: Calculated nutrient composition of broiler finisher diets (%)

Fractions	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>5</sub>
Crude protein	21.07	21.06	20.90	20.90	20.90
Crude fibre	4.98	4.98	4.96	4.96	4.96
Ether Extract	5.25	5.25	5.21	5.21	5.21
Calcium	0.44	0.44	0.44	0.44	0.44
Phosphorous	0.80	0.80	0.79	0.79	0.79
ME (Kcal per kg)	2898.00	2878.80	2858.80	2858.00	2858.00

## RESULTS AND DISCUSSIONS

The results for the growth performance of broiler chickens fed diets containing Antibiotic growth promoter (oxytetracycline HCl), *Ocimum gratissimum*, *Allium sativum* and a mixture of *Ocimum gratissimum* and *Allium sativum* are presented in Table 3. The values for Daily feed intake, Daily weight gain and Feed conversion ratio (FCR) ranged between 108.78 g - 117.26 g; 50.8 g - 52.19 g and 2.15 - 2.30 respectively. There was no significant

difference observed in Daily feed intake, Daily weight gain and Feed conversion ratio ( $p > 0.05$ ) among the treatments. Values obtained for daily feed intake in this study is within the range of the values (101.02 – 120.23 g) reported by Rahardja *et al.* (2010) for broiler birds fed dietary garlic. Values for final weight gain obtained in this study are similar to values of 2300.40g – 2549.20g reported by Nwaogu (2011) for broiler birds fed diets containing varying levels of *Ocimum gratissimum*. Rahmatnejad *et al.* (2009) also concluded that garlic given at the rate of 1000g/ton of feed did not affect feed intake and body weight gain and was corroborated by Mohebbifar and Toriki (2011). Odoemelam *et al.* (2015) had earlier reported no significant difference in daily feed intake for broiler birds fed dietary *Ocimum gratissimum* and antibiotic growth promoter. In contrast, Oladele *et al.* (2012) reported significant effects when comparing the weight gain of commercial birds fed diets containing garlic. Nidaullah *et al.* (2010) reported a reduction in daily feed intake for broilers fed garlic supplement. Similarly, Ghasemi *et al.* (2010) reported a decrease in feed intake at 0.1% and 0.2% inclusion of garlic and thyme in layers meal at 6 weeks of age. The variations in the effects of *Allium sativum* and *Ocimum gratissimum* as reported by various authors could be as a result of several factors such as type, time of harvest and processing method of the *Allium sativum* and *Ocimum gratissimum*. Other factors such as the genetic makeup of the chicken, management, health and environment of the broiler birds may also influence these results (Yang *et al.*, 2009). Values for FCR in this study were similar to values reported by Mansoub (2011) for broiler finisher birds fed 1g/kg garlic in broiler diet. However, it is not in agreement with the report of Kumar *et al.* (2005), who reported a significant difference in the FCR of broiler chicks fed diets supplemented with turmeric- a spice. Although looking at the values in absolute terms, T<sub>3</sub> – (Diet with 1% garlic) had the lowest and better feed conversion ratio compared to other treatment groups.

Table 3: Performance of broiler fed dietary Oxytetracycline HCl, scent leaf and garlic

Parameter	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>5</sub>	SEM
Initial Weight (g)	263.67	265.00	270.33	276.00	260.33	3.37
Total Feed Intake (g)	4787.46	4898.47	4568.87	4924.98	4808.37	194.22
Daily Feed Intake (g)	113.99	116.63	108.78	117.26	114.48	4.62
Final Weight (g)	2397.33	2422.67	2392.67	2491.00	2452.33	44.05
Total Weight Gain (g)	2133.67	2157.67	2122.33	2143.00	2192.00	44.69
Daily weight (g)	50.80	51.37	50.53	51.26	52.19	1.06
Feed Conversion Ratio (FCR)	2.28	2.30	2.15	2.30	2.22	0.11
Mortality (%)	1.19	1.18	1.33	1.11	1.25	

T<sub>1</sub> = Control, T<sub>2</sub> = Oxytetracycline, T<sub>3</sub> = *Ocimum gratissimum*, T<sub>4</sub> = *Allium sativum*, T<sub>5</sub> = *Ocimum gratissimum* and *Allium sativum*.

The results for the dressing percentage and organ characteristics of broiler birds fed diets containing antibiotics growth promoter (Oxytetracycline HCl), *Ocimum gratissimum* (Scent leaf), *Allium sativum* (Garlic) and a combination of *Ocimum gratissimum* and *Allium sativum* is presented in Table 4. Relative weights of the carcass, liver, spleen, lung, gizzard and pancreas of broiler birds fed the experimental diets did not differ significantly ( $P > 0.05$ ) except for dressing percentage, heart weight and abdominal fat. The non-significant effect observed for organs like liver, spleen, lung and gizzard corroborates the report of Ashayerizadeh *et al.* (2009), who reported same for broilers fed garlic supplemented diets. Values for dressing percentage were 65.00, 77.00, 74.67, 76.00, and 73.67 for T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> and T<sub>5</sub> respectively. Birds fed diets - T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> and T<sub>5</sub> had similar dressing percentages which were significantly higher compared to those on the control diet. Birds on diets containing the spices- *O. gratissimum* (T<sub>3</sub>), garlic (T<sub>4</sub>), and a combination of both (T<sub>5</sub>) compared favourably with those fed diet (T<sub>2</sub>) containing AGP (Oxytetracycline HCl). Values obtained in this study for dressing percentage (73% -77%) is comparable to 74.64% -75.10% reported by Nweze and Nwankwagu, (2010) for broilers fed diets containing Tetrapleura tetrapleura herb. For weight of heart and abdominal fat, birds in T<sub>3</sub> and T<sub>5</sub> had significantly heavier heart weight (2.29 g and 2.10 g) and lower abdominal fat (1.28 g and 1.27 g) respectively compared to birds in other treatments. *O. gratissimum* has been reported to have fat lowering effect (Amrani *et al.*, 2006). Recent investigations in medicine have also shown that administration of *O. gratissimum* will significantly reduce cholesterol (Khare, 2004). Thus, this result confirms the fat lowering effect of *O. gratissimum*.

The Organoleptic assessment of broiler finisher birds fed diets containing Antibiotic growth promoter (AGP- Oxytetracycline HCl), *Ocimum gratissimum*, *Allium sativum* and a combination of *Ocimum gratissimum* and *Allium sativum* is presented in Table 5. There were significant ( $p < 0.05$ ) differences in juiciness, tenderness, flavour and general acceptability among the treatment groups. Results for juiciness showed that meat from birds in T<sub>4</sub> (Diet containing 1% Garlic were juicier ( $p < 0.05$ ) followed by those in T<sub>3</sub> (Diet containing 1 % *O. gratissimum*) but significantly differed ( $p > 0.05$ ) from T<sub>5</sub>. This suggests that inclusion of garlic and *O. gratissimum* up to 1% in the diets of these birds may have improved the juiciness of the meat. Botsoglou *et al.* (2002) reported that constituents of essential oils found in spices like garlic and *O. gratissimum* can be deposited in a dose dependent fashion in tissues but has no reported negative effect on consumers. This result also

corroborates the reports of Odoemelam *et al.* (2013a). Result for tenderness showed that broiler birds fed diet T<sub>3</sub> (*O. gratissimum*) and T<sub>4</sub> (Garlic) also had more tender body tissues compared to other treatments. This tenderness is obviously related to the juiciness as perceived by the panelists. This result for tenderness however, doesn't follow the explanation by Egena and Ocheme (2008) that some compounds such as tannin and saponin contained in spices like *O. gratissimum* or garlic release juice which result in low pH and loss of water which consequently leads to meat being less tender. Meat from broilers in T<sub>1</sub> (control), T<sub>2</sub> and T<sub>4</sub> were scored to be similar ( $p > 0.05$ ) in terms of flavor but significantly ( $p < 0.05$ ) higher in flavor when compared to meats from birds in T<sub>3</sub> and T<sub>5</sub> which are diets containing *O. gratissimum*. This result is contrary to earlier reports by Nwaogu (2011) who reported that inclusion of *O. gratissimum* led to improvement in flavor of the meat. The variations in flavor as perceived by different panelists from various reports may be due to the percentage of inclusion. Botsoglou *et al.* (2002) reported that constituents of essential oils found in spices can be deposited in a dose dependent fashion. The experience and perception of the panelists can also play a role.

General Acceptance was similar ( $p > 0.05$ ) for meat from birds in T<sub>1</sub>, T<sub>2</sub>, T<sub>4</sub> and T<sub>5</sub> but differed significantly from meat of birds in T<sub>3</sub>. Meat from broilers in T<sub>3</sub> was the least accepted. General acceptability is an indication of perception, acceptance and preference of the meat from the different treatments by the panelists.

Table 4: Dressing percentage and organ characteristics of broiler fed dietary Oxytetracycline HCl, scent leaf and garlic and their mixture

Parameter	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>5</sub>	SEM
Live weight (kg)	2.60	2.43	2.37	2.50	2.53	0.05
Carcass (Kg)	1.67	1.85	1.77	1.93	1.87	0.04
Dressing percentage	65.00b	77.00a	74.67a	76.00a	73.67a	1.58
Liver (g)	9.14	8.61	8.40	7.39	8.84	0.29
Spleen (g)	0.62	0.56	0.80	0.57	0.64	0.04
Lung (g)	2.31	2.43	2.63	2.98	2.79	0.15
Full Gizzard (g)	12.79	13.80	14.60	13.20	14.80	0.44
Empty gizzard (g)	8.28	8.20	9.52	8.02	8.32	0.26
Pancreas (g)	0.87	0.99	1.01	1.14	1.05	0.05
Heart (g)	1.82b	1.65b	2.29a	1.74b	2.10a	0.07
Abdominal Fat (g)	1.84ab	1.61b	1.28b	2.80a	1.27b	0.20

T<sub>1</sub> = Control, T<sub>2</sub> = Oxytetracycline, T<sub>3</sub> = *Ocimum gratissimum*, T<sub>4</sub> = *Allium sativum*, T<sub>5</sub> = *Ocimum gratissimum* and *Allium sativum*.  
<sup>a, b, c</sup>; along the same row with different superscript are significantly different ( $P < 0.05$ )

Table 5: Organoleptic assessment of broilers fed dietary Oxytetracycline HCl, scent leaf and garlic and their mixture

Parameter	T1	T2	T3	T4	T5	SEM
Juiciness	6.17bc	6.17bc	6.50b	7.17a	5.67c	0.19
Tenderness	6.33bc	6.33bc	6.83a	6.83a	6.17c	0.10
Flavour	6.17a	6.33a	4.17b	6.00a	4.50b	0.27
General Acceptability	6.83a	7.00a	5.33b	6.17a	6.33a	0.18

T<sub>1</sub> = Control, T<sub>2</sub> = Oxytetracycline, T<sub>3</sub> = *Ocimum gratissimum*, T<sub>4</sub> = *Allium sativum*, T<sub>5</sub> = *Ocimum gratissimum* and *Allium sativum*. NS = not significant ( $P > 0.05$ ), \* = significant difference ( $p < 0.05$ ). <sup>a, b, c</sup>; along the same row with different superscript are significantly different ( $p < 0.05$ )

## CONCLUSION AND RECOMMENDATION

Birds fed diets containing *O. gratissimum* and garlic had a better Dressing percentage than other treatment groups. Incorporation of scent leaf (*Ocimum gratissimum*), garlic (*Allium sativum*), their mixture and Oxytetracycline in broiler diets had no significant or adverse effect on their growth performance. Organoleptic assessment showed that meats from birds fed diets containing garlic (1%) and *O. gratissimum* were preferred in terms of juiciness and tenderness. Considering growth performance, Dressing percentage, Organ weight and Organoleptic evaluation, T<sub>4</sub> (Diet containing garlic 1%) is recommended as the most favorable diet and a suitable alternative to antibiotics compared to *Ocimum gratissimum* or the combination of *Ocimum gratissimum* and garlic.

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