
CARCASS CHARACTERISTICS AND VILLI MORPHOMETRIC TRAITS OF BROILER CHICKENS FED DIET CONTAINING COMBINATIONS OF *OCIMUM GRATISSIMUM* AND *OCIMUM CANUM*

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ABSTRACT

Scent leaf (*Ocimum gratissimum*) and curry leaf (*Ocimum canum*) essential oils possess all the attributes of natural growth promoters (NGPs) and may be used as an alternative to common artificial growth promoters. Thus, this study was carried out to evaluate the effect of combination of *Ocimum gratissimum* and *Ocimum canum* on carcass characteristics and villi morphometric traits of broiler chickens. A total of 405 day-old Cobb 500 broiler chicks were allotted randomly to five dietary treatments each replicated thrice, with 27 chicks. Combination of *Ocimum gratissimum* and *Ocimum canum* were included at 0g, 75:25, 50:50 and 25:75 (T1-T4) while oxytetracycline was used as positive control (T5). Data were collected and analyzed on carcass characteristics and villi morphometric traits using analysis of variance and significant differences among treatment means were compared using Tukey procedures. Result on carcass characteristics revealed that cut parts were similar statistically but organs weights were significantly ($p<0.05$) increased while abdominal fat contents were reduced in birds fed combinations of the PFAs ($p<0.05$) at 600:200 and 200:600 g/100kg diet. Villi area, villi perimeter, height, width, crypt depth and villi height/crypt depth ratio were higher ($p<0.05$) in birds fed dietary combinations of *O. gratissimum* and *O. canum* at 600:200 and AGP compared to the control. Inclusion of *O. gratissimum* and *O. canum* in broiler chickens diets in combinations at 600:200 and 200:600 resulted into higher live weight, dressing percentage and villi morphometric traits with reduction in abdominal fat. Farmers and feed millers can use *O. gratissimum* and *O. canum* each in combinations at 600:200 or 200:600 g/100kg diets for improved live weight.

Keywords: Antibiotic Growth Promoter, Antibiotic Resistance, Feed Additives, Phytochemicals

INTRODUCTION

Antibiotics used for growth promotion are typically administered to all animals in a pen, herd, or flock, at a relatively low dosage and over long periods of time. Alternatives such as in fed enzymes, organic acids, prebiotics, probiotics, phytochemicals like essential oils are used commercially for growth promotion and occasionally disease prevention. Phytogenic feed additives (PFA) are the plant derived products used to improve performance of livestock and poultry (Windisch *et al.*, 2008; Jacela *et al.*, 2010). Antimicrobial and growth promoting effects of phytogenic feed additives (PFAs) have been reported (Wati, 2015). Possibly, the essential oils present in the PFAs promote gut functions by stimulating secretion of digestive enzymes, bile and mucus (Platel and Srinivasan, 2004). Moreover, due to their antibiotic effects, essential oils in PFA influence intestinal microbiota and facilitate production of digestive enzymes to increase nutrient utilization (Mountzouris *et al.*, 2011). Scent leaf (*Ocimum gratissimum*) and curry leaf (*Ocimum canum*) essential oils possess all the attributes of natural growth promoters (NGPs) and may be used as an alternative to common artificial growth promoters. The study was therefore carried out to evaluate effect of combinations of *Ocimum gratissimum* and *Ocimum canum* on carcass characteristics and villi morphometric traits of broiler chickens.

MATERIALS AND METHODS

Experimental site

The experiment was conducted at the Poultry Unit of the Department of Animal Science Teaching and Research farm, Ahmadu Bello University, Zaria, Kaduna State. Zaria is in the Northern Guinea Savannah zone, located on longitude 11° 09' 01.78" N and 7°39'14.79"E 671m above sea level (IARMS, 2023).

Experimental design and management of birds

Four hundred and five day old Cobb 500 broiler chicks were allotted to five dietary treatments with 3 replicates of 27 birds each in a completely randomized design (CRD). The birds were housed in deep litter pens and managed with all necessary routine management practices. Feed and water were provided *ad libitum* throughout the experimental period (49 days).

Experimental diets

Five treatment diets were formulated to meet the nutritional requirement of the birds. *Ocimum gratissimum* and *Ocimum canum* leaf meals were added in combinations at 0g (control), 600:200, 400:400 and 200:600 representing 0, 75:25, 50:50, 25:75 while oxytetracycline as recommended by manufacturer was used as positive control.

Carcass analysis

Three chickens with representative weights from each treatment were selected for carcass evaluation. The selected birds were starved of feed but given water *ad libitum* overnight. They were bled by severing the jugular vein and then scalded in hot water to remove the feathers. Live weight for each chicken was taken before slaughter. Dressed weight, standard cut parts and weight of organs were measured while dressing percentage was calculated. The organ weights: liver, lungs, kidney, gizzard and heart and abdominal fat content were expressed as percentage of live weight while the cut parts: thigh, drumstick, breast and back were expressed as percentage of dressed weight.

Villi morphometric study

Intestinal segment samples (approximately 2cm in length) were taken from the birds used for carcass evaluation to ascertain villi morphometric traits. Intestinal tissues were harvested and fixed in 10% formolsaline. They were histologically processed according to the method of Bancroft and Stevens (2010). The morphometric indices that were evaluated include villi height, width, crypt depth, surface area and perimeter at the Histology Laboratory, Department of Human Anatomy, Ahmadu Bello University, Zaria.

Data analysis

Data were statistically analysed using the General Linear Model Procedure of Statistical Analysis Systems software package (SAS, 2002) while significant differences between treatment means were separated using Tukey Procedure.

RESULTS AND DISCUSSION

Carcass characteristics of broiler chickens fed diets containing combinations of *Ocimum gratissimum* and *Ocimum canum*

The carcass characteristics of broiler chickens fed diets containing combinations of *O. gratissimum* and *O. canum* is presented in Table 1. There were significant ($p<0.05$) differences in live weight, dressed weight and organ weights while the cut parts showed no significant differences. The results obtained showed that birds fed dietary supplements of combinations of *O. gratissimum* and *O. canum* and those diets containing the AGP had higher ($p<0.05$) live weight and dressed weight compared to those of other dietary treatments. Organ weights were significantly ($p<0.05$) higher in birds fed diets containing combinations of *O. gratissimum* and *O. canum* in all levels of combinations. The enlargement of these organs may be due to their involvement in detoxification of the materials and hence may also confer superior benefits.

Studies have reported that the use of antibiotics as a growth promoter has ability to improve weight gain as well as carcass yield of birds (Al-Kassie, 2010; Vitor *et al.*, 2010). The result is in agreement with the observation of Khaksar *et al.* (2012) who reported significant improvements in some carcass traits due to inclusion of thyme essential oil. However, Schulze *et al.* (2008) did not observe a significant effect in the broiler carcass yield due to the dietary inclusion of essential oil blend based on thyme and cinnamon. Abdominal fat were significantly ($p<0.05$) lowered in broiler chickens fed diets containing combinations of *O. gratissimum* and *O. canum* at different proportions and oxytetracycline, while the control had the highest level of abdominal fat. The higher the level of *Ocimum gratissimum* in the combination, the lower the level of abdominal fat. Reduction in the levels of abdominal fat implies that they have the ability to reduce the consumption of excess fats in broiler chicken meat. The findings of this study agrees with that of Myandoab and HosseiniMansoub (2012) who reported that licorice extract lowered abdominal fat levels in Japanese quails.

Table 1: Carcass and organs characteristics of broiler chickens fed diet containing combinations of *Ocimum gratissimum* and *Ocimum canum*

Parameters	Control	Mixtures of <i>O. gratissimum</i> and <i>O. canum</i> Inclusion (g/100kg Diet)			Oxytet	SEM
		600:200	400:400	200:600		
Final live weight (g/b)	2650.00 ^c	2900.00 ^{ab}	2783.00 ^b	2800.00 ^{ab}	2917.00 ^a	60.09
Dressed weight (g/b)	1933.00 ^b	2186.00 ^a	2085.00 ^a	2078.00 ^a	2179.00 ^a	56.28
Dressing (%)	72.94	75.38	74.92	74.21	74.70	1.32
Cut parts expressed as percentage of dressed weight (%)						
Breast	25.48	25.75	25.93	25.12	26.56	1.40
Back	14.31	14.82	15.13	14.73	14.46	0.55
Thigh	10.83	11.23	11.43	10.69	11.13	0.38
Drumstick	9.20	9.61	9.43	9.18	9.08	0.45
Organ weights expressed as percentage of live weight (%)						
Gizzard	2.33 ^a	1.99 ^b	2.10 ^{ab}	2.11 ^{ab}	2.26 ^{ab}	0.17
Heart	0.57 ^{ab}	0.72 ^a	0.53 ^{ab}	0.54 ^{ab}	0.42 ^b	0.08
Lungs	0.42 ^c	0.49 ^{bc}	0.67 ^a	0.56 ^{ab}	0.63 ^a	0.07
Liver	2.05 ^{ab}	2.26 ^a	2.40 ^a	2.39 ^a	1.89 ^b	0.18
Kidney	0.63 ^b	0.60 ^b	0.74 ^a	0.65 ^b	0.64 ^a	0.04
Abdominal Fat	1.32 ^b	0.45 ^a	0.70 ^{ab}	0.97 ^{ab}	0.97 ^{ab}	0.38

^{abc}Means with the same superscripts along the rows are not significantly different ($p>0.05$), SEM: standard error of means, Oxytet-Oxytetracycline, g/b: gram per bird.

Villi morphometric traits of broiler chickens fed diet containing combinations of *Ocimum gratissimum* and *Ocimum canum*

The results of the effect of combinations of *O. gratissimum* and *O. canum* on villi morphometric traits is presented in Table 2. Significant ($p<0.05$) differences were observed in all parameters measured across the dietary treatment. Villi area, perimeter, height, width, crypt depth and villi height/crypt depth ratio were higher ($p<0.05$) in birds fed dietary supplement of combinations of *O. gratissimum* and *O. canum* at 600:200 g/100kg diet compared to the control and other treatment means. Villi perimeter, height and width were also higher in birds fed diets containing AGP as an additive. The morphology of intestinal villi and crypts is associated with intestinal function and growth in chickens. Higher intestinal villi are associated with increased absorptive surface area of the intestine and thus, an increased absorptive capacity with resultant higher body weight gain (Kanduri *et al.*, 2013). Generally, a large crypt indicates a fast tissue turnover and a high demand for new tissue (Xu *et al.*, 2003). The result obtained in this works showed that the improvement in the gut morphology may be responsible for higher live weight in birds fed diets containing combinations of *O. gratissimum* and *O. canum*.

Table 2: Villi morphometry of broiler chickens fed diet containing combinations of *Ocimum gratissimum* and *Ocimum canum*

Parameters	Control	Mixtures of <i>O. gratissimum</i> and <i>O. canum</i> Inclusion (g/100kg Diet)			Oxytet	SEM
		600:200	400:400	200:600		
Villi Area (μm^2)	14,020.00 ^c	38,999.00 ^a	21,572.00 ^b	22,424.00 ^b	21,484.00 ^b	3619.93
Villi perimeter (μm)	716.60 ^c	1076.00 ^a	892.50 ^{bc}	882.60 ^{bc}	916.20 ^{ab}	91.35
Villi height (μm)	309.20 ^c	465.80 ^a	394.30 ^{ab}	377.30 ^b	400.70 ^{ab}	37.35
Villi width (μm)	91.90 ^c	149.40 ^a	84.79 ^c	114.60 ^{bc}	135.00 ^{ab}	16.51
Crypt depth (μm)	117.40 ^{cd}	101.00 ^d	166.50 ^a	139.80 ^b	136.70 ^{bc}	10.18
Villi height/ crypt depth	2.65 ^b	4.83 ^a	2.38 ^b	2.71 ^b	2.94 ^b	0.36

^{abcd}Means with the same superscripts along the rows are not significantly different ($p>0.05$), SEM: standard error of means, Oxytet-Oxytetracycline.

CONCLUSION

Inclusion of *O. gratissimum* and *O. canum* in broiler chickens diets in combinations at 600:200 and 200:600 had outstanding live weight, dressing percentage and villi morphometric traits with reduction in abdominal fat.

RECOMMENDATION

Farmers and feed millers can use *O. gratissimum* and *O. canum* each in combinations at 600:200 or 200:600 g/100kg diets for improved live weight.

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