
CARCASS CHARACTERISTICS AND VILLI MORPHOMETRIC TRAITS OF BROILER CHICKENS FED DIET CONTAINING CLOVE (*SYZIGIUM AROMATICUM*)

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ABSTRACT

Poultry industry continually explores alternative feed additives to enhance the overall performance and health of broiler chickens. Clove (*Syzygium aromaticum*), a well-known spice, has gained attention for its potential benefits in animal nutrition. Therefore, this study was undertaken to evaluate clove (*Syzygium aromaticum*) as an alternative for synthetic antibiotic growth promoters. A total of 300 day-old Ross 308 broiler chicks were allotted to five dietary treatments replicated thrice with 20 chicks in a completely randomized design. Clove was included in the diet at 0, 100, 200 and 300g while oxytetracycline was used as positive control. Data were collected on carcass characteristics and villi morphometric traits. Data were subjected to analysis of variance and significant differences amongst treatment means were compared using Tukey procedures. Result obtained showed that clove inclusion at 300g/100kg diets of broiler chickens significantly increased carcass percentages of prime cuts (back, breast and drumstick). Similarly, clove (*Syzygium aromaticum*) inclusion in diets of broiler chickens at 300 g/100kg diet resulted in improved villi area (46184.56 μm^2) and villi perimeter (924.12 μm) against those fed with 0 g/100kg diet with values of 31547.25 μm^2 and 760.79 μm for villi area and perimeter, respectively. Clove inclusion at 300g/100kg diet are recommended to farmers and feed manufacturers for improved carcass traits and villi morphology.

Keywords: Essential Oil, Growth Promoter, Health, Phytogetic Feed Additives,

INTRODUCTION

The poultry industry continually explores alternative feed additives to enhance the overall performance and health of broiler chickens. Clove (*Syzygium aromaticum*), a well-known spice, has gained attention for its potential benefits in animal nutrition. Its rich composition of bioactive compounds, including phenolic compounds and essential oils, suggests possible positive effects on growth, carcass characteristics, and gut health in broiler chickens (Windisch *et al.*, 2009; Abd El-Hack *et al.*, 2016). Phytogetic feed additives (PFAs) as natural growth promoters (NGPs) have been reported for their beneficial effect on gut health, immunity and growth performance of broiler chickens through better feed utilization (Abd El-Hack *et al.*, 2016; Salihu, 2021).

Thus, the essential oils and other bioactive components contained in onions, garlic, clove and spring onions possess attributes which may act against wide range of microbial populations or improving the microbial population and are considered safe to be used as the ingredients in the food industry as well as in animal diet as an ideal growth promoter (Li *et al.*, 2016; Moses *et al.*, 2017). Hence, there is need to evaluate the graded levels of these phytogetic materials on the performance and immune response of broiler chickens. In this premise, this study evaluated carcass characteristics and villi morphometric traits of broiler chickens fed dietary supplement of clove bud Clove (*Syzygium aromaticum*) as phytobiotic.

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

A total of 300 broiler chicks Ross 708 chicks at a day old were obtained and raised in a deep litter system under the same environment were placed on five experimental diets containing graded levels of cloves with three replicates of 20 chicks in a completely randomized design (CRD). Throughout the experimental period, feed and clean water were provided *ad-libitum*.

Experimental diets

Five standard experimental diets were formulated containing graded levels of cloves as phytogetic source at the starter and finisher phases respectively to meet the requirement of broiler chickens as recommended by NRC (1994) 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 2 cm 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 from the study 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 graded levels of at 8 weeks of age

Table 1 shows the result of carcass parameters measured at eight weeks of age. Live weights, dressed weights, dressing %, prime cuts (back, breast, drumstick, and thigh) and abdominal fat deposition were all affected by levels of clove inclusion in diets. All organs' weights were unaffected by clove inclusion. Birds fed 100g/100kg diet of cloves were significantly higher in dressing percentage compared to those fed the control diet by 3.48%. Birds fed 100g/100kg of clove inclusion had 71.14% dressing percentage there statistically similar to birds fed 200g and 300g of clove which had 71.38% and 71.04% respectively while birds fed the control diet had 68.75%. Birds fed graded levels of clove (100, 200 and 300g) were significantly ($P<0.5$) higher in percentages of thigh and drumstick compared those fed the control diet, they had 16.64%, 16.21% and 16.94% while those fed the control diet had 14.60%. Birds fed 300g of clove inclusion were significantly ($P<0.5$) higher in back, breast and drumstick compared to those fed the control diet, they had 18.33%, 34.98% and 16.92% respectively compared to birds fed the control diet which had 15.63%, 30.03% and 14.60% for back, breast and drumstick respectively. Birds fed clove treated diets were all significantly ($P<0.5$) better in abdominal fat deposition compared to those fed the control diets while those fed with oxytetracycline were statistically similar to the control group. Birds fed the control diet had abdominal fat of 0.87% but it reduces with clove inclusion with birds fed graded levels of clove (100g, 200g and 300g) having 0.41%, 0.33% and 0.31%; this amounted to 52.87%, 62.07% and 64.37% reduction in abdominal fat deposition compared with birds fed the control diet

The significant difference observed in dressed weights, prime cuts and dressing % in this study is expected. Considering the result obtained from growth performance, the 3.48% increment in dressing percentage of birds fed 100g/100kg diet of cloves compared to those fed the control diet is in line with the reports of Tariq *et al.* (2015) cited an increase in dressing percentage and breast weight of chickens fed clove. The significant reduction in abdominal fat deposition reported in this study

corroborates the report of Gamaleldin *et al.* (2020). This was similarly reported by Dalkiliç and G uler (2009) who observed a significant reduction in abdominal fat content with the high level of clove extract inclusion in broiler diet.

Table 1: Carcass Characteristics of Broiler Chickens Fed Graded Levels of Cloves (8wks)

Parameters	Level of Clove (<i>Syzigium aromaticum</i>) Inclusion					SEM
	0	100	200	300	Oxytet	
Live weight (g)	2286.67 ^c	2433.33 ^{bc}	2520.00 ^b	2570.00 ^{ab}	2616.67 ^a	80.66
Dressed weight (g)	1572.00 ^b	1734.67 ^{ab}	1800.00 ^{ab}	1827.33 ^a	1860.33 ^a	87.26
Dressing %	68.75 ^b	71.14 ^a	71.38 ^a	71.01 ^a	71.10 ^a	1.20
Prime cuts expressed as % of dressed weight						
Back	15.63 ^b	16.26 ^{ab}	17.66 ^{ab}	18.33 ^a	18.91 ^a	1.51
Breast	30.03 ^b	32.28 ^{ab}	32.80 ^{ab}	34.98 ^a	33.11 ^{ab}	2.04
Drumstick	14.60 ^c	16.64 ^{ab}	16.21 ^{ab}	16.92 ^a	17.77 ^a	0.79
Thigh	14.60 ^c	16.64 ^b	16.21 ^b	16.94 ^{ab}	17.84 ^a	0.54
Wings	11.47	11.10	11.05	10.94	11.33	0.39
Organs expressed as % of live weight						
Kidney	0.39	0.45	0.33	0.40	0.40	0.13
Gizzard	2.13	2.33	2.22	2.03	2.27	0.17
Lungs	0.49	0.55	0.50	0.34	0.42	0.14
Heart	0.47	0.45	0.48	0.43	0.54	0.13
Liver	1.61	1.92	1.81	1.85	1.73	0.12
Abdominal fat	0.87 ^b	0.41 ^a	0.33 ^a	0.31 ^a	0.54 ^{ab}	0.17

^{abc} Means with the same superscripts along the rows are not significantly different ($p>0.05$), SEM: standard error mean and oxytet: oxytetracycline

Villi morphometric traits of broiler chickens fed graded levels of cloves at 8weeks

The result for villi morphometric traits of broiler chickens fed graded levels of cloves at 8weeks of age is presented on Table 2. The villi area, villi perimeter, villi height and villi height/crypt depth were significantly affected by levels of experimental diets. Villi Width and crypt depth were however, unaffected by clove inclusion in diet. Villi area and villi perimeter increases across the treatments. Birds fed diets with oxytetracycline had significantly ($P<0.5$) higher villi height having 470.77 μm compared to those fed the control diet having 384.00 μm . There is a noticeable 36.28% and 46.40% increment in villi area of birds fed 200g and 300g of cloves in diets respectively when compared to birds fed the control diet. Birds fed diet with oxytetracycline inclusion had significantly ($P<0.5$) higher ratio of Villi height/crypt depth of 3.84 compared to the rest of the treatments.

The increment in villi area and villi perimeter with clove inclusion observed in this study agrees with the findings of Salihu *et al.* (2020) who similarly reported increment in villi area and perimeter with *Ocimum gratissimum* and *Ocimum canum* inclusion in broiler chickens diet. The normal functioning of the GIT has been associated with the morphology of the villi and its crypts. Higher intestinal villi are associated with increased absorptive capacity with a resultant higher BWG (Kanduri, 2013).

Table 2: Villi morphometric traits of broiler chickens fed graded levels of cloves (8wks)

Parameter	Level of Clove (<i>Syzigium aromaticum</i>) Inclusion					SEM
	0	100	200	300	Oxytet	
Villi Area (μm^2)	31547.25 ^b	39565.30 ^{ab}	42992.41 ^{ab}	46184.56 ^a	44294.27 ^{ab}	6671.48
Villi Perimeter (μm)	760.79 ^b	786.06 ^b	877.95 ^b	924.12 ^{ab}	1069.49 ^a	83.35
Villi Height (μm)	384.00 ^b	353.87 ^b	387.85 ^b	352.64 ^b	470.77 ^a	38.60
Villi Width (μm)	113.81	115.64	144.08	124.56	131.19	18.11
Crypt Depth (μm)	116.48	116.60	123.33	128.07	127.44	13.56
Villi height/crypt depth	3.30 ^b	3.12 ^b	3.28 ^b	2.82 ^b	3.84 ^a	0.24

^{abc} Means with the same superscripts along the rows are not significantly different ($p>0.05$), SEM: standard error means, oxytet: oxytetracycline.

CONCLUSION

Inclusion of clove (*Syzygium aromaticum*) at 300 g/100kg in broiler chickens diets increased carcass characteristics, reduced abdominal fat with improved villi morphometric traits.

RECOMMENDATION

Poultry farmers and feed manufacturers can use clove buds (*Syzygium aromaticum*) at 300 g/100kg diet for improved performance and carcass traits.

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