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Growth performance and nutrient digestibility of Ross 308 broiler chickens fed diets containing clove bud (*Syzygium aromaticum*) as a natural feed additive

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Target Audience: *Animal Scientists, Poultry Farmers, Researchers*

Abstract

*The study was carried out to determine the response of broiler chickens to the use of clove bud (*Syzygium aromaticum*) as a natural feed additive. One hundred and sixty (160) Ross 308-day-old broiler chicks of mixed sexes were used for the experiment. The birds were weighed and randomly allotted to four treatments with four replicates using the Completely Randomized Design (CRD). Treatment 1 was the control without clove bud, while treatments 2, 3 and 4 were diets supplemented with 0.40, 0.80 and 1.20 % of clove bud respectively. Birds were raised on deep litter. The result of growth performance showed that the daily body weight gain, daily feed intake and feed conversion ratio were not affected significantly ($p>0.05$) by dietary treatments. This implies that the inclusion of clove bud in broiler chicken diets did not affect their growth performance. Results obtained on the apparent nutrient revealed that the dry matter, crude protein, ash, ether extract and nitrogen-free fibre showed no significant ($p>0.05$) difference among dietary treatment groups except for crude fibre which showed significant ($p<0.05$) difference among treatments. Basically, from the results obtained from this research, the addition of up to 0.40 % clove bud to the diet of broiler chickens is therefore recommended since it did not have a significant negative effect on the overall performance.*

Keywords: *Performance; feed additive; apparent nutrient digestibility; *Syzygium aromaticum**

Description of Problem

The poultry industry is currently moving toward the reduced use of antibiotics for growth promotion because of increased concern about antibiotic-resistant bacteria and antibiotic residue in meat and eggs [1]. Due to these factors, there is a growing concern about discovering safer substitutes for the use of antibiotics for growth promotion in broiler production.

Herbs, spices and various other natural plant compounds are being assessed as effective alternatives to antibiotics and possibly can promote growth effects, antibacterial properties and other health-related advantages (2, 3, 4, 5).

Growth enhancers occur to be the major additives used in poultry feeds, they are accountable for enhancement in animal efficiency, particularly in the early phase of rearing. Several studies have been demonstrated to evaluate the effect of broiler chicken diets supplemented with cloves on the performance, carcass, and production traits of broilers [6]. The effects of clove leaf powder on growth performance, immune response, blood parameters and lymphoid organs in broiler chickens have also been studied [7]. It was discovered by [6] that broiler chicken diets supplemented with clove oil improved the performance and feed conversion ratio by increasing

gastrointestinal villus height and crypt depth. [8] also investigated using varying quantities of clove oil as a dietary supplement for broiler chickens, the results showed improvements in feed efficiency and growth performance for all experimental groups of chickens. Dietary spices containing essential oils can also be responsible for improving digestion [9]. Clove has attracted the attention of researchers due to its potent antioxidant and antimicrobial activities which are exceptional among other spices [10]. Intake of cloves can result in the creation of favourable micro-ecological conditions in the gut that suppress harmful bacteria and favours beneficial bacteria, and eventually enhance well-being. This is also essential for proper functioning and efficient digestion of nutrients, which will, in turn, result in improved growth performance. It is conceivable that herbal agents could serve as safer alternatives as growth promoters due to their suitability and preference, lower cost of production, reduced risks of toxicity and minimum health hazards. Interestingly, recent biological trials of certain herbal formulations as growth promoters have shown encouraging results and some of the reports have demonstrated improvement in weight gain, feed efficiency, lowered mortality, increased immunity and increased life ability in poultry birds [11]. Also, these herbal growth promoters have been shown to exert therapeutic effects against liver damage due to feed contaminants like aflatoxin [12]. This research study will therefore be carried out to gain more insight and scientific knowledge on the effect of the supplementation of clove bud in the diets of broiler chickens. The major aim of this research is to evaluate the effect of dietary supplementation of clove bud (*Syzygium aromaticum*) on the growth performance and

apparent nutrient digestibility of broiler chickens.

Materials and Method

Experimental location

The research was conducted at the poultry unit of the Department of Animal Production Teaching and Research Farm, Gidan Kwano, Federal University of Technology Minna, Niger State. Minna is located within latitude 09° 30' and 06° 45' North and longitude 06° 30' and 06° 45' East of the equator. It falls within the Southern Guinea Savanna agro-ecological zone of Nigeria. The mean annual rainfall varies from 1100 to 1600 mm and the mean annual temperature of between 21 °C and 35 °C [13].

Source of experimental test material

Mature and dry clove bud (*Syzygium aromaticum*) was purchased from Kure ultra-modern market Minna, Niger state. The clove bud was sun-dried for three days. It was ground with the use of a hammer mill and stored in a plastic container.

Experimental design

A total of one hundred and sixty (160) day-old Ross 308 broiler chicks were used for the experiment. The birds were weighed and randomly allotted to four treatments with four replicates using the Completely Randomized Design (CRD). Treatment 1 (T1) was the control without *Syzygium aromaticum*, while treatments 2 (T2), 3 (T3) and 4 (T4) were diets supplemented with 0.40, 0.80 and 1.20 % of *Syzygium aromaticum* (clove buds) meals respectively. The diets were formulated to contain 22 % crude protein (CP) and 3048.74 kcal/kg ME in a single-phase feeding (Table 1).

Table 1: Composition of experimental diet in a single-phase feeding regime

Ingredient	Percentage (%)
Maize	45.85
Full-fat soybeans	40.00
Maize offal	6.00
Fish meal	4.00
Bone meal	2.00
Limestone	1.00
Methionine	0.25
Toxin binder	0.15
Lysine	0.25
Salt	0.25
Vitamin premix	0.25
Total	100
Calculated analysis	
Crude protein (%)	22.42
Energy (kcal/kg ME)	3,044.22
Determined analysis	
Moisture	7.05
Crude protein	21.98
Crude fibre	6.62
Ash	8.00
Ether extract	8.46

ME = Metabolizable energy

Management of experimental birds

One hundred and sixty (160) broiler chicks of mixed sexes were used for the experiment. Birds were raised on deep litter. The pen was thoroughly washed and disinfected. Drinkers and feeders were washed and made ready for use. Before the arrival of the birds, wood shavings were evenly spread on the floor, a heat source was made available for the brooding of the chicks and a foot dip was provided at the entrance of the poultry house. Upon the arrival of the chicks, they were weighed to obtain their initial weights after which they were randomly distributed to the various treatment groups. The chicks were thereafter administered anti-stress (Vitalyte®) through drinking water according to the manufacturer's instructions. The birds were vaccinated against the prevailing diseases.

The feeding trial was carried out for seven (7) weeks. Feed intake was measured daily while the weighing of birds was done every week. There was no mortality recorded during the experiment.

Data collection and Analysis

Data were collected on growth performance i.e feed intake, body weight gain, and feed conversion ratio were obtained from daily feed intake and weekly weight recordings. The digestibility trial was conducted by randomly taking two birds from each replicate group between the 6th - 7th weeks for the determination of the apparent nutrient digestibility. The birds were housed in metabolic cages and daily faeces were collected separately from each replicate for a period of seven days. The faecal samples from each treatment group

were bulked, oven-dried at 65 °C, weighed and put together for proximate analysis as described by [14]. All data collected during the experiment from the measured parameters were subjected to one-way analysis of variance (ANOVA) using IBM SPSS version 23.0. The significant means were separated using Duncan's multiple range test.

Results and discussion

Dietary influence of clove bud on the growth performance of broiler chickens

The results on the influence of clove bud (*Syzygium aromaticum*) on the performance of broiler chickens is presented in Table 2. The result showed that all the growth performance parameters; the final

body weight, daily body weight gain, daily feed intake and feed conversion ratio were not affected significantly ($p>0.05$).

This implies that the inclusion of clove bud in broiler chicken diets had no significant effect on their growth performances. This result may imply that the dose of clove bud used was high. The findings of this study are consistent with the report of [6] found that the addition of clove bud to the diet of broiler chickens had no significant effect on daily feed intake, daily weight gain, feed conversion ratio, or final body weight. [8] and [15] also found that the supplementation of clove bud to the diet of broiler chickens did not have a significant effect on growth performance.

Table 2: Effect of dietary clove bud on the growth performance of broiler chickens

Parameters	Treatments				SEM	P- value	LS
	T1	T2	T3	T4			
IBW	38.38	38.38	38.38	38.50	0.17	0.99	NS
FBW	2105.63	2033.13	1966.88	1886.88	45.88	0.31	NS
DBWG	42.19	40.71	39.36	37.72	0.85	0.31	NS
DFI	60.37	56.99	58.58	57.16	2.14	0.88	NS
FCR	1.43	1.40	1.49	1.53	0.04	0.68	NS

IBW: Initial body weight; FBW: Final body weight; DBWG: Daily body weight gain; DFI: Daily feed intake; FCR: Feed conversion ratio; SEM: Standard error of mean; P-value: Probability value; LS: Level of significance; NS: Not significant

T1: 0 % inclusion of clove bud; T2: 0.40 % inclusion level of clove bud; T3: 0.80 % inclusion level of clove bud; T4: 1.20 % inclusion level of clove bud

Influence of clove bud supplementation on the apparent nutrient digestibility of broiler chickens

The nutrient digestibility of broiler chickens fed diets supplemented with clove bud meal is shown in Table 3. Results obtained revealed that the dry matter, crude protein, ash, ether extract and nitrogen-free extract showed no significant ($p>0.05$) difference among dietary treatment groups except for crude fibre which showed significant ($p<0.05$) difference among treatments. The results show that the control

(Treatment 1) recorded the highest crude fibre digestibility of 65.78 % which was statistically similar to Treatment 2 with 60.73 %. [6] found that the addition of 0.40 % clove bud to the diet of broiler chickens did not have a significant negative effect on the digestibility of crude fibre. However, they also found that the addition of 0.80 % clove bud to the diet did have a significant negative effect on the digestibility of crude fibre. [15] reported similar results, with the addition of 0.40 % clove bud having no significant effect on the digestibility of crude

fibre, but the addition of 0.80 % clove bud having a significant negative effect. [16] also found that the addition of 0.80 % clove bud to the diet of broiler chickens had a significant negative effect on the digestibility of crude fibre.

The outcome of the study suggests the possibility that the active compounds in

clove bud, such as eugenol and caryophyllene, may have a laxative effect, stimulating the movement of food through the gut and reducing the amount of time that crude fibre has to be digested. This effect might be obvious at high levels of clove bud supplementation in the diet of broilers.

Table 3: Apparent nutrient digestibility of broiler chickens fed diets supplemented with clove bud

Parameters	T1	T2	T3	T4	SEM	P-value	LS
Dry matter	57.06	57.44	52.86	53.91	1.422	0.634	NS
Crude protein	53.35	48.84	49.25	48.71	1.346	0.610	NS
Crude fibre	65.78 ^a	60.73 ^{ab}	52.10 ^c	54.93 ^{bc}	1.791	0.013	*
Ash	59.65	60.59	56.95	59.72	1.095	0.713	NS
Ether extract	60.82	60.13	60.31	63.78	1.389	0.734	NS
Nitrogen free extract	56.07	59.39	51.43	53.20	1.770	0.443	NS

^{a, b, c} means across treatment on a row are significantly ($p < 0.05$) different

T1: 0 % inclusion of clove bud; T2: 0.40 % inclusion level of clove bud; T3: 0.80 % inclusion level of clove bud

T4: 1.20 % inclusion level of clove bud; SEM: Standard error of mean; P-value: Probability value; LS: Level of significance; *: Significant; NS: Not significant

Conclusion and Applications

- Overall, the results of this study suggest that the addition of clove bud to the diet of broiler chickens does not have a significant effect on growth performance. However, further studies are needed to confirm this finding and to investigate the potential mechanisms by which clove bud may affect growth performance.
- In regards to the apparent nutrient digestibility, all parameters measured showed no significant difference among treatment groups except for crude fibre digestibility. The addition of 0.4 % clove bud to the diet of broiler chickens did have a significant negative effect on the digestibility of crude fibre. This suggests that the amount of clove bud that can be added to the diet of broiler chickens without

negatively affecting the digestibility of crude fibre is limited. Basically, from the results obtained from this research, the addition of up to 0.40 % clove bud to the diet of broiler chickens is therefore recommended since it did not have a significant negative effect on the overall performance.

- The results of these studies provide valuable information about the potential effects of clove buds on the digestibility of crude fibre in broiler chickens. Further studies are needed to confirm these findings and to investigate the potential mechanisms by which clove bud may affect the digestibility of crude fibre.
- In addition, further studies may be conducted on the importance of considering the strain of broiler chickens when studying the effects of

clove buds. This is because the response of broiler chickens to clove bud may vary depending on the strain of the birds.

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