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Haematological and serum biochemical indices of cocks drenched varying levels of clove powder (*Syzygium aromaticum*)

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Abstract

There is stimulated increased interest in the usage of consumer accepted natural alternatives such as phytogenic feed additive (PFAs) to improve livestock performance. Clove is a wonderful phytogenic feed additives with little information in its benefit in poultry production. This study was conducted to assess the effect of clove powder (Syzygium aromaticum) on haematological and serum - biochemical indices of cocks. Clove was obtained from a local market in Saki, Oyo State. Dried clove buds were cleaned and air dried for 24 hours prior to milling and stored in air-tight bags until the period of usage. Cocks (48 birds assigned into four treatments) were drenched at 0.0g (T1), 0.05g (T2), 1.00g (T3) and 1.5g (T4) after 2 weeks of acclimatization. Haematological parameters measured were: packed cell volume (PCV), red blood cell (RBC), white blood cell (WBC), haemoglobin (Hb), mean corpuscular volume (MCV), Mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC). While biochemical evaluated were total protein, albumin, globulin, uric acid, creatinine, cholesterol and glucose. Data obtained were subjected to one-way analysis of variance in a completely randomised design. RBC (3.64 – 3.76 X10^{6}/mL), Hb (3.64 – 12.86 g/dL), MCH (32.79 – 36.86 µµg) and MCHC (31.62 – 32.85%) showed significant difference (P<0.05), while PCV (39.00 – 41.00%), WBC (18.66 – 19.10 X10^{9}/mL), MCV (103.74 – 112.23 µ^{3}) shows no significant difference (p>0.05). Total protein showed significant difference (P<0.05) with values ranging between 4.46 and 5.40 g/dL There exists significant difference (P<0.05) in the mean value of albumin, with highest value in 1.50g CP (5.40). Other biochemical parameters studied also showed significant differences (P<0.05) with the highest value in 1.50g CP. Drenching cocks with clove powder up to 1.5g was discovered posing no harmful effect on cocks.

Keywords*: clove powder, biochemical indices, haematological indices, cocks*

Introduction

The increasing cost of antibiotics and their residual effects has necessitated the need to research for a natural plant base products that could serve as a cheap and effective alternative compared to commercial (synthetic) antibiotics. Using plants with phytogenic properties as additives in livestock nutrition is becoming popular due to its resultant effect on animals such as improved productivity, reproduction, and quality of animal products through improved health (Olayemi *et al*., 2016). Cloves are the sweet-smelling dried buds of a tree named botanically as *Eugenia caryophyllata* similarly called Syzgium. This plant serves as one of the richest sources of phenolic compounds such as eugenol, eugenol acetate,

and gallic acid and possesses great potential for pharmaceutical, cosmetic, food, agricultural, and for many other applications. *Syzygium aromaticum* (clove) is a well-known medicinal herb having various proven therapeutic properties as per the published scientific reports (Shifali *et al*., 2021). Eugenol is the main principal constituent of clove responsible for the restorative property of clove. It is a most commonly used spice and food preservative traditional ayurvedic (Shifali *et al*., 2021). Poultry production has a very crucial role in the economic development of any country (Kafi *et al*., 2017). Agriculture accounts for about 35.2% of Nigeria's GDP; therefore, it plays a relevant role in reducing poverty and enhancing food security (Heise *et al*., 2015). With the gradual rise in human population, increasing demand for poultry meat as a source of protein is expected in the nearest future; as such, poultry health is a significant issue. Due to extremely crowded poultry pens, poor hygiene, and other management problems, antibiotics and other therapeutic chemical agents are used extensively to maintain health and improve poultry growth (Guil-Guerrero, 2017). These chemical agents help to overcome the issues of morbidity and/or mortality with poultry production; however, they can cause adverse public health issues by developing drug-resistant microflora (Mahesh and Prabhakar, 2018). In addition, the reduction of natural gut microorganisms predisposes the birds to opportunistic infections. In 2006, the European Union banned antibiotics as feed additives due to their residual effects in animal tissues, subsequently leading to anti-microbial resistance in humans (Gobiraju *et al*., 2017). To avoid the extreme use of anti-biotics and other medication, it is essential to find alternative feed supplements, to improve and decrease the cost of production through efficient feed utilization. Alternatives include phytogenic feed additives, prebiotics, probiotics, enzymes, organic acids, and essential oils. Phytogenic feed additives are obtained from plants with anti-microbial properties (Gobiraju *et al*., 2017).

Materials and Methods

Procurement and Preparation of Test Ingredient

Clove (*Syzygium aromaticum*) was obtained from Sango market in Saki in Oyo State, Nigeria, in March 2023. Dried clove buds were cleaned and air dried for 24 hours prior to milling. Thereafter, it was milled into a fine particle size using a blender stored in air-tight bags until the period of usage.

Management of Experimental Animals

A total of 48 sexually matured and healthy light ecotype genotypes of Nigerian local cocks (normal feathered) were used. Sample population of similar age, size, and body weight (between 1.5 and 1.8 kg) used for the study were obtained from the Department of Animal Production Technology Teaching and Research Farm, The Oke - Ogun Polytechnic, Saki. The birds were randomly allotted into 4 treatments groups: birds in T1 were drenched 0.00g CP and this served as control group birds in T2, T3, and T4 were drenched 0.50, 1.00 and 1.50g CP respectively. Each treatment had 12 cocks and were replicated 3 times with 4 birds per replicate. The birds were reared and managed intensively in cage housing system and were observed and acclimatized for 2 weeks before the commencement of the study. Drenching of experimental material commenced at the end of the acclimation period. Feed and water were given to the birds *ad libitum.*

Data Collection

Blood Collection

At 42 days of drenching the birds with clove powder blood samples (2.0 ml) were

collected with needle and syringe through the brachial wing vein of three cocks per replicate into EDTA bottles and plain bottles (2mls per cock) directly for the determination of haematological and serum biochemical indices using standard procedures, as described by (Weiss and Wardrop, 2010). Haematological indices such as Red Blood Cell RBC), Packed Cell Volume (PCV), White Blood Cell (WBC) and Haemoglobin concentration. Haemoglobin concentration was determined photo-metrically using cyano-haemoglobin method (Elarabany, 2018), and PCV using Hacksley haematocrit centrifuge (UK) according to the procedure by (Morris *et al*., 2001), PCV results were determined using a micro hematocrit reader. The WBC as determined using the Neubaer count chamber following procedure described in previous studies (Fudge, 2000; Cray and Zaias, 2004). The serum metabolites determined were Total protein, Albumin, Globulin, blood glucose, uric acid, creatinine and cholesterol.

Statistical Analysis

At the end of the field trial, data collected were analysed in accordance with one-way analysis of variance (ANOVA) in completely randomized design (CRD) using SAS computer analytical package and means were separated with Duncan multiple range test of the same software (SAS, 2003).

Results and Discussion

Table 1 shows the haematological result of cocks drenched with varying levels of clove powder. Packed cell volume (PCV) values showed no significant difference (P>0.05) across the treatment. Its value ranged from 39.00 - 41.00%, which fall within the normal range of 26.00 - 41.20% (Mitruka and Rawnsley, 1977). This could be interpreted that clove could be drenched in cocks up to 1.5g without any harmful effect on their packed cell volume. This finding is in agreement with that of (Ayodele *et al.,* 2021), who reported the harmless effect of phytogenic substances (turmeric and clove) on broiler birds fed at the rate of 0.00%, 1.00% and 2.00% for eight (8) weeks. Clove powder had significant effect across the treatment on RBC (P>0.05) with value ranging from 3.64 $X10^6$/mL (1.00g CP) to3.74 $X10^6$/mL (0.00g CP), these values fall within the recommended range of (2.90 - 4.10 $X10^6$/mL) according to (Mitruka and Rawnsley, 1977). This result indicates normal production of red blood cells (erythropoiesis) as reported by Okpuzor *et al*., (2009). Haemoglobin values ranged between 3.64 and 12.86 g/dL. There was significant difference (p> 0.05) in 0.0g CP and 0.5g CP (12.86 and 12.33 respectively). The haemoglobin value for 1.00g CP and 1.50g CP were obviously lowered (3.64 and 3.65 respectively) than the established normal range of 7.50 – 13.10 g/dL by (Mitruka and Rawnsley, 1977). This study revealed that administration of higher levels of clove in cocks can affect the oxygen transport of the birds. WBC showed no significant (P>0.05) with value ranging from 18.66 - 19.10 ($X10^9$/L). This finding negates the report (Ayodele *et al.,* 2021), who reported WBC value of 6.10 to 6.65 $X10^9$/L for broilers administered 0.00%, 1.00% and 2.00% CP. MCV showed no significant difference (P>0.05) with value ranging from 103.74 (0.00g CP) -112.23 (1.50g CP) which is within the normal range of (100.00 - 128.00fl) reported by (Mitruka and Rawnsley, 1977). MCH showed significant difference (P<0.05) with value ranging from 32.80 pg (0.50g CP) - 36.86 pg (1.50g CP) which is higher than the reported (27.2 - 28.9 pg) of Chicken Vet (2023). There exists significant difference (P<0.05) in the value of MCHC ranging from 32.16% (0.50g CP) - 32.85 % (1.5g CP) and is within the range of

32.41 - 33.37% reported by (Chicken Vet, 2023).

Table 1: Haematological indices of Cocks drenched with varying levels of Clove Powder

Parameters	0.00g CP	0.50g CP	1.00g CP	1.50g CP	SEM
PCV (%)	40.00	39.00	39.00	41.00	1.22
RBC ($X10^6$/ml)	3.74^a	3.76^a	3.64^b	3.65^b	0.07
Hb (g/dl)	12.86^a	12.33^a	3.64^b	3.65^b	0.53
WBC ($X10^9$/ml)	19.10	19.00	18.66	19.01	2.85
MCV (fl)	106.95	103.74	107.13	112.23	2.88
MCH (pg)	34.40^{ab}	32.80^b	34.79^{ab}	36.86^a	0.92
MCHC (%)	32.16	32.00	32.24	32.37	0.05

$^{a, b, c}$ means with different superscript within a row are significantly different

Key: PVC – Packed Cell Volume, RBC – Red Blood Cell, WBC – White Blood Cell, Hb – Haemoglobin, MCV –Mean corpuscular volume, MCH - Mean corpuscular haemoglobin, MCHC- Mean corpuscular haemoglobin concentration

Total protein showed significant difference ($p<0.05$) ranging from 4.46 (1.00g CP) - 5.40g/dL (1.5g CP). Value for total protein was elevated in 1.50g CP while it has similar value in other treatments. This could be accredited to high protein digestibility in birds placed on 1.5g CP, since high protein in serum is suggestive of protein sufficiency (Ahamefule *et al*., 2006). There exists significant difference ($p<0.05$) in the mean value of albumin, the value increased with the increase in clove powder level with 0.50g CP having the least value (0.60g/dL) and 1.50g CP having the highest value (5.40g/dL). High concentration of albumin, usually indicates dehydration while a low concentration may be due to poor function of the liver due to malnourishment and infection (Esubonteng, 2011). Result of Globulin showed significant ($p< 0.05$) difference, its value ranged between 3.80 and 4.20g/dL. Globulin value in this study were above the reference range of 2.13g/dL-3.02g/dL (Chernecky and Berger, 2008). These raised values could be credited to enhanced host's immune system and improved hepatic function since the liver is the location of protein synthesis. The uric acid observed in this study showed significant difference ($p< 0.05$) with values ranging from 0.02 - 0.03 mg/dL. Birds on 0.00g CP, 0.50g CP and 1.00g CP had similar result (0.02mg/dL) while the value for 1.5g CP was elevated (0.03mg/dL). Uric-acid in the blood is manufactured as a consequence of protein metabolism. Amplified protein metabolism, stress and dehydration affects the concentration of Uric acid in the blood (Chernecky and Berger, 2008). High serum uric acid concentrations might be due to ineffective protein deployment (Oduguwa and Ogunmodede, 1995). The phytogenic supplement (clove powder) had significant ($p<0.05$) effect on the creatinine of the cocks having values ranging from 0.50 - 0.60 mg/dL. Creatinine is used to determine the condition of the kidney. Kidney functions to eliminate waste products resultant from protein metabolism and muscle contraction (Ileke *et al*., 2014). Cholesterol showed significant effect across the treatment with 1.50g CP having the highest value (135.33mg/dl),while birds on 0.0g CP had the least value (120.66mg/dL) with birds on 0.50g and1.00g CP had similar value (106.33 and 109.66mg/dL

respectively). However total blood cholesterol was within the reported range (52.00mg/dL- 148.00 mg/dL) (Mitruka and Rawnsley, 1977). Glucose values across the treatments showed significant difference ($p< 0.05$) ranging from 205.33 mg/dL in 0.50g CP and 304.00 mg/dL in 1.5g/dL. The results obtained in this study was above the 152.00 – 182.00 reported by (Mitruka and Rawnsley, 1977).

Table 2: Serum biochemical indices of Cocks drenched with varying levels of Clove Powder

Parameters	0.00g CP	0.05g CP	1.00g CP	1.50g CP	SEM
Total protein (g/dl)	4.80[b]	4.50[b]	4.46[b]	5.40 [a]	0.16
Albumin (g/dl)	0.86[c]	1.60[c]	4.46 [b]	5.40 [a]	0.13
Globulin (g/dl)	3.93[ab]	3.90[ab]	3.80[b]	4.20 [a]	0.09
A:G	0.22[ab]	0.15[bc]	0.07[c]	0.28[a]	0.00
Glucose (mg/dl)					
Uric acid (mg/dl)	0.02[b]	0.02[b]	0.02[b]	0.03 [a]	0.00
Creatinine (mg/dl)	0.53[b]	0.50[b]	0.50[b]	0.60[a]	0.00
Cholesterol (mg/ml)	120.66[b]	127.33[ab]	128.33[ab]	133.66 [a]	3.04

[a, b, c] means with different superscript within a row are significantly different

Conclusion

It is concluded that cocks could be drenched with clove up to 1.50g without any detrimental effect on their health status. Higher level of clove above 1.50g is recommended for further studies.

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