



ORIGINAL ARTICLE

**EFFECT OF CLOVES (*SYZYGium AROMATICUM*) SUPPLEMENTATION  
ON HAEMATOLOGY OF YANKASA RAMS**

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**Abstract**

The present study was carried out to investigate the effect of different levels of clove supplementation on the haematology and blood serum biochemical parameters of growing Yankasa rams. In a completely randomized design model, twelve growing Yankasa rams of  $12.00 \pm 0.50$ kg body weight were randomly allocated into three groups. The first group received a control diet (concentrate-to-forage ratio: 70:30) without clove powder (CLP) (T<sub>1</sub>), the second group received a control diet (T<sub>1</sub>) supplemented with 0.5% CLP (T<sub>2</sub>) on a dry matter (DM) basis, and the third group received (T<sub>1</sub>) control diet supplemented with 1.0% CLP (T<sub>2</sub>) on a DM basis. The experiment lasted for 70 days. The results of the study revealed a highest ( $P < 0.01$ ) organic matter (86.27% DM), ether extract (4.30% DM) and tannins concentration (2.86% DM) in dietary treatment T<sub>3</sub> compared to T<sub>1</sub> and T<sub>2</sub>. Mean values of packed cell volume, and haemoglobin concentration decreased ( $p < 0.05$ ) from T<sub>1</sub> (44.84 g/dL and 15.03%) to 35.99 g/dL and 11.10% in T<sub>3</sub> respectively. White blood cells count ( $18.52 - 20.72 \times 10^{12}$ ), mean corpuscular haemoglobin (12.14 -15.84 pg, mean corpuscular haemoglobin concentration range (36.29 - 47.49 %), mean corpuscular volume (33.32 -33.47fl) and red blood cells ranged from 8.52 - 10.27 g/dL were not significantly ( $P < 0.05$ ) affected by clove supplementation. Health status using haemato-biochemical parameters indicated clove supplementation up to 1.0% level to rams as the most acceptable supplement level for Yankasa rams in the present study.

**Keywords:** Blood profile; herbal supplementation; animal health; sheep.

**Introduction**

A major goal of livestock production system today is restriction of using antibiotics and other synthetic medicinal drugs as feed additives and growth promoters, versus natural growth promoters as effective alternatives to those products. Many studies have focused on the alternative strategies development to maintain animal productive performance and health (Matloup *et al.*, 2017). Phytogenic feed additives commonly known as phytobiotic, or herbal plants can be defined as source of plant derived products supplemented to animal feeds in order to increase production and enhance performance. Phytogenic feed additives mainly meant plant secondary metabolites such as tannins, saponin and essential oils use as a natural rumen modifier (Ali, *et al.*, 2016). Cloves (*Syzygium aromaticum*) are considered one of the most versatile spices. They contain a large number of biologically active compounds, such as tannins, saponin eugenol acetate, and  $\beta$ -caryophyllene etc (Jimoh *et al.*, 2017). Many studies have evaluated the effects of clove powder on performance, immune response, blood parameters, and lymphoid organs in broiler chickens (Mahrous *et al.*, 2017). Clove has been reported to improve the average daily weight gain, feed conversion ratio, gross energy digestibility and crude protein digestibility of poultry (Maenner, 2011). Haematological traits are essential parameters for evaluating the health and physiological status of animals and herds (Kral and Suchy, 2000). According to Daramola *et al.* (2005), haematological study of livestock could serve as a base line information for comparison in conditions of nutrient deficiency, physiology and health status of farm animals especially those kept under native husbandry system in Nigeria. Many feed products such as phytogenic herbs are fed to livestock without recourse to their health and physiological implication on the animals. Moreover comparison of blood picture and biochemical indices with nutrient intake, might indicate the need for adjustment of certain nutrients in the diet of animals. However, there is

a paucity of information on the haematological and biochemical profiles of any indigenous breed of sheep fed clove supplemented diet. The present study was therefore designed to assess some haematological parameters of Yankasa sheep fed clove (*Syzygium aromaticum*) supplemented diets. The present study aims at providing ruminant animal nutritionists' adequate knowledge on the use of clove (*Syzygium aromaticum*) as one of phytogetic feed additives that can be supplemented to the diets fed ruminant animals as natural growth promoter and animal health enhancer.

## **Materials and Methods**

### **Experimental Site**

The study was carried out at a private farm New Bussa located at longitude 9° 81' 95" N and 9° 49' 10" N and latitude 4° 58' 05" N and 4° 34' 49" N in the Guinea savanna areas of Niger Basin, North Central Zone of Nigeria.

### **Procurement and Preparation of Test Ingredient**

Clove buds were purchased from a herbal shop at Monday market, New Bussa, Nigeria. It was ground into powder and then added at various levels of concentration in sheep diets. Thus, the clove powder that was used in the study was derived from dry buds of cloves.

### **Experimental Animals Management Diets and Design**

Twelve intact Yankasa rams (live weight,  $12.3 \pm 0.68$  kg) were procured from local markets, quarantined for 14 days during which they were treated against internal and external parasites with Ivermectin. The lambs were housed in individual pens, with concreted floor with straw bedding materials. The experiment was conducted in a completely randomized design with three treatments and four replications. The rams were balanced for their initial BW. Each animal within each of the treatments was randomly assigned to one of the three dietary treatments. The chemical composition of CLP, Panicum maximum and ingredient composition of the dietary treatments depicted in table 1.

### **Experimental Diets and Determination of Feed Intake**

Throughout the experiment, animals were fed experimental diets (Table 1) based on 4% of their weight twice per day, at 08:00 and 16:00 h, and water was made available ad libitum. The experiment lasted for 70 days (56-day feeding trial and 14-day adjustment period). All feed offered to the animals and orts (left over feed) were weighed daily. Samples of fresh feed and orts were collected every day to calculate dry matter (DM) percentage and subsequently DM and nutrient intake.

### **Haematological Study**

The rams were bled through jugular vein and 10 ml of blood collected, 5ml of the blood samples was dispensed into plastic tube containing EDTA for haematological studies. Packed cell volume (PCV) and haemoglobin (Hb) concentration determination followed the procedures outlined by Dacie and Lewis (2001). Red blood cell (RBC) and differential total white blood cell (WBC) counts were carried out using the Neubauer haemocytometer after appropriate dilution. Mean corpuscular haemoglobin concentration (MCHC), mean corpuscular haemoglobin and mean corpuscular volume (MCV) were calculated as described by Jelalu (2014).

### **Chemical Analyses**

The DM, CP, ether extract and ash contents of diets and faeces were analyzed according to the AOAC (2002). The neutral detergent fibre (NDF), acid detergent fibre (ADF) and lignin were according to Van Soest *et al.* (1991). Non-fibre carbohydrate (NFC) was estimated using the equations of Sniffen *et al.* (1992). Condensed tannins (CTs) were determined as reported by Makkar (2003).

**Table 1: Ingredient compositions of concentrate (% DM)**

Ingredient	Clove supplementation level		
	T1 (0%)	T2 (0.5%)	T3 (1.0%)
Cassava peel	50.00	50.00	50.00
Wheat offal	22.00	22.00	22.00
Cowpea husk	20.00	20.00	20.00
Groundnut cake	5.00	4.95	4.90
Cloves powder	0.00	0.50	1.00
Bone meal	1.00	1.00	1.00
Salt	1.00	1.00	1.00
Premix	1.00	1.00	1.00
Total	100.00	100.00	100.00
<b>Calculated analysis</b>			
Crude protein	12.00	12.02	12.02
Neutral detergent fibre	46.42	46.43	46.43
Metabolizable energy (MJ/kg)	12.14	12.16	12.17

### Statistical Analysis

Data was subjected to a one way ANOVA using version 9.1 of SAS software (SAS Institute, 2003). Significant difference between individual means was separated by Duncan's procedure.

### Results

#### Proximate Composition of Experimental Diets and Ingredients

The dry matter (DM) contents of the experimental diets varied between 93.65 and 94.15% (Table 2). Crude protein (CP) content (16.58 – 17.44%) was similar ( $P>0.05$ ) for all the treatments. Neutral detergent fibre (47.32%) was highest ( $P<0.05$ ) for treatment 3 compared with T1 (46.16%) and T2 (46.4) respectively. ADF had similar trend with NDF. Tannin concentration was not detected in treatment 1 (Control diet), but higher in treatment 1 compared with treatment 2.

**Table 2: Chemical composition of concentrate supplemented with different levels of clove (*Syzygium aromaticum*)**

Nutrient (% DM)	T <sub>1</sub> (0.0%)	T <sub>2</sub> (0.5%)	T <sub>3</sub> (1.0%)	SEM	P. Value
Dry matter	93.99	93.65	94.15	0.24	0.162
Organic matter	85.81 <sup>ab</sup>	85.23 <sup>b</sup>	86.27 <sup>a</sup>	0.31	0.026
Crude protein	16.58	17.25	17.44	2.63	0.808
Ether extract	2.77 <sup>b</sup>	2.80 <sup>b</sup>	4.30 <sup>a</sup>	0.39	0.006
Ash	8.17	8.41	8.14	0.32	0.679
Neutral detergent fibre	46.16 <sup>b</sup>	46.43 <sup>b</sup>	47.32 <sup>a</sup>	0.14	0.001
Acid detergent fibre	20.04 <sup>c</sup>	22.30 <sup>a</sup>	20.78 <sup>a</sup>	0.17	0.001
Acid detergent lignin	5.36 <sup>c</sup>	7.60 <sup>a</sup>	5.38 <sup>b</sup>	0.13	0.001
Tannins	ND	0.94 <sup>b</sup>	2.86 <sup>a</sup>	0.25	0.025

<sup>abc</sup> means within a row not bearing a common superscript letter significantly differ, ( $P < 0.05$ )

ND means not detected

#### Haematological Parameters of Yankasa Ram Fed Diet Supplemented With Clove

The results of the effect of feeding Panicum maximum supplemented with clove powder diets on haematological profile of Yankasa rams are presented in (Table 3). Except for Hb (11.10 – 15.30%) and PCV (35.99 – 44.84 g/dL) parameters which were significantly affected ( $P<0.05$ ) by the level of clove supplementation in the diets, all the other haematological parameters such as RBC (8.52 – 10.27 g/dL),

WBC ( $18.12 - 20.72 \times 10^{12}$ ), MCV (33.32 - 33.47 fl), MCH (12.14 - 15.84 pg), and MCHC (33.32 - 33.47 %) were not significant ( $P > 0.05$ ) in all the dietary treatments.

**Table 3: Haematological parameters of Yankasa ram fed diet supplemented with clove**

Parameter	Normal range	T <sub>1</sub> (0.0%)	T <sub>2</sub> (0.5%)	T <sub>3</sub> (1.0%)	SEM	P. Value
PCV (g/dL)	24-50	44.84 <sup>a</sup>	40.40 <sup>ab</sup>	35.99 <sup>b</sup>	3.34	0.074
Hb (%)	9-15	15.03 <sup>a</sup>	13.47 <sup>ab</sup>	11.10 <sup>b</sup>	1.11	0.067
WBC ( $\times 10^{12}/L$ )	15-27	20.67	18.12	20.72	33.21	0.367
MCH (pg)	12-20	15.01	15.84	12.14	1.66	0.104
MCHC (%)	15-33	33.47	33.32	33.33	0.14	0.531
MCV (fl)	38-103	44.85	47.49	36.29	4.81	1.103
RBC (g/dL)	7-10	10.22	8.53	10.27	1.32	0.682

<sup>abc</sup> means within a row not bearing a common superscript letter significantly differ, ( $P < 0.05$ )

PCV: Packed cell volume, haemoglobin: (Hb), RBC: Red blood cell, WBC: White blood cell (WBC) counts, MCHC: Mean corpuscular haemoglobin concentration, MCV: Mean corpuscular volume.

## Discussion

### Chemical Composition of the Experimental Diets Fed To Yankasa Rams

The high DM content of the formulated diet may be as a result of high dry matter content of the ingredients used in the diet which is the characteristics of most tropical crop residues (Millam *et al.*, 2020). The crude protein content (16.58 - 17.44%) of the diets was adequate and above 7 % protein requirement for healthy lamb (Gatemby, 2002). The similarities in some nutrients composition of the feeds might be attributed partly to closeness of the ingredients in their chemical composition and partly due to fact that the ingredient compositions for all the dietary treatments are the same.

Effect of Clove Supplementation on Haematological Parameters of Yankasa Rams. The analysis of blood content contributes to detailed checkup the organisms. So, blood as a vital tissue, plays a unique role in the metabolic, physiological, nutritional and also pathological status of a living organism (Aksoy *et al.*, 2021). Studies have shown a progressive decrease in PCV and RBC in sheep (Okaiyeto *et al.*, 2010; Olatunde *et al.*, 2021) infected with trypanosomes treated with different combination of herbal plants. The normal PCV values for healthy Yankasa sheep ranged from 27-45% 24-50% (Njidda, 2014). The values for packed cell volume (PVC) for this result are comparable to the values of 38-45% reported by Hendawy *et al.* (2020) when supplementing herbal plant to pregnant ewe. Marcotty *et al.* (2008) observed that mean PCV was a good indicator of the health status of animals.

With normal PCV in blood, enhanced nutrient transport is achieved, leading to efficient feed utilization and absorption, implying better body weight gain. The values of Hb for all the treatments in this study were within range of 9-15 g/dL of growing sheep reported by Njidda (2014) and 9.37 - 10.50 dl values reported by Aruwayo *et al.* (2011). The Hb is a good indicator of the physiological status of the animals. And with the relatively higher Hb concentration observed in this study, it is an advantage in terms of the oxygen carrying capacity of the blood. The values obtained for PCV and Hb show that the experimental diets were adequate for the nutritional requirements, and the test diets did not constitute any health hazards to the rams. The values for WBC were within the values of  $3.77 - 16.10 \times 10^9/L$  reported by Mohammed and Saleh (2018) for fattening Yankasa sheep fed sugarcane peels containing diets. The major functions of the white blood cell and its differentials are to fight infections, defend the body by phagocytosis against invasion by foreign organisms, produce or transport and distribute antibodies in immune response.

Since there was similarity among the WBC values observed in all experimental animals, none of the rams had higher risk of diseases, because all the rams will be capable of generating antibodies in the process of phagocytosis with high degree of resistance to diseases (Soetan *et al.*, 2013). Also, with the normal range values in all the animals, it implies clove supplementation in their diets will enhance adaptability to local environmental and disease prevalent conditions (Isaac *et al.*, 2013). The MCV, MCH, MCHC values found in this study were close to those of some other studies carried out by Aksoy *et al.* (2021). The RBC values obtained in this present study (8.53-10.27 g/L) were within the normal range reported by Njidda, *et al.*

(2014) who reported a range of  $7-10 \times 10^6$  g/L in Yankasa lambs and also similar to the values of 8.93 – 10.8 g/L reported by Musa *et al.* (2016) for haematological profile of Uda ram fed graded levels of *Xylopia aethiopica*. Normal red blood cells values have been associated with absence of haemolytic anaemia and depression of erythropoiesis whereas reduced red blood cells level is a requisite for susceptibility to anaemia-related diseases by animals (Hameed *et al.*, 2013).

### Conclusion and Recommendations

Clove may be supplemented at 1.0g/kg diet each to achieve an overall better immunological performance in sheep than feeding diet without supplementation. From the present study, it can be concluded that the haematological and biochemical parameters for sheep studied in this experiment fall within recommendations. Therefore, strategic herbal plant supplementation of diet fed sheep may serve as a cheap feed additive supplement without compromising the health of the animals as the sole supplement or in combination at 1g /kg (1.0%) supplementation level. Higher inclusion levels of clove are recommended for further research.

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