INFLUENCE OF COPPER GLYCINE SUPPLEMENTATION ON THE CARCASS CHARACTERISTICS OF WEST AFRICAN DWARF SHEEP

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ABSTRACT
A feeding trial was conducted for 90 days using sixteen (16) West African dwarf (WAD) Sheep to evaluate the influence of Copper Glycine (Cu-G) supplementation on carcass characteristics of WAD sheep. The sheep were randomly assigned into four dietary treatments in a Completely Randomized Design. Cu-G supplementation was incorporated at varying levels of 0, 5, 10 and 15 mg/kg to formulate four (4) dietary treatments. After feeding trial, three sheep were randomly selected and slaughtered for carcass evaluation to obtain the wholesales cut (rump, neck, flank, shoulder, loin, breastplate, rack). Cu-G supplementation did not significantly (P>0.05) influence carcass characteristics of WAD sheep. Slaughter weight, shoulder, flank and heart values obtained in this study ranged from 21.52-25.19, 7.88-9.57, 2.88-4.07 and 0.35-0.63 % respectively. It can be concluded that Cu-G supplementation in diets of WAD sheep had no influence on the carcass characteristics of West African Dwarf.
Keywords: Carcass, food security, ruminants, Copper deficiency, Dressing percentage

INTRODUCTION

For many years, sheep have been raised by societies for their meat, milk, and wool (Amane *et al.,* 2023). Their adaptability to different climatic conditions, their ease of care and feeding, their high utilization of poor pasture areas with low yield and quality, the ease of flock management, their high twinning rate, and their short intergenerational period (Tüfekci and Sejian, 2023), makes them essential contributors to global food security and agricultural economies. Sheep, like other ruminants rely on a range of trace elements to support essential physiological functions for optimal growth and productivity. These elements serve as cofactors for enzymes, catalysts for biochemical reactions, and structural components of tissues and organs. One important documented element with health-promoting effects is copper (Cu) (Lim and Paik, 2006). Copper (Cu) is necessary in maintaining the functioning of living organisms, being an essential trace element (Mertz, 2013). The Copper requirements for sheep was set as 5 mg/kg dry matter (NRC, 1981) and later increased to 7-11 mg/kg dry matter (NRC, 1996). Copper deficiency reduces feed intake, growth and immunity, making animals more susceptible to diseases (Dorton *et al.,* 2006). Also, excess copper in the diet also has a negative effect (Karimi *et al.,* 2011). Merino Spanish sheep that were placed on diet containing 200 mg Cu had lower dressing percentage than those fed the control diet containing lower Cu at the rate of 13.8 mg/kg (Solaiman *et al.,* 2006). This study therefore, evaluate the efficacy of dietary inclusion of Copper Glycine on the carcass characteristics of WAD sheep.

Material and Methods

Experimental site and duration: The experiment was conducted at the Teaching and Research Farm, Federal College of Animal Health and Production Technology, Moor Plantation, Apata, Ibadan. The experiment lasted for 90 days, the temperature and relative humidity ranges from 35°C-40°C and 76-78% respectively.

Experimental animals, diet and design: A total number of sixteen (16) West African dwarf (WAD) sheep were purchased from Akinyele market in Ibadan, Oyo State. Prior to the arrival of the animals, the pens were thoroughly washed and disinfected with Morigads purposely to prevent the growth of micro-organisms. They were confined in individual pen and quarantined for a period of four (4) weeks prior to the onset of the study. Fresh cool clean water and feed were made available *ad libitum.* The sheep were vaccinated against *Peste des petits* ruminant (PPR) and given prophylactic treatments. After adaptation period, the sixteen animals were balanced as closely as possible for body weight and allotted into four dietary treatments, during which they were fed with the experimental diet and basal forage (*Pennisetum purpureum*). Copper glycine (Cu-G) was purchased from Alli-tech incorporation limited. It was incorporated at varying levels of 0, 5, 10 and 15 mg/kg respectively with other ingredients to formulate four experimental diets as shown in Table 1. Starch and molasses were introduced into their feed at ratio of 1:2 purposely to formulate 6 mm pelletized feed. Starch served as binder while molasses was used as sweetener.

Table1: Gross and Chemical Composition of the experimental diet

Ingredients	Cu-G supplementation (mg/Kg)				
	0	5	10	15	
Maize bran	48.00	48.00	48.00	48.00	
Corn cob	5.50	5.50	5.50	5.50	
Wheat offal	34.00	34.00	34.00	34.00	
Groundnut cake	5.00	5.00	5.00	5.00	
Premix (Cu free)	0.50	0.50	0.50	0.50	
Limestone	3.00	3.00	3.00	3.00	
Salt	1.00	1.00	1.00	1.00	
Starch/molasses	3.00	3.00	3.00	3.00	
Total	100.00	100.00	100.00	100.00	
Determined Analysis					
Crude Protein (%)	14.11	14.11	14.11	14.11	
Crude fibre (%)	10.04	10.04	10.04	10.04	
ME (MJ/Kg)	21.11	21.11	21.11	21.11	
Basal Cu level (mg/Kg)	4.58	4.58	4.58	4.58	
Total Cu Level (mg/Kg)	4.58	9.58	14.58	19.58	
Calculated Analysis					**PP**
Dry matter	75.93	74.09	72.59	74.17	75.05
Crude Protein	12.55	12.63	12.63	11.02	13.35
Ether extract	3.19	2.99	2.55	3.02	0.40
Ash	27.43	25.48	16.28	29.19	12.67
NFE	37.51	47.40	45.67	39.61	31.33
ADF	5.14	5.81	3.95	3.95	9.94
ADL	1.81	1.82	1.09	1.06	4.76
NDF	16.18	16.02	14.59	11.83	34.69
CL	3.33	4.49	2.86	2.89	5.18
HM	11.04	10.21	10.64	7.90	24.75

NFE: Nitrogen Free Extract, **ADF:** Acid Detergent Fibre **ADL:** Acid Detergent Lignin, Cu-**G:** Copper Glycine, **G.N.C:** Groundnut cake, **M.E:** Metabolizable energy

Data Collection: At the end of the feeding trial, three animals were selected from each dietary treatment, the animal were starved of food for 16 hours but had access to clean cool water prior to slaughtering. The live weight of the animals were determined using a spring balance scale before slaughtering. Animals were slaughtered by severing the carotid artery. The animals were hoisted for proper bleeding, then the slaughtered weight of the animal was determined. The animals were scalded by pouring hot water on the carcass for the hair to loosen and scraped off with a hand metal scrapper designed for this purpose. Then dressed weight was determined after scalding and evisceration. Carcass evaluation was carried out according to the standard commercial procedure to obtain the wholesales cut (rump, neck, flank, shoulder, loin, breastplate, rack) and each part was weighed

$$\text{Empty Carcass Weight} = \text{Scalding Weight} - \text{Total Internal Organs}$$

$$\text{Hot Carcass Weight} = \text{Empty Carcass Weight} - (\text{Head} + \text{Legs})$$

$$\textbf{Dressing Percentage} = \frac{\textbf{Hot Carcass Weight}}{\textbf{Live Weight}} \times 100$$

Statistical Analysis: All data obtained were subjected to analysis of variance using statistical package of SAS (2005). The means among the variables were separated using Duncan multiple range test of the same statistical package

RESULT AND DISCUSSION

Table 2 shows the effect of copper glycine supplementation on the carcass characteristics of West African dwarf Sheep. Cu-G supplementation had no influence on the carcass characteristics of West African dwarf Sheep. The live weight, empty carcass, flank, rump, heart and liver values obtained in this study ranged from 22.29-26.38 kg, 50.07-62.21, 2.88-4.07, 12.49-13.99, 0.35-0.63 and 1.85-2.74 respectively.

Cu-G supplementation had no effect on the carcass characteristics of WAD sheep observed in this study This was in accordance with the previous research conducted on steers (Engle and Spears, 2000; 2001; Engle *et al.,* 2000a; 2000b) and lambs (Cheng *et al.,* 2008) indicated that Cu supplementation had no effect on hot carcass weight, dressing percentage and longissimus muscle area. It is well documented that Cu metabolism varies greatly among the different breeds of sheep (NRC, 2005). Dressing percentage is majorly used to evaluate cost price of meat slaughtered thus; the values obtained in this study were slightly similar with the values (43.80 - 47.30%) reported by Ukanwoko *et al.* (2009).

Table 2: Influence of copper glycine supplementation on carcass composition of West African dwarf Sheep

Parameters	Inclusion levels of copper glycine (mg/kg)				
	$T_1(0)$	$T_2(5)$	$T_3(10)$	$T_4(15)$	SEM
Live weight (kg)	22.29	22.94	26.38	25.21	0.73
Slaughtered weight (kg)	21.95	21.52	24.39	25.19	1.15
Dressed weight (kg)	9.53	11.34	10.41	13.05	0.88
Empty carcass (%)	54.24	59.53	50.07	62.21	2.19
Hot carcass (%)	42.75	49.42	39.47	51.77	2.32
Wholesales cut weight expressed in percentage of live weight					
Head	8.21	7.21	7.56	7.59	0.23
Neck	4.88	2.91	3.87	3.82	0.33
Leg	3.26	2.81	3.04	2.85	0.09
Hind shank	3.09	2.61	2.72	2.56	0.12
Fore Shank	2.17	1.88	1.94	1.94	0.06
Flank	4.07	3.12	3.04	2.88	0.28
Breast	2.47	1.95	2.43	2.20	0.13
Rack	13.57	10.52	12.01	13.57	0.53
Loin	5.78	4.82	5.33	5.69	0.31
Rump	13.39	12.49	13.78	13.99	0.42
Shoulder	9.57	7.88	8.60	8.80	0.25
Organs weight expressed as a percentage of live weight					
Kidney	0.38	0.29	0.36	0.33	0.02
Spleen	0.19	0.15	1.00	0.17	0.20
Heart	0.63	0.35	0.51	0.51	0.05
Liver	2.74	1.85	2.38	2.24	0.18
Lung	1.60	1.29	1.47	1.16	0.10

[a,b]Means along the same row with different superscripts are significantly different (P<0.05)

CONCLUSION:

It can be concluded that Cu-G supplementation in diets of WAD sheep had no influence on the carcass characteristics of West African Dwarf.

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