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Effect of wet season supplementation on growth and haematology of Djallonké sheep

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Target Audience: *Ruminant farmers*

Abstract

Despite the numerous benefits derived from livestock, it is faced with several challenges denying livestock owners of maximum gains from this enterprise. There is availability of forage in the wet season however, farmers have to tether or stall feed their animals limiting them access to the available forage because of the cropping period. Supplement is required to rectify deficiencies of soluble nitrogen and minerals. The effect of wet season supplementation on growth and haematology of Djallonké sheep was investigated. A total of twelve (12) young Djallonké sheep (6 males and 6 females) were randomly assigned to two treatments groups: No supplemented (NS) T1 and Concentrate Supplementation (CS) T2. The results showed that final weight of sheep were not influenced (P>0.05) by the diet. The average daily gain (ADG) of sheep was significantly higher (P<0.05) in the CS group. The red blood cells (RBCs) was significantly different (P<0.05) with recorded values of 6.89 ($10\wedge^{6}$/l) and 5.15 ($10\wedge^{6}$/l) for NS and CS, respectively. The nutritive value of native pastures during the wet season were adequate to support growth performance of the animals.

Keywords: Wet season, supplementation, haematology, growth, Djallonké sheep

Description of problem

The livestock subsector plays crucial role in supplying the nutritional needs of Ghanaians (meat and milk)(1). Livestock is an important constituent of Ghana's agriculture, and it adds about 9.3% to agriculture Gross Domestic Product (GDP) with a yearly growth rate of 5.4%(2).This makes investment in livestock a worthwhile venture as it has the potential to reduce household poverty and food insecurity. Despite the numerous benefits derived from livestock, it is faced with several challenges denying livestock owners of maximum gains from this enterprise.

The major challenge to livestock production in Ghana is the unavailability of feed resources, especially, during the dry season. There is availability of forage in the wet season but accessibility is often limited because during the cropping period, farmers have to tether or stall feed their animals (3). Animals depend solely on natural pastures and crop residues for their nutrient supplies with agro-industrial by-products contributing less (4). The deteriorating natural pastures in urban zones owing to infrastructural development has mounted pressure on urban farmers to search for alternative sources of feed.

Supplement is required to rectify deficiencies of soluble nitrogen and minerals,

as sources of protein or energy to increase basal diet intake and enhance animal production. Most forages are low in nitrogen and high in fibre; nitrogen supplementation will help improve the rumen ecosystem to enhance the ability of animals to digest the fibrous portion (5). The majority of Ghanaian smallholders of livestock have knowledge on the use of agro-industrial by-products in ruminant feeding (6). However, much research attention has not been given to it even though there is a high potential for their use in improving livestock productivity especially in the fattening of small ruminants for sale (6). Supplementation may be necessary to meet the nutritional requirements of grazing animals and improve their performance (7). Therefore, the main objective of this study was to investigate the effect of supplementing an agro-industrial by-product based diet on growth and haematology of Djallonké sheep grazing on native pastures during wet season.

Materials and Methods

Experimental site

The experiment was conducted at the Livestock unit of the Department of Ecological Agriculture, Bolgatanga Technical University Sumbrungu, between June and August, 2021. The University is located in Sumbrungu 8km away from Bolgatanga Township.

Source of Experimental feed and animals

A total of twelve (12) Djallonké sheep comprising of 6 males and 6 females with average weight of 18.65±2.408kg were purchased from the Bolgatanga livestock market in the Upper East Region. The animals were fitted with ear tags for easy identification.

Experimental design

The animals were assigned to two treatments (T1 and T2) with six replicates each. The treatments include: No Supplement (NS) T1 and Concentrate Supplementation (CS) T2. The experiment lasted for 56 days.

Experimental animals, housing and feeding

The animals were housed individually in metal cages (2.5m ×1m) with concrete floors. The cages were fitted with plastic bowls to serve as feed troughs. The animals were fed the concentrate diet at 6:00 am and released at 9:00am. During the day time all animals had access to natural pasture grazing and were penned at night. The dominant forage species grazed by the animals were identified by observing the grazing animals between 9:00 to 11:00 am each day for 7 days. The forage species grazed by animals were sampled and composited into daily samples. The fresh samples were oven dried for proximate composition. The supplementary diet consisted of 60% Maize bran, 10% Cassava peels, 15%, Rice bran, 14% *Faidherbia albida*, 0.5% Mineral premix and 0.5% Salt with 10 MJ ME/kg. Tap water was provided daily *ad libitum*. All animals were weighed weekly early in the morning before they were fed. The animals were allowed 14 days of acclimatisation to the feed and the environment. The animals were fed the supplement on individual basis and each animal received 200g/d. The leftover feed was weighed every morning for each animal and the difference between quantity offered and quantity left was the amount of feed eaten. Daily samples of the concentrate diet offered was taken and stored in a refrigerator until the experiment was over. After the feeding trial, the sampled diet was bulked for each replicate and subsamples taken for drying in the oven. Duplicates of the subsampled were weighed and oven dried at 60^{o}C for 48 h.

Collection of blood

Blood was taken in the morning before feeding. 5 ml of blood was taken from the jugular vein into hypodermic syringes containing anticoagulant. The haematocrit and red blood cells were determined by using hydrodynamically focused detection method. Sampled blood was diluted with WBC diluting fluid (Turks solution). This solution destroyed

all the RBCs and stained WBCs for easier identification during counting. The solution was then transferred into an improved Neubauer counting chamber for the counting of WBCs using ×10 objective lens microscope.

Proximate composition of supplement

The samples were milled into 1 mm using a milling sieve (Retsch® ZM 200) for proximate composition. The samples were analyzed for dry matter (DM), ash, crude protein (CP) using the procedures of AOAC 2000.

Statistical Analysis

The data was subjected to General Linear Models (GLM) procedure using Genstat 18.2 edition. The initial weight of the animals was used as co-variate. The difference between specific treatments were tested for significance by least significant difference (LSD).

Results

The chemical composition of the experimental diet fed to sheep is shown in Table 1. The formulated diet was found to be higher in dry matter (93.25%), fibre (10.25%) and organic matter (93.17%) than grass which recorded dry matter (17.32%), fibre (7.92%) and organic matter (84.33%). However, crude protein content was higher in grass (16.50%) than formulated diet (10%).

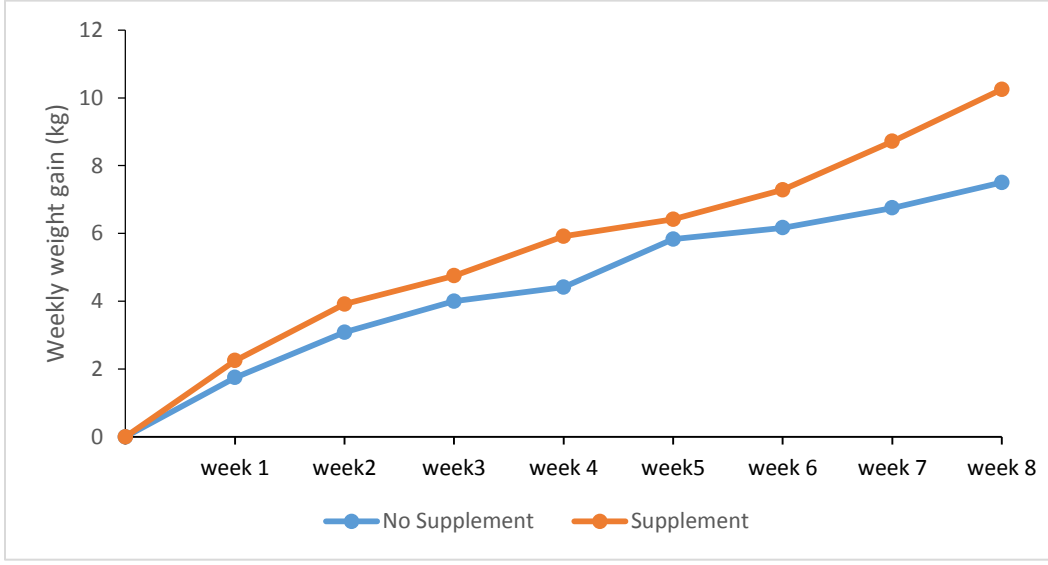

Figure 1: Effect of Concentrate supplementation (CS) on sheep weekly liveweight gain.

Table 1: Proximate Composition of Experimental Diets

Parameter (%)	Native Pastures (T1)	Supplement (T2)
Dry matter	17.32	93.25
Crude protein	16.62	12.00
Fibre	26.16	10.25
Ether Extract	8.44	12.15
Ash	11.11	6.83

Table 2: Effect of Supplementation on growth performance and haematological parameters

	Treatment			
Parameter	T1 (No supplement)	T2 (Supplemented)	SED	P. value
DMI (g)		130.24		
CPI (g)		13.15		
Initial weight (kg)	18.50	18.83		0.58
Final weight (kg)	26.42	29.08	1.221	0.10
Weight change (kg)	7.917	10.25	0.4167	0.08
ADG (g)	133.9[b]	183.00[a]	3.72	0.001
WBC (10□6/l)	7.32	7.02	0.9758	0.88
RBC (10□6/l)	6.89[a]	5.15[b]	0.4750	0.001
PCV (%)	26.35	22.52	0.487	0.10
HB (g/d)	11.53	10.90	0.433	0.36
EOS%	0.012	0.00	0.008	0.34
NEU%	4.17	3.92	0.492	0.72
BAS%	7.03	5.73	0.4833	0.68

Means within the same row with different superscripts are significantly different (P< 0.05).
DMI = dry matter intake; CPI = crude protein intake; ADG = average daily weight gain. WBC = white blood cell; RBC = red blood cell; PCV = packed cell volume; HB = haemoglobin; EOS = eosinophil; NEU = neutrophil; BAS = basophil.

The effects of supplementation on haematological indices of sheep are shown in Table 2. The Red blood cell levels in this study differed (P<0.05). The white blood (WBC) count was not significantly different for the treatment groups (P>0.05). Group without supplement (T1) recorded 7.32 ($10\wedge^6$/l), against supplemented group (T2) with record value of 7.02 ($10\wedge^6$/l).
Supplemented group (T2) recorded 11.53 ($10\wedge^6$/l) hemoglobin, against No supplement group (T1) 10.9 ($10\wedge^6$/l). Similarly, T2 recorded 26.35 ($10\wedge^6$/l) of Packed cell volume against T1 22.52 ($10\wedge^6$/l).

Discussion

The values for the DM, OM and CP corroborates values reported by (9).The CP (10%) content in the diet is higher than the 7% minimum requirement recommended for ruminants by (10), confirming its potential to supply enough rumen nitrogen for microbial activities (11). The fibre contents obtained in this study are higher than 1.50% reported by (9) in corn starch residue supplementation but lower than the 24.50% and 20.83% reported by (12), in diets (palm kneel cake + corn) fed to Dorper lambs. However, the fibre content of the supplementary diet would augment rumination; feed digestibility and nutrient availability (13).

All the animals gained weight during the period of study however, the supplemented animals consistently had the highest final liveweight and average daily gain (ADG). This is an indication that the liveweight of Djallonké sheep grazing native pastures could be significantly improved with the supplementation of concentrate diet. The improved daily weight gain is attributed to the supplementation of the concentrate diet. The ADG recorded in this study was higher than 31.45g/d and 46.23g/d reported by (9) when Djallonké sheep were supplemented during the dry season with 200g/d (Maize bran) and a combination of 100g/d (maize bran) + 200g/d (Groundnut haulms) respectively. It was also high than the ranges of 25 to 60g/d recorded for sheep grazing from natural pasture with concentrate supplementation by .(14); ITC(15) and further greater than 71 and 74 g/d reported by (16), when Djallonkè sheep were

fed a mixture of AIBPs at 200 and 400gDM/d grazing on natural pasture during the wet season. The higher ADG recorded among sheep on supplement compared to sheep solely on pasture without supplementation could be attributed to balance of energy and protein in the supplementary diet thereby providing favourable rumen environment for rumen microbes. According to (17), supplementary diet ought to supply enough digestible energy and CP in order to improve production in animal.

The WBC counts obtained in this study were all within the normal range of 5 – 11×10^6/dl reported by (18) for healthy sheep. This implies that the feeding trial did not have any negative effect on the ability of the animals to fight infections, since WBCs are responsible for fighting infections and foreign materials entering the body. The RBC count was lower in sheep fed Concentrate Supplementation (CS) and this is attributed to the low CP content in the diet. This agrees with (19) observation of higher RBC counts in ruminant fed high CP diets compared to diets with low CP. The PCV values recorded in this study were below the normal physiological range of 29-39% for sheep (19). According to (20) the normal PCV for physiological healthy sheep ranges from 27-45%. The HB concentrations in this study were within the normal physiological range of 8-10.05% reported by (21) in sheep. The study recorded sufficient HB levels to prevent anaemia by supplying the RBC with high blood oxygen-carrying capacity (22). The lack of significance difference in most of the haematological parameters between the No supplement and the Supplemented sheep suggests that the native pastures within the study area supplied needed nutrient requirement for the sheep.

Conclusion and Applications

1. Supplementing Djallonké sheep grazing on native pasture with agro-industrial by-product and *Faidherbia albida* had a positive effect on daily weight gain.
2. There was no negative effect of supplement on haematology.
3. Agro-industrial by-product and *Faidherbia albida* could be used as supplement for sheep grazing on native pastures during the wet season.
4. The results opened up a discussion on management decision of small ruminants during the wet season taking into consideration the feed costs involved.

Conflict of interest statement

The authors declare they have no conflict of interest.

Ethics approval

All applicable institutional and/or national guidelines for the care and use of animals were followed.

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