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FEED INTAKE AND BODY WEIGHT GAINS OF TSWANA SHEEP FED ON BUFFEL GRASS HAY AND SUPPLEMENTS UNDER DRYLOTTING

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SUMMARY

Twenty eight yearling sheep (16 non –pregnant, non lactating and 12 castrated males) were used for a feeding trial conducted at Botswana college of Agriculture, content Farm, Gaborone, for a period of 125 days. The study was to investigate the performance of Tswana sheep under drylot feeding lucerne, sorghum bran, caged layer waste (CLW) and broiler litter as supplements. All animals were fed buffel grass hay plus supplements and lucerne was fed to the control group as supplement. Water was provided daily and mineral block offered ad- lib to all sheep. Both water and feed left overs were measured and recorded. The animals were weighed every fortnight before feeding. Feed analysis was done in the laboratory to determine nutritive values.

Average daily weight gain (g) by Tswana sheep was 102.34, 112.78, 82.71 and 73.31 for Lucerne, sorghum bran, caged layer waste and broiler litter respectively, there was significant difference in daily weight gains at ($p< 0.05$). Sheep fed on sorghum bran had a higher daily weight gain (112.78±1.1) compared with sheep on lucerne at (102.34 ±1.2). Treatment effects on daily total DM intake by sheep were significant at ($p<0.05$) .The control sheep had 860±18.90 daily feed intake while those fed on sorghum bran had the highest 955 ±21.04 and those on CLW had the least 893.33 ±11.53.Supplement intake was significantly different at ($p<0.05$), lucerne intake was 426.48±2.53 while broiler litter intake was the least 339.80 ±2.53.

There was no significant difference ($p>0.05$) in the daily water intake by sheep. Those fed lucerne had the highest water intake of 1430 ±26.14 ml and those fed on broiler litter had the least (1400±28.14) ml. Sheep fed on sorghum bran were the most efficient in feed conversion having a ratio of (8.47 ±0.16) and lucerne (8.58 ±0.23) and the least being broiler litter (12.34 ±0.16).This study indicated that supplements such as CLW, sorghum bran and broiler litter can be used to replace lucerne as supplement for the Tswana sheep fed on buffel grass hay as basal diet.

Keywords: Tswana sheep, drylotting, supplements, lucerne, cage layer waste, broiler litter

INTRODUCTION

The people of Botswana, recognize the important role that small ruminants play in the economy of the country especially among the small farmers to whom these animals provide meat, milk for home consumption, and cash income from sale of breeding animals (Aganga *et.al* ,1998). The economic importance of the sheep depends on the value of their produce or services. Sheep are a way of converting poor quality forage into desirable products, they are a form of investment. The advantages of keeping sheep are low cost, little feed needed, manageable quantities of products and there is low risk of total loss (Bundy *et. al.*, 1982). Drylot feeding consists of confining the sheep in a lot devoid of green feed and using a combination of the various cured forage feeds, grains and protein supplements to bring the sheep up to the desired weight and finish (Charray 1992). In dry lot feeding the sheep are kept for 90 - 120 days or even more for the finishing /fattening. This system allows the flock to be split into groups based on age, sex which is difficult when grazing. The most important biological principle in considering efficient production is that the animal should gain weight so that it reaches a weight suitable for slaughter within a reasonable period of time; thus nutrient intake must exceed requirements for maintenance of body weight.

The rations used for feeding may consist of roughage (50% of the total diet) and concentrate (50% of the total diet) (Aganga *et al.*, 1998). High quality legume hay is recognised as the most nutritional roughage. It is high in protein, minerals and vitamins. Supplementation helps in providing those nutrients that are not available in the feed. Legume forages have shown to be good supplements to poor quality fibrous diets. Lucerne produces herbage high in dry matter and crude protein. When legume hay is fed, sheep usually make very satisfactory gains on legume hay and some cereal as the entire ration. Feeding trials have shown somewhat higher gains when protein supplements are fed to sheep receiving high protein roughage. Aganga *et al.*, (1998) stated that poultry droppings is a renewable source for

nitrogen in Botswana. They noted that broiler droppings contain 20 - 30% CP on dry matter basis. This amount of nitrogen can be utilised efficiently when recycled through ruminant animals as feed. Nitrogen is required in sheep feed for maintenance and weight equilibrium. Most tropical grasses and available crop residues have low crude protein especially in the dry season thus leading to poor utilisation by ruminant animals. Utilisation of the energy of such feeds is highly dependent upon the efficiency of fermentable activity in the rumen.This study focused on performance of Tswana sheep when fed different supplements under drylotting system.

MATERIALS AND METHODS

This trial was conducted at Botswana College of Agriculture, sebele Gaborone, for 125 days. Four separate feed treatments were allocated to 4 groups of yearling sheep, 7 animals per treatment.

Treatment	Supplement(50%)	Roughage(50%)
Control	Lucerne	Buffel grass hay
1	Sorghum bran	Buffel grass hay
2	Caged layer waste(CLW)	Buffel grass hay
3	Broiler litter (BL)	Buffel grass hay

Other feeds provided to the sheep were mineral block –free choice and molasses of 100g/head/ day.Poultry litter being broiler waste, which included poultry excreta, feathers, spilled feed and the bedding. Cage litter waste (CLW) included excreta, feathers, broken eggs, and spilled feeds. Both the CLW and broiler litter were collected from the college poultry house. Processing was done by sun drying which included spreading an approximately 1-2 cm thick layer of the B.L and the CLW on separate sheets and raked thoroughly twice a day; midday and in the afternoon. Drying lasted 2-3 days depending on weather conditions. The dried crispy litter was put in 50kg bags. The dryness of the litter was measured by pressing between the fingers. When it was dried it shattered between the fingers.

Twenty eight yearling sheep, consisting of 16 non-pregnant females, non-lactating and 12 castrated males. The sheep were de-wormed and vaccinated against botulism, weighed and balanced for weight and sex into 4 treatment groups. Allocation was done using a completely randomised block design such that each group had 4 females, and 3 males making a total of 7 animals per group. The sheep were housed in separate pens, under a common roof measuring 2m by 1m with concrete floors. Cleaning of the floors was done every morning just before feeding. Feeding of the animals was done every morning at 0800 a.m. and the feed left-overs removed every morning before the day's feed was introduced to the animals. The daily feed intake and refusals were weighed and recorded. The animals were watered daily and the amount of water consumed was measured using a measuring cylinder and recorded. All the experimental animals were weighed using an Avery walk –in scale before commencing the trial and thereafter their weights were taken every fortnight until the end of the study.

Representative samples of the feeds were collected and put in small sampling bags. The samples were weighed and then put in the oven at 40°c for 72 hours .The oven dried samples were weighed again and the obtained weight and the initial weight were used to calculate the respective feed dry matter (DM) content. Part of the samples were ground using a laboratory hammer mill and were labelled and stored in air –tight containers. Ash content of the feeds was determined according to AOAC (1995), the feed samples were weighed and placed in the muffle furnace at 600°C for 2 hours and the remaining ash weighed. Crude Protein was determined using the Kjeldahl method AOAC (1995) whereby the %N was multiplied by 6.25 to get the % CP. Atomic absorption spectrophotometer and the flame photometer were used to determine the mineral contents of the feeds (AOAC,1995). Neutral detergent fibre (NDF), acid detergent fibre (ADF) and acid detergent lignin (ADL) and *in-Vitro* digestibility were determined using the ANKOM (1997a&b) procedures. Gross Energy (GE) was determined using the SANYO Gallenkamp bomb calorimeter (AOAC,1995). The collected data were analysed statistically using ANOVA and Duncan"s new Multiple Range Test (DMRT) (Steel and Torrie,1980).

RESULTS AND DISCUSSION

From Table 1, chemical composition and DM content of the feed given to the sheep. sorghum bran has the highest DM of about 95.1, followed by lucerne 94.1% given as hay, broiler litter 89.7%, CLW 89.2% and 93.1% for buffel grass hay. Broiler litter had the highest crude protein (CP.) 21.9% and sorghum bran the least at 11.7%. The ADF of broiler and lucerne were within the same range respectively 33.6% and 38.0% but buffel grass hay being the highest at 41.3% and the least being

sorghum at 13.7%. The NDF of Buffel grass hay was the highest at 71.0 % and broiler litter at 67,1% with lucerne and CLW in the same range and sorghum bran 28.9%. CLW had the highest total minerals (ash) 20.1% with sorghum bran being the poor source of minerals 3.2%. Lucerne at 9.0% and CLW at 19.3%. Sorghum bran was the one with highest digestibility 88.3% and broiler litter 77.0%. Lucerne was less digestible than CLW at 66% while CLW 74.4% among the supplements.

Table 1. Chemical composition of the experimental feeds,(%DM) and GE of the feeds fed to the sheep

	Lucerne	Sorghum bran	CLW	Broiler litter	Grass hay	Molasses
DM %	94.1	95.1	89.2	89.7	93.1	94.1
CP %	16.4	11.7	21.1	21.9	6.1	4.3
ADF %	33.6	13.7	24.1	38.0	41.3	-
NDF %	46.6	28.9	45.8	67.1	71.0	-
ADL %	6.5	3.1	3.3	4.8	5.5	-
IVTD %	66.0	88.3	74.4	77.0	47.6	-
Ash %	9.0	3.2	20.1	19.3	9.7	-
GE(Kcal/g)	4.8	5.2	3.3	3.4	4.1	2.9

Table 2 indicates mineral composition of the feeds; macro and micro minerals. CLW had the highest amount of calcium 33.7g/kg, and sorghum bran contained the least calcium content (2.5g/kg). Sorghum bran and broiler litter had similar phosphorus content. Magnesium content in the feeds was higher in Lucerne 3.3g/kg and least in CLW 0.7g/kg. Sodium content was generally low in all the feeds. Lucerne had more K than other feeds 2.4g/kg and sorghum bran had the least 1.2g/kg among the supplements but buffel grass hay had the highest at 10.1g/kg. The micro minerals analysed were Cu, Fe, Mn, Zn. CLW and the highest Cu content 86mg/kg was found in CLW and lucerne had the least at 10.3mg/kg. The highest content of Fe was 412mg/ kg in BL.

Table 2. Mineral composition of the feeds (DM Basis)

	Macro minerals in g/kg					Micro minerals in mg/kg			
Feed	Ca	P	Ca:P	K	Na	Mg	Cu	Fe	Mn	Zn
Lucerne	8.8	1.9	4.53:1	2.4	0.4	3.3	10.3	352.0	48.3	41.3
Sorghum bran	2.5	6.2	0.41:1	1.2	0.06	2.8	12.2	125.0	35.0	31.0
CLW	33.7	20.9	1.61:1	0.7	2.4	1.7	86.0	400.0	341.0	190.0
Broiler litter	8.4	7.0	1.19:1	1.4	0.2	3.0	59.7	412.0	400.0	197.0
Buffel grass hay	13.1	0.8	16.17:1	10.1	0.3	1.3	16.5	200.0	200.3	1.5

From Table 3; CLW fed sheep had the highest CP (g) intake per day and sorghum bran had the lowest intake while lucerne and broiler litter had CP (g) within the same range. Calcium intake was the highest in CLW fed sheep 194.54g and the lowest being sorghum bran supplemented sheep 79.2g, Phosphorus intake was lowest in sheep fed lucerne 12.65 g with the highest amount of Mg 21.52 g. Water intake per day was relatively similar with the lowest water intake in sheep fed broiler litter 1400ml (table 4). Body weight gain was significantly different among the treatments at ($p<0.05$) with the sheep fed sorghum bran at 12.86kg and broiler litter fed sheep had 8.36kg. There was no significant difference in daily DM grass intake (g) at ($p>0.05$). Intake from the supplement was significantly different at ($p<0.05$).Lucerne fed sheep had the highest intake at 426.48±3.58g and broiler litter fed sheep had the lowest 339.80±2.53g.

Table 3. Daily nutrient intake of sheep

Supplements	Control Lucerne	T1 Sorghum bran	T2 CLW	T3 BL
CP(g)/day	110.17	78.84	113.84	109.92
Gross Energy (KJ/g)	12037.37	12039.05	12031.09	12031.51
Ca (g)	107.45	79.23	194.54	97.93
P (g)	12.65	27.081	81.88	28.16
Mg (g)	21.52	19.30	10.15	10.19

Livestock productivity in Botswana is mainly limited by inadequate forage quality and/ or quantity during the long dry season which lasts for about 8 months in a year. Therefore , there is a need to supplement minerals, protein and vitamins obtained from grazing during this period. Protein is the

nutrient found in highest concentration in organs, muscles and tissues and as such it is important in feeding animals. As shown in Table 1, which shows the chemical composition. DM, broiler litter had the highest CP content 21.86%. This is in agreement with Cross and Jenny (1998). They reported that litter can be low in CP because of excess volatilization of nitrogen in the poultry house. High temperature and excess moisture in the poultry house leads to nitrogen volatilisation. If the CP values are less than 18%, the litter should be used only as a fertilizer and not as a feed source. Lucerne CP was similar to that reported by Aganga and Monyatsiwa, (1999). Lucerne as a legume is expected to provide enough protein to the animal and can be used as a supplement in ruminant feeding on poor quality grass as basal diet.

Table 4. Intake and response of Tswana sheep during the experimental period

Supplements	Control Lucerne	Treatment 1 Sorghum bran	Treatment 2 CLW	Treatment 3 Broiler litter
Initial weight(kg)	19.29± 1.0	18.29± 2.13	20.43± 3.9	19.14± 1.8
Final body weight(kg)	30.71±2.2	31.14±2.3	29±3.0	27.51±2.2
Body weight gained(kg)	11.67± 1.7^{a}	12.86± 1.68^{a}	9.43±1.5^{b}	8.36± 1.4^{b}
Average daily body weight gain(g)	102.34± 1.2^{a}	112.78± 1.1^{a}	82.71± 1.3^{b}	73.31±1.6^{b}
Average daily DM grass intake(g)	527.73± 7.86^{a}	525.680± 8.71^{a}	524.88± 7.75^{a}	522.29± 6.97^{a}
Average daily supplement(g)	426.48± 3.58^{a}	370.64± 2.47^{b}	370.59± 2.47^{b}	339.80± 2.53^{c}
Average daily total DM feed intake(g)	860.54± 18.90^{b}	955.20± 21.04^{a}	893.43± 1.53^{b}	904.43±18.22^{b}
Average daily water intake(ml)	1430± 26.14^{a}	1430± 25.14^{a}	1420± 30.01^{a}	1400± 28.14^{a}
Feed conversion DM/gain	8.58± 0.23^{b}	8.47± 0.16^{b}	10.81± 0.03^{a}	12.34± 0.16^{a}

Broiler litter had the highest amount of ash content of 20.14%, since it contains saw dust or wood shavings, but ash content above 28% in the litter should not be fed to ruminants since such high ash levels indicate that large amounts of soil contaminated the litter. Litter with a high ash content will result in poor consumption and subsequent poor animal performance (Cross and Jenny,1998). As shown in Table 4; sorghum bran fed sheep had the highest body weight gained 12.86±1.68kg with the highest feed conversion 8.47g/g which was comparable with sheep fed on lucerne . The implication is that feeding sheep lucerne as supplement can be as good as feeding sorghum bran, with feed conversion ratio not significantly different at ($p > 0.05$). Broiler litter fed sheep had the least body weight gain (kg) 8.36± 1.4 and the least efficient feed conversion ratio 12.34g/g, this in line with the findings of Cross and Jenny (1998) that found that broiler litter substituted in high grains diets resulted in a reduction in daily gains and a lower feed conversion ratio. Performance of sheep supplemented with broiler litter was not significantly different from those supplemented on CLW.

Sorghum bran fed sheep had the highest average daily gain (g) (ADG) 112.78±1.6 as compared to that of broiler litter 73.31 ± 1.6 .The DM intake in relation to gain of sheep supplemented on CLW was higher compared to those on broiler litter; this is in agreement with the findings of Ayangbile and Tallam,1992; who reported better feed conversion for sheep supplemented with deep stacked CLW in kenya. Daily total DM intake was highest with sorghum bran , this might be due to its high digestibilty. Average daily DM supplement intake was highest in control sheep fed with Lucerne. The main reason for the differences in intake between feeds appear to be the same as that which relates to digestibility that the more rapidly a feed is digested and leaves the rumen the quicker is space made available in the rumen and the more of that feed the animal can eat . Sheep fed on broiler litter had the lowest intake of supplement due to its unpalatibility as reported by Cross and Jenny (1998) . Broiler litter is not as palatable as other common feed sources, and sheep require a period of time to get adjusted to it. To make it more palatable, it is usually mixed with more palatable feeds such as corn, milo, commercial grain mixes and soybean hulls. Raw broiler litter needs to be processed to ensure its safety from potentially harmful pathogens. Processing can be achieved by moderate heat, either during the ensiling process, sun drying, or deep stacking the broiler litter (Ayangbile and Tallam, 1992). The palatability was enhanced by sprinkling the ration with 100g molasses powder in this study. The water intake in millimeter was comparable with all the rations, indicating that intake of all the supplement did not affect water consumption .Sheep on Lucerne and Sorghum bran had almost the same amount 1430ml/ head /day .

Minerals are important in the development of the body of an animal. Therefore it is important to know the mineral composition of a particular feed given to the animals. Mineral deficiencies and toxicities do occur in the body. Both Ca and P are found in high concentration in the animal's body and are important constituents of the skeleton and teeth. Imbalance in Ca and P results in rickets in young growing animals and osteomalacia in mature animals. A ratio of 2:1 must be maintained. The results

from table 3 and table 4 shows that CLW has the highest amount of Ca. it might be attributed to high amounts of Ca needed for the formation of egg shell. Lucerne and broiler litter had no significant difference in their amounts of Ca .Cereals are low in calcium and if extra Ca is not given to bring the ratio of Ca:P (2:1) male lamb will suffer from Urolithiasis (blockage of urine passage) (Speedy 1990).Too little micro minerals can be as dangerous as too much of them. Copper toxicity has been a problem widely reported when broiler litter is fed to sheep (Cross and Jenny ,1998) therefore, when feeding broiler litter it should not be fed continuously for more than 5 months. Lucerne and sorghum bran had the least amount of Cu 10.3mg/kg and 12.23mg/kg respectively and which can then be recommended for feeding sheep in a drylot since it will provide adequate Cu to the animals and not excess thus; no possible problem of Cu poisoning.

CONCLUSION

The study showed that poultry waste, sorghum bran and lucerne can provide a protein source as they are rich in crude protein and therefore can be used as supplement to low quality forages.Body weight gains of Tswana sheep fed Lucerne as supplement were similar to that fed sorghum bran, while CLW and broiler litter were also similar. Daily intake of lucerne was the highest with sorghum bran and CLW being the same while broiler litter had the lowest intake. Feed conversion ratio was similar between sheep fed Lucerne and those fed sorghum bran. This shows that Tswana sheep can utilise sorghum bran as efficiently as they utilise Lucerne.

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