COMPARATIVE INTAKE, DIGESTIBILITY AND NITROGEN UTILIZATION OF UREA ENSILED SORGHUM PANICLE AND BREWER'S DRIED GRAIN BY RED SOKOTO GOATS

[1]*Onaleye, K. J. and [2]SarkinKwambo, G. I.

[1]Department of Animal Production and Health, Federal University Wukari, Wukari, Taraba, State
[2]Department of Animal Production and Health, Taraba State University, Jalingo, Taraba State
*Corresponding author: onaleye@fuwukariedu.ng, +2347036450294

ABSTRACT

Fifteen growing Red Sokoto goats with average weight 13.28kg were used to evaluate digestibility of urea (4% w/w) ensiled (UESP) and unensiled (SP) sorghum panicle and brewer's dried grain (BDG) by Red Sokoto goats. The trial was conducted for a period of 14 days. Treatments T_1, T_3 T_4 and T_5 were supplemented with brewer's dried grain at 200g, 150g, 150g and 200g respectively while T_2 was fed urea-ensiled sorghum panicle without brewer's dried grain. Sorghum panicle intake was significantly ($p<0.05$) different among the treatments with T_5, T_4 and T_2 significantly higher than T_1 and T_3 with values that ranged from (62.03g/d – 144.49 g/d). T_1 and T_3 were similar ($p>0.05$) in sorghum panicle intake. BDG intake (g/d) was similar ($p>0.05$) across the treatments. Dry matter intake (DMI) ranged from 130.33g/d in T_2 – 226.92g/d in T_5 and differ significantly ($p<0.05$) among the treatments with T_5 being the highest, T_4 was higher than T_1 while T_2 and T_3 were similar ($p>0.05$) and lower than T_1. It was concluded that urea treatment did not significantly improve sorghum panicle intake perhaps due to the repulsive smell of ammonia but supplementation with brewer's dried grain improved overall dry matter intake at 200g/head/day BDG supplementation. It is recommended therefore that farmers could supplement poor sorghum panicle with BDG for improved performance especially during the dry season when forages are scarce.

Keywords: Sorghum panicle, Red Sokoto goats, Brewer's dried grain, Digestibility, Urea treatment

INTRODUCTION

The ability of small ruminant to produce milk, meat and skin in unfavourable environment has attracted attention to its production (Makun et al., 2013). However, the productive potentials of goats have been hampered by poor nutrition from poor quality roughages, insufficient concentrate supplement associated with high cost of conventional feed supplement and completion with human for these feed resources (Balawa & Akinsoyinu, 2006).Threshed sorghum top (TST) or chaff is an empty panicle of sorghum after the grainshave been removed. It is a roughage feed, characterized by high fibre contents (above 40 %), low crude protein (<70 g/kg dry matter) and low metabolizable energy (<7.5 MJ/kg dry matter (DM)) (Emyr, 1994). Supplementation of poor quality roughages has been reported to improve ruminant performance (Onaleye, 2018) and Brewer's dried grain (BDG) is available for use. Therefore, this study was designed to evaluate nutrient intake and the digestibility by growing Red Sokoto Goats fed ensiled Sorghum panicle (SP) and graded levels of Brewers Dried Grain (BDG).

MATERIALS AND METHODS

The research was conducted at the small ruminant unit of Teaching and Research farm, Faculty of Agriculture and Life Sciences, Federal University Wukari Taraba state, Nigeria. Sorghum panicle was collected from farmer's threshing-floor. The threshed head (panicle) was chopped to 3-5cm then properly mixed together, hydrated and ensiled with urea while a portion was left untreated. Seventy kilogram (70 Kg) of panicle was hydrated with 100 liter of 4% (w/w) fertilizer grade urea solution and ensiled in air-tight sack silos for thirty (30) days and fed to the animals after exposure to the air for at least one hour to reduce the pungency of the ammonia from the ensiled feed.

Completely randomized design was employed in this trial with five treatments replicated thrice. A total of 15 growing Red Sokoto goats were used for the trial, with the animals confined in metabolism crates and fed the test diets with graded levels of the BDG for 7 days acclimatization and 7 days data collection periods. Record of feed intake, fecal and urine output were taken for the last seven dayswith 10% of representative samples of feces and urine daily collected and preserved for chemical analysis.

Samples of feed, feaces and urine were analyzed for proximate composition according to Association of Official Analytical Chemists (2006) method and cell wall fractions (NDF, ADF and ADL) as described by Van Soest et al. (1991). Data collected were analyzed using one-way ANOVA and Duncan multiple range test was used for mean separation where differences exist.

RESULTS AND DISCUSSION

Table 1 presents the proximate composition of Urea Ensiled Sorghum Panicle (UESP) and Unensiled Sorghum Panicle (SP) fed to Red Sokoto Goats. Dry matter (DM) ranged from 84.07% in urea treated sorghum panicle (UESP) to 90.35% in SP. UESP is higher in CP (24.51%), and Ether extract (7.80%) and lower in Dry matter (84.07%), Crude fiber (10.33%) and NFE (36.76%) than SP. The DM obtained in this study is similar to (85.0 – 97.0%) reported by Abdullahi et al., (2016) for urea- treated and untreated sorghum panicle but higher than (24.1 – 37.0%) reported by Heuzé et al. (2017) for ensiled maize stover. The reason could be attributed to differences in experimental materials.

The crude protein observed in this study is higher than 8.0% CP recommended by Norton (1994) as minimum for proper proliferation of rumen microbes for ruminants and may suggest that it could support animal growth. The higher CP in UESP is in consonance with the findings of Assefa et al. (2022) and is attributable to the effect of urea treatment on the sorghum panicle. The lower CF (10.33%) and the lower (36.76%) NFE in UESP may be the effect of urea on fiber and fermentation on the soluble carbohydrate content respectively which is consistent with Moran (2005) who reported that ensilage reduces the dry matter and nutrient content of the material by 10-15%.

Table1. Proximate Composition of Urea Ensiled Sorghum Panicle and Unensiled Sorghum Panicle fed to Red Sokoto Goats

PARAMETER (%)	SP (g/day)	UESP(g/day)	BDG(g/day)
DM	90.35	84.07	87.96
CP	14.74	24.51	23.24
CF	15.98	10.33	12.71
EE	7.14	7.80	11.33
NFE	47.57	36.76	39.92
ASH	4.92	4.67	0.71

SP = Unensiled sorghum panicle
UESP= Urea ensiled sorghum panicle
BDG = Brewers dried grain
DM = Dry matter, CP = Crude protein, CF = Crude fibre, EE = Ether Extract, NFE = Nitrogen free extract.

Table 2 presents cell wall fraction of Urea Ensiled Sorghum Panicle (UESP) and Unensiled Sorghum Panicle (SP) fed to Red Sokoto Goats. NDF ranged from 39.51% in SP to 46.00% in UESP. ADF ranged from 28.81% in SP to 41.15% in UESP. ADL ranged from 7.85% in SP to 9.50% in UESP.

The % NDF (39.512% - 46.00%) for untreated and urea treated sorghum panicle respectively reported in this study fall within the range of (36.50 – 54.70%) reported by Heuzé et al. (2017) for maize stover silage. Similar trend was observed in ADF (28.81%) in untreated sorghum panicle and (41.15%) in urea treated sorghum panicle. This shows that by urea treatment, the NDF and ADF value of the experimental diet increased which may likely depress intake (Ahmad *et al.,* 2014). Similar trend was also observed in ADL (7.85%) in untreated sorghum panicle and (9.50%) in urea treated sorghum panicle.

The lower NDF (39.51%) obtained in unensiled sorghum panicle compared to urea treated sorghum panicle (46.00%) could be responsible for the higher intake (136.47 – 144.49%) in T_4 and T_5 (Ahmad et al., 2014) with the exception of T_2 probably due to lack of supplementation and the need for the animals to feed to satisfy their energy demand.

Table 2: Cell wall Fraction of Urea Ensiled Sorghum Panicle (UESP) and Unensiled Sorghum Panicle (SP) fed to Red Sokoto Goats

Parameters (%)	SP(g/day)	UESP(g/day)	BDG(g/day)
NDF	39.51	46.00	32.47
ADF	28.81	41.15	19.84
ADL	7.85	9.50	6.58

SP = Unensiled sorghum panicle
UESP= Urea ensiled sorghum panicle BDG = Brewers dried grain
NDF = Neutral detergent fibre, ADF = Acid detergent fibre, ADL= Acid detergent lignin

Table 3 presents the dry matter intake and nutrient digestibility of the experimental diets across the different treatments (T_1 – T_5). Sorghum panicle intake (SPI) ranged from 62.03 g/d in T_3 to 144.49 g/d in T_5 and differed significantly ($p<0.05$) across the treatments with T_5, T_4, and T_2 being higher than T_1 and T_3. The observation could be the due to the depressing effect of NDF on intake which is consistent with Ahmad et al. (2014). The similarity of T_2 to T_4 and T_5 in SPI could be attributed to increased intake of T_2 to satisfy energy need of the animals as it was not supplemented. Dry matter intake (DMI) differed significantly ($P<0.05$) and ranged from 130.33 g/d in T_2 to 226.92 g/d in T_5. The DMI of T_4 and T_5 are similar but significantly higher ($P<0.05$) than others. This could be due to the combined effect of lower NDF and supplementation with BDG and corroborates the findings of Babayemi et al. (2010), Ahmad et al. (2014) and Onaleye (2018). It is also consistent with the report of Norton (19944) that attributed proper proliferation of the rumen microbes to improved crude protein (CP) content.

Nutrients digestibility across all the treatments were similar (P > 0.05) and suggests that the treatment had no effect on nutrient digestibility. Although all digestibility parameters are similar across treatments, most of them fall within the medium to high digestibility coefficients (40 – ≥60%) described by (Food and Agricultural Organization, 1995).

Table3: Dry Matter Intake and Nutrient Digestibility of treated and untreated Sorghum panicles Supplemented with BDG by Red Sokoto Goat.

Parameters	T_1	T_2	T_3	T_4	T_5	SEM	P-value
SPI (g/d)	64.58^b	130.33^a	62.03^b	136.74^a	144.49^a	20.28	0.033
BDGI (g/d)	98.89^a	-	77.55^a	61.12^a	82.43^a	21.00	0.66NS
DMI (g/d)	163.47^c	130.33^d	139.58^d	197.86^b	226.92^a	16.75	0.010
DMD (%)	68.13	65.17	65.96	67.95	64.48	6.10	0.99NS
CPD (%)	66.87	72.91	67.71	57.76	59.59	5.05	0.27NS
CFD (%)	47.28	32.13	45.28	52.18	45.46	10.96	0.76NS
EED (%)	55.14	39.12	51.64	40.61	37.08	11.64	0.75NS
NFED (%)	84.42	77.41	81.03	88.10	82.44	4.05	0.48NS
NDFD (%)	62.25	60.30	53.98	56.03	53.79	7.28	0.87NS
ADFD (%)	63.38	67.81	54.90	56.82	47.18	8.36	0.50NS
ADLD (%)	31.45	47.15	45.54	49.39	21.33	12.13	0.450NS

a,b,c: means with different superscripts are significantly different (p<0.05)

SPI = Sorghum panicle intake, BDGI = brewers dried grain intake, DMI = dry matter intake, DMD = dry matter digestibility, CPD = crude protein digestibility, CFD = crude fibre digestibility, EED = ether extract digestibility, NFED = Nitrogen free extract digestibility, NDFD = Neutral detergent fibre digestibility, ADFD = acid detergent fibre digestibility, ADLD = acid detergent fibre lignin.

T_1 = Urea ensiled sorghum panicle + 200g BDG; T_2 = Urea ensiled sorghum panicle without BDG

T_3 = Urea ensiled sorghum panicle + 150g BDG; T_4 = Unensiled sorghum panicle + 150g BDG

T_5 = Unensiled sorghum panicle + 200g BDG; SEM = Standard error of means; NS = Not significant

Table 4 shows the nitrogen utilization of Sorghum panicle with or without BDG supplement by Red Sokoto goat. Nitrogen intake ranged from 5.11g/d in T_2 to 6.48g/d in T_5. Nitrogen intake was similar (p>0.05) across the treatments, Nitrogen retention ranged from 18.11% in T_2 to 37.71% in T_5 and similar (p>0.05) across the treatments. The difference in absolute nitrogen retention values between the T_5 (37.71%) and T_2 (18.11%) seems to corroborate the importance of concentrate supplementation as initially reported by Hassan et al. (2016) and Onaleye (2018).

Table4. Nitrogen utilization of Sorghum panicle with or without BDG supplement by Red Sokoto goat

Parameter	T_1	T_2	T_3	T_4	T_5	SEM	P-value
*NI $_{(g/d)}$	6.22	5.11	5.32	5.49	6.48	0.54	0.37
N in Urine $_{(g/d)}$	2.02	2.74	2.09	1.33	1.46	0.56	0.44
Feacal N $_{(g/d)}$	1.98	1.41	1.76	2.34	2.63	0.35	0.20
N-balance $_{(g/d)}$	2.22	0.96	1.47	1.83	2.39	0.76	0.68
*N-rentention$_{(g/d)}$	31.86	18.11	30.21	33.54	37.71	12.61	0.84

NI = Nitrogen Intake, N-retention = Nitrogen retention, BDG = Brewers dried grain

T_1 = Urea ensiled sorghum panicle + 200g BDG; T_2 = Urea ensiled sorghum panicle without BDG

T_3 = Urea ensiled sorghum panicle + 150g BDG; T_4 = Unensiled sorghum panicle + 150g BDG

T_5 = Unensiled sorghum panicle + 200g BDG; SEM = Standard error of means

CONCLUSION

It was concluded from this study that urea treatment did not significantly improve sorghum panicle intake perhaps due to the repulsive smell of ammonia but supplementation with brewer's dried grain improved overall dry matter intake at 200g/head/day.

It is recommended therefore that farmers could supplement poor quality diets with BDG for improved performance especially during the dry season when forages are scarce.

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