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Original Article

Effect of Supplementing Inclusion of Grounded *Acacia Albida* pods with Sesame Cake on Feed Intake and Body Weight Change of Abergelle goats

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ABSTRACT

The experiment was conducted to evaluate supplemental value of inclusion of grounded *acacia albida* pods and sesame cake on intake and body weight changeusing twenty intact Abergelle goats with initial body weight (BW) of 11.2 ± 1.2 (mean ± SD). Randomized complete block design having 5 blocks were involved. Treatments were natural pasture hay fed *ad libitum* (T1) or with 105 sesame cake (SC) + 105 AAp g/day (T2), 84 SC + 126 AAp g/day (T3) and 63 (SC) + 147 *Acacia albida* pods (AAp) g/day (T4). The CP content of the AAp, SC and hay was 17.7%, 38.3% and 6.7%, respectively. Goats in T1 consumed higher ($P < 0.05$) hay (452.5 g/day) compared to the supplemented groups. Higher ($P < 0.05$) total DM intake of 521.2, 524.7 and 524 g/day for T2, T3 and T4, respectively were recorded than T1 (452.5 g/day). CP intake was the lowest for T1 compare to the supplemented groups. In case of the supplemented groups T2 is significantly higher ($P < 0.05$) than T4whereas T3 is similar ($P > 0.05$) with both T2 and T4. Average daily gains were 5.55 (loosing), 80.0, 71.1 and 63.3g/day respectively for T1, T2, T3 and T4.

Key words: *acacia albida*, sesame cake, goats, feed intake, body weight.

INTRODUCTION

Supplementation concentrate feeds is one strategy, which can increase digestibility, nutrient supply and intake in livestock production (Preston and Leng, 1987). However, concentrate feed resources especially grains are expensive and highly valued as human food. Therefore, it is better to look for other alternative feedstuffs and feeding managements like mixing different types of pods and other plant parts which do not compete with human food (Niguse, 2014).

Acacia albida pods (AAp) have high nutritive value (Tanner *et al*., 1990). The crude protein (CP) content of AAp is about 20% (Hassen *et al*., 2007). The higher crude protein (CP) and lower crude fiber (CF) contents in pods suggest that it may be used as a replacer feed for the high cost protein supplements such as sesame cake which has 38% CP (Niguse,

2014). The feeding value of AAP and the cost of sesame cake can improve by mixing these two types of feeds. Therefore, the objective of this study was: To evaluate the effect of inclusion of *A. albida* pods to sesame cake on feed intake and body weight change of Abergelle goats fed native hay as basal diet.

MATERIALS AND METHODS

Study Site

The study was conducted in Tigray Regional state specifically Naedier Adiet district. The altitude of the area is 1981 meters above sea level and is found between 14^{o} 00’ 00'N latitude and 38^{o} 37’ 37'E longitude. The average annual temperature of the area is about 26 ^{o}C and the annual rainfall ranges from 400 to 650 mm.

Animals and Feeding Management

The goats used in this study were twenty intact Abergelle breed aged about one year. There were four treatments and each treatment had five animals which were allocated to the treatments randomly using completely randomized block design (RCBD). The animals were confined in individual pens and fed individually. Known amount of the basal diet was given for each goat then leftovers were weighed in the next morning just before offering any feed for that day. The supplements were given in two halves, one half in the morning and the other half in the evening. The animals were given fifteen days adjustment period before data collection was started. Animals were weighed at the beginning of data collection and at the end of the experiment (end three months). Before the experiment was started, the animals were deformed and sprayed to control internal and external parasites, respectively. Water and mineral salts were provided to the animals *ad libitum* in the individual pens.

Treatment Diets

Native hay was used as a basal diet and was offered *ad libitum* to all the animals in the treatments. The hay was purchased from the local area of the experimental site. *Acacia albida* pods were collected from the communal lands of the area. The pods were dried well which could be easily fallen from the trees and picked from the ground. The hay was chopped to an approximate size of 2.5 cm stored in sacks. *A. albida* pods were chopped first and grounded manually by using traditional grinder then stored in sacks. Sesame cake was crashed well and mixed with the already grounded *A. albida* pods based on levels set for each mixture treatments. The animals were offered the daily supplement in two equal halves at 08:00 h and 16:00 h of the day. All supplements were given on DM basis. Treatment diets were native hay, *A. albida* pods and sesame cakeas shown in Table 1.

Table 1: Experimental treatments

Treatments	Native Hay	Supplements	
		AAp (g DM/day/goat)	SC (g DM/day/goat)
T_1	*Ad libitum*	0	0
T_2	*Ad libitum*	105	105
T_3	*Ad libitum*	126	84
T_4	*Ad libitum*	147	63

AAp = *Acacia albida* pods; DM = dry matter; SC= sesame cake

Measurement of Intake and Live Weight Gain

Feed offered and refusals were recorded daily to determine daily feed intake by subtracting refusal from offered. Feed samples from each feed and refusals from each animal were sampled. The feeds were weighed every morning separately for supplement and basal diets. Left over basal diet was weighed every morning between 06.00 h and 08.00 h, but left over of

supplemental feeds were weighed at every morning and night. At the end of feed trial, daily refusal and offered samples were thoroughly mixed well for each animal and each feed, respectively and sub-sampled. Refusal samples for each feed type were bulked per treatment for chemical analysis. The animals were weighed at the beginning and at the end of the experimental period after overnight withholding of feed. To get the daily live weight gain, the initial weight was subtracted from the final weights then divided by the number of days of the experiment (90 days).

Chemical Analysis

Samples of feed offered and refusals were subjected to laboratory analysis for dry matter (DM), CP and ash (inorganic matter) determination following the procedure of AOAC (1990). The acid detergent fiber (ADF), neutral detergent fiber (NDF), hemicellulose (HC) and acid detergent lignin (ADL) contents of feed and refusal samples were determined following the procedures of Van Soest and Robertson (1985).

Statistical Analysis

Data from the experiment were subjected to analysis using the General Linear Model procedure of SAS (2002). The treatment means were separated by least significant difference (LSD). The model used for data analysis was:

$Y_{ij} = \mu + T_i + B_j + e_{ij}$.

Where: - Y_{ij} = response variable.

μ = overall mean

T_i= treatment effect

B_j= block effect

e_{ij}= random error

RESULTS

Chemical compositions of the experimental feeds are shown in Table 2 below. The mean daily DM intake of hay of unsupplemented goats was significantly higher ($P<0.05$) than the supplemented animals and hay DM intake was similar among the supplemented goats. The total DM intake of supplemented goats was significantly higher ($P<0.05$) than the unsupplemented group of goats. In addition, the total DM intake of supplemented animals was significantly higher ($P < 0.05$) than the unsupplmented goats (T_1).As the level the feeds varied there was no significant difference ($p > 05$) with all supplemented groups but numerically the intake increased with increasing of sesame cake in the feeds. In case of OM intake T_4 was significantly higher ($P < 0.05$) than T_2 but T_3 was similar with both T_2 andT_4.

Table 2: Chemical composition of experimental feeds

Sample type	DM %	% of the DM						
		OM	CP	NDF	ADF	HC	ADL	ASH
Hay	93.5	90.3	7.3	71.4	52.2	19.2	7.4	8.7
SC	94.4	89.9	38.3	30.6	23.9	6.7	11.5	10.1
AAp	93.2	95.8	17.8	43.9	34.7	9.2	4.3	4.2
AAp+SC (105 g + 105 g)	93.4	92.9	28.1	37.3	29.3	8.1	7.9	7.1
AAp+SC (126 g + 84 g)	74.7	74.3	22.5	29.8	23.4	6.5	6.3	5.7
AAp+SC (147 g + 63 g)	56.0	55.7	16.9	22.4	17.6	4.9	4.7	4.3

AAp = *Acacia albida* pods; ADF= acid detergent fiber; ADL= acid detergent lignin; CP= crude protein; DM=dry matter; HC = hemicellulose; NDF = neutral detergent fiber; OM = organic matter; SC = sesame cake.

Dry Matter and Nutrient Intake

Table 3 shows the mean daily DM and nutrient intake of experimental goats during the feeding trial. The total daily CP intake was lowest for the supplemented goats ($P < 0.05$) compare to supplemented groups of goats. Among the supplemented goats daily CP intake was significantly higher ($P < 0.05$) in T_3 and T_2 compared to lowest inclusion of sesame cake (T_4).The NDF, HC and ADF intake of the animals had no significant difference ($p > 0.05$) among all the treatments.

Table 3: Nutrient intake of goats fed native hay basal diet supplemented with different levels of *Acacia albida* pods and sesame cake.

Parameters	Treatments				SEM
	T_1	T_2	T_3	T_4	
Hay DMI (g/day)	452.5[a]	323.4[b]	329.2[b]	332.6[b]	10.5
SPF DMI (g/day)	-	197.8	195.5	191.4	2.08
Total DMI (g/day)	452.5[b]	521.2[a]	524.7[a]	524 [a]	6.82
OMI (g/day)	429.5[c]	512.5[b]	514.8[ab]	517.6[a]	7.01
HCPI (g/day)	31.2[a]	22.31[b]	22.71[b]	22.95[b]	1.8
SCPI (g/day)	-	54.4	50.05	42.87	2.6
Total CPI (g/day)	31.2[c]	76.71[a]	72.76[a]	65.82[b]	2.68
NDFI (g/day)	310.87	294.38	301.04	304.49	2.42
ADFI (g/day)	240.28	226.32	231.3	233.25	2.01
HCI (g/day)	70.59	68.06	69.74	71.24	2.1
Substitution rate	-	0.65	0.63	0.63	0.03

[a,b,c] Means having significantly different; ADFI = acid detergent fiber intake; CPI = crude protein intake; DMI = dry matter intake; HCI = hemicellulose intake; HCPI = hay CP intake; NDFI = neutral detergent fiber intake; OMI = Organic matter intake; SC = sesame cake; SCPI = supplement CPI; SEM = standard error mean; SPF = supplemental feeds; T_1 = hay ad libitum; T_4 = hay ad libitum + 105 g DM sesame cake + 105 g DM.; T_3 = hay ad libitum + 84 g DM sesame cake + 126g DM; T_2 = hay ad libitum + 63g DM sesame cake + 147 g DM *Acacia albida* pods (AAp)

The initial body weight, final body weight, total body weight change and average daily gain (ADG) of the experimental goats are given in Table 4. Initial body weight was similar among treatments ($P > 0.05$). Compared to the unsupplemented goats, supplemented animals had greater ($P < 0.05$) final body weight, weight change and ADG. Among the supplemented groups, animals supplemented with highest level of sesame cake (105 g DM + 105 g DM) or T_2 had the highest weight change as well as ADG compare to the goats supplemented with highest level of A. albida pods (T_4). Animals supplemented with T_3 were similar ($P >0.05$) with all other supplemented groups.

Table 4: Live weights change of Abergele goats fed on native hay basal diet and supplemented with mixtures *Acacia albida* pods and sesame cake

Live weight	Treatments				SEM
	T1	T2	T3	T4	
IBW (kg)	10.8	10.9	11.4	11.7	0.21
FBW (kg)	10.3[b]	18.1[a]	17.8[a]	17.4[a]	0.38
Weight change (kg)	-0.5[c]	7.2[a]	6.4[ab]	5.7[b]	0.26
ADG (g /d)	-5.55[c]	80.0[a]	71.1[ab]	63.3[b]	3.12

[a,b,c] Means with different superscripts in the same row differ significantly; ADG = average daily gain; FBW= final body weight; IBW = initial body weight; SEM = standard error of mean; T_1 = hay ad libitum; T_2 =hay ad libitum + 105 g DM sesame cake + 105 g DM; T_3 = hay ad libitum + 84 g DM sesame cake + 126g DM; T_4 = hay *ad libitum* + 63g DM sesame cake + 147 g DM *Acacia albida* pods (AAp).

DISCUSSION

The DM content of hay used in this trial was 93.5%, which was comparable to the DM content (93.3 %) of mixed hay reported by Getachew (2005). Dry matter of *A. albida* pods in this study was 93.2%. Hassan *et al*., (2007) reported values of 90.0 and 93.3% of DM for *A. albida*seed and pulp, respectively. The result is in line with the result of this study. The sesame cakeused in this study contained 94.4% DM component. Yakubu and Alfred (2014) reported a dry matter content of 93.66% from sesame meal and this value is comparable with the result of this study. The CP content of the hay in this study was (7.3%) this level is about the maintenance requirement of ruminants (Susan, 2003). Aweke (2014) reported slightly better (7.9%) CP than the hay used in this study. However, the fiber content of the hay used in this study appeared to be relatively high and can limit the efficient utilization of the hay as feed for ruminants (Lopez and Carcia, 1995**)**.

Acacia albida pod used in this study was contained (17.5%) good level of CP and can serve as a replacer feed for high cost protein supplements. The CP content of *A. albida* pods used in this experiment was comparable to the values 19.5% reported by Hassan *et al*., (2007) for the pulp of the pods.

There are different similar reports of this study observeddecrease basal feed or hay intake due to supplementation has been reported in other studies (Jemberu, 2008) and (Niguse, 2014). This could be attributed to the relatively low CP content of the basal feed hay (Aweke, 2014). The basal diet native hay contained 71.4% NDF, 52.2% ADF and 19.2% HC which have high destructive impact on intake and digestibility of diets. Cheeke (1999) stated that NDF is one of the major factors that affect forage intake and digestibility because it is the major component to affect nutrients by rumen fill. Therefore, in this study, differences between the unsupplemented and supplemented goats in DM intake could be due to both the high fiber and less CP content of the hay. The higher total DM intake of supplemented animals of this study might be due to the effect of low CP content in the basal feed than both the supplemental feeds. Pond *et al.,* (1995) reported that consumption of low quality roughages such as straw and poor hay can be increased by the addition of protein supplements. Differences observed in CP intake of this study among treatments appeared to be related to variation in CP content of the supplements and/or to differences in DM intake of the diets.

In the present study the average daily gain (ADG) of supplemented animals ranged 63-80 g/day which is higher than the values reported by Matiwos (2007) daily gains ranging 41–64 g/day from Sidama goats supplemented 200-400 g/day cottonseed meal. Merera *et al.* (2014) was reportedhigher (117.36 g/day) ADG of concentrate supplemented Horro rams whereas, Birhanu (2008) had reported lower daily gain of 14–19 g/day than noted in this study from goats supplemented with 200-400 g/day concentrate mixtures of wheat bran and noug seed cake to a grass hay basal diet. Such comparison of previously reported results with the current study suggest that mixtures of grounded A. albida pods and sesame cake to be a potential supplement to improve body weight gains of goats.

In this study, the unsupplemented group had shown decreasing body weight (-5.55 g/day) which might be related to the low nutrient content and that lead to low DM digestibility of the hay. Similarly, the weight reduction of unsupplemented animals might be attributed to the lack of enough nutrients for the rumen microbes and the consequent supply of essential amino acids to the tissues of the animals. Salim *et al.*, (2003) indicated protein supplementation to have a positive impact on daily body weight gain, while feeding hay alone resulted in body weight loss. Moreover, Birhanu (2008) reported that, goats fed grass hay only decrease their body weight (-12.8 g/day). Solomon *et al.* (2004) reported that supplementation with mixtures of multipurpose trees to Menz ewes fed on tef straw promoted higher feed consumption efficiency. Moreover, Matiwos (2007) reported that feed conversion efficiency was higher in goats supplemented with 200 g/day cottonseed meal than the unsupplemented ones.

CONCLUSIONS

Generally, the intake of total DM, OM and CP was significantly higher in the supplemented goats than the control group. The intake of total DM and other important nutrient was become constant as the level of sesame cake increased. In general, *acacia albida* pod was replaced to sesame cake up to 50%.

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