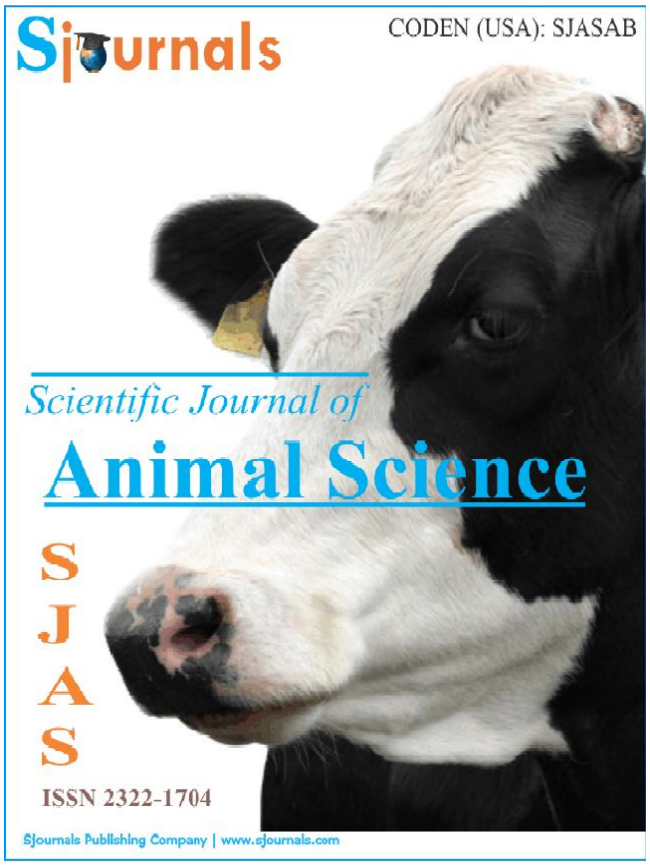

Sjournals
Scientific Journals

Scientific Journal of Animal Science (2016) 5(7) 322-328
ISSN 2322-1704
doi: 10.14196/sjas.v5i7.2202

CODEN (USA): SJASAB

Contents lists available at Sjournals

Scientific Journal of **Animal Science**

Journal homepage: www.Sjournals.com

Original article

Effect of on farm supplementation of dried *Sesbaniasesban* (L.) leaf on performance of Abergelle rams

Desta Tekle[a,*], Gebreslassie Gebru[a], Hailai Hagos[a], Shumiye Belay[b]

[a]*Abergelle Agricultural Research Center, Abyi Adi, Tigray Agricultural Research Institute, Mekelle, Ethiopia.*
[b]*Mekelle Agricultural Research Center, Tigray Agricultural Research Institute, Mekelle, Ethiopia.*

*Corresponding author; Abergelle Agricultural Research Center, Abyi Adi, Tigray Agricultural Research Institute, Mekelle, Ethiopia.

ARTICLE INFO

Article history,
Received 11 June 2016
Accepted 10 July 2016
Available online 17 July 2016
iThenticate screening 14 June 2016
English editing 08 July 2016
Quality control 14 July 2016

Keywords,
Ethiopia
Intake
Partial budget
Weight gain

ABSTRACT

The objectives of the study were to evaluate the effect of supplementation of dried *Sesbaniasesban* (L) leaf on supplement intake, body weight gain and cost benefit analysis of the feeding regimes for Abergellerams under farmer's management system in Tigray region, northern Ethiopia. The experiment was carried using 21 yearling intact Abergelle rams with an initial body weight of 22.83 ± 3.11Kg (mean ± standard deviation). The experiment comprised 90 days of feeding trial after 14 days of adaption period. Farmers having each 3 yearling intact Abergellerams with similar body weight were first purposively identified and then from the identified farmers 7 farmers were randomly selected. Randomized complete block design with 4 treatments and 7 replications was applied. The treatments were local feeding practices (T1), local feeding practices + 250 g^{-1}day dried *Sesbaniasesbania* leaf (T2) and local feeding practices + 300 g^{-1}daydried *Sesbaniasesbania* leaf (T3). The CP of dried *Sesbaniasesban* leaf was 23.34%. The DM, OM, CP, NDF, ADF and ADL intakes from the *Sasbaniasesban* leaf were significantly higher ($p<0.0001$) for T3 than T2. The average daily gain of Abergelle rams in T2 and T3 were significantly higher ($p<0.0001$) than T1 but similar in T2 and T3. The average daily gains were 28.98 g, 67.96 g and 75.71 g for T1, T2 and T3, respectively. Supplementation of dried *Sesbaniasesba*n leaf for Abergelle rams provide more profit

compared to unsupplemented rams. Though T2 and T3 given comparable result in terms of body weight gain, the marginal rate of return suggested that supplementation of dried *Sesbaniasesban* leaf with 250 g^{-1}day than 300 g^{-1}day for Abergelle rams provided better economic gain and therefore, T2 is recommended as biological and economical sufficient supplementary regime for Abergelle rams.

1. Introduction

Shortage of feed is the main constraint to livestock productivity in the arid and semiarid zones. A large proportion of the rift valleys grazing lands have dry seasons lasting from six to eight months each year (Lema et al., 1999). In Ethiopiacrop residues are the main feed resource for ruminants during the dry season. Animal performance on crop residues can be improved by chemical treatment and by supplementation. *Sesbaniasesban* and *Leucaenaleucocephala* a retropical forage legumes which are rich in protein and which have consequently become important in the world of research as a protein supplement for ruminants fed poor quality roughages such as maize Stover (Devendra, 1984).

Sesbania foliage crude protein (CP) content is generally above 22 % Dry matter (DM) and it can be higher than 30 % DM. Sesban foliage (stem + leaves) has also moderate to low cell wall content (NDF < 30% of DM) in most cases. It is one of the less tanniniferous forage tree legumes though some accessions are reported to have higher tannins (Kaitho et al., 1998a). Kaitho et al. (1998b) reported that the optimum levels of *Sesbaniasesban* supplementation in terms of live weight gain per gram supplement is 30% DM of total ration. Furthermore, Mekoya (2008) indicated supplementation of *Sesbaniasesban* at 30% of the ration (0.98% of body weight) improved basal and total feed intake and digestibility, growth rate and the overall reproductive performance of Sheep. Tibebu et al. (2009) noted that sheep that were fed the diet containing 300 g^{-1}kg sesbania foliage showed higher average daily body gain (103 g-1day) than the unsupplemented control group (75.6 g-1day). *Sesbaniasesban* could also substitute a concentrate when it accounted for up to 33 % of the mix (Wondwosen et al., 2013).

Therefore, in order to utilize effectively the cereal crop residues which constitute the principal source of fodder in Ethiopian as well as Tigrayregion there is a need of research to improve the nutritional value of the crop residues through supplementation. The objectives of this study were to evaluate the effect of dried *Sesbaniasesban* leaf supplementation on body weight gain of Abergelle sheep and to determine cost benefit analysis of the feeding regimes using partial budget analysis.

2. Materials and methods

2.1. Study area

The study was conducted on a farm at Tabia Shika Tekli in Tanqua Abergelle wereda, Tigray region, northern Ethiopia. The wereda is located at 13° 14' 06" N latitude and 38° 58' 50" E longitude. It is categorized as hot to warm sub-moist lowland (SM1-4) sub-agro ecological zone of the region with an altitude of 1300 to 1800 m above sea level and its mean annual rainfall ranges from 400 to 650 mm and the mean annual temperature ranges from 21 to 41°C.

2.2. Experimental feeds preparation and feeding

Sesbania leaf was collected from Agbe and Sele irrigation sites in wereda Tanqua Abbergelle of Tigray region, Northern Ethiopia. After collection, *Sesbaniasesban*leafwas air dried under a shed, packed in sacks and properly stored until feeding. The experimental rams were fed a basal feed on natural pasture and crop residues. The *Sesbaniasesban* leaf was weighed based on the required amounts and then supplemented to the experimental rams according to the respective treatments. The experimental rams were allowed 14 days of adaptation period

and the feeding trial was taken 90 days. The supplement was offered twice per day in equal portions at 800 and 1600 hrs.

2.3. Experimental animals and their managements

A total of 21 yearling intact male Abergelle sheep with similar body weights were randomly selected from farmers with each farmer provided three sheep. The experimental rams were ear tagged for identification and treated with Albendozole bolus 600 mg/head and Vetazinon 60% EC against internal and external parasites, respectively before commencement of the experiment.

2.4. Experimental design and treatments

In this experiment, randomized complete block design (RCBD) experimental design was employed. Farmers were used as blocking. The experimental rams were assigned to the dietary treatments randomly within the block. Each treatment was replicated seven times. The dietary treatments were:

T_1 = Local feeding practices
T2 = Local feeding practices +250g dried *Sesbaniasesbania* leaf
T_3= Local feeding practices+300g dried *Sesbaniasesbania* leaf

2.5. Data collection

The quantities of daily offered and refused supplements were recorded, and then the supplements' DM and nutrients intakes were calculated.

Supplement DM intake = (amount of supplement offered x DM% of supplement) – (amount of supplement refusal x DM% of supplement refusal)

Supplement nutrient intake = nutrient content of supplement offered – nutrient content of supplement refusal

The initial body weight, bi week body weight and final body of the experimental rams were taken. The body weight change was determined as difference between final and initial body weights and the average daily gain (ADG) was calculated using the following formula:

$$\text{ADG (g/d)} = \frac{\text{Final body weight (g)} - \text{Initial body weight (g)}}{\text{Number of feeding days}}$$

The costs of air dried *Sesbania sesbania* leaf, estimated purchasing and selling prices of the experimental rams were also documented for the determination of economic feasibility using partial budget analysis.

2.6. Laboratory analysis

From representative samples of the *Sesbaniasesbania*leaf offer and refusal DM, OM, Ash and N content were analyzed using the procedures outlined by AOAC (2005). The CP was determined by N content multiplied by 6.25. The NDF, ADF and ADL of the samples were analyzed according to Detergent method of analysis (Van Soest et al., 1991). The chemical analysis was done at Animal nutrition laboratory in Haramaya University.

2.7. Data analysis

The collected data were analyzed using the general linear model procedure of SAS version release 9.2 (SAS, 2008) and mean separation was done by Tukey's Studentized range (HSD) test. The statistical model used for the analysis of the data was:

$$Yij = \mu + ti + bj + eij$$

Where: Yij = response variable

μ = over all mean
ti = i^{th} treatment effect
bj = j^{th} block effect
eij = random error

3. Results

3.1. Chemical composition of supplements

The dried *Sesbaniasesban* leaf in the present study had higher CP and lower fiber fractions, but the *Sesbaniasesban* leaf refusals had comparatively lower CP and higher cell wall components.

Table 1
Chemical composition of dried *Sesbaniasesban* leaf.

Parameter	DM%	OM (% DM)	CP (% DM)	NDF (% DM)	ADF (% DM)	ADL (% DM)
Offered Sesbaniasesban leaf	93.41	89.68	23.34	25.85	17.47	5.52
Refusal Sesbaniasesban leaf	93.43	89.73	21.27	29.13	20.64	7.45

DM= dry matter; OM= organic matter; CP= crude protein; NDF= neutral detergent fiber; ADF= acid detergent fiber and ADL= acid detergent lignin.

3.2. Dry matter and nutrient intake from supplements

The DM, OM, CP, NDF, ADF and ADL intakes from the *Sasbaniasesban* leaf were significantly different ($p< 0.0001$) between rams in T2 and T3.

Table 2
Dry matter and nutrient intakes of Abergelle rams from *Sasbaniasesban* leaf.

	Treatments				
Intake (g/day/head)	T1	T2	T3	SEM	P- value
Supplement DM	-	227.66[b]	268.78[a]	0.148	0.0001
OM	-	204.16[b]	241.03[a]	0.133	0.0001
CP	-	53.26[b]	62.97[a]	0.031	0.0001
NDF	-	58.66[b]	69.10[a]	0.043	0.0001
ADF	-	39.59[b]	46.59[a]	0.031	0.0001
ADL	-	12.45[b]	14.61[a]	0.011	0.0001

[a,b]Mean in the same row with different superscript differ significantly ($P<0.0001$); T_1 = Local feeding practices; T2 = Local feeding practices + 250 g air dried *Sesbaniasesbania*leaf; T_3= Local feeding practices + 300 g air dried *Sesbaniasesbania* leaf; DM= dry matter; OM= organic matter; CP= crude protein; NDF= neutral detergent fibre; ADF= acid detergent fibre; ADL= acid detergent lignin; SEM= standard error mean and P value= Probability value.

3.3. Body weight gain

The total weight gain and average daily gain of Abergelle rams supplemented with T2 and T3 were significantly higher ($p<0.0001$) than those supplemented with T1.

Table 3
Body weight gain of Abergelle rams suplemented on *Sesbaniasesban* leaf hay.

	Treatments				
Parameters	T1	T2	T3	SEM	P Value
IBW (kg)	22.69	22.86	22.96	0.943	0.979
FBW (kg)	25.29[b]	28.97[ab]	29.77[a]	1.029	0.021
TWG (g)	2.61[b]	6.12[a]	6.81[a]	0.450	0.0001
ADG (g)	28.98[b]	67.96[a]	75.71[a]	5.005	0.0001

[a,b] Mean in the same row with different superscript differ significantly ($P<0.05$) or ($P<0.0001$); T_1 = Local feeding practices; T2 = Local feeding practices + 250 g air dried *Sesbaniasesbania* leaf; T_3= Local feeding practices + 300 g air dried *Sesbaniasesbania* leaf; IBW= initial body weight; FBW= Final weight body; TWG= total weight gain; ADG = average daily gain; SEM= standard error mean and P value= Probability value.

3.4. Cost benefit analysis

The partial budget analysis showed that supplementation of dried *Sesbaniasesban* leaf for Abergelle rams provided higher economic return compared to unsupplemented rams.

Table 4
Cost benefit analysis of supplementation of dried *Sesbaniasesban* leaf for Abergelle rams.

	Treatments		
Description	**T1**	**T2**	**T3**
Number of rams	7	7	7
Average purchasing price of rams (ETB^{-1}head)	720 .00	720.00	720.00
Driedssesbania leaf hay consumed (kg^{-1}head)	0	21.94	25.90
Cost for sesbania leaf hay (ETB^{-1}head)	0	219.40	259.00
Total variable (feed) costs (TVC) (ETB^{-1} head)	0	219.40	259.00
Gross income (ETB^{-1}head)	892.85	1364.28	1428.60
Total return (TR), (ETB^{-1}head)	172.85	644.28	708.60
Net return (NR), (ETB^{-1}head)	172.85	424.88	449.60
Change of total return (Δ TR)	0	471.43	535.75
Change of total variable costs (Δ TVC)	0	219.40	259.00
Change of net return, ΔNR (ΔTR-ΔTVC)	0	252.03	276.75
Marginal rate of return, MRR (Ratio)	-	1.15	1.07
Marginal rate of return, MRR (%)	-	115	107

T_1 = Local feeding practices; T2 = Local feeding practices + 250 g dried *Sesbaniasesbania* leaf and T_3= Local feeding practices + 300 g dried *Sesbaniasesbania* leaf.

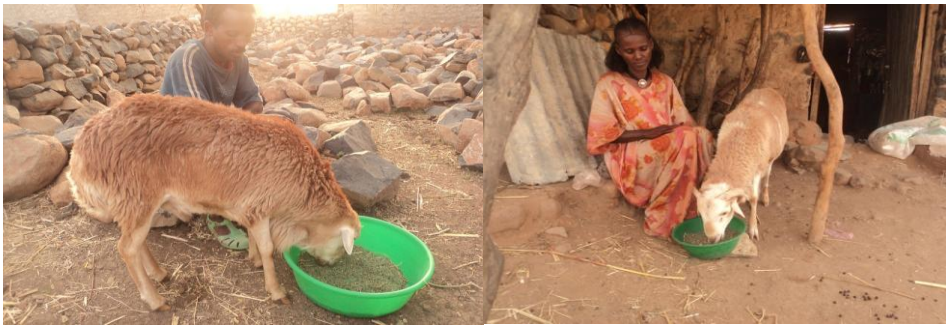

Fig. 1. Supplementation of dried *Sesbaniasesba*n leaf for Abergelle rams.

4. Discussion

The DM of *Sesbaniasesban* leaf in the present study is similar to the result reported by Hagos (2014) and the OM is comparable to the value reported by Etana et al. (2011). The CP in this study is lower than the values reported for *Sesbaniasesban* leaves by Alemayehu et al. (2015). The NDF, ADF and ADL of *Sesbaniasesban* leaf in this study are higher than the results reported by Etana et al. (2011) but lower than the values indicated by Alemayehu et al. (2015). The difference observed in chemical composition of *Sesbaniasasban* leaf between the present study and other studies might be due to variations in stage of harvesting, drying process, season and environment. The difference for DM, OM, CP, NDF, ADF and ADL intakes from supplements between T2 and T3 was attributed due to the higher level of *Sasbaniasesban*leaf offered for Abergelle rams in T3 which resulted greater DM and nutrients consumption compared toT2.

The supplemented Abergelle rams had higher total weight gain and ADG than control ones. Moreover, T3 had higher final body weight than T1. Though higher DM and nutrients intake in T3 than T2 was observed in this study, the body weight gain parameters were the same in T3 and T2. The ADG for Abergelle rams supplemented with

dried *Sasbaniasesban* leaf in this study is higher than 42 g for local sheep supplemented with 280 g/day DM *Sesbaniasesban* leaf (Hagos, 2014) but lowerthan103 g for sheep breed fed diet containing 300 g^{-1} kg sesbania foliage (Tibebu et al., 2009) and 86.11 g for Kaffa sheep supplemented with 300 g/day DM *Sesbaniasesban* leaf (Alemayehu et al., 2015). The Gross income, total return, net return and change of net return were in the order of T1< T2 <T3 from lower to higher values, respectively. The supplement (variable) costs and change of variable costs were greater in T3 than T2 and the marginal rate of return was superior for T2 compared to T3.

5. Conclusion

Supplementation of Abergelle rams with 250 g^{-1}day (T2) and 300 g^{-1}day (T3) dried *sesbaniasesban* leaf provided higher ADG than unsupplemented rams but similar in T2 and T3. Though T2 and T3 given comparable result in terms of body weight gain, the marginal rate of return suggested that supplementation of dried Sesbaniasesban leaf with 250 g^{-1}day than 300g^{-1}day for Abergelle rams provided better economic gain and therefore, T2 is recommended as biological and economical sufficient supplementary regime for Abergelle rams.

Acknowledgments

The authors are acknowledging to Tigray Agricultural Research Institute that funded the whole cost of this research.

References

Alemayehu, W., Getachew, A., Mengist, U., 2015. Supplementing rice bran, Sesbania (Sesbaniasesban) leaf and their mixtures on digestibility and performance of Kaffa sheep fed native grass hay. Int. J. Agr. Sci. Res., 4(3), 057-066.

AOAC (Association of Official Analytical Chemists), 2005. Official methods of analysis. 18th ed. Association of Official Analytical Chemists, Washington, DC.

Devendra, C., 1984. Physical treatment of rice straw for goats and sheep and the response to substitution with variable levels of cassava (Manihotesculente), leucaena (Leucaenaleucocephala) and gliricidia (Gliricidiamaculata) for ages. Nutr. Abst. Rev., 54(9), 487.

Etana, D., Adugna, T., Lars, O.E., Ragnarsalte, 2011. Nutritive value of morphological fractions of Sebaniasesban and Desmodiumintortum. Trop. Subtrop. Agroecosys., 14, 793 - 805.

Hagos, H., 2014. Effect of supplementation of concentrate mixture, dried local brewery by-product (Atella), Faidherbiaalbida and Sesbaniasesban on the performance of local sheep fed hay basal diet. MSc Thesis presented Haramaya University, Haramaya, Ethiopia. 36-50.

Kaitho, R.J., Umunna, N.N., Nsahlai, I.V., Tamminga, S., Bruchem, J.V., 1998a. Utilization of browse supplements with varying tannin levels by Ethiopian Menz sheep: Intake, digestibility and live weight changes. Agroforestry Systems, 39(2), 145-159.

Kaitho, R.J., Umunna, N.N., Nsahlai, I.V., Tamminga, S., Bruchem, J.V., 1998b. Effect of feeding graded levels of Leucaenaleucocephala, Leucaenapallida, Sesbaniasesban and Chamaecytisuspalmensis supplements to teff straw given to Ethiopian highland sheep. Anim. Feed. Sci. Technol., 72(3), 355-366.

Lema, B., Lambourne, L.J., Fana, T., 1999. Feeding value of sesbania and leucaena: utilization of research results on forage and agriculture by product materials as animal feed resource in Africa. In: Proceedings of the first joint workshop held in Lilongwe, Malawi, December 1988. PANESA/ARANAB, Addis Ababa, Ethiopia. 833.

Mekoya, A., 2008. Multipurpose fodder trees in Ethiopia; Farmers' perception, constraints to adoption and effects of long-term supplementation on sheep performance. PhD thesis presented to Wageningen University, Wageningen, the Netherlands.

Tibebu, M., Adugna, T., Tessema, Z., 2009. Feed intake, digestibility and body weight gain of sheep fed Napier grass mixed with different levels of Sesbaniasesban. Livest. Sci., 122(1), 24–29.

Van Soest, P.J., Robertson, J.B., Lewis, B.A., 1991. Methods for dietary fiber, neutral detergent fiber, and non-starch polysaccharides in relation to animal nutrition. Symposium: Carbohydrate methodology, metabolism, and nutritional implications in Dairy caltle. J. Dairy. Sci., 74(10), 3583-3597.

Wondwosen, B., Solomon, M., Yoseph, M., 2013. Effect of substitution of concentrate mix with Sesbaniasesban on feed intake, digestibility, body weight change, and carcass parameters of Arsi-Bale sheep fed a basal diet of native grass hay. Trop. Anim. Health. Prod., 45(8), 1677-1685.

How to cite this article: Tekle, D., Gebru, G., Hagos, H., Belay, S., 2016. Effect of on farm supplementation of dried *Sesbaniasesban* (L.) leaf on performance of Abergelle rams. Scientific Journal of Animal Science, 5(7), 322-328.