Journal of Biology, Agriculture and Healthcare
ISSN 2224-3208 (Paper) ISSN 2225-093X (Online)
Vol.4, No.23, 2014

Impact of Supplementing Blends of Crashed *Acacia Albida* Pods and Sesame Cake on Carcass and Non-Carcass Parameters of Goats

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ABSTRACT
The experiment was conducted to evaluate supplemental value of blend levels of crashed *acacia albida* pods (AAP) and sesame cake on carcass and non-carcass physiognomies of goats using twenty intact goats with initial body weight (BW) of 11.2 ± 1.2 (mean ± SD) kg. The study was used randomized complete block design (RCBD). Treatments were natural pasture hay (T_1) or with different levels of sesame cake (SC) and AAP (105 SC + 105 AAp, 84 SC + 126 AAp and 63 SC + 147 AAP g/day for T_2, T_3 and T_4, respectively). The experiment had 90 days feeding period for evaluation of carcass at the end. Hot carcass yield and dressing percentage were the same in case of T_3 and T_4. Slaughter body weight and the rib eye muscle areas were similar to all the supplemented groups of goats. Therefore, grounded AAP can replace sesame cake up to half of the ration of goats for carcass improvements.
Key words: Acacia albida, Sesame cake, Carcass, non-carcass.

INTRODUCTION

Ruminant production is basically a function of nutrition, health, genetics, climate and management among which nutrition plays an important role (Seyoum *et al*., 1996). Level of nutrition is known to influence carcass composition (Taylor and Murray, 1991). Dressing percentage increases with increasing proportions of concentrates in the ration. High percentages of crude fiber and roughage with low digestibility that contribute to low dressing percentages (Payne and Wilson, 1999). Balance of absorbed amino acids is the most important factor affecting the efficiency of protein utilization for production of meat and other products (Cole and Van Lunen, 1994). Lean tissue deposition is maximizing by optimal protein supply (McDonald *et al*., 2002). The major available feed resources in Ethiopia are natural pasture, crop residues, aftermath grazing, agro-industrial by-products, to a lesser extent improved pasture and forage crops (Seyoum and Zinash, 1989).

Acacia. albida pods (AAp) have high nutritive value (Tanner *et al*., 1990). A report by Niguse (2014) indicated that dray AAP has 17.8% crude protein (CP). The same author also suggested that higher CP and lower crude fiber (CF) content of AAP may be important to replace high cost protein supplements such as sesame cake which contains about 38% CP. 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 with sesame cake on carcass and non-carcass characteristics of goats.

MATERIALS AND METHODS

Study Site

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

Treatment diets

Grass hay was used and offered ad libitum to all the animals in the treatments. Dray AAP were bought from farmers of the area and crashed. The hay was chopped to an approximate size of 2.5 cm stored and in sacks. Sesame cake was crashed well and mixed with the already grounded AAP based on levels set for each mixture treatments. The animals were offered supplements on DM basis in two halves daily at 08:00 h and 16:00 h based on the ratio in the treatment diets.

Table 6. Experimental treatments

Treatmes	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

Carcass evaluation

At the end of feeding time (90 days) all animals were fasted overnight, then weighed and slaughtered for carcass evaluation. The goats were slaughtered by severing the jugular vein with a sharp knife. The blood was drained in to bucket and weighed. During slaughtering blood was collected into plastic buckets and weighed. The esophagus was tied off close to the head to avoid leaking of gut contents. The slaughtered animals were flayed and the legs were cut at the carpal and tarsus joints and the skin was separated from the leg by making circular cuts around the fetlock joints. Then the weight of skin without legs, weight of head without tongue, and weight of legs were measured and recorded. The combined weights of lung, trachea, esophagus and heart were measured and recorded. The weight of liver, gall bladder with bile, kidney, tongue, spleen and pancreas, kidney with its fat were weighed. The entire alimentary tract (gut) was removed and weighed with and without gut contents. The gut content was removed by flushing water using plastic tube. The weight of the gut contents were measured by difference. The empty body weight was calculated by subtracting the weight of the alimentary tract contents from the fasted body weight. The dressed carcass which was obtained after the removal of head, feet, skin, viscera and offal was also weighed separately.

The cross-section of the rib-eye (*longissmus dorsi*) muscle was traced on transparency paper between the eleventh and twelfth ribs (Galal *et al*., 1979) of the left half side of the carcass after freezing and the area was measured using planimeter. The value for the rib-eye area was taken as the average of the two sides of the ribs.

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.

RESULT AND DISCUSSION

Carcass Parameters

Carcass characteristics of the experimental goats are given in Table 2. The supplemented groups were significantly higher ($P < 0.05$) in slaughter body weight compare to the supplemented group. There was no observed significant difference ($P > 0.05$) among the supplemented groups. Empty body weight of unsupplemented group was significantly lower ($P < 0.05$) compared to the supplemented groups (T_3 and T_4). The carcass weight of supplemented groups were significantly higher ($P < 0.05$) compared to unsuplmented group. Among the supplemented groups T_3 and T_4 were not significantly different ($P > 0.05$). Dressing percentage of T_3 and T_4 were not significantly different ($P > 0.05$) compare to each other. The rib eye muscle areas of supplemented groups were not significantly different ($P > 0.05$) compared to each other.

In line with the result of this study, an increased slaughter weight by supplementation had also been reported from other studies. Bimrew, (2008) revealed that daily body weight gain that highly affects carcass weight increased proportionally to the increase in CP intake of experimental sheep. Goats under semi-intensive scheme had significantly higher slaughter weight than goats under the extensive scheme (Atti *et al*., 2004). The hot carcass weight acquired the same trend like that of dressing percentage of slaughter weight basis. According to Devendera and Burns (1983), dressing percentage is affected by plane of nutrition and other factors such as breed, age and sex. Pralomokarn *et al.* (1995) also indicated that dressing percentage increased as feed intake increased. The reason for the lack of significant differences in different cases of the carcass components indicating as there is no reasonable impact between the treatment diets of this study.

Table 2. Carcass characteristics of goats fed on native hay basal diet and supplemented with mixtures of grounded *Acacia albida* pods and sesame cake.

Parameters	T_1	T_2	T_3	T_4
SBW (kg)	12.7^{b}	15.2^{a}	15.3^{a}	16.0^{a}
EBW (kg)	7.6^{c}	10.1^{bc}	12.4^{ab}	13.9^{a}
HCW (kg)	5.2^{c}	7.0^{b}	8.0^{a}	8.5^{a}
FQCW (kg)	2.9^{b}	3.9^{a}	3.9^{a}	4.0^{a}
HQCW (kg)	2.3^{c}	3.4^{b}	3.7^{ab}	4.6^{a}
Dressing percentage:-				
SBW	40.9^{c}	47.0^{b}	50.3^{a}	53.1^{a}
EBW	68.4^{a}	72.3^{a}	62.1^{b}	61.2^{b}
FQCW to HCW	55.8^{a}	53.4^{ab}	55.6^{ab}	47.1^{b}
HQCW to HCW	44.2^{b}	46.6^{ab}	48.1^{ab}	54.1^{a}
REMA (cm^2)	4.8^{b}	9.7^{a}	10.1^{a}	10.4^{a}

[a,b,c] Means with different superscripts in the same row differ significantly; EBW = empty body weight; FQCW= fore quarter carcass weight, HCW = hot carcass weight; HQCW= hind quarter carcass weight, REMA= rib-eye muscle area; SBW = slaughter body weight; T_1 = hay ad libtum; T_2 = hay ad libtum + 63g DM sesame cake + 147 g DM Acacia albida pods (AAp); T_3 = hay ad libtum + 84 g DM sesame cake + 126g DM; T_4 = hay ad libtum + 105 g DM sesame cake + 105 g DM.
Dressing percentage on empty body weight basis was significantly higher ($P < 0.05$) in unsupplmented group compared to T_3 and T_4 and this was due to the higher gut content. Dressing percentage values on the empty body weight basis were higher than that of slaughter weight basis. Nutrition influences dressing percentage through variation in weight of gut contents, or variation in actual organ weight (Warmington and Kirton, 1990). Similarly Shaljhal (2000) reported that gut fill could constitute 20 -22% of live weight.

Compared to the unsupplment group supplemented groups had significantly higher ($P < 0.05$) rib eye muscle area (REMA). Supplemented groups were not show significant differences ($P > 0.05$) compared to each other. Sendros (1993) reported a mean value of 8.2 cm^2 rib eye muscle area for both supplemented and unsupplemented sheep and a fat thickness of 3 mm and 4.7 mm. Moreover, Ulfina *et al*. (1999) reported a significant effect on omental and kidney fat, back fat thickness and rib-eye muscle area for a pre-market supplementary feeding of old Horro ewes. More intake of dietary protein from high protein diet resulted in greater values for depth and width of rib-eye muscle (Shahjalal *et al*., 1999).

Non - carcass components
The non- carcass components obtained from the slaughter of the goats kept on grass hay based feeding and supplemented with mixtures of grounded AAP and sesame cake are presented in Table 3 below. In the present study most of the non-carcass component significantly increased ($P < 0.05$) with the increase of sesame cake. But in case of empty gut there was significant difference ($P < 0.05$) between supplemented groups. In this study, changes of the different internal organs were difficult to decide ether it was due to the treatments diets or other impacts. Most of these organs are related with basic productive and physiological activities of the body and are early maturing and as such might not be greatly impacted by plain of nutrition. Riley *et al.* (1989) described that differences in the weight of internal organs and other body parts such as head, skin and feet could be due to the metabolic differences among different age groups, breed and sex.

Table 3. Non - carcass components of Abergelle goats fed on native hay basal diet and supplemented with inclusions of grounded *Acacia albida* pods and sesame cake.

Parameters	T_1	T_2	T_3	T_4
Blood (g)	466^c	613^b	720^a	812^a
Heart (g)	176^b	158^b	157^b	256^a
Head & tongue (kg)	1.1	1.3	1.3	1.2
Lung, trachea & esophagus (g)	221	249.8	264	249
Liver & spleen (g)	247^c	292^{bc}	310^{ab}	356^a
Reproductive organs & urinary bladder (g)	186	160	135	160
Kidney with its fat(g)	75^b	81^{ab}	93.8^a	99.6^a
Empty gut (kg)	1.1^b	1.7^a	1.5^a	1.5^a
Gut content(kg)	2.7^a	1.7^b	1.6^b	1.4^b
Skin (kg)	1.1^b	1.3^{ab}	1.3^{ab}	1.4^a
All distal legs (g)	323.0	336.0	390.0	360.8

[a,b,c] Means having significantly different; T_1 = hay ad libtum; T_2 = hay ad libtum + 63g DM sesame cake + 147 g DM Acacia albida pods (AAp); T_3 = hay ad libtum + 84 g DM sesame cake + 126g DM; T_4 = hay ad libtum + 105 g DM sesame cake + 105 g DM.

Correlation of slaughter weight, carcass weight and other carcass related components
In this study, all the carcass components were positively correlated with each other. The empty body weight of the goats was less correlated compare to the others. Gut content was negatively correlated to all carcass components in this study.

Table 4. Correlation between slaughter body weight, hot carcass weight, dressing percentage, empty body weight and gut content of goats.

	SBW	HCW	DPSW	REMA	EBW	GCW
SBW	1.0					
HCW	0.92***	1.0				
DPSW	0.72***	0.93***	1.0			
REMA	0.81***	0.88***	0.83***	1.0		
EBW	0.67***	0.75-***	0.71***	0.63***	1.0	
GCW	-0.74***	0.87***	-0.88 ***	-0.90 ***	-0.65***	1.0

* = (P<0.05); ** = (P<0.01); *** = (P<0.001); DPSW= dressing percentage by slaughter weight; EBW= empty body weight; GCW= gut content; HCW=hot carcass weight; SBW=slaughter body weight.

CONCLUSIONS

1. Generally, the grounded *acacia albida* pods and sesame cake supplementation improved the carcass components of goats than the control group.
2. Mixtures of grounded *acacia albida* pods and sesame cake did not show more differences with the supplemental diets on the improvement of carcass components.
3. Grounded *acacia albida* pods can replace sesame cake up to half of the ration of the goats in carcass improvements.

ACKNOWLEDGEMENTS

First, I would like to thank the Almighty God for giving me health, strength and protection throughout my study. Secondly I would like to express my special and heartfelt thanks to Naedier Adiet Wereda youth office for organizing of this study.

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